IDENTIFICATION PROGRAMME FOR POISONOUS AND HALLUCINOGENIC MUSHROOMS OF INTEREST TO FORENSIC SCIENCE.

A THESIS

presented by

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BEWARE OF MUSHERONS, MOCH PURSLANE,

GOURDES, AND AL OTHER THINGES,

WHICHE WYLL SONE FUTRIFIE.

Thomas Elyot

The Castel of Helth (1541)

PSILOCYBE SEMILANCEATA
Psilocybe

Psilocybe semilanceata collected

by the author.

Original watercolour

by R. Furlong.

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SUMMARY.

An efficient differential diagnosis of mushroom poisoning is essential for a successful treatment of this type of intoxications.

An integrated multidisciplinary approach to the identification of poisonous and hallucinogenic mushrooms by a completely interractive, - on-line - identification programme is proposed.

Twenty four characters showing 127 possible states have been chosen to define each taxon included in the data bank. These characters, microscopical, ecological, medical and chemical are described and discussed.

Essential information is retrieved with each taxon identified, as well as a complete up to date bibliographic record.

223 poisonous or suspect species of mushrooms are included in the data bank which contains a total of over 30'000 data. A reference collection of 223 Scottish species of suspect mushrooms has been built and used to check, complement or expand the microscopical, ecological and chemical data.

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I. INTRODUCTION.

With the advent of modern scientific and technological developments, areas once confined to religion, folklore, art and even gastronomy have become the concern of science. The study of higher fungi and their toxicology are two fields which have been neglected until recent years. Only in the last two decades has substantial systematic research warranted the application of highly sophisticated equipment in the evaluation, identification and diagnosis of mushroom poisoning. However, this scientific approach in no way denigrates the value of historical records obtained from folk and medical sources, it merely renews and increases the potential for pure research by suggesting new horizons. Information acquired from such sources should be thoroughly tested and stored as a basis for a completely integrated approach to the study of the mycotoxicology of the higher fungi.

The present thesis is a modest contribution to what will hopefully be a major field of research and development. It has been helped by recent extensive contributions which, although they do not introduce new concepts, are a wealth of recorded historical, medical and scientific information (Arietti and Tomasi, 1969/1975; Flammer, 1980; Gérault, 1976; Heim, 1963/1978; Lincoff and Mitchel,

1977; Rumack and Salzman, 1978). The success of these reports may be attributed to the fact that the information is concentrated in monographic form, rather than diluted in chapters included in more general works. However, they also fail because the subjects are presented in a way biased towards the individual authors' speciality, together with all its specialised jargon. This makes diagnostic keys difficult to follow and identification becomes a difficult task to the practising scientist, whether he is a physician, toxicologist, forensic scientist, mycologist or a naturalist.

Information sciences and electronics have given the scientific community, in the form of computers and microprocessors, a very potent tool for data storage, fast retrieval and up-dating of information. These new concepts have to be applied if one wants to give a wider sector of the scientific community access to the available up to date information. For a meaningful use of these facilities, facts have to be consistent and complete with respect to the characters used for information retrieval.

An efficient and integrated approach to the identification of poisonous higher fungi is proposed, taking full advantage of modern computer services.

1.1 Mycotoxicology of the Higher Fungi.

Although mushrooms have been eaten since well before recorded history, and the toxicity of some of them has been known from as far back as Greek and Roman times, the methodic and scientific study of mycotoxicology only started at the end of the eighteenth century.

Following a study of the toxicity of certain species of mushrooms on animals, Paulet (1793) described a number of toxic species, gave warnings on how to prevent accidents and also suggested possible means of treating poison-cases. He was soon followed in the nineteenth century by a whole generation of scientists, such as Elias Fries (1794-1878) in Uppsala, who established the basis of modern taxonomy for the higher fungi, Mathieu J. B. Orfila (1787 - 1853) who.in 1813, at the age of 26, pioneered the era of a new science, toxicology, in his "Traité des poisons". Finally, chemists who, with Schmiedeberg and Koppe (1869), isolated muscarine thus opening the door to a century of research on Amanita muscaria which culminated in 1954 with the synthesis of muscarine by Eugster and Waser.

In the 1920's and thirties, the number of general works, treaties and theses on poisonous mushrooms flourished. This went someway towards establishing the

reliability of folklore data and still provides a major source of information on toxic fungi (Sartory and Maire, 1921; Martin-Sans, 1929 and Henry, 1931; to name but a few). With the exception perhaps of Heim's general work in 1963, interest in mycotoxicology seemed to wane, and only specific aspects of research, mainly by three major groups headed by the Wielands in Heidelberg, Eugster in Zürich and Hofmann in Basle, continued (Lynen and Wieland U., 1937; Wieland H. and Hallermayer, 1941; Wieland T. and Wieland O., 1972; Wieland T. and Faulstich, 1978; Waser and Eugster, 1954; Müller and Eugster, 1965; Good et al., 1965; Catalfomo and Eugster, 1970; Hofmann et al., 1958; Hofmann et al., 1959).

Following advancements in medicine, fungal biochemistry, modern taxonomy and toxicology accompanied by a parallel development of a general interest in wild mushrooms as food or, in some cases, as a drug used for recreational purposes, a number of textbooks have appeared. Of particular interest are the publications of Arietti and Tomasi (1969/1975), Lincoff and Mitchel (1977), Heim (1963/1978), Rumack and Salzman (1978) and Flammer (1980). Theses by Gérault (1976) on the higher fungi and their intoxications and by Bornet (1980) on intoxications due to mushrooms other than Amanita phalloides are also of importance. These books represent today's

state of the art. Lincoff and Mitchel (1977) and Flammer (1980) with the help of mycologically or medically orientated identification methods set out an efficient and logical, albeit traditional, approach to the management of emergency toxicology in the case of mushroom poisoning. One major drawback is that this scheme of diagnosis and treatment requires a broad specialist knowledge of mycology/anatomy, botany, chemistry and/or medicine. Such broad training would only be feasible if the majority of toxicological emergencies arose from this particular type of poisoning, which is not the case. In fact, it would be bad management to induce laboratory directors, in charge of toxicological centres, to divert their experts' normal priorities towards such a marginal problem.

Statistics on mushroom poisoning are scarce, scattered and most of the time not reliable. To illustrate the argument one need only look at enquiries made to the British National Poisons Information Centres (Moffat, 1980). In 1977, 32'892 enquiries were processed, of which only about 10 % concerned plants and insect bites. Certainly less than 10 % of those concerned mushrooms with for instance, only 16 such enquiries for Scotland (Margot, 1977). Most of these 16 reports concerned small children who ate unidentified mushrooms and were sent to hospital by worried parents, rather than because poisoning

symptoms developed.

Over a thirty year period (1920 - 1950), Ramsbottom (1953) reported 39 fatalities due to mushroom poisoning in England and Wales. This number is in marked contrast to the total number of deaths caused by poisoning in England and Wales in a single year (1975). These latter 2984 deaths mainly involved manufactured drugs (Moffat, 1980).

A more worrying example is highlighted in a recent thesis by Bornet (1980). In Switzerland, where there is a control organisation of mushroom collections and a fairly extensive network of specialists trained in the identification of mushrooms (VAPKO : Vereinigung der amtlichen Pilzkontrollorgane), there were only 806 calls to the "Centre Suisse d'information toxicologique" in Zürich relating to mushroom intoxications between 1966 and 1978 out of a total 100'554. Of these 806 calls, 134 concerned poisoning with Amanita phalloides and related species, 87 suspected mushroom poisonings were found to be unconnected with fungi and 342 cases concerned unidentified species. Of the remaining 243 calls, mushroom identification was conclusive in all but 15. In one case of intoxication involving a whole family, the parents and child were sent to different hospitals and the child subsequently died. The parents were found

to have been intoxicated with Amanita phalloides (Death Cap), whereas the death of the child was attributed to Armillaria mellea (Honey Fungus), a perfectly edible mushroom under usual circumstances. Bornet painted a bleak picture about the value of the identification of mushrooms invòlved in past poisoning cases and their use in statistics. He judged that only approximately one third of the identifications were acceptable, although some of his criteria for acceptance he considered, in his own words, "parfois subjectifs et discutables" *.

These reports are sufficient to highlight the artificiality of such well thought-out books and leave no alternative but to have at hand a number of specialists (i.e. a mycologist, an analytical chemist, a toxicologist, a kidney or liver specialist, etc) who can be contacted in an emergency to help the practitioner.

Whilst such an arrangement might lead to a correct identification of the problem, it might also introduce an unacceptable and perhaps fatal time delay before diagnosis is complete and treatment instituted.

The traditional approach to the identification of mushrooms usually incorporates the use of diagnostic keys, that is the identification is obtained after a set of questions

* "sometimes subjective and debatable"

has been answered. These are in a sequential order, and at each step two (dichotomous keys) or more (polytomous keys) answers are possible. Each answer, in turn, leads to a new question which has two or more answers, etc until a species is diagnosed. The alternative parts of questions in keys are called leads because they lead from one question to another. Each fundamental item of information in a key is called a character. Characters, when observed, are seen to show various states (or values or attributes). For example "colour" is a character and "red", "blue", "yellow", etc are each one state of this character. In an hypothetical key an answer of "red" to the question "What is the colour of the cap?" will lead after x steps to the identification of Amanita muscaria, whereas "green" would lead to Amanita phalloides after y steps.

Should one of the characters be missing near the start of a key an identification becomes impossible and the problem remains in its entirety.

Another problem arises from possible errors made during the use of the keys by identifying characters not clearly defined in a given sample. If the error occurs near the beginning of the key, the consequences may be critical: the wrong lead will be followed and the user will continue in the wrong part of the key. If the above

example is used, the colour of a dry or old cap might be identified as brown, instead of green, thereby leading the user to a totally wrong and potentially dangerous conclusion. The fact that an answer is necessary at each step of the key is a serious drawback because samples provided in emergency toxicology are rarely complete and in good condition. Therefore every chance exists that the keys either cannot be used, or worse, can lead to the wrong answer with all the implications that follow.

On the other hand, with the increased interest in natural food resources and also in hallucinogens by a marginal sector of the population, it is clear that cases of accidental intoxication will increase, as has been demonstrated lately (Watling, 1980; Short et al., 1980) Detailed information is therefore required on the identification of the mushrooms concerned, whether they are submitted for analysis as large and fresh samples or, more likely, as old fragments such as from stomach washings or meal remnants.With respect to the latter situation, the identification of the mushroom and any information on the pharmacokinetics of any toxins present would be of great help to the physician and clinical chemist in deciding the prognosis of the patient.

CHAPTER II : REQUIREMENTS FOR AN IDENTIFICATION PROGRAMME

II. REQUIREMENTS FOR AN IDENTIFICATION PROGRAMME.

From the above introduction, it is clear that a mass of information exists which, if made accessible to the clinician, will lead to a proper management of mushroom poisoning cases. However, because the problem is marginal in the context of the total number of poisoning cases, it cannot be expected, at present, for this information to be made available as quickly and efficiently as it should be. As a first step towards a successful treatment, it is necessary to establish an efficient mushroom identification method initially using existing data, but capable of expansion to include knowledge of toxic fungi accumulated by studying certain limited aspects of the chemistry, pharmacology and toxicity of certain species or genera.

2.1 Requirements for an Efficient Identification Method.

A list of suspect and known poisonous mushroom species should be recorded based upon information derived from historical and medical sources as well as the state of knowledge of each species from the point of view of their taxonomy and chemistry. A number of fundamental items of information should then be selected

from the data matrix : these are the diagnostic characters. They should fulfil certain criteria so as to offer a high degree of usefulness for the purpose of identification. These criteria are governed mainly by their ease of observation and the information content of the character used. This latter concept is not absolute and has to be weighed in relation to the objects to be identified or taxa under study. (sing. "taxon" = taxonomic group of any rank. Every individual fungus is treated as belonging to a number of taxa of consecutively subordinate ranks, among which the rank of species is basal (Hawksworth, 1974)).

These characters and their states, for obvious reasons, should show as little variation within taxa as possible and the states should be mutually exclusive. It is also essential that any selection and sequence of characters can be used in the identification process, because the material under investigation may be incomplete or fragmentary. Furthermore, the user might have a limited knowledge of only certain types of characters used in the key, or might even want to limit himself to the use of these characters.

If the material, or the user, cannot generate enough characteristic information to reduce the identity

of a specimen to a single taxon, a short list of taxa should be obtained which might just provide the information required in an emergency. Keys where any selection of characters may be used, and in any order, are called <u>multi-access</u> keys (Pankhurst, 1978). This is the first requirement for an efficient identification system independant from the data matrix itself.

Another requirement is that the identification should not necessarily depend on the correct observation of all the characters; that is, some errors should be tolerated. Some extremely useful characters might be difficult to observe or untypical of a given taxon under some extreme circumstances and might be genuinely mistaken. Rather than have no identification due to a mistaken observation, the computer can be told what number and which characters are permissible as disagreements. This is a precaution against the effect of erroneous characters in the specimen description called variability limit by Morse (in Pankhurst, 1978). That means that the data observed are compared with all the sets of data of the taxa included in the data bank and identified with whichever of these agrees exactly, or is the most similar when no agreement is found.

Conventional multi-access keys produced on punched cards fit these requirements and have been used in a

number of fields. However, they suffer some major drawbacks which rule them out of the present project: they are not easy to publish, they are expensive, bulky and fragile. Furthermore, they are slow to use and not easy to update.

These drawbacks illustrate further requirements for an efficient system of identification in the case of mushroom poisoning. The system should be fast, that is, the time scale should be in terms of seconds rather than minutes or even hours as is common with traditional systems. It should also be readily updated and corrected without involving major alterations to the whole system. The cost/benefit ratio should be low, so that the system can have a wide application. Finally, and above all, such an identification should be reliable and accurate as far as the matching or identification process is concerned. For this reason, the data should be carefully and thoroughly tested and checked so that, provided the observed data is accurate, there is a high degree of certainty that the results are strictly accurate.

In short, the system should not be intelligent, but capable of making complex decisions and matchings in a matter of seconds once all the necessary data has been provided. Computers are ideal tools for such an identification scheme once the factual data is complete and

consistent, in that they can produce accurate and fast identifications. Computers are available to most hospitals, universities, toxicological centres and forensic science laboratories and this justifies their use in such fields as mycotoxicology.

In order to have an identification system as foolproof as is humanly possible, a number of requirements should be further included into the system, bearing in mind computer capabilities and programme logic.

The main and first requirement is that it should be easy for the user to handle. He should not have to code the information collected but should be able to use his own natural language to communicate with or command the machine. The user should also be free to use and choose any character at random included in the programme and finally to select how many and which characters are permissible as disagreements if no perfect match is found.

These facilities are offered by a completely interactive or on-line identification programme. The user has a computer terminal, in the case of a large time-sharing computer system, or a desk-top microcomputer with a keyboard for typing instructions, and a printer or a visual display unit (VDU) for obtaining the answers in the form

of a dialog.

2.1.1. Summary.

The requirements for an efficient management of mushroom poisoning through the identification of the causative agent cover two basic aspects: the data matrix and the key system.

The data matrix is a series of descriptions of the taxa. The descriptions have to be complete and accurate if an automatic system is to be used. From that, a number of characters, which are easy to observe and/or have a high information content, have to be selected to be used in the identification process.

The key system must provide a multi-access facility, be fast and easy to update. It should also be reliable, accurate, have a low cost/benefit ratio and a language understandable to the user. Finally it should be capable of accommodating a limited amount of incorrect information in such a way that the whole system does not fail.

An on-line identification programme is offered here as a tool fulfilling all these requirements.

2.2. The Data Matrix.

Before any computing, or before data can be coded in a format or in a way which is useful for identification, the data must be collected. It may be obtained by a literature or field research, or by analytical means. The total data can be conveniently divided into two partially overlapping categories: that of the data retrieval and the diagnostic data.

2.2.1. Data Retrieval.

Part of the data matrix, the data retrieval, should consist of information one would wish to retrieve in an emergency. Experience and good sense has shown that the following information is required in most poisoning cases:

- identity of the poisonous species
- its frequency of occurrence
- the toxin involved
- the favoured treatment
- bibliographic information
- the relative toxicity
- the geographical distribution.

2.2.1.1. Identity of the Poisonous Species.

As in most taxonomical systems, there is no universal agreement on the identity of families, genera and species. Different taxonomists use different names for identical species. For example, the genus Pholiota is included in the family Cortinariaceae by British authors (Dennis et al. 1960) whereas it is included in the family Strophariaceae by their American (Singer, 1975) or German-speaking counterparts (Moser, 1978); the genus Hypholoma (Moser, 1978; Dennis et al. 1960) is called Naematoloma by American authors (Singer, 1975). Similarly, the species Psilocybe wassonii described by Heim (1957) is called Psilocybe muliercula by Singer and Smith (1958), and so on. These intricate inconsistencies warrant the use of a taxonomical reference, which is used throughout the present work unless otherwise stated. That reference is the "Check List of British Agarics and Boleti" (Dennis et al. 1960) and its subsequent amendments and complements (Orton, 1964; 1969; 1972; 1976 a; 1976 b; Watling, 1967; 1970; 1972; Henderson et al. 1969; Orton & Watling, 1979; Rayner, 1974).

2.2.1.2. Frequency of Occurrence

It may be important to know just how common a given species may be in order to assess if that species is likely to be involved in a large scale poisoning such as described by Grzymala (1957) for Cortinarius orellanus which occurred in Poland in 1952. From such information it should also be possible to assess to a certain extent the danger to public health and safety. The frequency of occurrence of mushrooms is a very difficult factor to determine due not only to the lack of extensive records but also because of variability associated with differing weather conditions, geographical location and other ecological factors. With all its limitations, a frequency of occurrence in Great Britain is included in the data matrix as a guide or an estimate. It arises from information gathered by the British Mycological Society (Rayner, 1980) during the forays of autumn 1958 to spring 1976. Frequencies are expressed as the number of localities at which the species was found, determined as a percentage of the total number visited, i.e. 253 locations. It provides a fairly good and, at least, objective estimate of the relative frequency of species included in the British Check List (Dennis et al. 1960). Despite its limitations, this is likely to be preferable to the rather subjective evaluations

to be found in traditional fungal floras. In such a survey it is natural that easily identified, or widely known species will appear to be more frequent than they are, whereas less easily identified species may appear to be rarer. Furthermore, since the forays take place each year in May and September, the frequency of species that fructify mainly during these two months will be overestimated. This frequency value may also be affected by how the sporophore is distributed, that is, it may grow in high densities in a limited number of areas and show a lower frequency (i.e. less important toxicologically) than another mushroom which is widespread throughout the country, but producing only a small amount of sporophores. It should be clear here that the reverse is true, i.e. that a high density species is more likely to be involved in a case of mass poisoning such as experienced in Poland in 1952 (Grzymala, 1957), although the frequency value may tend to indicate otherwise. Mycologists, throughout Britain, are recording data, which, as time goes on, may prove more accurate and will replace the present values where adjustments prove necessary.

2.2.1.3. Toxins.

The identity of the toxins is to be found in both the data retrieval and the diagnostic data. It is given here for completeness and to help the non-chemist. This repetition is necessary because the key is intended for specialists in widely different fields. The taxonomist, or clinician identifying a poisonous mushroom will also want to know the identity of any toxin associated with that particular mushroom. If the toxin proves to be unknown, the specimen should be forwarded to an analyst/ chemist/toxicologist in order that the chemical entity responsible for intoxication can be identified and its toxicity established. This information can eventually be used to extend the data system.

2.2.1.4. Favoured Treatment.

For practical purposes, the fourth data to be retrieved is a short outline of the treatment generally accepted as best at the time of presentation of this thesis.

In some cases, where the toxin is well known, such as muscarine, the treatment is simple and an antidote to muscarine can be administered. In other cases, the

toxin is either unknown or treatment for a particular poison has not been firmly established, usually because of a lack of knowledge of what happens in the body when such a toxin is ingested. Extensive research is still necessary if the efficient management of all mushroom intoxications is to be achieved.

2.2.1.5. Bibliographic Information.

While the present programme has some tolerance for errors, the results have still to be checked by comparison with full descriptions, illustrations, or, better even, with preserved or voucher specimens. Therefore three bibliographic references are included which allow the user to find complementary information.

The three texts selected are reviews, or the most complete work on a given aspect of a certain species. When modern relevant information is found, preferably in English and of easy access (i.e. in widely available publications),it is selected and preferred to original work published in different languages and in sometimes obscure journals.

The first reference gives a complete taxonomical description of the species, that is to say it includes

macroscopical features, smell, taste, microscopical features, ecological data and, in most recent publications, herbarium references. Often a comment describes and discusses differences between closely related taxa.

The second reference deals with the isolation and identification of the toxin(s) where known, or gives a survey of what is known about the chemistry of the given species under investigation. It does not necessarily relate to the species itself, but to the toxin known or suspected to be present in the species.

Lastly, the third reference gives detailed information on the symptoms of the intoxication and its treatment or proposed treatment. As before, the text relates to the toxin(s) and not necessarily to the species under investigation.

2.2.1.6. Relative Toxicity.

An assessment of the relative toxicity of described species is given. This assessment is purely informative and cannot be measured in any real terms. It is based on medical records which indicate that some mushrooms provoke often fatal intoxications, as is the case of Amanita phalloides, estimated to be at the source of

75 to 90 % of all deaths due to mushroom poisoning. Some are dangerous, but rarely fatal such as Entoloma sinuatum, some rarely dangerous such as Agaricus xantho-dermus (no death reported, this species is eaten without ill-effects by many), or even only upsetting under certain circumstances, such as Coprinus atramentarius (conditional intoxication in the presence of alcohol). How to distinguish the degree and severity of intoxication is not clear and is based on historical repute. Until proper statistics exist on the concentration of the different toxins in the fungi, the frequency of occurrence in a given area and the reliable identification of all mushrooms involved in poisoning cases, this relative estimation of the toxicity will remain an educated guesswork (i.e. very subjective).

2.2.1.7. Geographical Distribution.

The distribution of European species is well documented and it is even possible to distinguish North or South European flora or mountain flora. This is true too for North American species, but otherwise records are scattered, sometimes inaccurate and in any case incomplete. The indication of a geographical distribution in this thesis is as known at the time of filing of the data, and should be regularly up-dated.

2.2.1.8. Discussion and Example.

The final format of the retrieval data has been modified and completed after discussion and consultation with interested sectors of the scientific community. Extensive testing has shown that all the necessary data is retrieved and that it provides an efficient service for use in an emergency situation providing an accurate diagnosis of the source of the intoxication is established.

Figure 1 illustrates the form in which the data is retrieved. It is all condensed in a maximum of six lines of text. The species is identified by its generic name Psilocybe, specific name semilanceata and the taxonomic authors who described and named the species (Fr.)Kum. (Fr. = Fries who described first Agaricus semilanceatus, name altered to Psilocybe semilanceata by Kum. = Kummer; who elevated Psilocybe to the rank of a genus). It is followed by six lines of text giving all the necessary information to deal with an emergency case involving this mushroom.

Figure 1: Data retrieval's presentation: an example.

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POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
PSILOCYBE SEMILANCEATA (FR)KUM UK FREQ 5.3  PSILOCYBIN/INDOL HALL.
PROPOSED TREATMENT PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT
BEHAV,QUIET POSSIB DIAZEPAM.CHLORPROMAZINE  TAXON VON MICHAELIS (1977)
Z PILZK 43,305-310 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572
MED LINCOFF & MITCHEL (1977)TOX & HALLUC. MUSHROOM POISONING,VAN NOST-
RAND R,NY  HALLUCINOGEN, UPSETTING  EU; N.AM.
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2.2.2. Diagnostic Data.

The other set of data, a prerequisite for an identification programme, is a data bank consisting of a compilation of diagnostic characters and their respective states found in different species. This thesis describes a wide range of characters identified from different scientific sources, chemical, morphological, pharmacological, geographical, historical and ecological.

The choice of diagnostic characters is of prime importance since the whole identification process relies solely on the knowledge of these characters and their corresponding states. A number of factors have to be taken into account, before a character can be chosen as part of a programme. It has to answer a number of general criteria.

The first criterion is that the character should be stable within certain limits and its states should not be alterable from one to another. For example, if one takes the character "colour of the cap", in the case of Russula, the dyes giving the cap colour are water soluble and the state shown may be "red" in dry weather conditions or "white" after a shower!i.e. this character is not stable. All characters which change quickly in a mushroom, such

as colour, texture, stickiness, shape, smell and flavour and, for that matter most macroscopical data should be excluded from an identification system because in most emergency poisoning cases the sample is fragmentary, half digested, cooked and/or decomposed since they are often collected from litter bins or as left-overs after a meal.

A second criterion is the ease of observation of a character. An easily observed and stable character is likely to be important in a diagnostic key because it can be used by relatively unexperienced personnel.

A third and important criterion is the information content of a given character, i.e. a character that splits species quantitatively in roughly equivalent groups is a good character with a high information content whereas characters dividing species in grossly unequal groups might be highly diagnostic for a particular group of species, but of little use for distinguishing species in general.

Other useful criteria are the independence of characters and the discreteness of the states of the different characters. For example, the cause and the effects are dependent characters. In the case of mushroom poisoning, the analysis of the toxins and the observation of the symptoms define two separate but dependent characters.

Used concurrently, they do not further the identification and the use of only one character is required. Similarly, continuous characters are not useful in the identification process because they cannot be defined within precise limits and overlap between states is almost inevitable. Only when the states show widely different values can they be of some help to the identification.

All these criteria are rarely united for a given character and a balance between good and bad features should be made before it is included in the key. The ease of observation probably outweighs all the other criteria when the users of a key are from widely different academic disciplines, and by no means specialists in the field of mycotoxicology.

Unfortunately, the information content of easily observable characters is not always very good and, therefore, highly informative characters also have to be included to allow for species identification when necessary, rather than identification of a group of closely related species. The discriminative power of a character is not an absolute concept and has only meaning in relation to the taxa which are taken into consideration in the data bank.

Each discipline included under the all embracing term of mycotoxicology has its own specialised characters which should be represented in the key, thus allowing a reasonable diagnosis based on the one speciality with perhaps only one or two easily identified characters pertaining to other disciplines.

Because of all these reasons, the measure of the information content or of the separation coefficient for each character becomes meaningless and will even vary considerably depending on the qualifications or ability of the user of the key. The choice of each character included is discussed in its own right and in relation to other characters as seen by the author. An objective weighting being impossible, the choice of characters has therefore been subjective and based on personal experience. The usefulness of certain characters (microscopical) is demonstrated by their extensive use in traditional keys.

2.2.2.1. Character Choice.

For practical reasons, the characters are grouped by user's specialities rather than in the order they are used in the programme. Each character's name is followed by a number in brackets indicating its position

in the key. For example "Toxins" (14) indicates that the character "toxins" is the character number 14 in the list used by the computer.

Four separate groups of characters are included:

1) microscopical characters (title 2.2.2.1.1.)

2) ecological characters (title 2.2.2.1.2.)

3) medical characters (title 2.2.2.1.3.)

4) chemical characters (title 2.2.2.1.4.)

2.2.2.1.1. Microscopical Characters.

2.2.2.1.1.1. Introduction.

These characters are traditionally used by modern taxonomists and follow the definitions laid down in the "Introduction to the Agarics and Boleti" of the British Fungus Flora (Henderson et al. 1969) and further detailed by Largent et al. (1977). Being the traditional means of identification of mushrooms, these characters are indeed sufficient to permit the identification of the taxa included in the key.

For practical reasons, states of characters which are numerous, or continuous have been categorised in groups of related states which are still found to carry

a useful information content,in order to allow a useful split within the included taxa.

With the publication of the first observation of fungal spores in 1588 by Giambattista della Porta (Ainsworth, 1976), one of the most useful elements for mushroom identification was discovered.

Eight diagnostic characters based on the morphology of the spores are used here, whereas only five, three and one are based on the hymenium structures, the hyphal trama and the cuticle respectively. (see Figure 2).

These characters are almost always present, even in the smallest fragmentary material, and some keep their diagnostic value even after they have been through extreme conditions (e.g. spores are still found in perfect condition in gastric lavage of poisoned people exhibiting a rapid onset of symptoms).

Prior to describing each character and its location in detail, it is assumed that the reader/user of the key has some experience of basic microscopy. An ordinary student's microscope with magnification capabilities of 30 to 300 x is perfectly adequate for most, if not all, the microscopical examinations.

Whenever a reagent is mentioned for a special

purpose (e.g. staining), its composition is referred to and described in the appendix (title 6.1)

2.2.2.1.1.2. Anatomic characters.

Each character used for identification has a special purpose and a specific position in the anatomy of a carpophore. A number of sections can be made, and are illustrated in Figure 2. All the sections are made on the pileus and three sections show all the microscopical features of interest:

A: section 1: surface of the pileus

B: section 2: transverse section of the gills

C: section 3: part of a gill

The position of each character used here is always located in relation to the above sections in the subsequent chapters.

2.2.2.1.1.3. Cuticle Structure. (18)

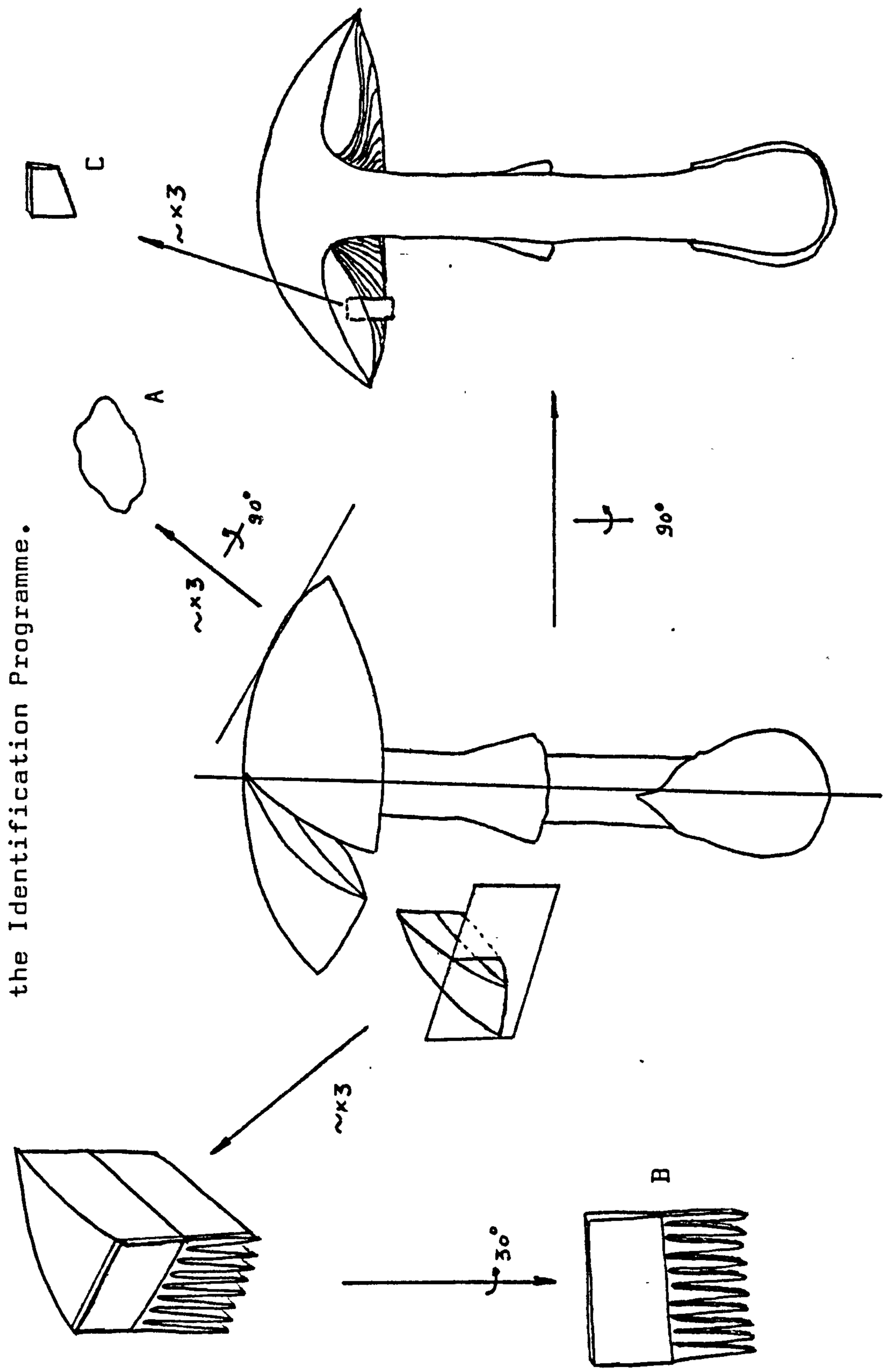
States: - cellular

- filamentous

- absent

A section of the surface of the pileus (section 1), which can be described as a scalp shows the general

Figure 2: Dissection of a Carpophore of a Mushroom to Locate the Characters Used in the Identification Programme.



A: section 1: surface of the pileus B: section 2: transverse section of the gills

C: section 3: part of a gill

configuration of the outer surface of the pileus called the cuticle or pileipellis. This configuration can be one of two types in the Basidiomycetes: either cellular or filamentous. These states are illustrated in Figure 3.

This is one of four characters used by modern taxonomists to split the Basidiomycetes into families and, as such, is an important diagnostic character (See Table 1). This feature is totally absent from the carpophores of the Ascomycetes which have their hymenial layer on their external surface.

This feature is unlikely to be found in gastric lavage, but can, for instance, still be observed in remnants of meals.

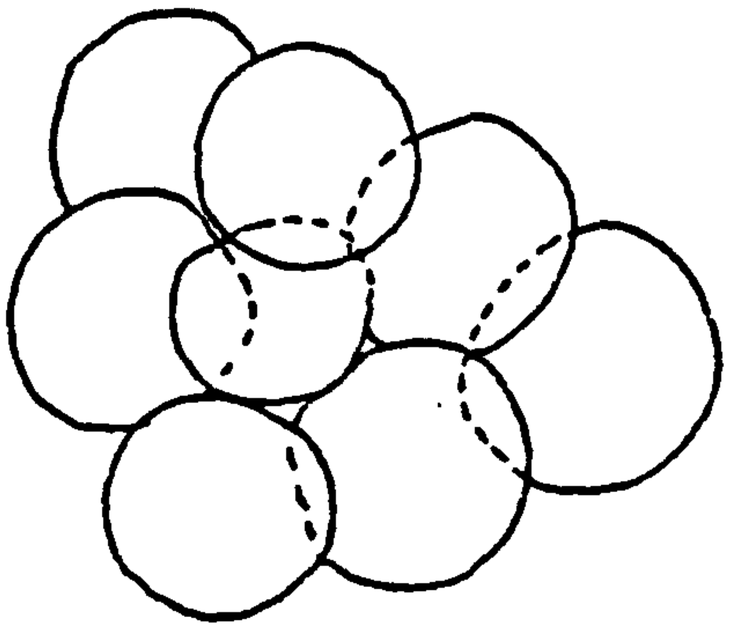
2.2.2.1.1.4. Transverse Section of the Gills.

This section (section 2; Fig.2) gives the most rewarding results because all but three microscopical features can be studied on this section.

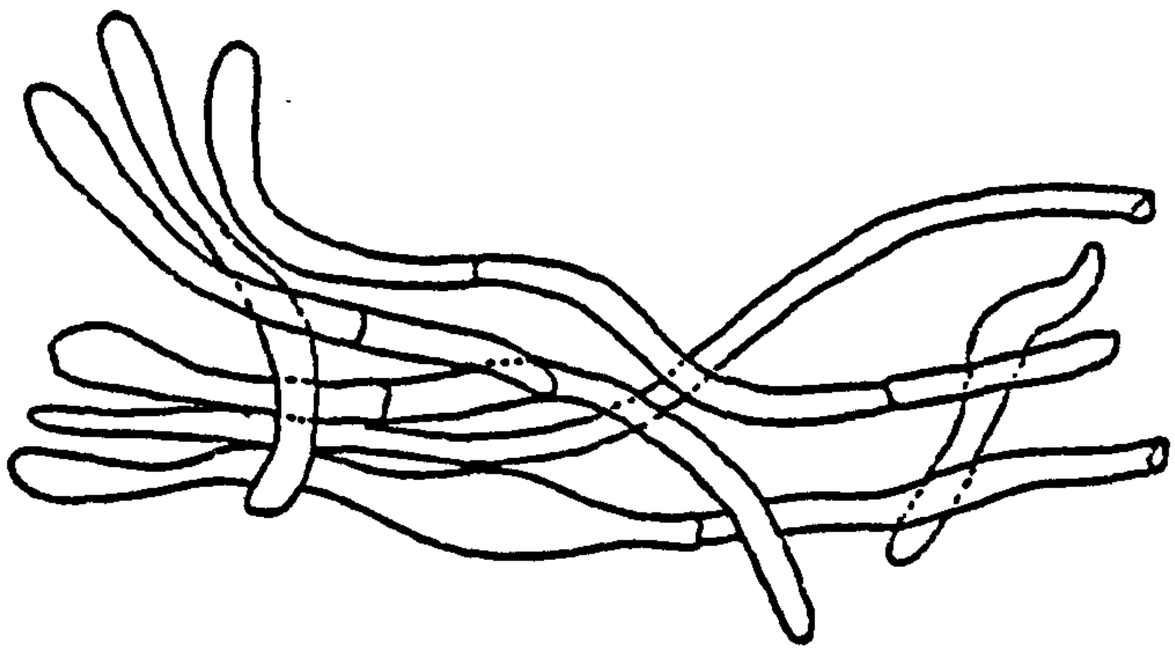
2.2.2.1.1.5. Pileus Trama (16)

States : - homoiomerous

- heteromerous



cellulcr



filamentous

Figure 3 : Cuticle Structure

The pileus trama describes the arrangement of the hyphae in the flesh of the pileus. This trama can be one of two types: the flesh can be made of filamentous intertwined cells and form an homogeneous tissue called homoiomerous or it can be made of intertwined filamentous cells intersperced with nests of spherical cells. The latter arrangement is called heteromerous trama. Figure 4 illustrates these two types of trama.

This is the second of four characters used by the taxonomists to split the Agaricales into their sixteen recognised families. Although this is an important taxonomic character, it is not very useful in our context because only one large family has the feature "heteromerous" trama and only a few mildly poisonous mushrooms are found in that family (Russulaceae).

This feature can also be observed in sections of the flesh of ascocarps.

2.2.2.1.1.6. Gill Trama.(17)

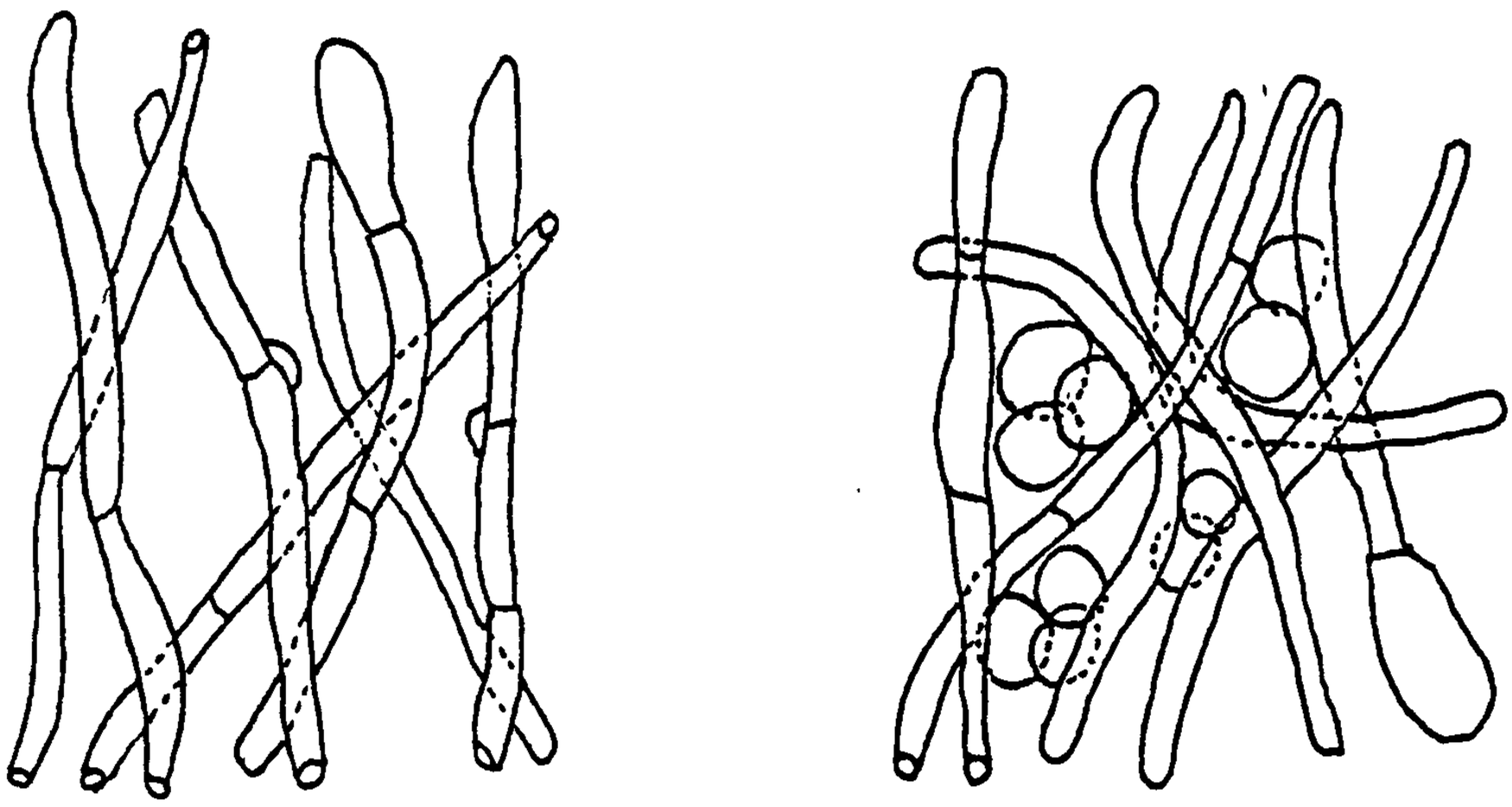
States : - regular

- inverse

- bilateral

- irregular

- absent



homoiomerous

heteromerous

Figure 4: Structures of the Pileus Trama.

As previously mentioned, gills are absent in the Ascomycetes and therefore this character cannot be observed and is qualified as "absent".

The gill trama present four different states which give a useful split within the Agaricales. It is the third character used by modern taxonomists to define the 16 families of the Agaricales (see Table 1).

The four states are described by the arrangement of the hyphal cells down the gills or lamellae. It may be "regular", where the cells are arranged in straight parallel lines, "bilateral" where the cells diverge down towards the surface of the gills like the branches of a fir tree, "inverse" where the hyphae appear to converge down towards the centre of the trama and finally "irregular" where no specific arrangement can be observed. These states are illustrated in Figure 5.

The feature "irregular" qualifies all the genera and families which show an indefinite structure, and as such, includes mushrooms with a heteromerous pileus trama extending into the gills.

2.2.2.1.1.7. The Hymenium.

On the surface and edge of the gills, a differentiated

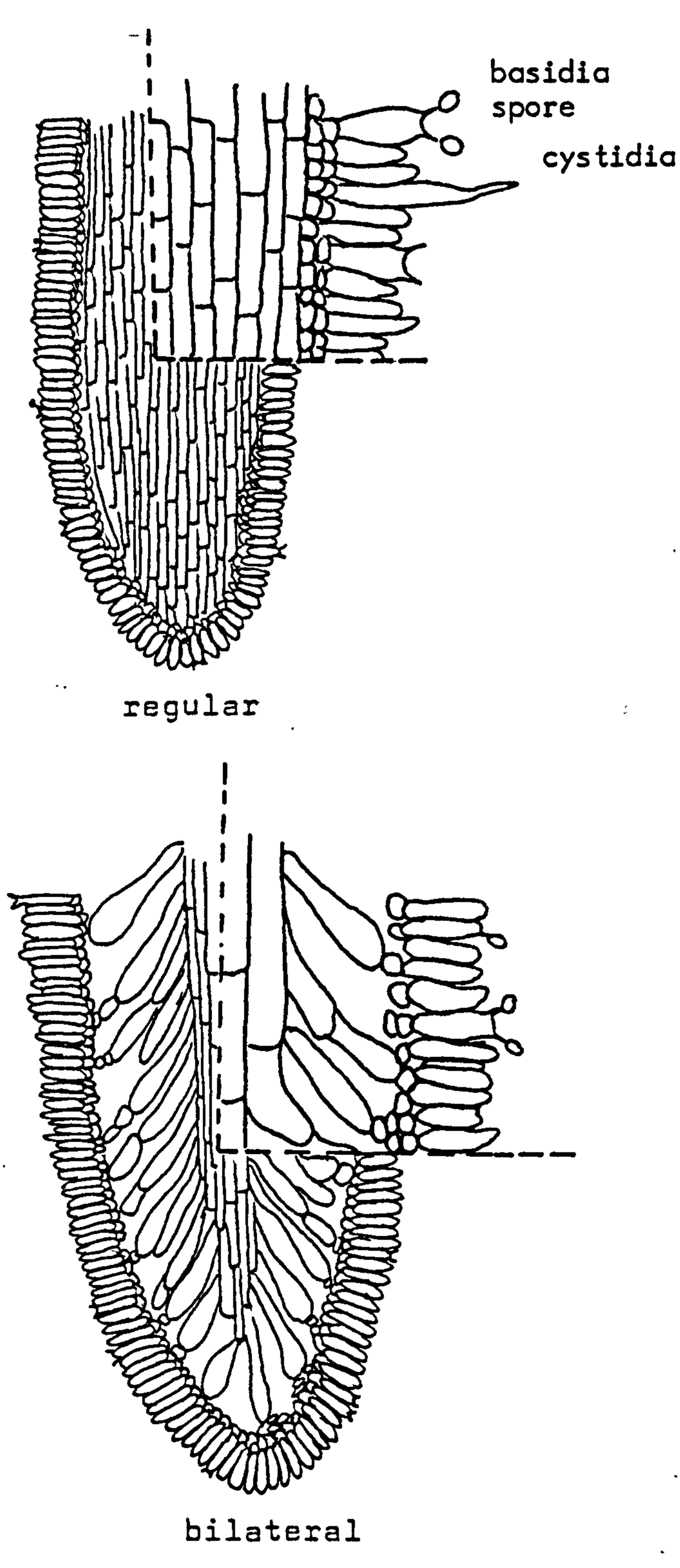


Figure 5: Gill Trama and Gill Surface (Hymenium)

layer of cells, reproductive and sterile, may be found: the hymenium. In the Ascomycetes, the genera of interest here bear their hymenium on the outer surface of the cap.

Two types of cells have interesting diagnostic features for identification: the reproductive cells, the basidia, spore bearing structures of the Basidiomycetes, or the asci, spore enclosing structure of the Ascomycetes and the sterile cells or cystidia. These latter cells are absent in the Ascomycetes and may be present on the margin (marginal cystidia = cheilocystidia) or on the faces (facial cystidia = pleurocystidia) of the gills of the Agaricales. They have specific shapes, colour and sizes which are going to be discussed subsequently.

The spore, which on germination gives rise to a new mycelium, is produced in the hymenial layer. Over the past two centuries it has been the most widely used feature for the identification of mushrooms. Under extreme treatment, spores are very resistant and retain their diagnostic features. It is such an important and stable structure that it accounts for eight identification characters used here. Although not totally independent, these characters are all included because they are easy to observe and qualify.

2.2.2.1.1.8. Colour of the Spore Print. (13)

States : - white
- pink
- brown
- black

The most important character used in modern and traditional keys is the colour of the spores, best observed as a spore print.

Although the range of colours is large, it can be conveniently divided into the four above mentioned states.

The state "white" includes the white, the pale cream to cream and the pale to brightly yellow (greenish in one case) coloured spores. "Pink" varies from bright pink to salmon, coral and peach while "brown" includes varicus shades of brown from dull clay-brown or ochraceous to bright rust-brown. Finally "black" covers the purplish, and the purple black to black shades. Reference colours are found in the"Flora of British Fungi: Colour Identification Chart" (Henderson et al. 1969) available separately from the Royal Botanic Garden in Edinburgh.

The spore print colour is the fourth microscopical character used by taxonomists to divide the Agaricales

into families (Table 1). It is now possible using the first four anatomical characters described above to place a mushroom into a family. The obvious result of this is that if a mushroom is involved in a poisoning case and these four features are available, then the species must belong to only a few related species. This is demonstrated and summarised in Table 1.

2.2.2.1.1.9. Spore Colour under the Microscope. (6)

States : - clear Substates : - amyloid
- inamyloid
- dextrinoid
- uncertain
- pale brown
- pale pink
- dark Substates: - resistant
- dissolves
- uncertain

The colour of a spore print is one of the most useful and easily observed characters, but it is rarely available in a poisoning situation because a fresh specimen is required before a spore print can be made!

Characters / Families	pileus trama	gill trama	spore print	cuticle	other characteristic features
Russulaceae	Het	Irr	w	Fil	amyloid spores
Boletaceae	Hom	Bil	br	Fil	no gills:tubes
Paxillaceae	Hom	Bil	br	Fil	
Gomphidiaceae	Hom	Bil	bl	Fil	
Amanitaceae	Hom	Bil	w	Fil	
Plutaceae	Hom	Inv	p	Fil/Cel	
Entolomataceae	Hom	Reg	p	Fil	angular spores
Agaricaceae	Hom	Reg	bl	Fil	
Lepiotaceae	Hom	Reg	w	Fil/Cel	dextrinoid spores
Strophariaceae	Hom	Reg	bl	Fil	
Cortinariaceae	Hom	Reg	br	Fil	
Coprinaceae	Hom	Reg	bl	Cel	
Bolbitiaceae	Hom	Reg	br	Cel	
Hygrophoraceae	Hom	Reg/Bil	w	Cel/Fil	long basidia
Tricholomataceae	Hom	Reg/Bil	w	Cel/Fil	
Pleurotaceae	Hom	Irr	w	Fil	

Table 1 : see the legend of the facing page

Table 1: The sixteen families of the Agaricales as defined by four anatomical characters (based on a field course by Dr. Roy Watling, Royal Botanic Garden, Edinburgh)

The abbreviations are the first letters of the respective states of the different characters: Het = heteromerous

Hom = homoiomerous

Irr = irregular

Bil = bilateral

Reg = regular

Inv = inverse

w = white

br = brown

bl = black

p = pink

Fil = filamentous

Cel = cellular

They are discussed in chapters 2.2.2.1.1.3; 2.2.2.1.1.5; 2.2.2.1.1.6 and 2.2.2.1.1.8.

While an experienced microscopist and mycologist is able to categorise the spore colour accurately from its microscopical examination, it cannot be expected that the same result will be obtained from the non-specialist but he should be able to distinguish the states "clear" (also called transparent or hyaline) and "dark" fairly accurately. These two states correspond exactly to the states "white" and "black" described in the previous chapter (2.2.2.1.1.8.) The unexperienced analyst might not be able to distinguish between the two intermediate states,"pale brown" and "pale pink" ("brown" and "pink" of the previous character respectively). Users should be aware of this drawback and avoid this character if they are uncertain with its determination, despite its tremendous informative content.

The state "clear" is divided into four substates. A chemical reagent, Melzer's Iodine (see appendix 6.1.1.) is necessary to observe these substates. When the reagent is unavailable to the analyst, the feature remains"uncertain". Otherwise, three reactions may occur. The spore surface can become blue to purple in colour and is usually referred to as"amyloid". Alternatively, the spore can remain unchanged or clear and is termed "inamyloid". If the spore turns reddish to purplish brown it demonstrate the feature called "dextrinoid" by British authors (Henderson et al. 1969) or "pseudoamyloid" by American

authors (Singer, 1975). The chemical significance of these reactions is not known.

Melzer's reagent is relatively unstable and it makes its application impractical, but this drawback is compensated by the usefulness of the reaction in separating some of the most dangerous toxic mushrooms into definite small groups.

Similarly, the state "dark" is further divided into three substates after treatment with concentrated sulphuric acid. The pigments of the dark spores either resist (i.e. substate "resistant") or dissolve in the acid (i.e. substate "dissolves"). When the acid is unavailable and the reaction is not attempted the substate is defined as "uncertain". This reaction has a limited interest and is only useful in separating genera within the Coprinaceae family (see Table 2).

2.2.2.1.1.10. Spore Length and Spore Breadth. (11 and 12)

Length states : - less than 6 µm
- 6 - 8 µm
- 8 - 10 µm
- 10 - 12 µm
- 12 - 17 µm
- more than 17 µm

BASIDIOMYCETES.

Order- Agaricales

I. Agaricaceae

Agaricus Fr.

II. Amanitaceae

Amanita (Fr.)Gray

III. Bolbitiaceae

Conocybe Fayod

IV. Boletaceae

Boletus Fr.

Tylopilus Karst.

V. Coprinaceae

Copelandia Bres.

Coprinus (Fr.)Gray

Panaeolus (Fr.)Quél.

VI. Cortinariaceae

Cortinarius Fr.

Galerina Earle

Gymnopilus Karst.

Hebeloma (Fr.)Kum.

Inocybe (Fr.)Fr.

VII. Gomphidiaceae

VIII. Hygrophoraceae

Hygrocybe (Fr.)Wünsche

IX. Lepiotaceae

Lepiota (Fr.)Gray

Leucocoprinus Pat.

X. Paxillaceae

Paxillus Fr.

XI. Pleurotaceae

XII. Entolomataceae

Entoloma (Fr.)Kum.

Nolanea (Fr.)Kum.

XIII. Russulaceae

Lactarius Gray

Russula (Fr.)Gray

Table 2: Systematic List of Genera Containing Poisonous Species of Mushrooms Included in the Data Bank.

XIV. Strophariaceae

Hypholoma (Fr.)Kum.

Psilocybe (Fr.)Kum.

Stropharia (Fr.)Quél.

XV. Tricholomataceae

Clitocybe (Fr.)Kum.

Tricholoma (Fr.)Kum.

Tricholomopsis Sing.

XVI. Plutaceae

ASCOMYCETES.

Order- Pezizales

A. Morchellaceae

Morchella Dill.

B. Helvellaceae

Gyromitra Fr.

Helvella L.

Table 2 (end)

Breadth states : - less than 4 µm
- 4 - 6 µm
- 6 - 8 µm
- 8 - 10 µm
- more than 10 µm

Spore dimensions in terms of spore length and breadth are two continuous quantitative characters and have a relatively poor diagnostic value, especially if one takes into account the biological variations. States are expressed in discrete ranges, large enough to allow for the variations and small enough to retain some diagnostic value. States being continuous in reality, they overlap in some cases and are not mutually exclusive, this being one major drawback with this type of character, where multiple answers are the rule rather than the exception. It therefore becomes practically useless in the identification of medium sized spored species. It is nevertheless retained because of its ease of observation and, when only a few characters are available for identification, it may help to reduce the number of species suspected for a given intoxication.

Mature spores should always be measured, preferably from spore deposits. Abnormal spores such as those originating from two-spored basidia, where most of the spores

originated from four-spored basidia, should be avoided.

2.2.2.1.1.11. Spore Shape. (7)

States : - globose
- ellipsoid
- angular
- various

The spore shape is an extremely useful character when it comes to the identification of poisonous mushrooms although it is partially dependent on the sizes of the spores (or vice-versa; e.g. a globose spore has a length equal to the breadth!). The range of shapes is extremely large, but can be usefully reduced into the four above mentioned categories. It demonstrates all the advantages of a good character: it is stable, selective and easy to observe. For these reasons it is widely used in traditional as well as modern keys.

2.2.2.1.1.11.1. Globose Spores.

Globose spores should theoretically be perfectly spherical, i.e. their length/breadth ratio should be 1. For practical reasons it includes all the rounded shaped spores with a length/breadth ratio no bigger than 1.2. This ratio is used by some modern taxonomists who

maintain that it is more meaningful than a separate measure of the length and the breadth since it appears to be less prone to variations within a species.

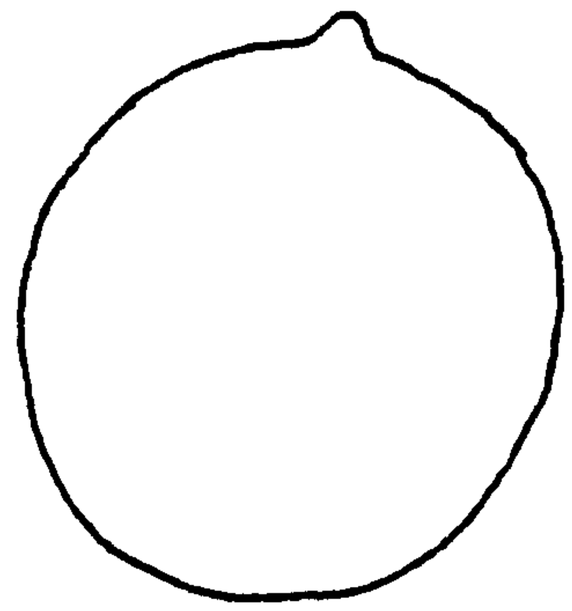
Globose spores include spores defined by mycologists as subglobose, dacryoid (=lachryform), cordate and rostrate (Figure 6).

2.2.2.1.1.11.2. Ellipsoid Spores.

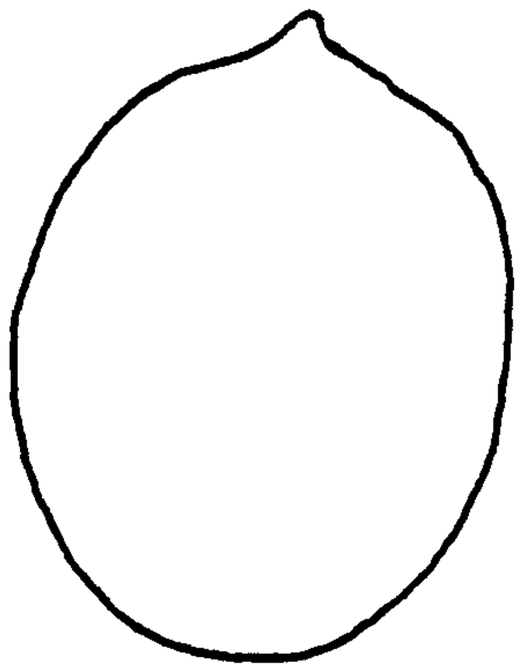
Ellipsoid spores include a whole variety of shapes and refere to the largest group of fungi. The shapes are all curved and have a length/breadth ratio always greater than 1.2. They can be ovate, pyriform, amygdaliform, fusiform, phaseoliform (bean-shaped), etc (Figure 7).

2.2.2.1.1.11.3. Angular Spores.

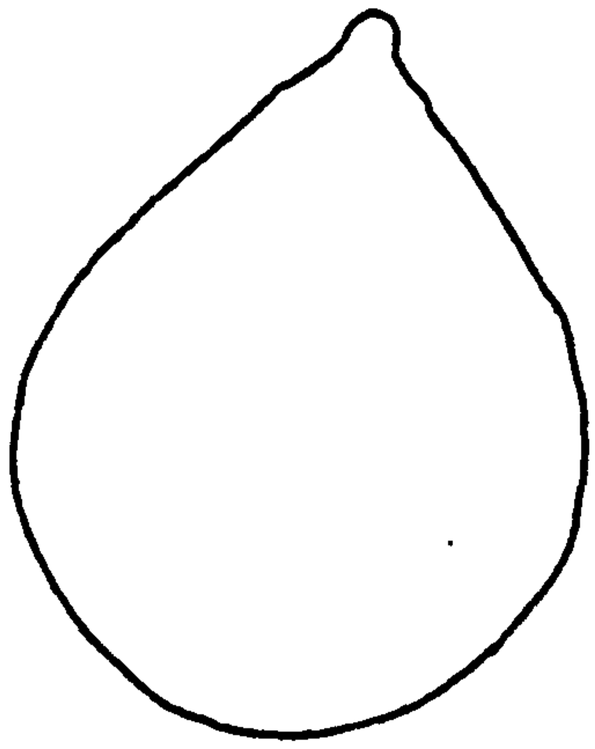
All the spores which exhibit distinct angular patterns, no matter what their orientation is, have their place here. The whole family of the Entolomataceae is separated from all other families by this character. The appearance of the spores may range from almost square to polygonal. (Figure 8)



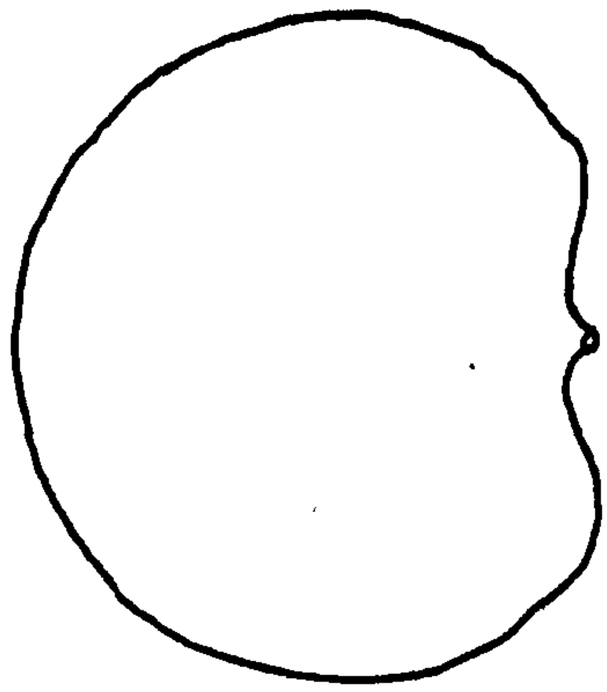
globose



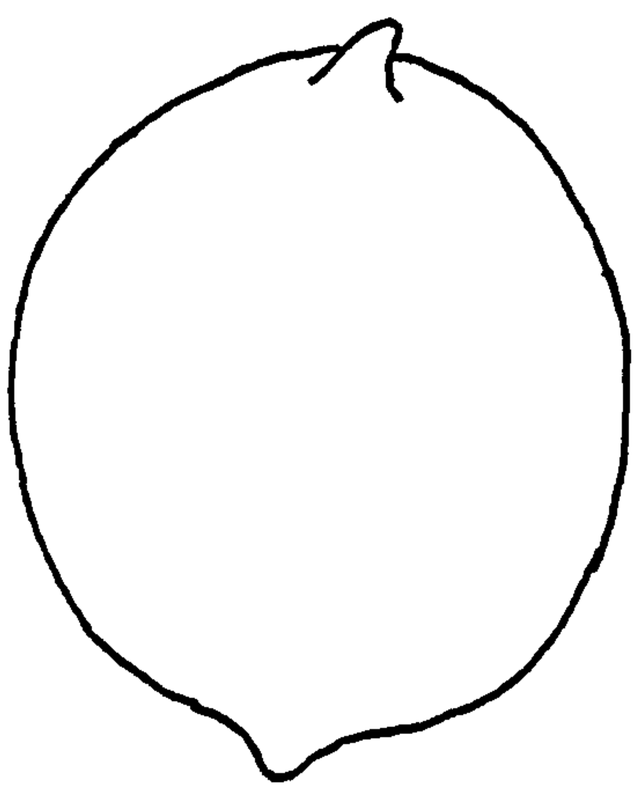
subglobose



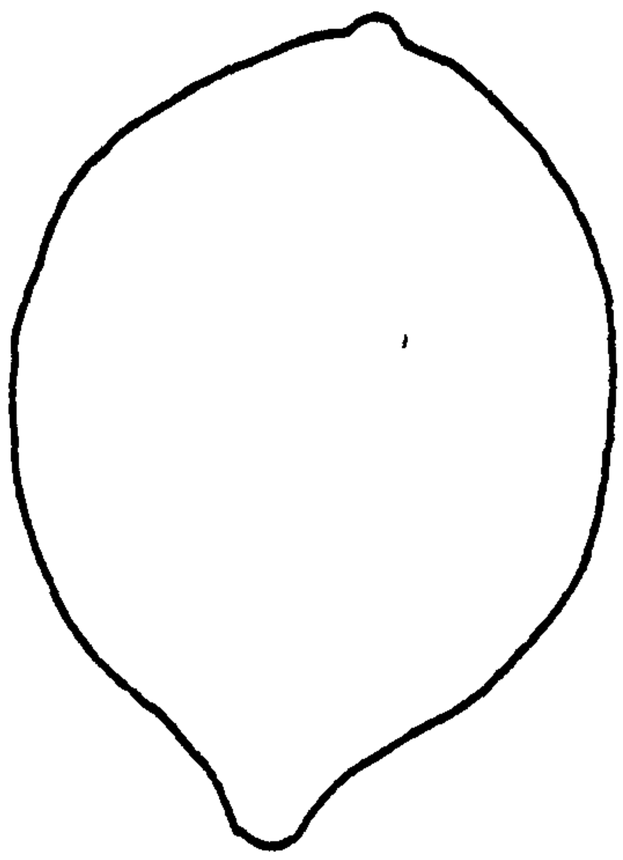
dacryoid



cordate

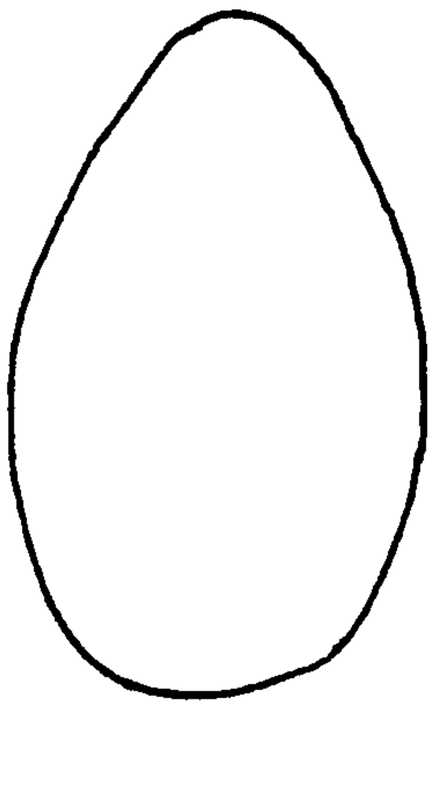


rostrate

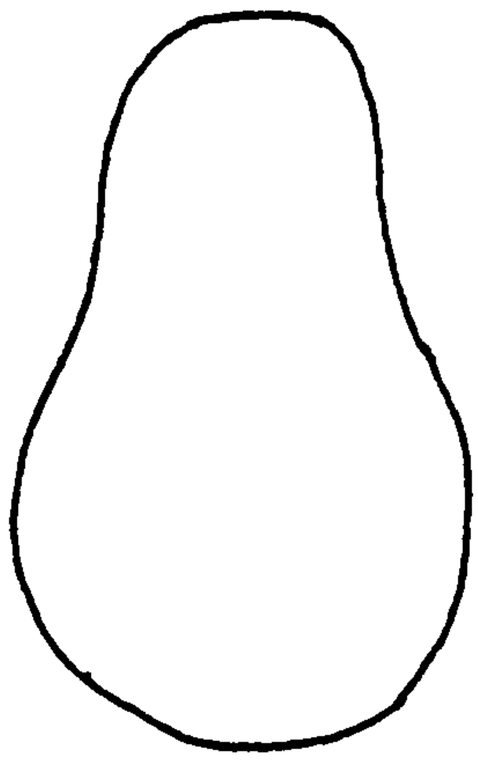


citriform

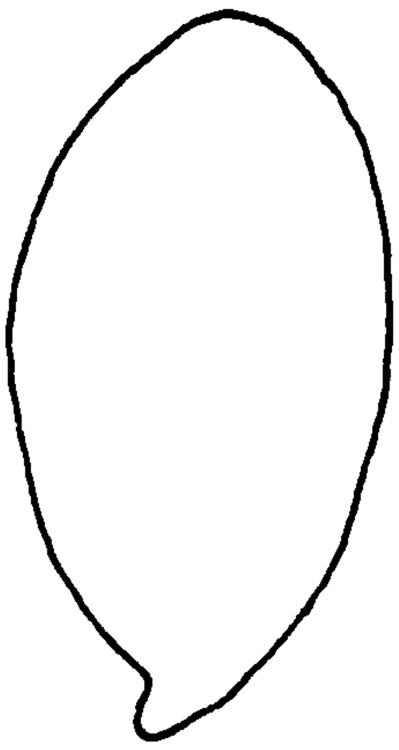
Figure 6: Examples of Globose Spores



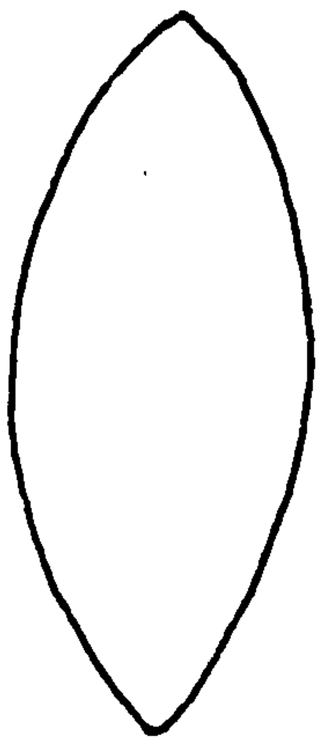
ovate



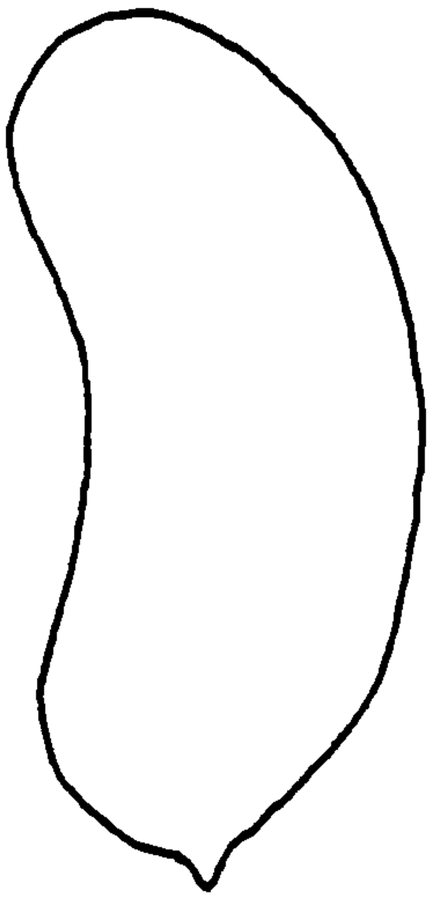
pyriform



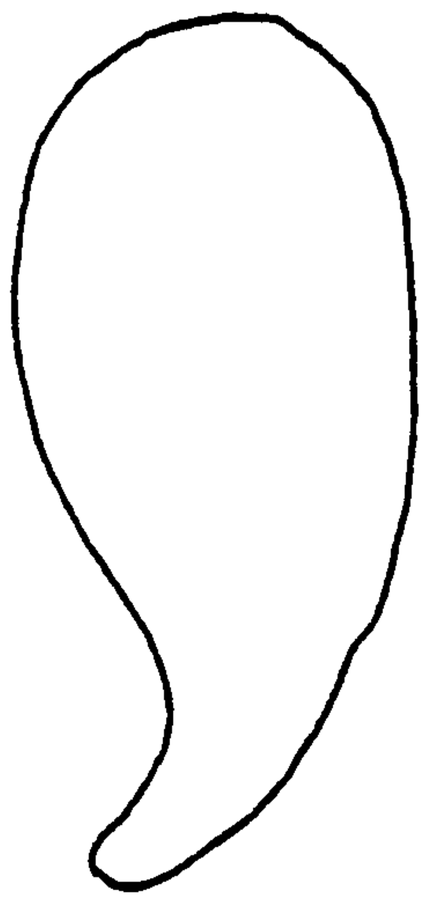
amygdaliform



fusiform

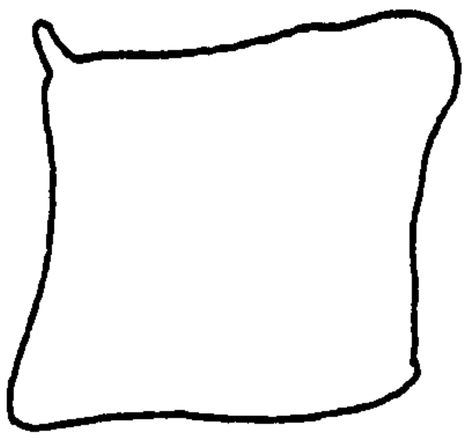


phaseoliform

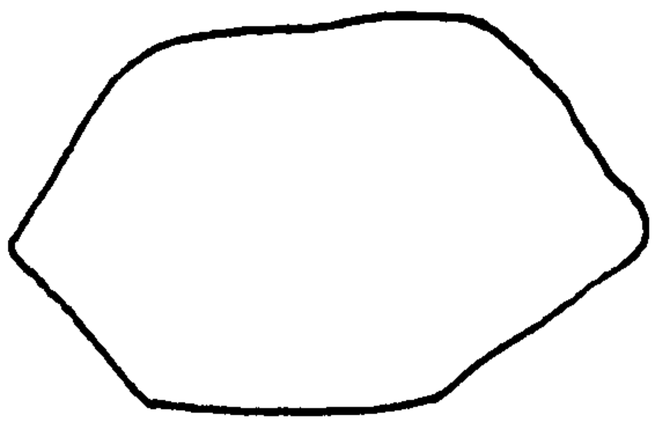


pip-shaped

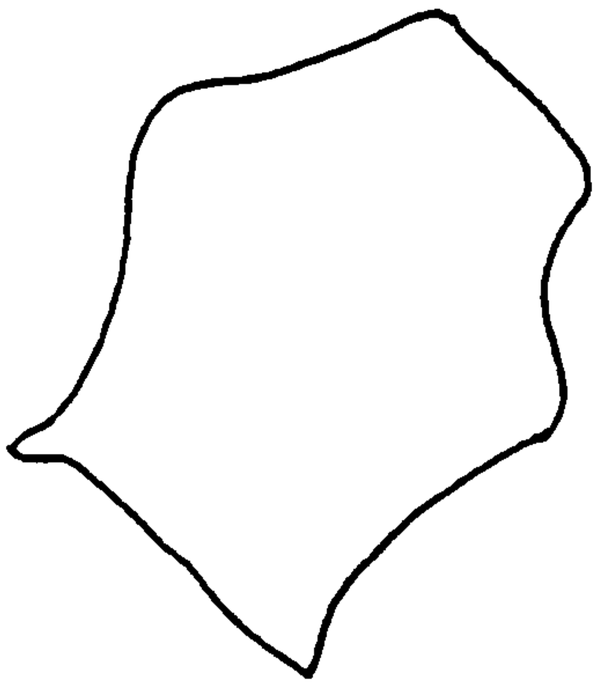
Figure 7: Examples of Ellipsoid Spores



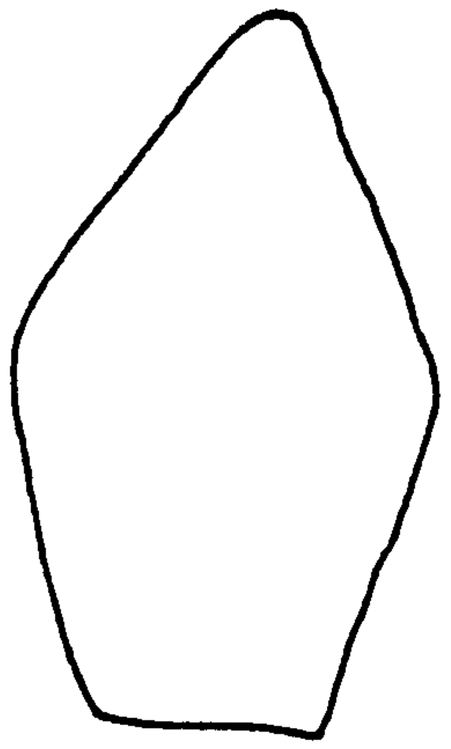
rhomboid



hexagonal



prismatic



pentagonal

Figure 8: Examples of Angular Spores

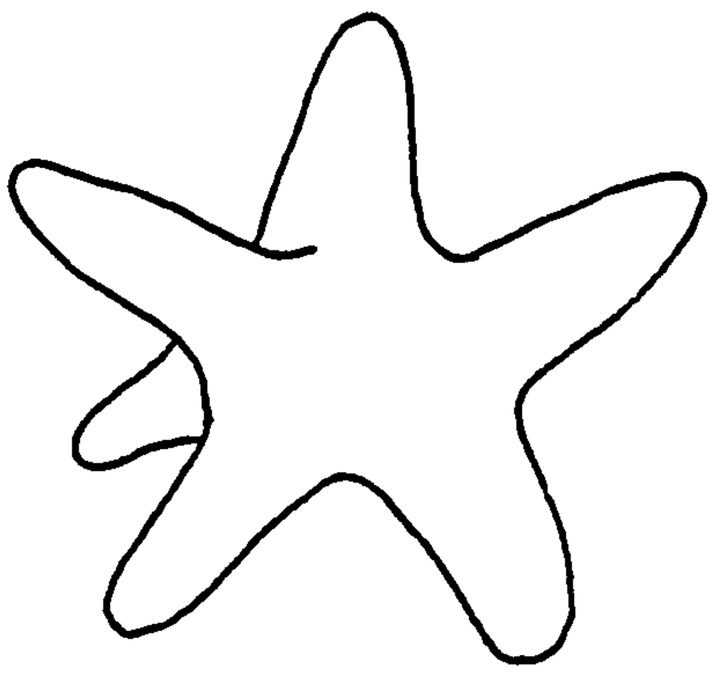
2.2.2.1.1.11.4. Various.

All spores which cannot be fitted into the first three categories come under this heading. They comprise stellate, nodulose, naviculate, bacilliform, cylindrical, etc (Figure 9). This helps in resolving a genus which contain a great number of poisonous species (Inocybe).

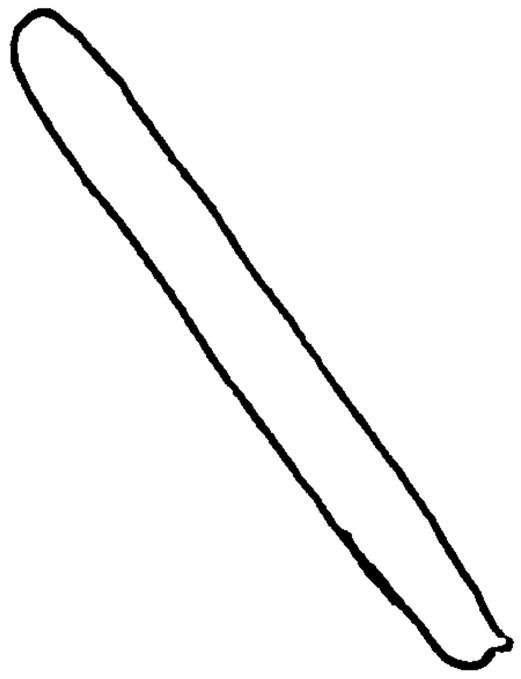
2.2.2.1.1.12. Spore Surface. (8)

States : - smooth
- rough
- ridged

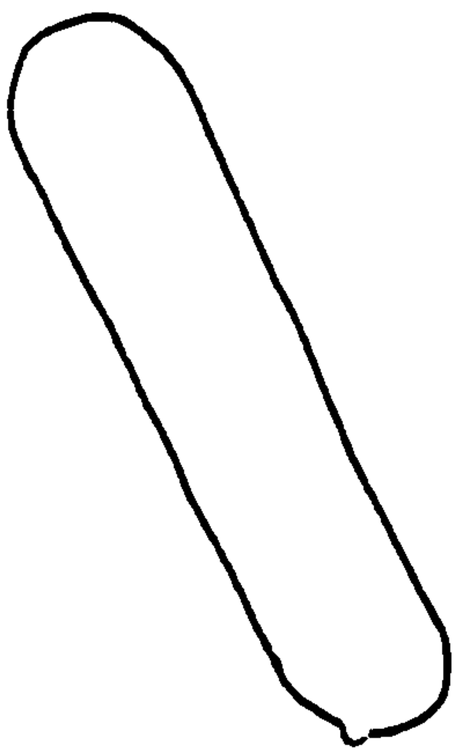
The spore surface can be smooth or ornamented in different ways. The ornamentation is not always easy to see and a high magnification is often necessary to observe this character (at least x400). Lack of ornamentation seen at lower magnification is not proof of the absence of such, and a higher magnification must be used before the state "smooth" is recorded. The ornamentation can either be a roughened surface (punctate, verrucose, spinose) or ridged (reticulate, striate). This observation may be enhanced using a staining reagent such as Melzer's as the mount (see appendix 6.1.1.).



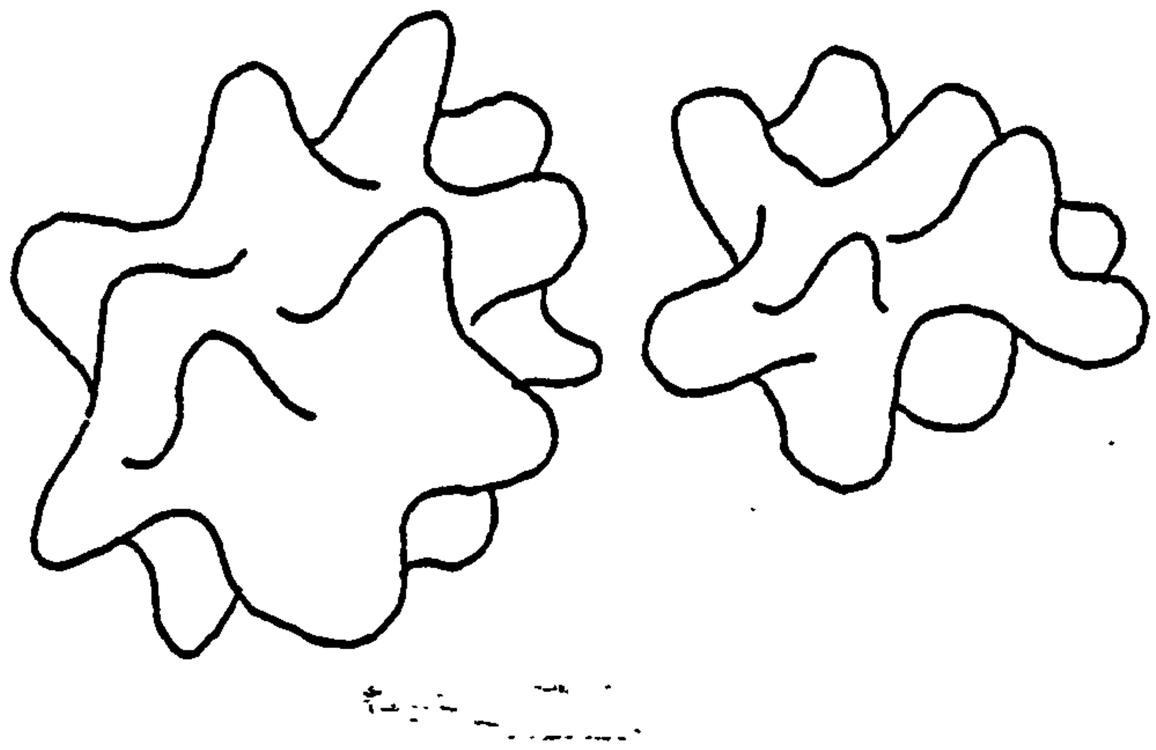
stellate



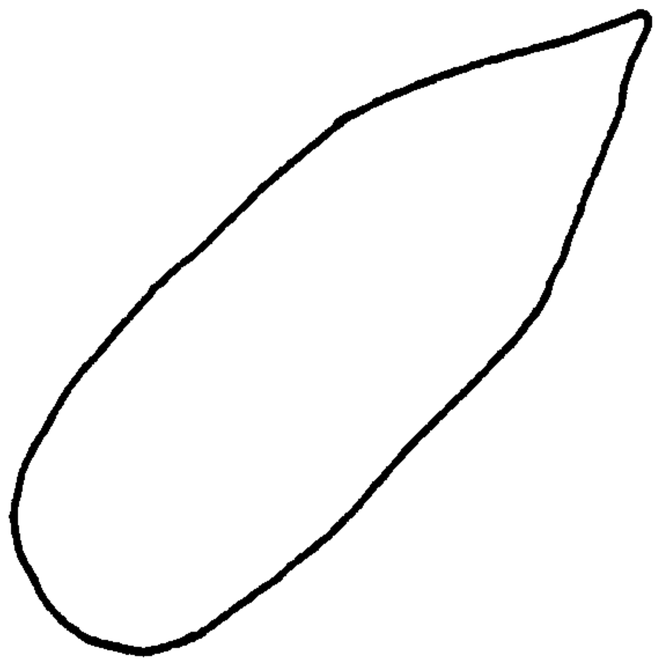
bacilliform



cylindrical



nodulose



naviculate

Figure 9: Various Shapes of Spores

2.2.2.1.1.13. Spore Wall Thickness. (9)

States : - thin

- thick

In many cases, the spore wall is simple, or so it seems under standard investigating techniques. That is to say it cannot be recognised as double or complex, and for this reason it is usually referred to as being "thin". However, in some dark-spored families, the spore wall often consists of two or three layers which may be readily distinguishable in dilute ammonia, sodium hydroxyde or Melzer's reagent (see Appendix 6.1.1.). The innermost layer is called the endosporium and the external layer the episporium. The endosporium is sometimes made up of two layers, while a further external layer may envelope the whole spore (perisporium) (Figure 10). The spore wall is determined as "thick" when it is not seen as simple. This character is readily observed and can be used by a relatively untrained microscopist. Sometimes, however a certain experience is needed to make an unambiguous determination. Because it is impossible to give an unequivocal description which will distinguish a thick from a thin walled spore, a mistake could genuinely be made by the analyst. To safeguard against such a misidentification, a near-miss match identification is

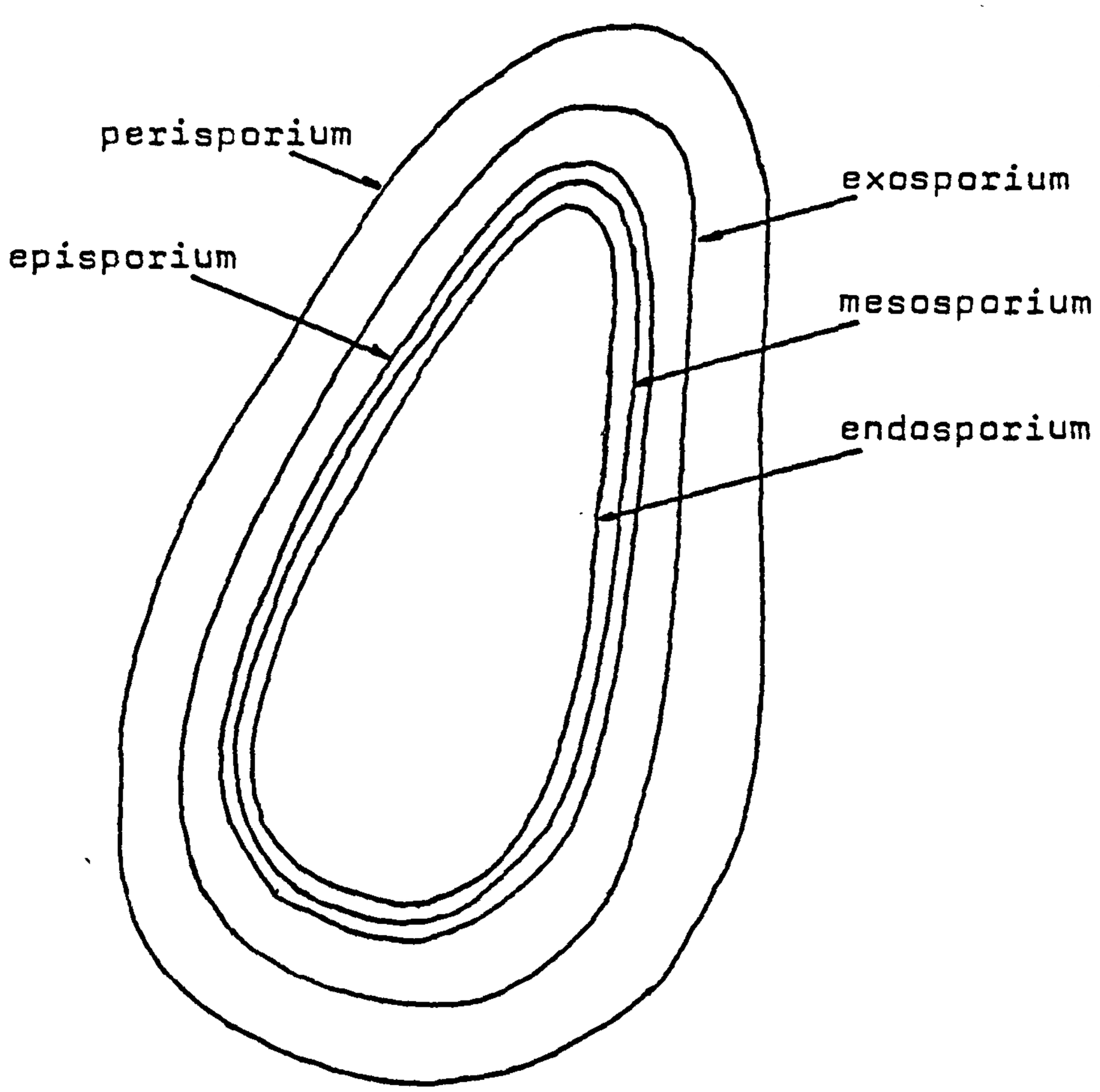


Figure 10: Spore Wall Structure

possible and details are discussed under the appropriate heading.(2.2.2.2.1.)

From the discussion it is obvious that this character is mainly useful in splitting dark spored rather than clear spored species and is therefore of minor diagnostic value.

2.2.2.1.1.14. Germ Pore. (10)

States : - present

- absent

The spore wall is continuous in many species, or modified at the apex in others. This apical modification may be either a germ pore or a callus, the apex of the spore often appearing as a paler coloured spot flattened or indented, which modifies the curvature of the apical zone. This modification is more or less convex. (Figure 11).

When a callus or germ pore is present, the character "germ pore" shows the state "present". Species whose spores have a continuous wall have the state "absent".

Fayod in1889 stressed the taxonomic importance of the germ or apical pore. In light coloured spores it is

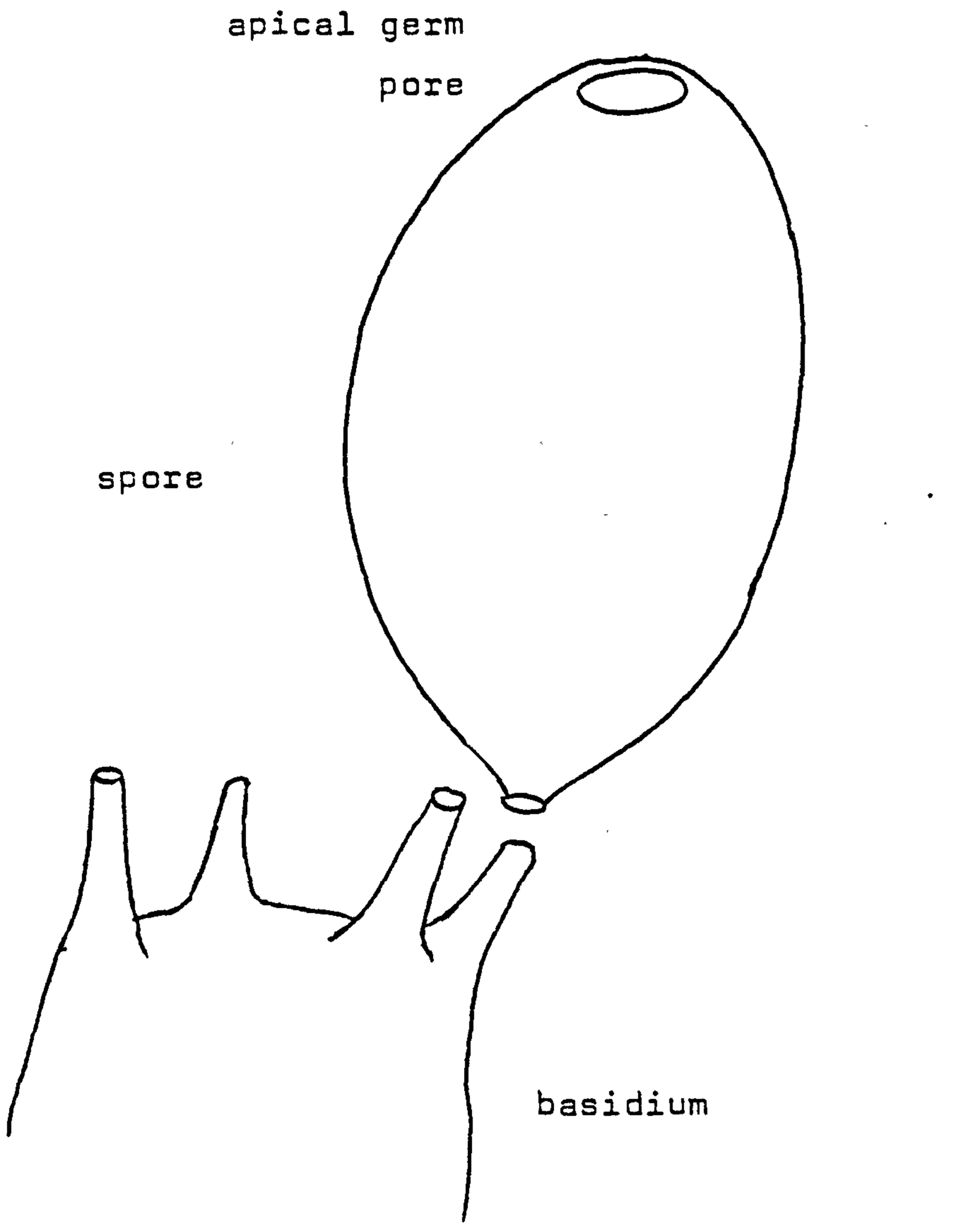


Figure 11: Germ Pore

unfortunately not always easy to observe with standard microscopical techniques unless the spores have been treated with dilute Potassium hydroxide and stained. Singer (1975) recommands an aqueous solution of cresyl blue or aceto carmine as a means of detecting the germ pore.

2.2.2.1.1.15. Clamp Connections. (19)

States : - present

- absent

Hyphae which make up the trama of the basidiocarp and its hymenial structure are usually divided into shorter units by crosswalls or septa. A specialised type of hyphal branching called "clamp connection" is often associated with septa. It is seemingly involved with the movement of the nuclei within the hyphae. This type of connection is best observed at the base of specialised cells (basidia, cystidia) because any hyphal modification may have this type of connection. Most are small and quite difficult to observe and staining is sometimes advised (e.g. with aqueous cresyl blue). A negative state should not be recorded unless a careful search had been made of several hyphae and, if possible, of several carpophores.

Although this is a relatively difficult feature to observe and might not be used often in emergency toxicology cases, it represents a very useful character which splits genera into groups of species throughout the taxa included in the key. It is therefore retained for its use by more experienced microscopists. (see Figure 5).

2.2.2.1.1.16. The Basidium or the Ascus: Number of Spores.

(20).

States : - 2 spores

- 4 spores

- others

The hymenium of fungi is partly made up of specialised reproductive cells.

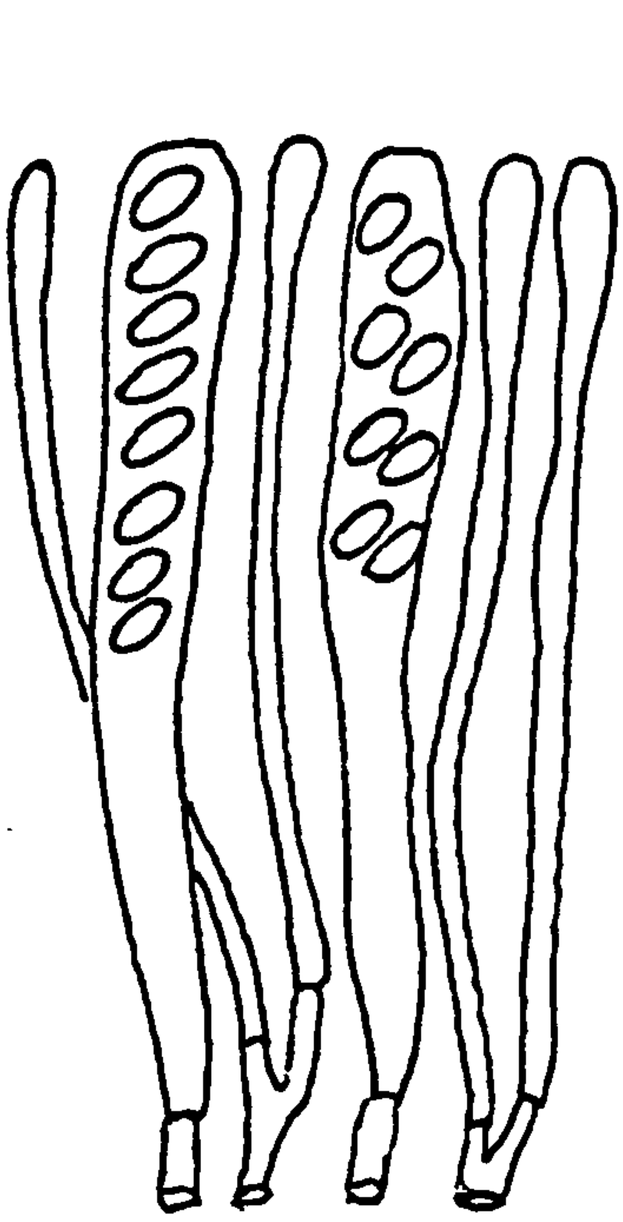
The basidia are single celled, thin walled spore bearing structures of the Basidiomycetes. They usually bear four spores. However a number of species have been described which possess only two spores per basidium and a few rarities have one or three spored basidia. This character is fairly easy to observe and very selective and as such is of limited value as a general diagnostic character. All the taxa but four included in the data bank are Basidiomycetes and only five show a state other than "4 spores".

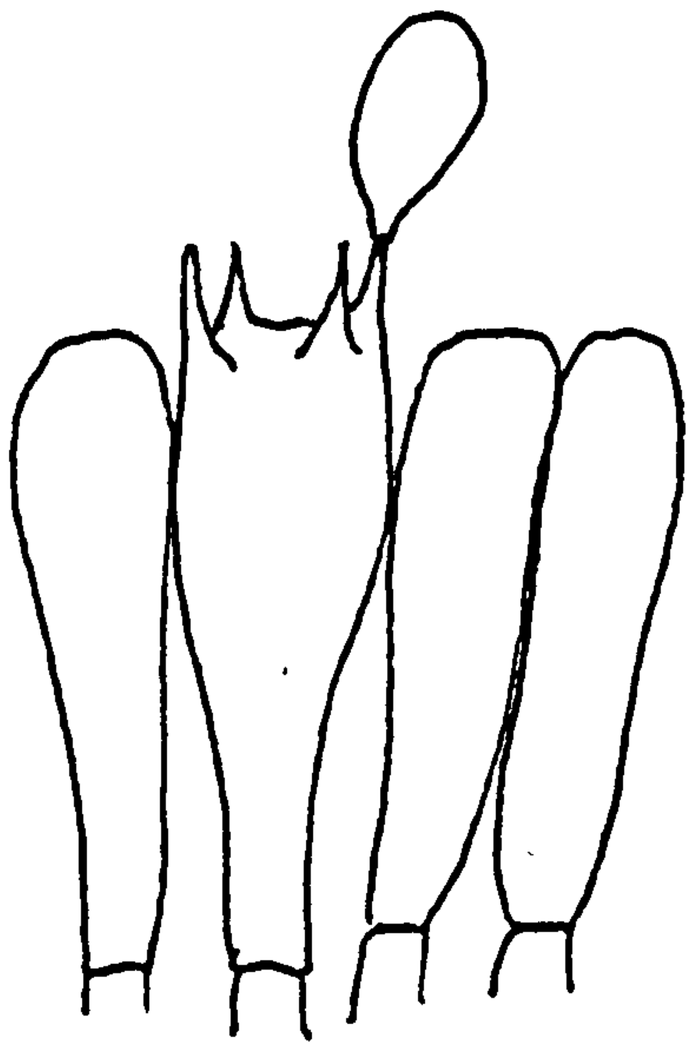
The remaining four taxa belong to the Ascomycetes, a large mostly microscopical class of fungi of no relevance to this thesis. Their reproductive cells, the asci, are single celled thin walled club shaped spore enclosures. Each ascus usually encloses 8 spores which are shot out when mature. Observation of this microscopical character will therefore be recorded under the state description "others" and will be readily distinguished from that of the Basidiomycetes. (Figure 12; location of basidia can be seen in Figure 5).

2.2.2.1.1.17. Basidia/Asci Sizes. (21).

States : - small (up to 35μ)
- medium (35 to 55μ)
- large (over 55μ)

Basidia are normally clavate to broadly clavate when mature and their length is two to four times their width. Only in a few limited cases are the basidia long and narrow, a feature which separates one genus from all the other Agaricales, i.e. the Hygrophoraceae. This helps in the identification of some very common British species of mushrooms and is important enough to warrant its inclusion in the programme although all the species concerned are only mildly poisonous and rarely come to





Asci containing 8 spores

basidium with 4 sterigma and 1 spore

Figure 12: Examples of Ascus and Basidium Morphology

the attention of toxicological centres.

The dimensions of the asci have no relevance in the identification of the four Ascomycete species included in the key because they all show the same state, i.e. medium. The result is that this character is only of limited interest and remains here only for completeness.

2.2.2.1.1.18. The Cystidia. (22, 23 and 24)

The last microscopical characters used in the identifying process refer to specialised sterile cells forming the hymenium of the basidiocarps : the cystidia.

A cystidium is defined, for our purpose, as a differentiated sterile terminal cell of the hyphae in the hymenium. This is a restrictive definition because it concerns only the hymenial surface. Strictly speaking, other cystidial types can be found on the cuticle or the stem of the basidiocarp. The latter are not used in the present key and therefore not included in the definition. The functions of cystidia are unknown, but their morphology is usually quite distinctive and varied and makes them a useful character for identification.

Cystidia can be further defined by their position on the hymenial surface. They can be found on the face of the

gills only (as seen in the transverse section of a gill, Figure 5) where they are referred to as facial cystidia or pleurocystidia, or, they can be found only on the margin of the gill (seen on the portion of the gill sectioned as described in Figure 2) i.e. marginal cystidia or cheilocystidia. Some species have both types of cystidia and some have no cystidia at all. This can have a great diagnostic significance when mushroom samples (rather than for example stomach content) are available for identification.

For the above reasons, marginal and facial cystidia are used as two separate characters, but both present the same states and are discussed together.

2.2.2.1.1.18.1. Marginal and Facial Cystidia.(22 and 23)

States : - present

- absent

Substates : when present: - cystidia sizes :

- small (less than 35 μm)
- medium (35 - 55 μm)
- large (over 55 μm)

Substates (continued) : - Cystidia Shapes :

- cylindrical
- lageniform
- ampulliform
- utriform
- metuloid
- uncertain

Cystidia may sometimes be quite remarkable and of significant diagnostic value, such as for example in the genus Inocybe (which has over 30 poisonous species), although they clearly need a certain experience of microscopy to be observed in a number of cases.

To maximise the use of this character, when cystidia are observed on either the face or the margin of the gills, it must then be further subdivided into subcharacters represented by the sizes and shapes of the cystidia. The various states of these subcharacters categorise large groups of poisonous fungi and are therefore important and useful diagnostic features.

2.2.2.1.1.18.2. Cystidia Sizes.

The cystidia sizes are continuous states and suffer the same drawbacks as discussed previously with the spore

sizes. It was found useful to divide sizes into three groups of delimited lengths defined as small (under 35μm), medium (35 - 55μm) and large (over 55μm). The majority of cystidia are of medium size, but when small or large cystidia are encountered, they quite obviously fall into their respective categories. If the character "cystidia" has been observed, it is an easy and routine exercise to measure their sizes. The problem usually is to locate the character and not to define it.

2.2.2.1.1.18.3. Cystidia Shapes.

Shapes of cystidia are numerous and it is a major difficulty to categorise them into a limited number of well-defined characteristic shapes. Five groups are defined as follows, but might be better described by the figures which relate to each state:

a) cylindrical cystidia essentially possess parallel sides in which the width remains roughly the same along the entire length of the cell. This includes filiform, cylindrical and clavate cystidia (Figure 13).

b) lageniform cystidia are cystidia having a swollen base and an apical part which tapers into a sort of beak. It includes acuminate, subulate, fusiform,

filiform

cylindrical

aciculate

claviform

Figure 13: Cylindrical Cystidia

lanceolate, obclavate and digitate cystidia (Figure 14).

c) ampulliform cystidia are broad, almost as broad as they are long; they are ventricose to sub-ventricose, napiform, vesiculate and pyriform (Figure 15)

d) utriform includes all cystidia which possess a constriction in their medium part. Some liberties have been taken here with the original mycological definition of utriform, i.e. "cystidia which have a slight constriction below a large, round head, like a bladder: therefore bladder-shaped" (from Largent et al. 1977). Sphaeropedunculate, capitulate, lecythiform, etc cystidia belong to that category. (Figure 16).

e) metuloid. Although it is included in the substate "shape of cystidia", the last group "metuloid" does not define a shape as such, but a special differentiated apex of some cystidia. It is always found in association with one of the other shape states, e.g. ampulliform with metuloid or lageniform with metuloid, etc. The cystidium with a metuloid has a special thick walled apex of variable shape containing amorphous or crystalline material (Figure 17).

The information content of these characters is very important although quite difficult to observe and define

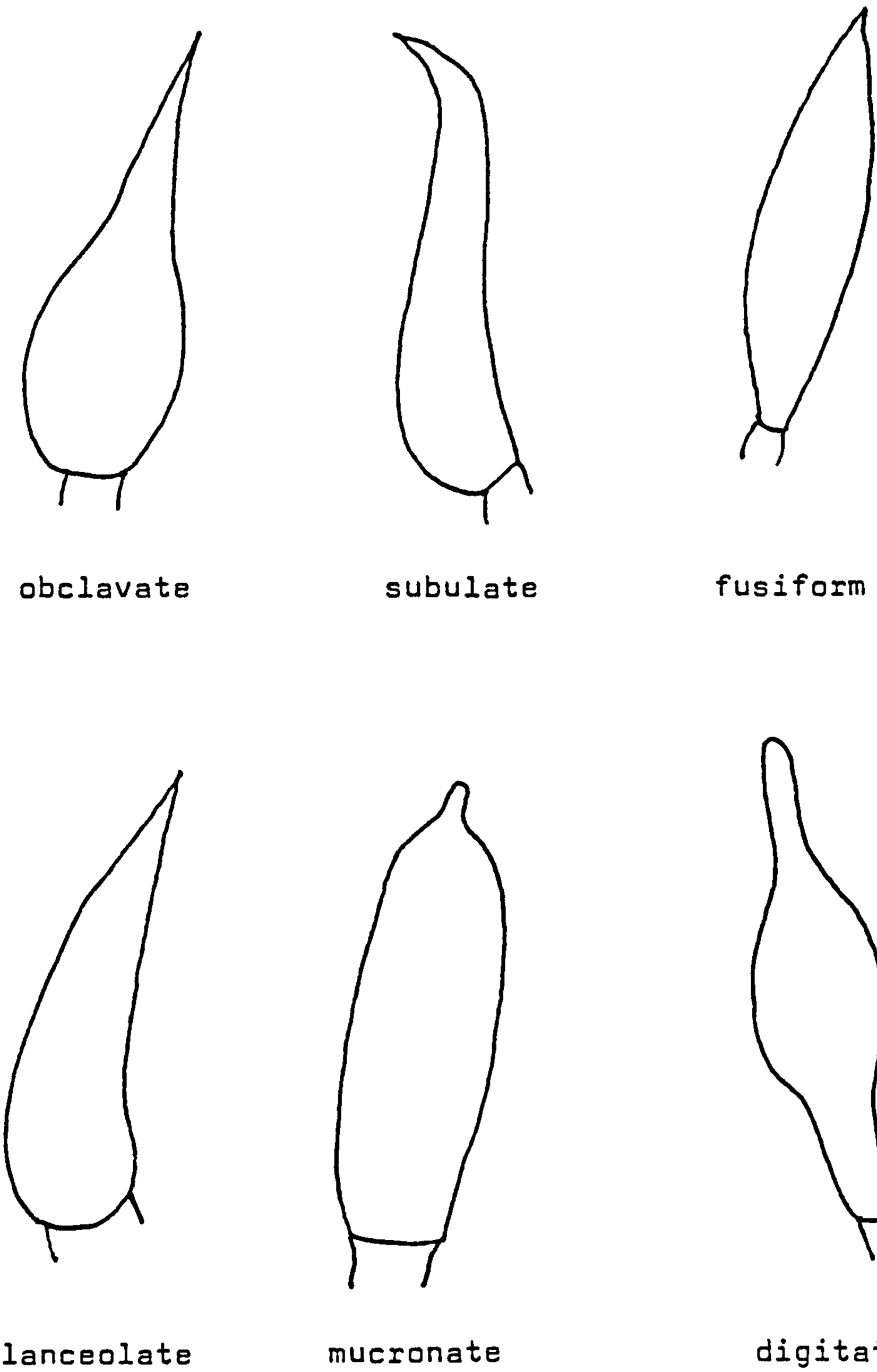
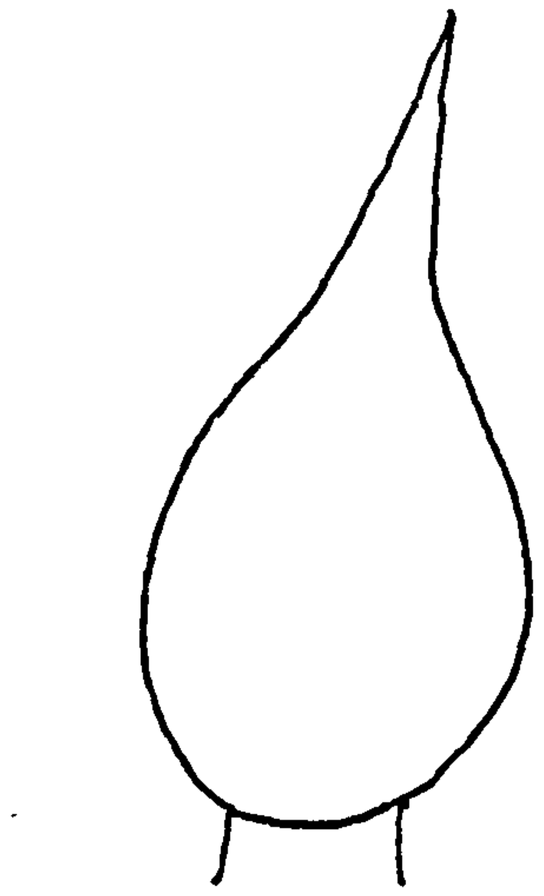
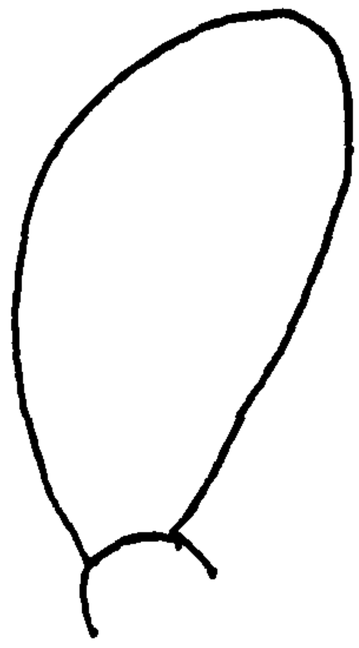


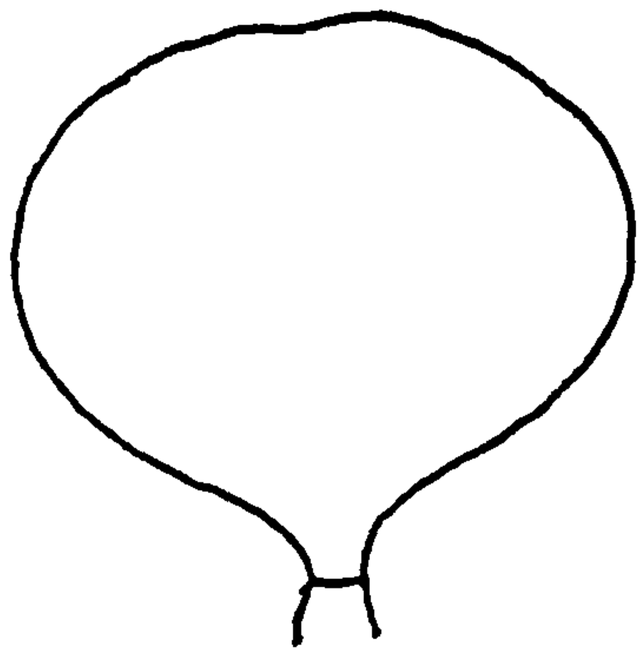
Figure 14: Lageniform Cystidia



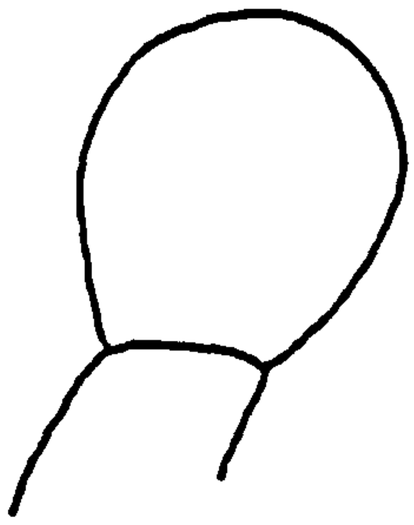
ventricose-rostrate



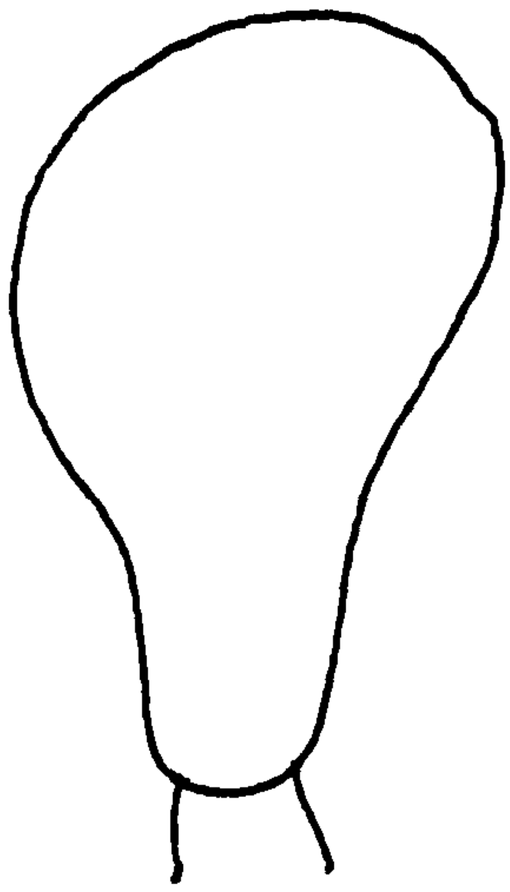
napiform



turbinate

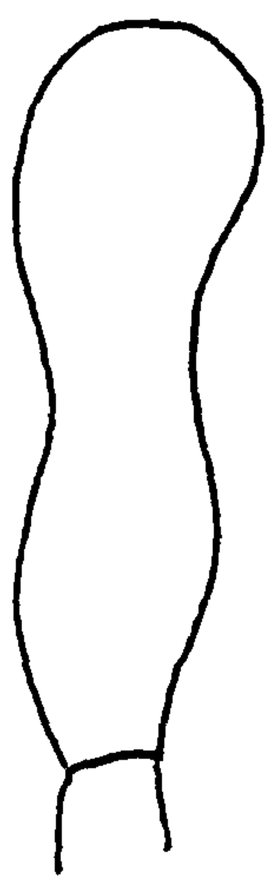


vesiculate



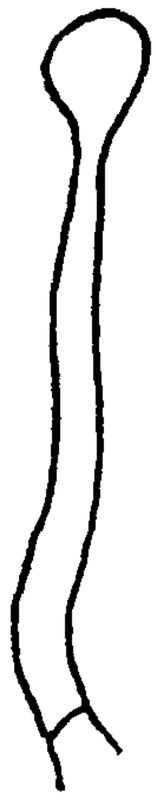
pyriform

Figure 15: Ampulliform Cystidia

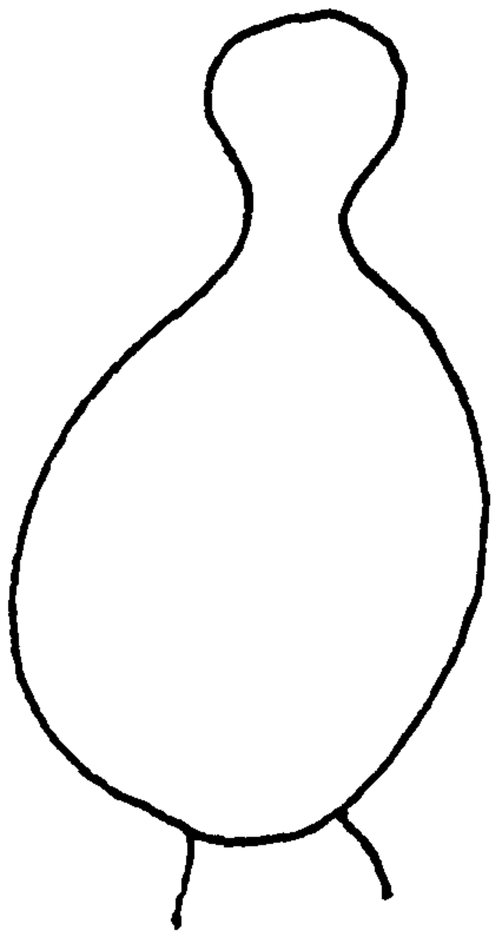


sphaeropedunculate

capitulate



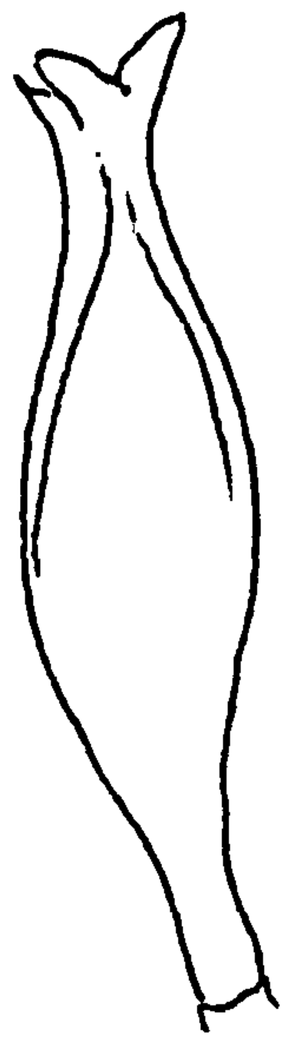
tibiiform



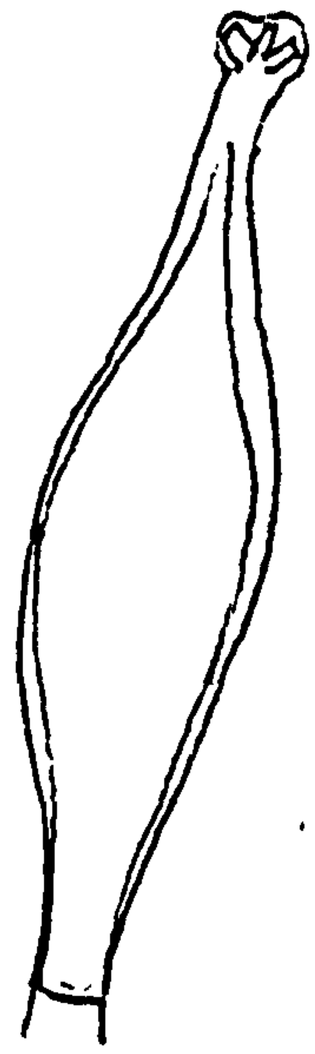
lecythiform

strangulated

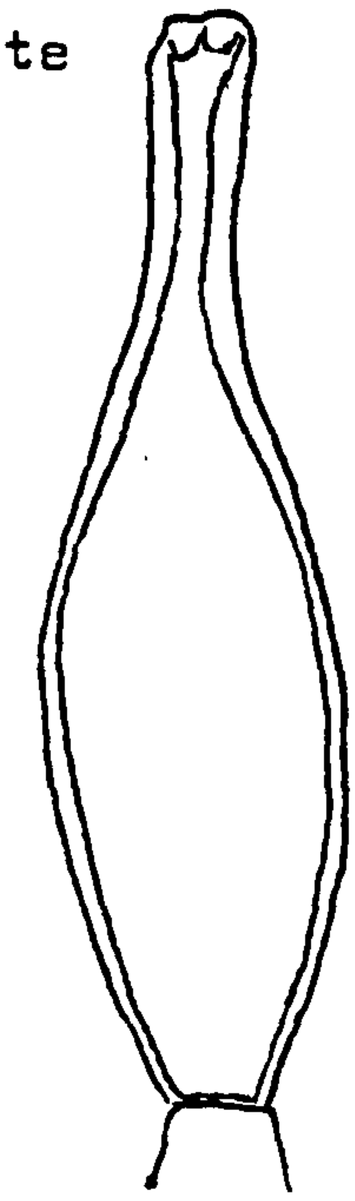
Figure 16: Utriform Cystidia



cornuate



fusoid metuloid



obclavate metuloid

Figure 17: Cystidia with Metuloid.

in a number of cases. An uncertain category has been included in the key for users who are not sure of their identification. On the other hand, a state such as metuloid is very easy to identify and provides an important split in the genus Inocybe (over 30 poisonous species).

The importance of this character seems to warrant a little training on the part of people interested in using the present identification scheme.

2.2.2.1.1.18.4. Chrysocystidia. (24)

States : - present

- absent

The last microscopical character introduced in the diagnostic key is in fact a microchemical character. Some cystidia, in the presence of strong aqueous alkali solutions (e.g. 50 % Ammonia) stain yellow to golden. They are specific to a few genera of interest to the mycotoxicologist (Stropharia, Hypholoma). These cystidia are called chrysocystidia and show the states "present" or "absent". No distinction is made here between facial and marginal cystidia because they show the same topological distribution for the genera of interest (i.e. they are found on both the margin and the face of the gills).

This completes the set of anatomical characters included in the programmed key. They are necessary if an attempt to identify a specimen down to species level is required, but in some cases they may not be sufficient, where closely related species are involved and further detailed microscopic examinations by a trained mycologist are necessary. For example, closely related Tricholoma are not specifically identified by the present set of characters.

2.2.2.1.2. Ecological Characters.

Three characters have been considered useful here because they are likely to be known at the time of an emergency. They are available to whoever uses the key and, above all, may carry very valuable information content. These are geographical distribution, habitat and time of growth.

2.2.2.1.2.1. Geographical Distribution. (3)

States : - North temperate

- South temperate

- subtropical

- tropical

- English

- Scottish

A general state definition is found to be practical and theoretically acceptable. It splits fungal distribution into four large climatic regions defined as North temperate, South temperate, subtropical and tropical.

A choice of alternative states was available. The geographical distribution could have been described by groups of countries such as Siberian, Northern European, Mediterranean, North American, Australian, etc, which theoretically would have had high diagnostic value and therefore given a very useful split in the population included in the data bank. This was found to be unpractical because the distribution of mushrooms is very well documented in Europe, but that is certainly not the case for other areas of the world. Major advances have been made in this respect during the last decade and another five to ten years of data collection may prove sufficient to consider using such state definitions.

The North temperate area includes most of Europe, most of North America and a large part of Asia. Since the key was constructed in Britain and distribution surveys were carried out in Scotland a more selective division has been introduced by taking into consideration the distribution of fungi in England and Scotland, two countries which show marked differences in their fungal

flora. Whereas England has a flora comparable to most Central and Western European countries, Scotland has one comparable to that of Northern European countries (Scandinavia, Iceland and Alpine areas). This is a very useful split at the European level where the data is fairly complete and comprehensive. The states "England" and "Scotland" could easily be replaced by, for example, "Germany" and "Sweden" or "Holland" and "Scandinavia", etc. It is obvious that this character will often show multiple states for given species i.e. widespread European species show states "North temperate", "English" and "Scottish". North temperate species which are neither English nor Scottish are in most cases North American and therefore are split by the fact that multiple answers are used. This is also reflected in the data retrieved when an identification is attempted (see 2.2.1.7.)

South temperate species are mostly Australian, New Zealand and South American species, but the data is incomplete and needs to be expanded if a comprehensive coverage is required.

Subtropical species are found mainly in South Mediterranean and Central American countries, the data for other areas being scattered and largely incomplete. When the fungal distribution is better known in

subtropical areas, this state will have to be divided into two separate states i.e."North subtropical" and "South subtropical".

Tropical fungal floras seem to be better known than the subtropical floras due to a number of surveys by eminent mycologists (Heim, Pegler, Heinemann, etc). This state covers a large part of Africa, South Asia, Indonesia and parts of South America.

It is obvious that an overlap between climatic areas is inevitable and that this character is continuous. Climatic conditions can change from one year to another and modify these areas to varying extents. This means that a subtropical mushroom may, for instance, be recorded, exceptionally, from the South of England. The likelihood of it being involved in a case of poisoning in the South of England is however very remote due to the rarity of its occurrence . Alternatively, a mass poisoning is likely to occur in a high frequency area for the given species. This guarantees the validity of this character and its selective strength.

Apart from data about Scotland, where personal collections and research supported and complemented literature data (see Title 4.2.), all the geographical data has been gathered from the mycological literature.

2.2.2.1.2.2. Habitat. (4)

States : - ground in coniferous woods
- ground in hardwoods
- ground in grass
- ground in dung
- on stumps
- others

All fungi, by their very nature, have to grow in association with other living,or once living, organisms as parasites, symbionts or saprophytes. The host-fungi association is often one of a selective nature and even sometimes of a specific nature (that is, a certain fungal species will necessarily be associated with a single specific host).

Many fungi are less specialised and a whole range of associations, from non-selective to specific can be found. It is useful to divide the host type into six selective groups representing the main types of association encountered with the higher fungi.

Mushrooms living in mycorrhizal association with trees are divided into coniferous (or softwood) and hardwood association. Multiple states are permitted and mushrooms found growing in both types (mixed) of woods or

in deciduous woods show both states of character. Most deadly poisonous mushrooms belong to one or other, or both the above categories.

Mushrooms growing in grasslands are quite common and a number of them are upsetting when ingested and provoke some gastrointestinal disturbances to the eater. Some hallucinogenic fungi are also found in this section although most of them grow on dung, the next specialised habitat considered in the key. Coprophilous fungi, as a group, are generally small and, because of their rather unappetising habitat are unlikely to find their way onto the plate of the mycophagist. Intoxications with coprophilous fungi are likely to arise from people collecting fungi for their hallucinogenic properties, since many hallucinogenic mushrooms listed in the data bank grow on dung. This fact warrants the use of this specific type of habitat as a separate state.

Other saprophitic fungi grow on dead wood or stumps. Lignicolous species are numerous and the most common British poisonous mushroom grows on such a specialised habitat (i.e. Hypholoma fasciculare) Apart from the example cited only a few poisonous species are to be found in this category and a number are not large or fleshy enough and their toxicity, if any, is unknown.

This makes this state fairly restrictive but still useful with regards to the frequency of occurence of the species found here.

The last state, "<u>others</u>", is, as it implies, a mixed bag containing various other types of specialised habitat such as burnt patches, sand-dunes, heathland, marshes, other fungi, etc. They are all grouped together because only a few species are associated with them or, more likely, only very few toxic or suspect species are known to grow in connection with these habitats.

There is one major drawback when using this character in that the division between one state and another is not always clear or can even be wrong. For example, a mushroom growing in grass, five meters outside a larch forest, may in fact be associated with the larches and not with the grass (e.g. <u>Suillus grevillei</u> or larch bolete). Further, a dung may not be seen as such after rain, and a pasture may be seen as rich "grass" rather than "dung" in grass. Equally, a change in vegetational history of an area may not be completely reflected in the fungal distribution found there. This phenomenon is known and has been used to study the ecological history of given plant communities. Fungi growing in association with specific hosts have been found to grow decades and centuries after

the host had disappeared, thereby adapting to a new-environment (Watling, 1978).

Such examples could fill pages and indicate that, in fact, the true habitat of a given mushroom could be genuinely mistaken, and hence defeat the whole purpose of identification unless provision for such a mistake could be introduced into the programme.

One such safeguard has been devised, in the key, which allows an identification despite incorrect observation of the state of the present character. That safeguard is discussed elsewhere under the heading "Near-miss match identification" (2.2.2.2.1.).

The main advantage of the character "habitat" is that, when accurately defined, it splits toxic and hallucinogenic fungi into large groups of relatively equivalent importance, i.e. the information has an important diagnostic impact. Its usefulness is also emphasised by its ease of observation, in a majority of cases, and is supported and exemplified by a major case of poisoning which occurred in Scotland in 1979 (Watling, 1980). Here, the victims were able to pinpoint the locality of collection to a coniferous wood near their camping site, a fact which helped greatly in the subsequent identification of the species involved and the clinical management of the

case (Short et al. 1980) (see 3.4.2.2. for further discussion of this case).

2.2.2.1.2.3. Time of Growth. (5)

States : - spring
- summer
- autumn
- winter

The time of growth has been described in terms of the seasons, spring, summer, autumn and winter. There are two reasons for including this character in the key. The first and deciding one is that a common deadly mushroom (Amanita verna) and a few dangerous ones grow at times other than during the summer or the autumn.

Mushrooms are rare in winter or spring and keen collectors or mycophagists may be tempted to try the few species available for collection and consequently have a greater chance of being poisoned than at other times, when common and well known edible species are at hand.

The other reason for using this character is its availability to whoever is using the key.

Nevertheless it remains one of the least useful characters because the peak time for growth of most higher fungi spreads from July to October and that means a very poor selectivity in terms of information which the character conveys.

This feature also shows the same drawback as the previous character in that it can genuinely be mistaken because the time of growth varies depending on the geographical location of the fungus as well as on the climatic conditions for a given year.

To safeguard against a misidentification due to a genuine error, a possible identification based on erroneous data is made possible by a device introduced into the programme, discussed under the separate heading "Near-miss Match Identification" (2.2.2.2.1.).

Example: in extreme weather conditions, summer may start at the beginning of June which, theoretically and strictly following calendar rules, is still spring. Allowance can be made for this misidentification in the same manner as for the previous character.

2.2.2.1.3. Medical Characters.

Here, the only concern for identification purposes relates to the symptoms produced by the mushroom poisoning: the array, the time of onset and the duration of the symptoms. These are well and widely documented. Lincoff and Mitchel's classification (1977) seemed to be appropriate and is used here.

2.2.2.1.3.1. The Symptoms. (1)

States : - gastroenteritis after 8 hours, no fever, cytolitic hepatitis.
- minimum 15 hours after ingestion: gastroenteritis, intense thirst, polyuria then renal failure.
- after alcohol consumption: flushing face and neck, swelling, tingling of hands; metallic taste, palpitations, hypotension, later nausea and sweating.
- perspiration, salivation, lacrymation, blurred vision, abdominal cramps, diarrhoea, constriction of pupils, fall in blood pressure, slow pulse.

- dizziness, drunkenness, incoordination, staggering, muscular cramps, spasms, hyperkinetic activity, deep sleep and visions.
- mood changing, unmotivated laughter, hilarity; muscle weakness, drowsiness, hallucinations.
- gastroenteritis; vomiting
- gastroenteritis after 5 hours; fever; cytolitic and haemolitic action; headaches.

It is practical and useful to group sets of symptoms to form the several states of this character. The symptoms, grouped in a set, are typical of one single type of mushroom poisoning. Seven sets of symptoms characterise seven definite types of mushroom poisoning, while an eighth state includes all the species which give uncharacteristic and usually mild gastrointestinal upsets.

An alternative approach was to divide the character "symptoms" into as many characters as there are symtoms and signs which doctors can observe. Each character would either be present or absent, e.g. a first character "nausea" could be present or absent, a second character "dilated pupils", in the same way, could be present or

absent, and so on, with fever, salivation, lacrymation, hallucinations, hypotension, etc.

This latter approach is unpractical for three main reasons. First, and not least, although it may seem trivial, is the length and tediousness of the procedure. Secondly, if the symptoms are recorded separately, an uncharacteristic and unrepresentative symptom may be selected which would foil the whole process of identification. Finally, a number of these characters, such as gastrointestinal disorders, nausea, emesis, diarrhoea, etc when taken in isolation are common to all or most mushroom poisonings and are therefore irrelevant to identification, but when used in combination with others, as a set or as an array, are characteristic of one single type of poisoning.

Symptoms can be readily divided into those with an immediate or rapid onset and those with a delayed onset after ingestion of the mushrooms. The symptoms provoked by the most dangerous mushrooms always have a delayed onset and are dealt with first.

2.2.2.1.3.2. Delayed Onset of Symptoms.

This concerns three states of the character "symptoms",

the first one, known also as "Amanita Poisoning", the second "Cortinarius Poisoning" and the last one, "Gyromitra Poisoning".

2.2.2.1.3.2.1. Amanita Poisoning.

When gastroenteritis appears, usually after eight to twelve hours, followed by signs of cytolitic hepatitis and a characteristic absence of fever, it is indicative of what is commonly called "Amanita Poisoning" (Mitchel, 1980). No complete and accurate statistics exist on the frequency and proportion of different types of mushroom poisoning, but it is generally admitted that about 50 % of all cases and up to 95 % of all the known fatal cases of mushroom poisoning are due to Amanita poisoning. These values fall to 18 % and 75 % respectively in a ten years' survey by Bornet (1980), but admittedly the mushrooms responsible for the intoxications were unknown in 47.5 % of the cases and in 16.3 % of the cases following death!

2.2.2.1.3.2.2. Cortinarius Poisoning.

This type of poisoning exhibits a delayed action usually of the order of three days but sometimes as short as 15 hours and as long as 17 days. The symptoms start with gastroenteritis, as with "Amanita poisoning", but

are then accompanied by intense thirst and polyuria and followed by renal failure. It was given the name of "paraphalloidic poisoning" when it first came to light in 1952 (Grzymala, 1957) but is more accurately described as "Cortinarius poisoning" because the symptoms are different to those provoked by Amanita phalloides (i.e. Amanita poisoning or phalloidic symptoms) and arise only after ingestion of some Cortinarius species. Some of the more recent serious cases of poisoning in Scandinavia (Hulmi et al., 1974) and Scotland (Short et al., 1980) showed this set of symptoms.

2.2.2.1.3.2.3. Gyromitra Poisoning.

A delayed action ranging from 5 to 8 hours is characteristic of "Gyromitra poisoning". The symptoms are revealed as fever, gastroenteritis with headaches, cramps and hemolysis followed by liver damage. This type of poisoning is serious and death ensues in a great number of cases. Mushroom poisoning of this type arises from highly regarded edible fungi sold as dried mushrooms in markets of a number of European countries. Eaten fresh, these mushrooms are highly toxic, but they loose their toxicity in the drying or cooking process. Lincoff and Mitchel (1977) reported that all deaths in the United

States due to mushroom poisoning other than "Amanita poisoning" arise from this type of mushrooms (Gyromitra and Helvella species).

2.2.2.1.3.3. Rapid Onset of Symptoms.

All other types of mushroom poisonings show an early onset of symptoms starting soon and usually within two hours after ingestion. These poisonings are less serious and rarely fatal in healthy adults.

2.2.2.1.3.3.1. Coprinus Poisoning.

This is state 3 of the character "symptoms". Coprinus poisoning is conditional and appears only if alcohol has been consumed with or after Coprinus species. It shows a remarkable similarity to the disulfiram-ethanol reaction: flushing of the face and neck, swelling of hands and feet accompanied by a metallic taste, palpitations, hypotension and followed by nausea and sweating. The complete metabolism of alcohol is impaired, resulting in the accumulation of toxic levels of acetaldehyde which produce the symptoms described above (Wiseman and Abeles, 1979). This disulfiram-like effect (or Antabuse^{R} reaction as it is often called) appears immediately after consumption of

alcohol, even if the mushroom has been eaten during the preceding four to five days. No death has been reported from this type of poisoning.

2.2.2.1.3.3.2. Muscarine, Psilocybin and Muscimol Poisonings.

The next three sets of symptoms are becoming increasingly important and common in modern society where large minority groups gather mushrooms for their use as a "recreational drug". This increase in popularity is undoubtedly due to the legal status of the so-called "magic mushrooms", as it is not a controlled drug under the present Misuse of Drugs Act (1971). Underground circles and cultures have very quickly taken advantage of the implications of such a legal status. This is emphasised by a recent Release publication (Release, 1979).

2.2.2.1.3.3.3. Muscarine Poisoning.

The three well known characters of muscarine poisoning, perspiration, salivation and lachrymation appear very quickly after ingestion of the toxin. This is accompanied by blurred vision, abdominal cramps and followed by diarrhoea, constriction of the pupils, fall in blood pressure and slow pulse.

For a long time all mushroom poisonings were attributed to muscarine, for which the antidote is atropine. Unfortunately, this dangerous assumption still persists even in recent pharmacy text books!

In Britain, muscarine is mainly confined to small fairly widespread mushrooms which are unlikely to find their way onto the plate of the mycophagist. However, they may be picked deliberately but mistakenly by "magic mushroom" gatherers!

2.2.2.1.3.3.4. Muscimol Poisoning.

This represent the fifth set of the character "symptoms", or state 5. Amanita muscaria - the "toad-stool" or "fairy tale mushroom" - gave its name to muscarine, but the main toxins of this mushroom produce a different set of symptoms, unrelated to those of muscarine. They are dizziness, drunkenness, incoord-ination, staggering, muscular cramps, spasms, hyper-kinetic activity, deep sleep and visions. These symptoms are produced by a number of common and closely related mushrooms which are sought after for their inebriating and hallucinogenic properties by some sectors of society. Amanita muscaria was widely used until fairly recently in Siberia and a long history of religious and shamanistic

traditions surrounds this mushroom (Wasson, 1968).

2.2.2.1.3.3.5. Psilocybin Poisoning.

This is the last set of characteristic symptoms elicited by some mushrooms after ingestion (or state 6). Hallucinogenic mushrooms produce symptoms similar to those recorded for LSD following ingestion. They include mood changes, unmotivated laughter, hilarity, muscle weakness, drowsiness and hallucinations and are often described under the collective name of "psilocybin poisoning".

Hallucinogenic mushrooms have attracted the interest of research scholars of the history of religions and ethnopharmacology, as well as a fringe of an hedonistic section of modern society. They have often been described as the "Mexican hallucinogenic mushrooms" after G. Wasson discovered, participated and described (Heim and Wasson, 1958) religious rites based on these mushrooms still taking place in some remote parts of Mexico. Hallucinogenic mushrooms were later found to be widespread throughout the world and their study form a substantial part of the research carried out in the present thesis (Margot and Watling, 1980).

2.2.2.1.3.4. Discussion.

For practical reasons, these descriptions of symptoms are limited to a few characteristic signs which are present when a specific type of poisoning occurs. It does not,in any way, describe or represent the whole array of medical information which can be gained from the patient. These symptoms have been widely, fully and expertly described by many authors and in many languages (English: Lincoff & Mitchel, 1977; Rumack & Salzman, 1978; German: Flammer, 1980; French: Heim, 1963/1978; Bornet, 1980; Italian: Arietti and Tomasi, 1969/1975; etc) and it is to these authorities that the clinician is referred for further details, or, better, to the bibliographic reference retrieved with the present programme when an identification is obtained. A full description is beyond the scope of this thesis and would not serve in the identification of the causal agent of a mushroom intoxication, - the primary purpose of this programme.

2.2.2.1.3.5. Onset of Symptoms. (2)

States : - within 2 hours

- 3 to 8 hours

- 8 to 12 hours

- typically over 15 hours

Repeated reference to the delay of the onset of symptoms was done in the previous paragraphs (2.2.2.1.3.2. to 2.2.2.1.3.3.). It is a primordial diagnostic factor which can mean the life or death of a patient. To emphasise its importance, it has been included as a separate character which can be used by non medically trained users of the programme. Bornet (1980) has shown from his studies over a ten years period that this character is known in 95.9 % of cases.

The onset of symptoms can be described in terms of the four selective states given above.

If symptoms appear within two hours of ingestion, all the most poisonous species of mushrooms to be found can be eliminated as being responsible for that clinical condition. This therefore makes a useful distinction between all the toxic species. The three other states conveniently divide the remaining and mostly dangerous species into three specific groups. A delay of action of three to eight hours is shown in cases of "Gyromitra poisoning" (usually 6 to 8 hours). "Amanita poisoning" is characterised by a delay of more than 8 hours but less than 15 hours (typically 10 to 12 hours) whereas "Cortinarius poisoning" shows a very long delay of action ranging from 15 hours to 17 days in extreme cases,

but typically of about 3 days. Earlier signs of gastro-enteritis have been reported by Flammer (1980) in a few rare cases of"Cortinarius poisoning" but this still needs further confirmation.

2.2.2.1.3.6. Duration of Symptoms. (15)

States : - weeks if not death

- 2 to 4 hours

- up to 6 hours

- 6 to 24 hours

- few days

The character "duration of symptoms" would seem to be more of an academic than practical interest and has no place in an identification process where emergency toxicology is concerned.

Nevertheless, it was thought useful to include this character as a preventive as well as for a medico-legal reason. In the preventive context, the identification of the causative agent of an intoxication, whether the victim dies or not, is necessary. People could be advised via the mass media that a certain poisonous species of mushroom is growing in a given geographical location and at a given time of the year. Furthermore, a full description and a warning could be issued, thereby preventing

further intoxications.

In the case of death, the identification of the causative agent becomes the main medico-legal concern and it can be of utmost importance (for example for insurance purposes) to determine that a poisoning is accidental rather than criminal or due to pollution or other hazards of modern society.

This necessity for identification warrants the inclusion of this character in a general multipurpose identification programme.

The first state of this character, "weeks if not death" is shown in all serious cases of intoxication. Slow acting toxins, which are present in the most dangerous mushrooms, may affect the victim of a poisoning for weeks. Sooner or later, depending on the individual and the dose ingested, the outcome may be death.

The second state, "2 to 4 hours" is very selective. Only conditional poisoning of the "Coprinus poisoning" type show symptoms appearing immediately after ingestion of alcohol and disappearing very quickly : within 2 to 4 hours.

Individuals poisoned by hallucinogenic mushrooms are affected up to five or six hours after ingestion.

It represents the third state of the character "duration of symptoms". This does not take into account possible recurrence of the symptoms at later dates (flashbacks as experienced with LSD).

The fourth state (6 to 24 hours) is experienced with most of the other poisonous mushrooms . Their effects gradually reside within one day.

Finally, a few species show more serious symptoms which can last for a few, usually two to three, days. Poisoning cases with these species are fairly common and a separate state - "few days" - is very useful in that context.

The time periods over which individuals adversely respond to mushrooms, just like the delays in the onset of the symptoms, are characteristic of given toxins and therefore are valuable diagnostically.

It should always be borne in mind however, that the medical history of the patient before the poisoning occurred may affect the duration of the symptoms, or even the outcome of the poisoning. An unhealthy victim may die from exposure to a mildly poisonous mushroom or small doses of toxin. This should be common sense for anybody working in the field of toxicology or medicine and should be allowed for when using the key.

2.2.2.1.4. Chemical Characters.

Only one character has found a place here: the toxins. The chemistry of most of the higher fungi is very poorly described. Furthermore, compounds known to occur in some species have not been widely surveyed in other species. The result is that the distribution of the toxins,within identical species of different origins or between species, is unknown.

2.2.2.1.4.1. Toxins. (14)

States : - cyclopeptides
- orellanine
- muscarine
- hallucinogens
- muscimol/ibotenic acid
- coprine
- others
- gyromitrin

At the present time, this character is only useful when fresh material is available for analysis, and will certainly not be used in cases of emergency toxicology for a while yet. The study of known toxins in the human body, their analysis and distribution is non-existant or,

at the very best, poorly documented. It is hoped that this will be a major area of research in the next few years.

Some personal research has helped to complete some data used in this programme and is discussed and described in the last part of this thesis (chapter 4).

Seven groups of known toxins form seven states of the character "toxins", whereas the eighth state, defined as "others" include all the yet unidentified toxins contained in a number of mushrooms. The state "gyromitrin" is placed last in the above list because it was added to the programme at a late stage.

2.2.2.1.4.1.1. Cyclopeptides.

The toxic cyclopeptides, characteristic of "Amanita poisoning", are responsible for the majority of deaths due to mushrooms (Mitchel, 1980; Bornet, 1980). The most lethal of these toxins are the amatoxins (Figure 18), first identified in Amanita phalloides, the "Death Cap" (Wieland and Faulstich, 1978). The amatoxins are a group of eight octapeptides that inhibit the transcription of RNA and DNA. As a consequence, protein synthesis and cellular reproduction are blocked, followed by necrosis

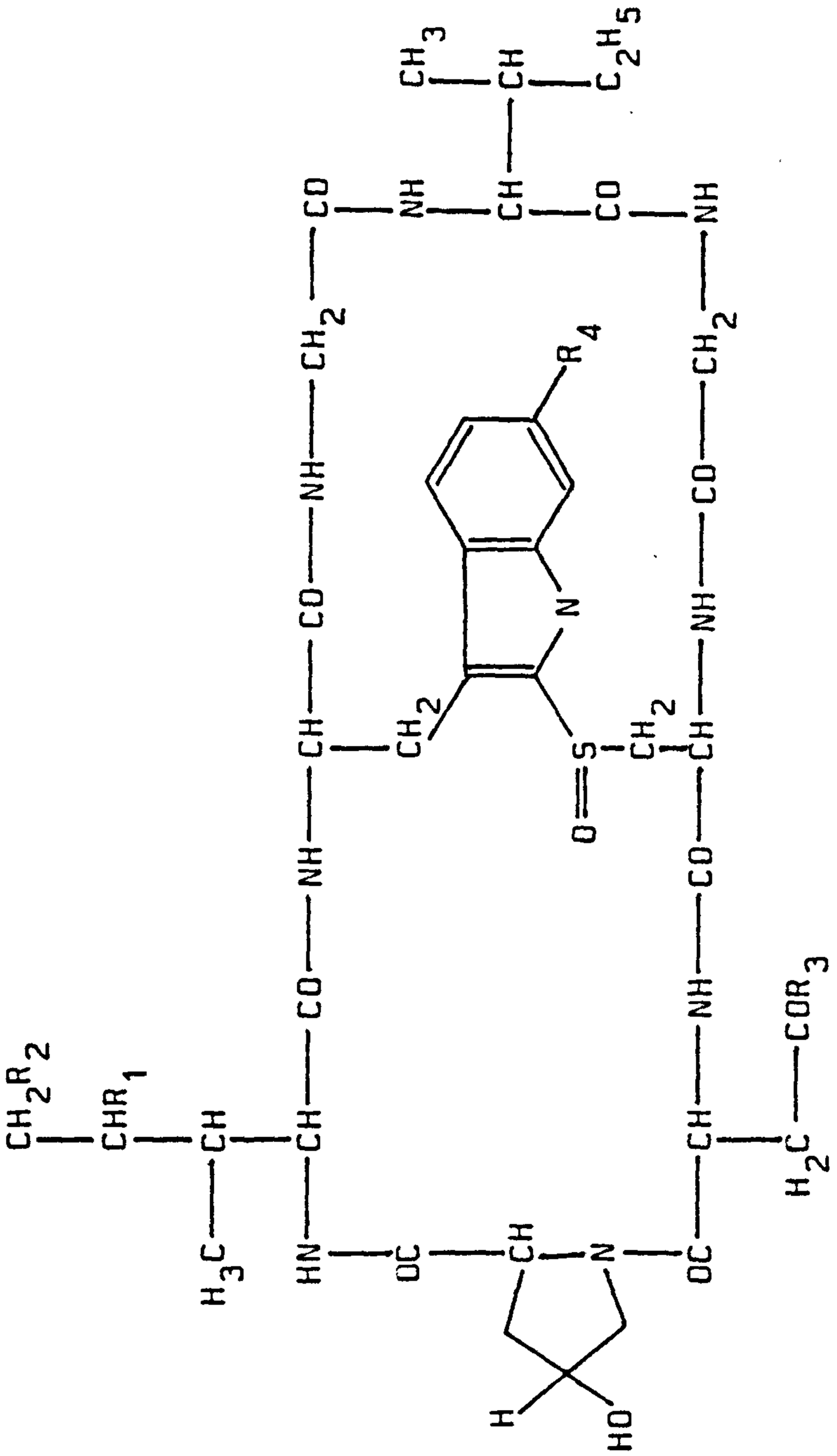


Figure 18 : Description of the General Structure of the Amatoxins

Figure 18 : Legend : respective structures of the related amatoxins

	R_1	R_2	R_3	R_4
α - amanitin	OH	OH	NH_2	OH
β - amanitin	OH	OH	OH	OH
γ - amanitin	OH	H	NH_2	OH
δ - amanitin	uncertain			
ε - amanitin	OH	H	OH	OH
Amanin	OH	OH	OH	H
Amanullin	H	H	NH_2	OH
Amaninamide	OH	OH	NH_2	H

of the affected cells. Seven heptapeptides, the phallotoxins have also been found in Amanita phalloides (Figure 19)but they are probably not involved in cases of human poisoning because of their heat lability. More recently, new cyclopeptides have been isolated and identified in Amanita virosa (the Destroying Angel). They are the virotoxins, related to the phallotoxins (Faulstich et al., 1980),and also amaninamide (see Figure 18)which is closely related to the amanitins (Buku et al. 1980).

A number of Amanita, Galerina and Lepiota species contain amanitins (Gérault and Girre, 1977) and are therefore highly dangerous. A number of analytical techniques have been devised and used in their characterisation and are detailed in the appendix (6.2.1.)

2.2.2.1.4.1.2. Orellanine.

There is much controversy surrounding the identity of this toxin or group of toxins (Greer, 1980). Undoubtedly it differs chemically from the Amanita toxins. Furthermore its physiological action also differs, the attack being observed in different organs, primarily the kidneys (Nieminen, 1976).

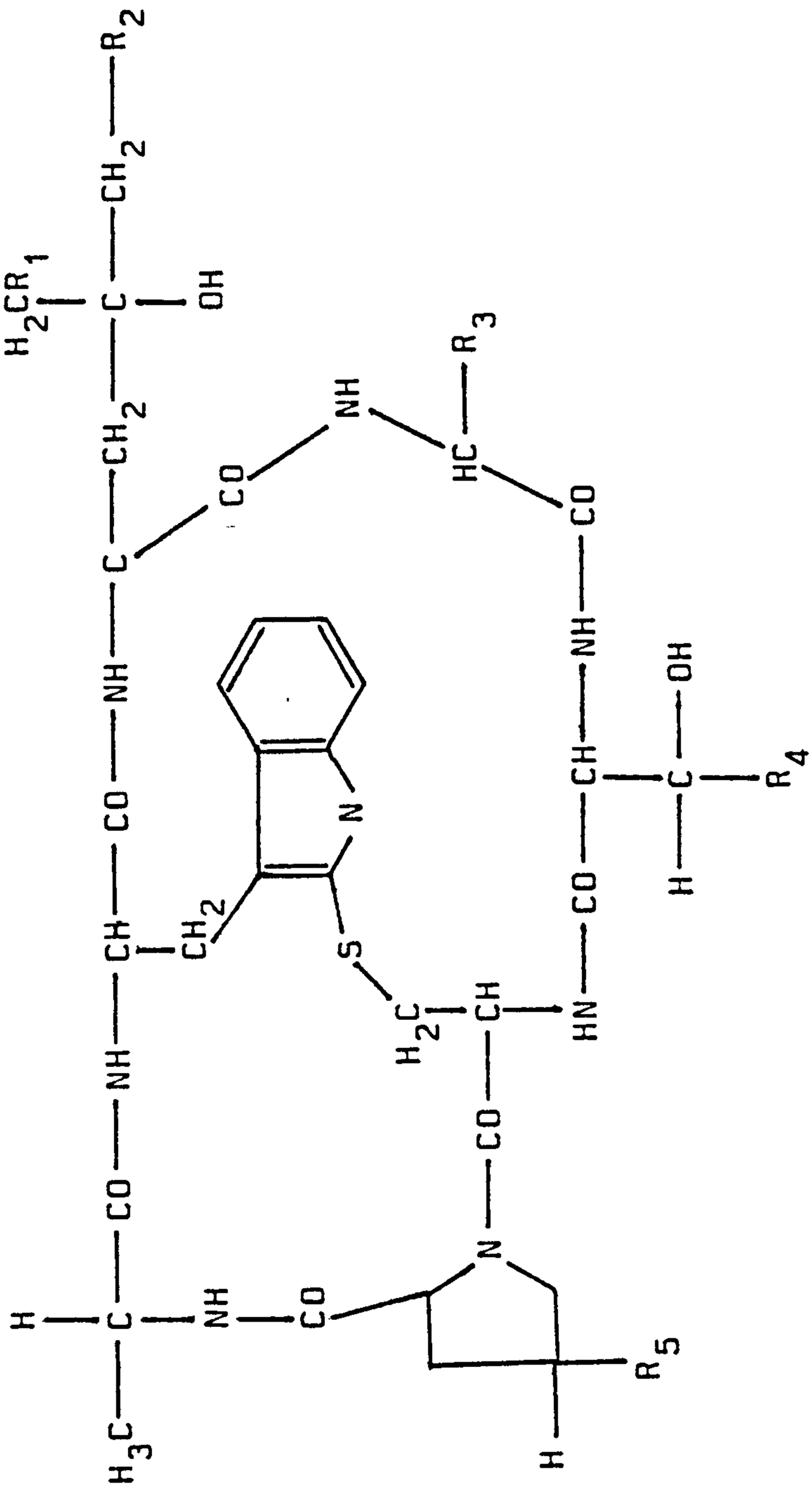


Figure 19 : General Structure of the Phallotoxins

Figure 19 : Legend : respective structures of the related phallotoxins.

	R_1	R_2	R_3	R_4	R_5
Phalloidin	OH	H	CH_3	CH_3	OH
Phalloin	H	H	CH_3	CH_3	OH
Phallisin	OH	OH	CH_3	CH_3	OH
Phallacin	H	H	$CH(CH_3)_2$	CO_2H	OH
Phallisacin	OH	OH	$CH(CH_3)_2$	CO_2H	OH
Phallacidin	OH	H	$CH(CH_3)_2$	CO_2H	OH
Phallin B	H	H	$CH_2C_6H_5$	CH_3	H

Antkowiak and Gessner in 1979 proposed a tetrahydroxy bipyridyl structure for orelline and its bis N-oxide derivative orellanine (Figure 20), structures which are still unconfirmed (Antkowiak and Gessner, 1980; Greer, 1980).

Analytical procedures for the isolation and partial characterisation of these compounds are described in the appendix (6.2.2.)

2.2.2.1.4.1.3. Muscarine.

Muscarine, first extracted from Amanita muscaria by Schmiedeberg and Koppe in 1869 was only characterised in 1954 by Eugster and Waser (Figure 21). For a long time muscarine was thought to be the cause of all mushroom poisoning, but recent work has shown that it does not even account for the toxicity of Amanita muscaria due to its very low concentration, coupled with a low oral toxicity.

It is,nevertheless, a common toxin found in high concentrations in a number of small mushroom species belonging to the genera Inocybe and Clitocybe. Its analysis is not easy and only a few claims for the presence of muscarine in higher fungi are based on chemical

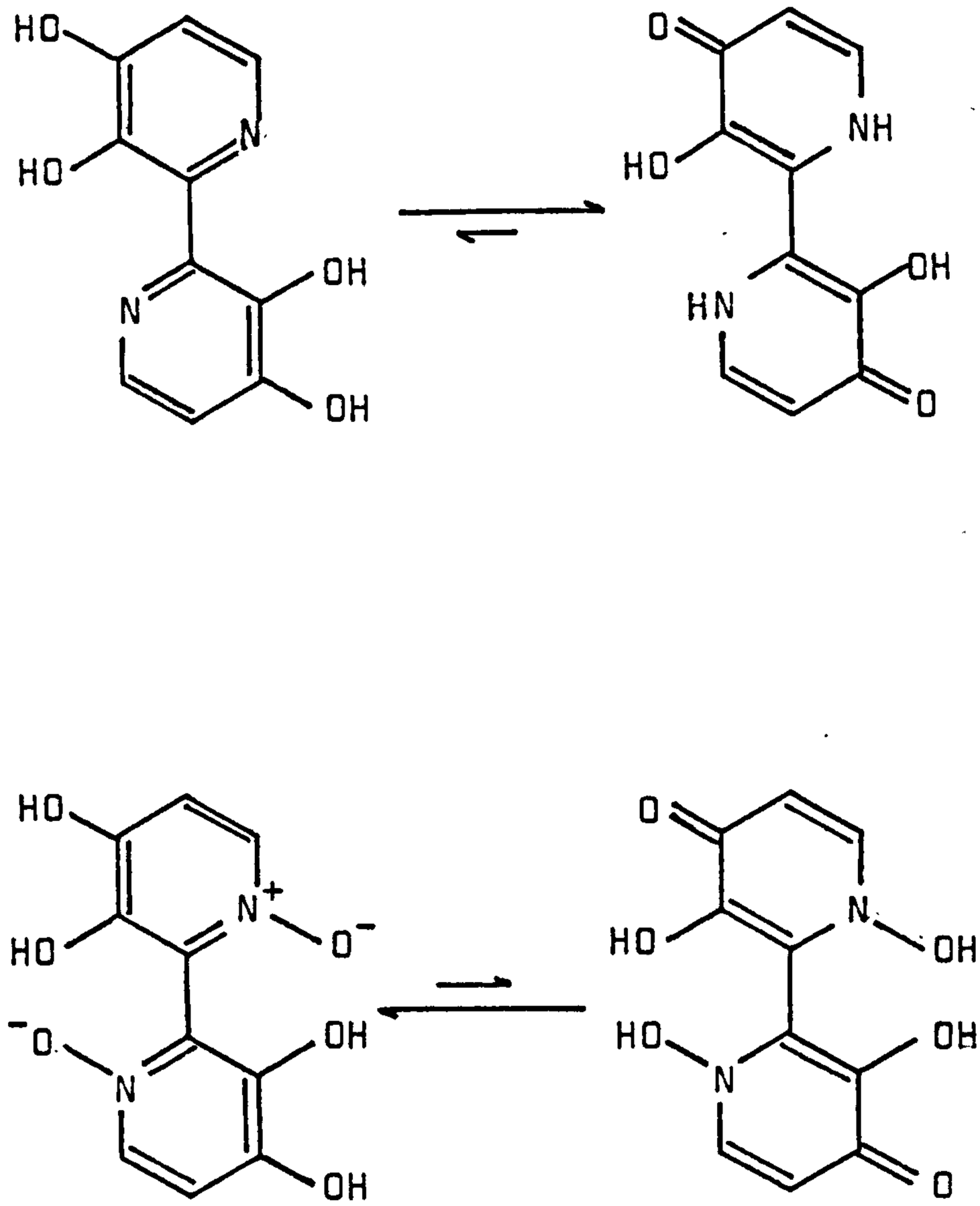
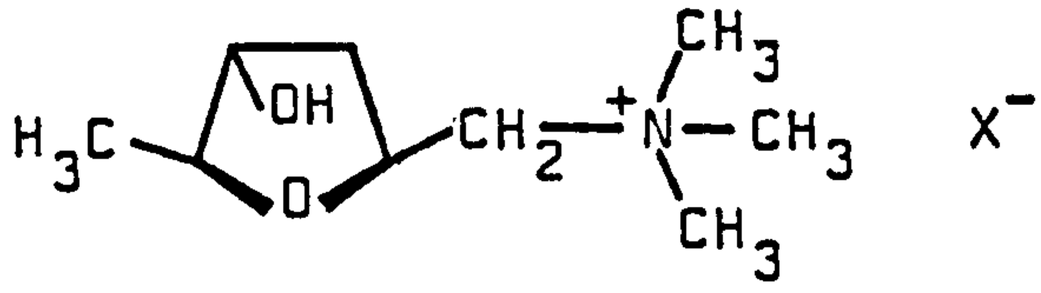
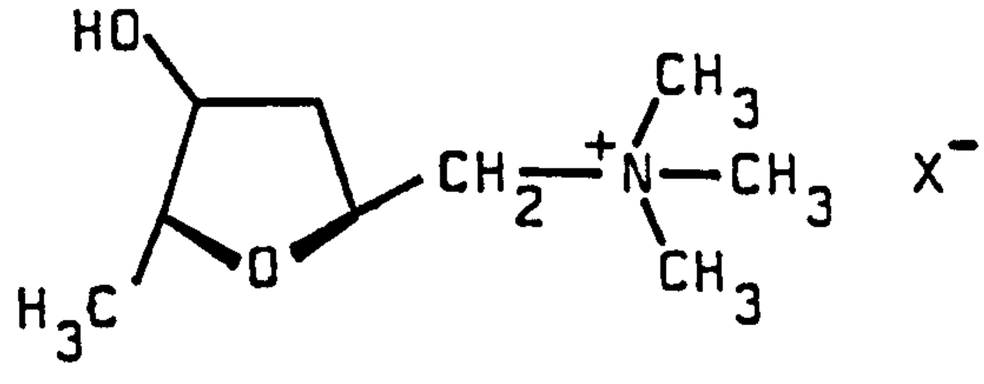


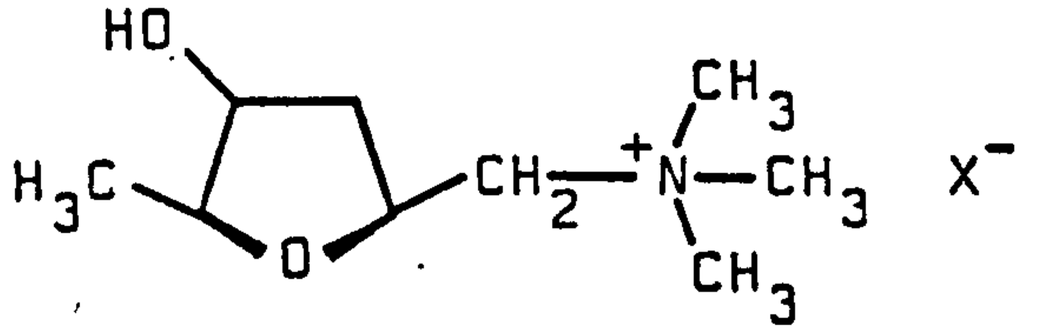
Figure 20: Proposed Structures for Orelline (top) and Orellanine (bottom) (Antkowiak & Gessner, 1979).



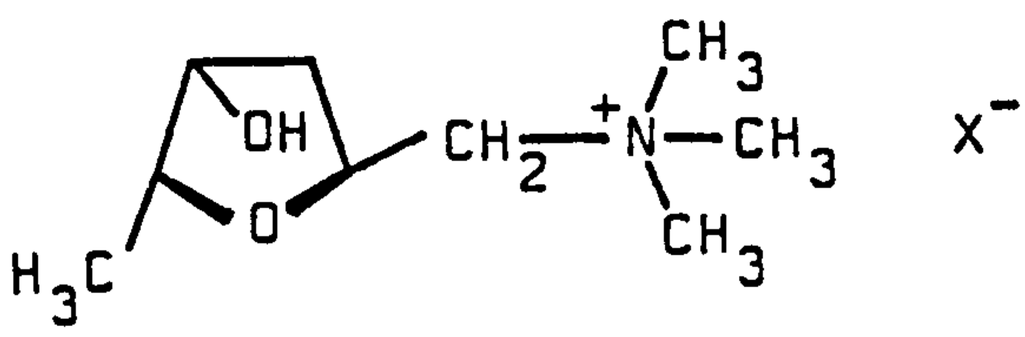
muscarine



allo-muscarine



epi-muscarine



epiallo-muscarine

Figure 21: Structure of Muscarine and its Isomers (Catalfomo & Eugster, 1970).

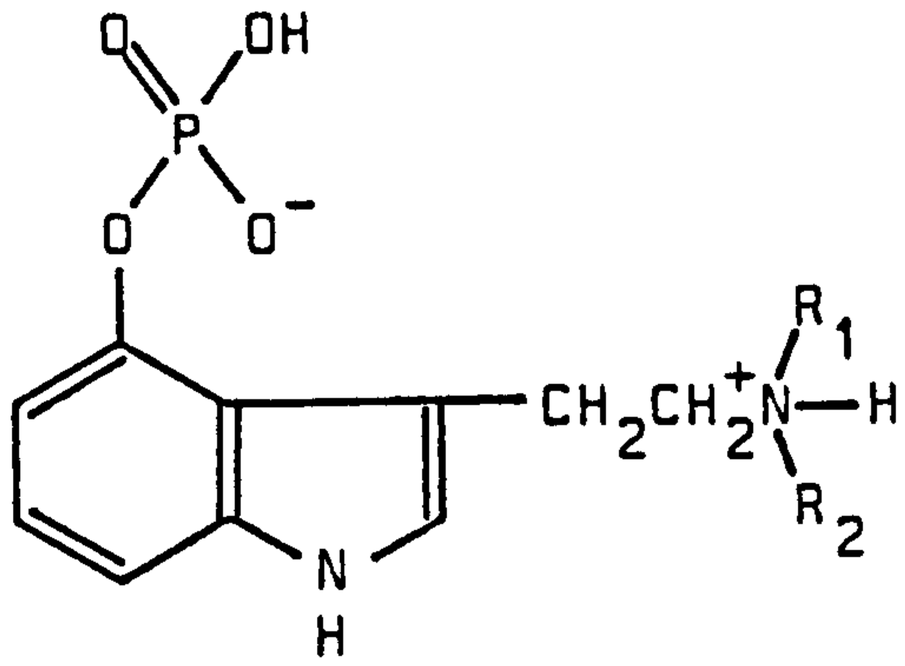
analysis (Eugster, 1969). The remaining claims are based on animal work and must therefore be considered as unsubstantiated. However, until further data are available, the present claims are used in this programme.

Detailed analytical procedures are given in the appendix (6.2.3.)

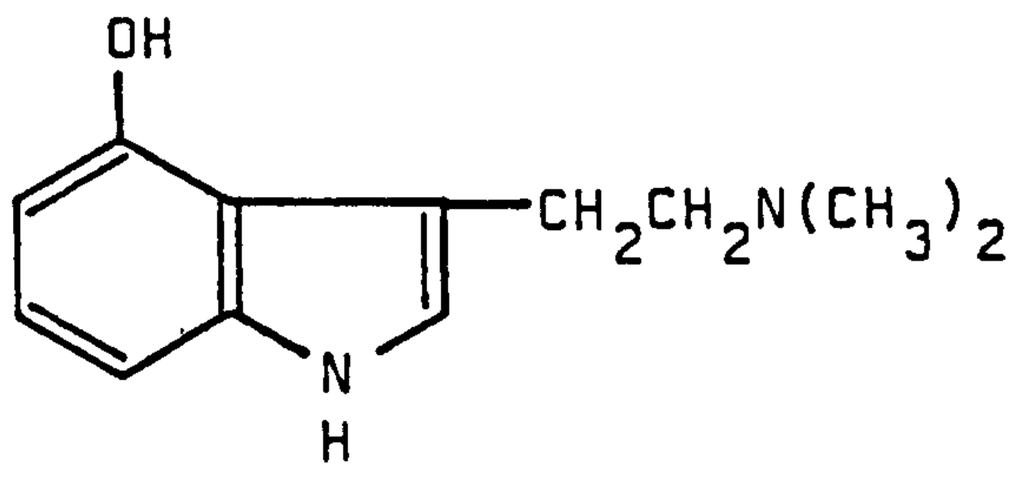
2.2.2.1.4.1.4. Hallucinogens.

Since the discovery of psilocybin and psilocin in 1958 and 1959 respectively by Hofmann and co-workers, two more indole hallucinogens of the higher fungi have been discovered: baeocystin and norbaeocystin, two analogs of psilocybin (Figure 22) (Leung and Paul, 1967; ibid., 1968).

In the past ten years, claims for the presence of some of these compounds in different mushrooms belonging to the genera Psilocybe, Stropharia, Conocybe, Hypholoma, Panaeolus, Gymnopilus, have been numerous and often unconfirmed. The list of species known to contain psilocybin and analogs is limited (see Table 3). Suspect species have also been included in the programme despite some negative results obtained in this laboratory (4.2.3.) These latter studies show that a number of claims for



(A)



(B)

Figure 22: Structure of Psilocybin and Analogues

		R_1	R_2
with (A)	psilocybin	CH_3	CH_3
	baeocystin	H	CH_3
	nor-baeocystin	H	H
(B)	psilocin		

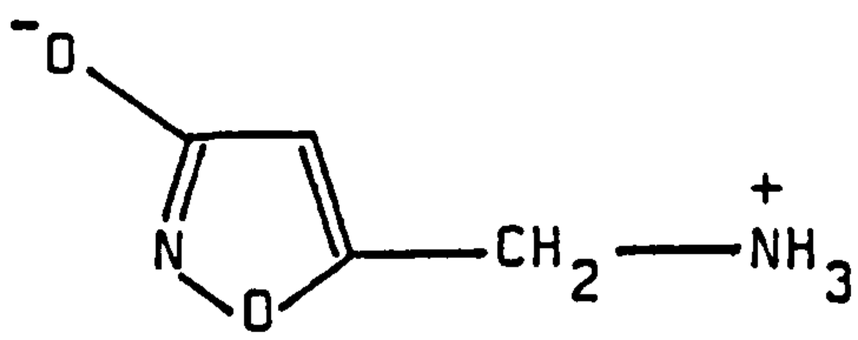
the presence of these compounds may be unfounded, or even, in the case of Panaeolus species, that other indole hallucinogens may be involved. Certainly, results presented by Ola'h (1969) could not be confirmed, thus supporting previously recorded doubts (Singer, 1975).

However, definite cases of intoxications, showing symptoms of psilocybin intoxication with Panaeolus species have occurred and have been investigated at Strathclyde University. It seems other, yet unidentified, hallucinogens may be at work here.

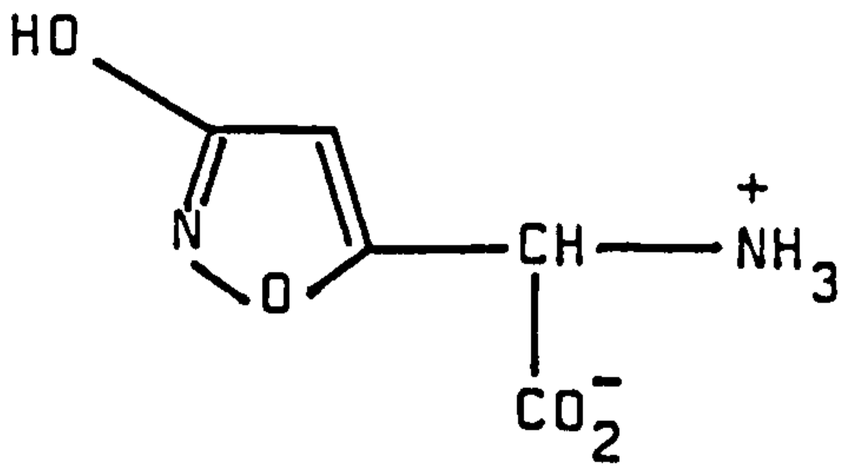
A thorough investigation of suspect species is necessary, and taxonomic positions should be made clear before further claims are made in the future. Furthermore, voucher specimens should be deposited in recognised centres.

2.2.2.1.4.1.5. Muscimol and Ibotenic Acid.

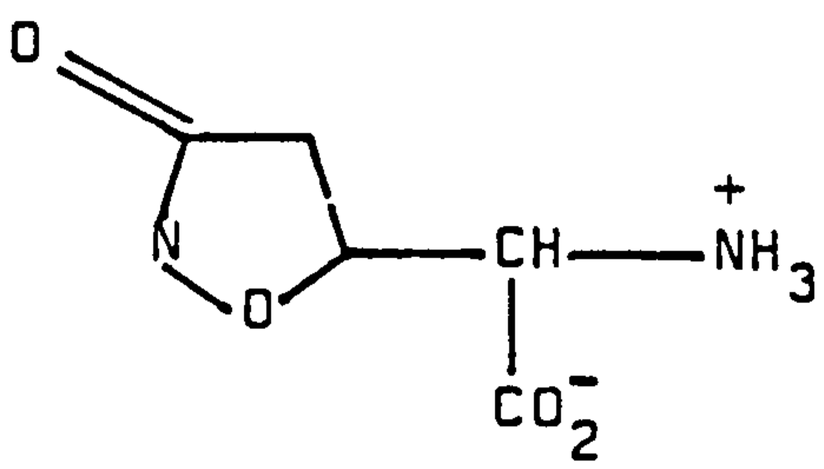
A number of compounds are included in this "state", which possess an isoxazole derivative structure (Figure 23) and which account for most of the symptoms shown by the, now famous, Amanita muscaria. They were isolated and characterised by



Muscimol



Ibotenic Acid



Tricholomic Acid

Figure 23: Structures of Isoxazole Derivatives Found in the Higher Fungi.

the Eugster team in Zürich from Amanita muscaria (Eugster, 1969). These compounds, muscimol and ibotenic acid, do not explain the whole range of physiological action experienced during intoxication with this mushroom. Eugster's work is the closest, yet known, to a complete investigation of the chemistry of one fungus. Ibotenic acid and muscimol are important compounds used by pharmacologists to obtain an understanding of the mechanism of γ-amino butyric acid (GABA) in the brain.

Mushrooms containing these isoxazole derivatives are well known and easily recognised by even the least experienced amateurs which means that accidental poisonings are unlikely. Most intoxications will be self-inflicted in the experimentation and search for natural and uncontrolled drugs. Extensive descriptions of Amanita species containing these toxins are to be found in the underground literature dealing with drugs (Margot, 1977).

Analytical procedures are detailed in the appendix (6.2.5.).

The related tricholomic acid (Figure 23) has been found in Japanese Tricholoma muscarium species and may be at the origin of the toxicity of other Tricholoma species found in Europe.

2.2.2.1.4.1.6. Coprine.

Hatfield and Schaumberg (1975) identified coprine, a cyclopropane derivative of glutamine (Figure 24), which inhibits the metabolism of alcohol in humans. Its effect, with alcohol, shows a remarkable similarity to the reaction elicited by disulfiram and alcohol, the former being a drug used in the treatment of chronic alcoholism. The toxin is not dangerous and is present in only a few species of Coprinus. It is unlikely to be found in emergency cases. The species involved are succulent and considered as delicacies by many, but, if alcohol is consumed, even two or three days after the mushrooms, it may trigger a rather unpleasant reaction which may lead to panic in the victim.

The analysis for coprine is detailed in the appendix (6.2.6.).

2.2.2.1.4.1.7. Gyromitrin.

Serious intoxications, with numerous fatalities (2 - 4 % of mushroom related deaths), have occurred in Europe involving a mushroom often sold as a delicacy in its dried form : Gyromitra esculenta. Gyromitrin (Figure 25) was first identified by List and Luft (1968)

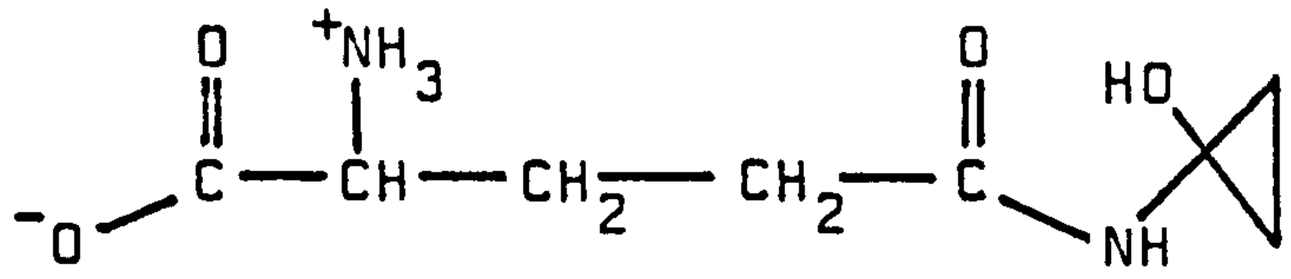


Figure 24 : Structure of Coprine

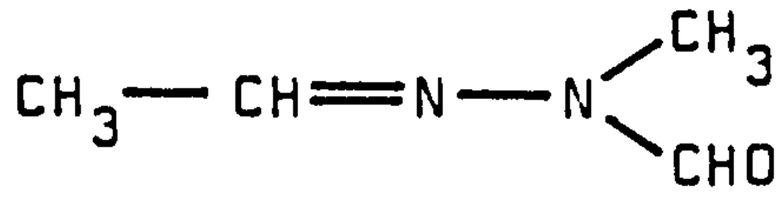


Figure 25 : Structure of Gyromitrin

and further hydrazone derivatives were later identified by Pyysalo (1975). It is suggested that these compounds undergo hydrolysis to form monomethylhydrazine, which is presumed to be the active component in human poisoning. The symptoms are consistent with symptoms produced by monomethylhydrazine poisoning (Lincoff & Mitchel, 1977).

Species containing gyromitrin are Ascomycetes and differ markedly (microscopically as well as macroscopically) from all the other higher fungi. It was found necessary to include them in the present programme because of the high incidence of poisoning due to them.

Analytical procedures are described in the appendix (6.2.7.)

2.2.2.1.4.1.8. Other Toxins.

Every year, a number of poisonings are recorded which involve tens of species of mushrooms. The symptoms produced are often described as mild to serious gastro-intestinal disturbances which disappear after one or two days, without further ill effects. In most cases nothing is known about the chemistry of the species involved, not to mention the toxins! In these cases, it frequently arises that only one or two people of a much larger group

are affected.

This remains a virgin field for research!

2.2.2.1.4.1.9. Comments.

It must be noted that poisoning by old, partially decomposed mushrooms, or by mushrooms contaminated by pesticides or heavy metals (Stijve & Roschnik, 1974) are not included in the present work because the intoxications are not due to toxins of the higher fungi.

Other important questions require to be investigated in relation to the mycotoxins of the higher fungi. What, for example, is the relationship of the host to the fungi in respect of the formation of toxic secondary metabolites? Does the toxin change if the host is different? For example, Amanita muscaria grows in mycorrhizal association with either birch or coniferous trees. The influence of the host tree on the metabolic activity may explain the absence of the toxins muscimol and ibotenic acid in some of the analyses reported in the chemical literature.(Catalfomo & Eugster, 1970). These questions need further investigations and might provide answers of great taxonomic significance and of great economic value to man.

2.2.2.2. Discussion.

Twenty four characters have been chosen to be included in a multi-access, interractive identification programme. If sub-characters are taken into account, 30 features can be used for the identification of poisonous and hallucinogenic mushrooms of forensic interest. All have advantages and disadvantages which have been discussed under their appropriate heading. All the characters are well documented, at least for the European species, and provide a solid data base. Furthermore, they are all stable within wide and documented limits and, in most cases, easy to identify and observe. Finally, different combinations of characters, using only five to eight observations give, in most cases, an identification down to species or a group of closely related species, as is shown in the next two chapters.

It must be emphasised that some closely related species cannot be differentiated using the above twenty four characters and would be identified only with great difficulty even by experienced mycologists, unless fresh samples were made available. In any case, when an emergency has been dealt with, samples should be sent to the appropriate specialists who can confirm the diagnosis, use the evidence to up-date records and, possibly, bring

about modifications to the present programme for even more efficient management. Detailed records of the anamnesis and clinical data should be given with the samples.

This should result in a marked improvement on the present state of the identification of poisonous mushrooms in emergency cases. For instance, such identification has been made by a specialist in only 10.7 % of the cases reported in Switzerland between 1967 and 1977 (Bornet, 1980),and this in a country specifically organised to deal with such matters!

As mentioned previously, the states of some of the characters observed could be genuinely mistaken under certain circumstances, thus hindering a possible match with the stored data in the data bank. Steps have been taken to prevent this happening and to allow what can be referred to as a "Near-miss match identification".

2.2.2.2.1. Near-miss Match Identification.

Five characters were found, after close scrutiny, to be uncertain when observations were made near the limits of their defined states because of their continuous nature (i.e. the length and breadth of spore, see 2.2.2.1.1.10.; the wall thickness of spores, see

2.2.2.1.1.13.; and the time of growth, see 2.2.2.1.2.3.) or because of historical and ecological reasons (i.e. habitat, 2.2.2.1.2.2.) as was demonstrated in the appropriate chapters.

If the user of the key, for some reason, thinks that the determination of one or more of these five characters is doubtful, he has then the opportunity to choose whichever of these characters is uncertain as a possible miss-match with the stored data.

Example: a mushroom identification is required in a hospital after a patient has been brought in showing definite symptoms of poisoning. Spores are found in a stomach washing, their colour determined and their dimensions found to be well-defined within the ranges used in the programme. The time of growth, 19th of June, is identified as "spring", despite the closeness of summer and a spell of mild weather. The user,with this data, should be able to get a reasonable identification, but having some doubts as to the determination of the character "time of growth", he can choose this character as a possible miss-match. That is, if no "perfect match" is obtained, species differing on the character "time of growth" with the given data are then listed as "species matching closely on character time of growth".

If more than one character's data is allowed to miss-match or permitted to disagree with the data stored, when a near-miss match identification is obtained, the character(s) in disagreement with the taxon identified is (are) specified to the user. In the above hypothetical example, if the spore length and the time of growth are judged uncertain and allowed to differ with the data of the data bank, the resulting identification could be of the kind:

Species A matches closely on spore length;

Species B matches closely on time of growth;

Species C matches closely on spore length and time of growth;

Species D matches exactly with the given data, etc.

Therefore, the characters allowed to disagree with the stored data in the identification process are well defined and the user is made aware as to which character observed disagrees with the data defining the taxon identified.

The "near-miss match identification" facility should be used when the character "habitat" is observed, unless a well characterised and historically well established habitat is known, for example, the native Scottish pine forest.

While this facility may not be relevant in most cases, it represents an important safeguard which guarantees the completeness and accuracy of an identification as far as is possible with the data at hand.

CHAPTER III : THE PROGRAMME

III. THE PROGRAMME.

On the basis of the requirements for an identification programme (chapter II) and characters available, some of which possess single and others multiple options, a programme was built by Mr. George Farquhar of the Computer Centre of Strathclyde University. His expertise was invaluable in helping to improve and modify this programme to suit all the requirements.

3.1. Data Coding.

Before an identification is attempted, the data of all the taxa included in the data bank had to be coded. To make the matching process easy for the machine, the data is coded as a string of numbers, where the first number corresponds to the state of character 1 of the given taxon, the second number corresponds to the state of character 2, and so on. When multiple options are possible for one character a "-1" indicates that the character has multiple options. The numeral immediately following "-1" indicates the number of possible options which is, in turn, followed by the numerals corresponding to the different possible states.

The way the data is coded can be likened to a chest

of 24 drawers where each drawer pictures a character. Each drawer is then subdivided into as many compartments as there are options for the given character. These pigeon-holes are filled corresponding to the states shown by the taxon defined.

When the identification is attempted, the data observed is coded in a similar way, the characters identified are like drawers being opened and their contents compared with the same level drawers of the different taxa stored in the data bank. When the content of these drawers are identical (i.e. match exactly) a possible identification is obtained. If a near-miss match is allowed, all the drawers' contents should be identical except possibly the drawer(s) allowed to missmatch (i.e. provided the suspect data was wrongly characterised).

3.2. Flow Chart. (Figure 26)

The computer is an extremely powerful, fast machine, but it can do only what it is told to do, and exactly as it is told to do it. It gets its direction from the stored programme. The flowchart is a pictorial representation of that programme which serves as a means of recording, analysing and communicating problem

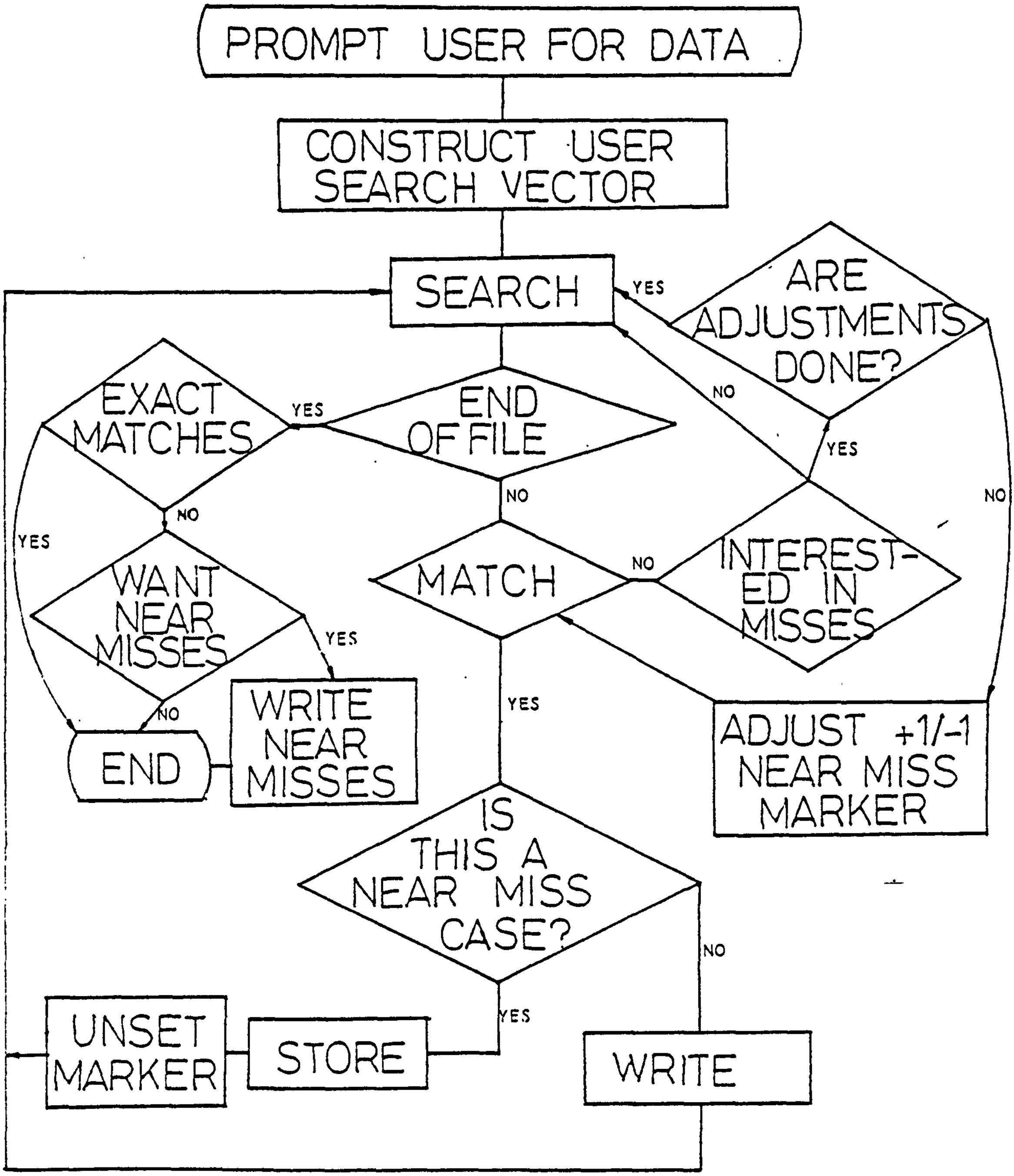


Figure 26 : Flow Chart of the Computer Programme for the Identification of Poisonous Mushrooms.

information.

Following the flowchart (Figure 26), the first step in the identification process is to prompt the user for data (i.e. open drawers and fill them up according to the states observed). The whole data thus obtained constitutes the user search vector.

This search vector is then compared with the corresponding vector of each taxon of the data bank. When the "SEARCH" is operated for the first taxon, the computer effects the comparison. If a match is found, which is not a near-miss match case, the taxon is given as a possible identification (i.e. "WRITE"). It then searches the second taxon, etc until the end of the data file. If there is no match, and no interest shown by the user in near-miss matches, as before, it searches the next taxon, and so on to the end of the file. All the exact matches, i.e. taxa identified, are printed. Ideally, only one taxon should appear!

On the other hand, if the user is interested in near-misses, the user search vector is modified ("ADJUSTED") for the character(s) allowed to disagree, so that other states for this character(s) are considered and the matching process ("SEARCH") is attempted again, but with the adjusted data. If after adjustment a match

is obtained, the taxon so identified is stored until the end of the file before being printed.

Each taxon identified is printed ("WRITE"), usually on the screen of a visual display unit (VDU), or for a permanent record, on the chart of a recorder. It is always accompanied by all the useful data included in the data retrieval side of the file. (2.2.1.)

3.3. Languages.

The programme has been produced in two forms so that it can be used in a large computer, as well as in a top-desk microcomputer.

A FORTRAN language is used on a Honeywell 6060 instrument at Strathclyde University. It has been kept to a standard form and is as machine independant as possible, so that it could be easily adapted to other machines.

In order to avoid any involved coding procedure of the data, which would require some training, a text in English is displayed on the VDU or printer. The user is only required to chose one option (or more as the case may be) out of a selected number presented to him and the computer does the rest of the work providing

the correct commands have originally been used.

A programme in BASIC language has been adapted along the same lines to be used on microcomputers, in our case on Apple II and Honeywell.

This should allow a wide use of this programme by large organisations with expensive computer capabilities as well as small laboratories or hospital wards with limited facilities.

3.4. Use of the Programme and Examples.

3.4.1. How it Works.

The basic set of commands is small and easy for anybody to remember.

The first command "/G" prompts the computer to search for the programme. In the meantime, it asks the user which data file he wishes to use with the programme by printing "Data File?". The user simply types the name of his file (here "KEEP") followed by a carriage return (CR).

The next command is "/F1" which prompts the user to supply data by displaying the 24 characters and asking the user "Which characters do you have data for?" (Figure 27)

```
./G
DATA FILE STEP

*/F1

            FUNGI IDENTIFICATION PROGRAM
            ----------------------------

 1 SYMPTOMS                          13. SPORE PRINT
 2 ONSET OF SYMPTOMS                 14. TOXINS
 3 GEOG  DISTRIBUTION                15. DURATION OF SYMPTONS
 4. HABITAT                          16. PILEUS TRAMA
 5 TIME OF GROWTH                    17. GILL TRAMA  .
 6 SPORE COLOUR UNDER M.SCOPE.       18. CUTICLE
 7 SPORE SHAPE                       13 CLAMP CONNECTION
 8 SPORE SURFACE                     20. BASIDIA/ASCI NO. OF SPORES
 9 SPORE WALL THICKNESS              21 BASIDIA/ASCI SIZES
10 GERM PORE                         22. MARGINAL CYSTIDIA
11 SPORE LENGTH                      23. FACIAL CYSTIDIA
12 SPORE BREADTH                     24. KOH CHRYSO CYSTIDIA

WHICH CHARACTERS DO YOU HAVE DATA FOR?
ENTER CHARACTER NUMBERS COMMA SEPARATED
=1,3 4,10.5


DATA FOR  5 CHARACTERS REQUIRED

IF NO SPECIES MATCH EXACTLY THE GIVEN DATA A CLOSE MATCH
CAN BE ATTEMPTED ON THE FOLLOWING CHARACTERS:-
          4. HABITAT
          5 TIME OF GROWTH
          9 SPORE WALL THICKNESS
         11. SPORE LENGTH
         12. SPORE BREADTH

PLEASE GIVE THE CHARACTER NUMBERS YOU REQUIRE(COMMA SEPARATED)
OR 0(ZERO) IF NO CLOSE MATCHING IS TO BE ATTEMPTED
=4,5
CLOSE MATCHING REQUIRED ON CHARACTERS   4,  5,
```

Figure 27 : Illustration of the First Commands to Start the Programme and of the Text Displayed to the User.

The user needs only to enter the numbers corresponding to the characters for which he has data, i.e. 1, 3, 4, 13 and 5 in the example of Figure 27. After a carriage return, the computer acknowledges the number of characters to be used (i.e. number of drawers to be opened) and asks if any "near-miss match" is to be attempted on one of the five characters described previously (2.2.2.2.1.). The user enters"0" if no close matching is required, otherwise, the numbers corresponding to the doubtful characters are entered, i.e. 4, 5 in the example of Figure 27.

After a carriage return, the computer takes each character identified by the user and displays the options available (i.e. takes each drawer for which the user knows the content and displays the choice of content it can have). At the end of the character display, the option observed in the sample to be identified is chosen and its number entered (multiple options can be entered where necessary). The computer then moves to the next character, until all the options of the characters chosen at the start have been correctly entered.

The programme is then "running" or "SEARCH" as described in the flow chart (3.2.) and taxa identified are retrieved on the VDU or the printer.

3.4.2. Examples.

Selected examples of cases which were either investigated or brought to the attention of the Forensic Science Unit at Strathclyde University demonstrate the use and advantages which this programme can bring to the efficient management of mycotoxicological emergencies.

3.4.2.1. Case 1.

On the 25th of July 1979, a young girl, Emily, 2½ was admitted to a London Hospital after her mother had seen her eat a mushroom from the garden lawn. No signs of poisoning were presented. Specimen from the lawn were brought to the toxicologist of the hospital who immediately contacted the Forensic Science Unit.

While on the phone, details of the spores were obtained, they were dark, thick-walled, rough, 13 - 14 μm long and 7 - 9 μm wide. The toxicologist could not give further characters as it was the first time he had encountered such a sample. Data for 8 characters were available:

1) geographical distribution : England

2) habitat: grass

3) time of growth : summer

4) spore colour under the microscope: dark

the colour was resistant in 50 % H_2SO_4

5) spore wall thickness : thick

6) spore surface : rough

7) spore length : 13 - 14 μm

8) spore breadth : 7 - 9 μm

A close matching on the spore wall thickness was requested in view of the inexperience of the analyst.

Out of 223 species making up the data bank, only one species matched the data perfectly : Panaeolus foenisecii.

This species is not dangerous, but can cause hallucinations and up-set if more than 5 or 6 carpophores are ingested. This diagnosis was later confirmed when the samples were sent to the laboratory for further investigations. In the meantime, the little girl had been kept under observation for 24 hours and released without showing any ill-effects.

This shows all the advantages of the present programme at its best: species identification in a matter of a few minutes based on simple information gathered by a non-specialist. (Figure 28).

```
/F1

          FUNGI IDENTIFICATION PROGRAM
          ---------- -------------- -------

 1 SYMPTOMS                          13. SPORE PRINT
 2. ONSET OF SYMPTOMS                14. TOXINS
 3 GEOG  DISTRIBUTION                15. DURATION OF SYMPTOMS
 4 HABITAT                           16. PILEUS TRAMA
 5 TIME OF GROWTH                    17 GILL TRAMA
 6 SPORE COLOUR UNDER M. SCOPE       18. CUTICLE
 7 SPORE SHAPE                       19. CLAMP CONNECTION
 8. SPORE SURFACE                    20. BASIDIA/ASCI NO. OF SPORES
 9 SPORE WALL THICKNESS              21. BASIDIA/ASCI SIZES
10 GERM PORE                         22. MARGINAL CYSTIDIA
11 SPORE LENGTH                      23. FACIAL CYSTIDIA
12 SPORE BREADTH                     24. KOH CHRYSO CYSTIDIA

WHICH CHARACTERS DO YOU HAVE DATA FOR?
ENTER CHARACTER NUMBERS COMMA SEPARATED.
=3.4 5.6.3,9,11.12


DATA FOR  8 CHARACTERS REQUIRED

IF NO SPECIES MATCH EXACTLY THE GIVEN DATA A CLOSE MATCH
CAN BE ATTEMPTED ON THE FOLLOWING CHARACTERS -
          4. HABITAT
          5. TIME OF GROWTH
          9 SPORE WALL THICKNESS
         11. SPORE LENGTH
         12 SPORE BREADTH

PLEASE GIVE THE CHARACTER NUMBERS YOU REQUIRE(COMMA SEPARATED)
OR 0(ZERO) IF NO CLOSE MATCHING IS TO BE ATTEMPTED
=9
CLOSE MATCHING REQUIRED ON CHARACTERS   9,

3  GEOGRAPHICAL DISTRIBUTION
   ------------ ------------
          1. N TEMPERATE
          2. S. TEMPERATE
          3. SUBTROPICAL
          4. TROPICAL
          5. ENGLISH
          6. SCOTTISH
OPTION NUMBERS?
ENTER DATA COMMA SEPARATED
=5
OPTIONS ACCEPTED --
          5. ENGLISH

4. HABITAT
   -------
          1 GROUND IN CONIF  WOODS
          2 GROUND IN HARDWOODS
          3 GROUND IN GRASS
          4. GROUND IN DUNG
          5. ON STUMPS
          6. OTHERS
OPTION NUMBERS?
ENTER DATA COMMA SEPARATED
=3
OPTIONS ACCEPTED --
          3. GROUND IN GRASS

 5  TIME OF GROWTH
    ------------
          1. SPRING
          2 SUMMER
          3 AUTUMN
          4. WINTER
OPTION NUMBERS?
ENTER DATA COMMA SEPARATED
=2
OPTIONS ACCEPTED --
          2 SUMMER
```

Figure 28 (see next page)

```
 6.  SPORE COLOUR UNDER MICROSCOPE
     ----------------------------
          1. CLEAR
          2 PALE BROWN
          3 PALE PINK
          4. DARK
OPTION NUMBER?
=4
OPTION 4 -- DARK
 SPORES IN SULPHURIC ACID
 -----------------------
          1. COLOUR RESISTANT
          2. COLOUR DISSOLVES
OPTION NUMBER?
=1
OPTION 1 -- COLOUR RESISTANT

 8.  SPORE SURFACE
     -------------
          1. SMOOTH
          2. ROUGH
          3. RIDGE ORNAMENTATION
OPTION NUMBER?
=2
OPTION 2 -- ROUGH

 9.  SPORE WALL THICKNESS
     --------------------
          1. THIN
          2. THICK
OPTION NUMBER?
=2
OPTION 2 -- THICK

11.  SPORE LENGTH(MICRONS)
     -------------
          1.  LENG < 6.0
          2.  6.0 < LENG < 8.0
          3.  8.0 < LENG < 10.0
          4.  10 0 < LENG < 12.0
          5.  12 0 < LENG < 17.0
          6.  17.0 < LENG
OPTION NUMBERS?
ENTER DATA COMMA SEPARATED
=5
OPTIONS ACCEPTED --
          5.  12.0 < LENG < 17.0

12.  SPORE BREADTH(MICRONS)
     --------------
          1.  BR < 4.0
          2.  4.0 < BR < 6.0
          3.  6.0 < BR < 8.0
          4.  8.0 < BR < 10.0
          5.  10.0 < BR
OPTION NUMBERS?
ENTER DATA COMMA SEPARATED
=3,4
OPTIONS ACCEPTED --
          3.  6.0 < BR < 8.0
          4.  8 0 < BR < 10.0

PROGRAM RUNNING

POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
PANAEOLUS FOENISECII (PERS EX FR)MRE UK FREQ 13.5 INDOLE HALLUC. PROPOSED
TREATMENT.PREVENT ABSOPP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUI
POSSIB DIAZEPAM,CHLORPROMAZINE TAXON OLA'H (1969)GENRE PANAEOLUS,REV MYC
EM HORS SERIE CHEM HOFMANN ET AL(1959)HELV CHIM ACTA 42,1557-1572
ED LINCOFF & MITCHEL(1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
Y   HALLUCINOGEN. UPSETTING COSMOPOLITAN


END OF PROGRAM

*
```

Figure 28 : Illustration of a Species Identification in the Example Case 1.

3.4.2.2. Case 2.

Three patient were admitted to the Royal Infirmary in Edinburgh on the 25th of August 1979. They showed symptoms of severe renal failure some ten days after eating a dish of wild mushrooms purported to be Cantharellus cibarius (a celebrated delicacy in most of Europe). They had been collected in a coniferous wood near their camping place in the North of Scotland (Watling, 1980; Short et al. 1980). Preliminary gastro-intestinal disturbances had appeared 2 to 3 days after ingestion.

The identification was made by Dr. Roy Watling, Senior Principal Scientific Officer of the Royal Botanic Garden in Edinburgh, as Cortinarius speciosissimus after a specimen had been collected from the site by the consultant medical specialist. This mushroom is a rare nordic species containing the deadly orellanine. On the basis of the elements available at the time of the emergency and using the present programme, one species would have been keyed out : Cortinarius speciosissimus with two other species Cortinarius gentilis and Cortinarius limonius also suspected of containing orellanine and a number of other species of Cortinarius which may also contain orellanine, but so far, no firm evidence is available

(Greer, 1980). With only five characters used for identification, i.e. symptoms, onset of symptoms, geographical distribution, time of growth and habitat, these species cannot be distinguished. It is quite remarkable that they are so closely related that only an experienced mycologist can distinguish between them, provided he has access to a good specimen!

It is also worth noting, that all these species are suspected to contain the same toxin, require the same treatment and have the same medical and chemical reference literature which is all a medical consultant needs for any clinical treatment. (Figure 29).

3.4.2.3. Case 3.

This is an example where a near-miss match is necessary. It is hypothetical since that facility has not been required in cases handled so far. The hypothesis is based on thorough field observations.

Two teenagers are admitted to hospital showing dizziness, drunkenness, incoordination, staggering, visions, cramps. One hour before the symptoms developed, they had eaten some mushrooms collected on a hill-side pasture near Pitlochry. Five characters can be used

```
:F1

            FUNGI IDENTIFICATION PROGRAM
            ----------------------------

 1 SYMPTOMS                          13. SPORE PRINT
 2 ONSET OF SYMPTOMS                 14. TOXINS
 3. GEOG. DISTRIBUTION               15. DURATION OF SYMPTOMS
 4. HABITAT                          16. PILEUS TRAMA
 5 TIME OF GROWTH                    17. GILL TRAMA
 6 SPORE COLOUR UNDER M. SCOPE       18. CUTICLE
 7 SPORE SHAPE                       19. CLAMP CONNECTION
 8 SPORE SURFACE                     20. BASIDIA/ASCI NO. OF SPORES
 9. SPORE WALL THICKNESS             21. BASIDIA/ASCI SIZES
10. GERM PORE                        22. MARGINAL CYSTIDIA
11. SPORE LENGTH                     23. FACIAL CYSTIDIA
12. SPORE BREADTH                    24 KOH CHRYSO CYSTIDIA

WHICH CHARACTERS DO YOU HAVE DATA FOR?
ENTER CHARACTER NUMBERS COMMA SEPARATED
=1,2,3,4,5

DATA FOR  5 CHARACTERS REQUIRED

IF NO SPECIES MATCH EXACTLY THE GIVEN DATA A CLOSE MATCH
CAN BE ATTEMPTED ON THE FOLLOWING CHARACTERS:-
          4. HABITAT
          5. TIME OF GROWTH
          9. SPORE WALL THICKNESS
         11. SPORE LENGTH
         12. SPORE BREADTH

PLEASE GIVE THE CHARACTER NUMBERS YOU REQUIRE(COMMA SEPARATED)
OR 0(ZERO) IF NO CLOSE MATCHING IS TO BE ATTEMPTED
=0
NO CLOSE MATCHING REQUIRED

1  SYMPTOMS
   --------
    1 GASTROENTERITIS AFTER 3HRS. NO FEVER, CYTOLITIC HEPATITIS
    2. MIN  15 HOURS AFTER INGESTION  GASTROENTERITIS INTENSE THIRST,
      POLYURIA THEN RENAL FAILURE
    3 AFTER ALCOHOL CONSUMPTION. FLUSHING FACE AND NECK, SWELLING,
      TINGLING OF HANDS, METALLIC TASTE, PALPITATIONS, HYPOTENSION,
      LATER NAUSEA AND SWEATING
    4. PERSPIRATION, SALIVATION, LACRYMATION, BLURRED VISION, ABDOMINAL
      CRAMPS, AFTER DIARRHOEA, CONSTRICTION OF PUPILS, FALL
      IN BLOOD PRESSURE, SLOW PULSE
    5. DIZZINESS, DRUNKENNESS, INCOORDINATION, STAGGERING, MUSCULAR
      CRAMPS, SPASMS, HYPERKINETIC ACTIVITY, DEEP SLEEP AND VISIONS
    6. MOOD CHANGING, UNMOTIVATED LAUGHTER HILARITY , MUSCLE WEAKNESS
      DROWSINESS, HALLUCINATIONS
    7. GASTROENTERITIS; VOMITING
    8. NAUSEA , GASTROENTERITIS , FEVER , CRAMPS, HEADACHES , CYTOLITIC OR
      HEMOLYTIC ACTION
OPTION NUMBER?
=2
OPTION 2

2  ONSET OF SYMPTOMS
   -----------------
          1 WITHIN 2HRS.
          2. 3 - 7 HRS.
          3. 8 - 14 HRS.
          4 AFTER 15 HRS.
OPTION NUMBER?
=4
OPTION 4 -- AFTER 15 HRS.
```

Figure 29: Example of Identification. Case 2.

```
   GEOGRAPHICAL DISTRIBUTION
   ---------- ------------ ------
         1 N TEMPERATE
         2 S.TEMPERATE
         3 SUBTROPICAL
         4 TROPICAL
         5 ENGLISH
         6 SCOTTISH
OPTION NUMBERS?
ENTER DATA COMMA SEPARATED
=5
OPTIONS ACCEPTED --
         5 SCOTTISH

4  HABITAT
   -------
         1 GROUND IN CONIF. WOODS
         2 GROUND IN HARDWOODS
         3 GROUND IN GRASS
         4 GROUND IN DUNG
         5. ON STUMPS
         6. OTHERS
OPTION NUMBERS?
ENTER DATA COMMA SEPARATED
=1
OPTIONS ACCEPTED --
         1 GROUND IN CONIF  WOODS

 5. TIME OF GROWTH
    -------------
         1 SPRING
         2. SUMMER
         3. AUTUMN
         4. WINTER
OPTION NUMBERS?
ENTER DATA COMMA SEPARATED
=2
OPTIONS ACCEPTED --
         2. SUMMER

PROGRAM RUNNING

POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
COPTINARIUS SPECIOSISSIMUS KUHN.& ROMAG.  ORELLANINE TREATMENT.SYMPTOMAT
TAXON. ORTON PD (1958) CORTINARIUS II THE NATURALIST, APRIL, 119
CHEM  ANTKOWIAK& GESSNER (1979) TETRAHEDRON L. 21,1931-34
   MEDIC.GERAULT & GIRRE (1977)BUL.SOC.MYCOL.FRANCE 93,373-405
DEADLY  EU & N  EU

POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
CORTINARIUS GENTILIS (FR)FR UK FREQ 0.4 SUSPECT ORELLANINE PROPOSED TREA
MENT SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2 FISCH
STUT NY CHEM ANTKOWIAK & GESSNER (1979) TETRAHEDRON L. 21,1931-34 MED FL
R (1980) DIFFERENTIALDIAGNOSE DER PILZVERGIFTUNGEN,FISCHER,STUTT,NY
DEADLY  EU
**MORE(YES OR NO)?
=YES
POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
COPTINARIUS LIMONIUS (FR EX FR)FR ORELLANINE SUSPECT  PROPOSED TREATMENT
SYMPTOMATIC TAXON MOSER M (1978) KLEINE KRYPTOGAMENFLORA IIB/2 FISCHER,
STUT NY CHEM ANTKOWIAK & GESSNER (1979) TETRAHEDRON L. 21,1931-34 MED FL
(1980) DIFFERENTIALDIAGNOSE DER PILZVERGIFTUNGEN,FISCHER,STUTT.  NY
SUSPECT DEADLY.  EU

POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
COPTINARIUS CALLISTEUS (FR)FR UK FREQ 0.4 SUSPECT ORELLANINE TREATMENT.
SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2 FISCHER.
STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934
MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-485 DEADLY? EU
**MORE(YES OR NO)?
=YES
```

Figure 29: continued.

```
--

POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
CORTINARIUS CINNAMOMEUS (L EX FR) UK FREQ 2.0 SUSPECT ORELLANINE
TREATMENT SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2
FISCHER,STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934
MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU N.AM

POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
CORTINARIUS PHOENICEUS (BUL)MRE SUSPECT ORELLANINE TREATMENT.SYMPTOMATIC
TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2,FISCHER,STUTT.
CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934 MED GERAULT &
GIRRE (1977)BUL SOC MYCOL FR 93,373-405  DEADLY?  EU
**MORE(YES OR NO)?
=YES

POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
CORTINARIUS SANGUINEUS (WULF EX FR)FR UK FREQ 0.4 SUSPECT ORELLANINE
TREATMENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2
FISCHER,STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34
MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405  DEADLY?  EU

POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
CORTINARIUS SEMISANGUINEUS (FR)GILL UK FREQ 4.0 SUSPECT ORELLANINE
TREATMENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2
FISCHER,STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34
MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405  DEADLY? EU;N.AM
**MORE(YES OR NO)?
=YES

POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
CORTINARIUS TRAGANUS (FR EX FR)FR UK FREQ 1.2 SUSPECT ORELLANINE TREAT-
MENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2
FISCHER,STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34
MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU

POSSIBLE SPECIES(EXACT MATCH ON SUPPLIED DATA) --
CORTINARIUS SANIOSUS (FR)FR UK FREQ 0.4 SUSPECT ORELLANINE TREATMENT:
SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2 FISCHER
STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34 MED
GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU


END OF PROGRAM

*
```

Figure 29 (end).

here (the same as in case 2). But how would a pasture be described using the habitat's options? "grass", "dung" or are there some tree in the vicinity associated with the mushrooms? Therefore the "near-miss match" facility is used with the character "habitat" and the option chosen is "grass".

No exact match is found, but three species, Amanita muscaria, A. pantherina and A. gemmata are identified as a "close match on habitat" (Figure 30) i.e. these are possible identifications, provided the state of the character "habitat" is not "grass". Field observations (detailed in chapter 4) have shown the presence of Amanita pantherina in hill-side pastures near Pitlochry (reference collections 121 and 244, see chapter 4) amongst Salix repens (a dwarf shrub of the willow family, i.e. hardwoods). An area which could be described by many as "grassy"!

It is obvious that in the case of an emergency, the results are rapid and accurate enough to allow clinicians to proceed with treatment (here again identical for the three species). Further investigations, in the field, on stomach washing and on the remains of the meal, etc, can be carried out afterwards for a more specific identification.

```
/F1

          FUNGI IDENTIFICATION PROGRAM
          ----------------------------

 1 SYMPTOMS                          13. SPORE PRINT
 2 ONSET OF SYMPTOMS                 14 TOXINS
 3 GEOG  DISTRIBUTION                15. DURATION OF SYMPTOMS
 4. HABITAT                          16. PILEUS TRAMA
 5 TIME OF GROWTH                    17. GILL TRAMA
 6 SPORE COLOUR UNDER M. SCOPE       18. CUTICLE
 7 SPORE SHAPE                       19. CLAMP CONNECTION
 8 SPORE SURFACE                     20. BASIDIA/ASCI NO. OF SPORES
 9 SPORE WALL THICKNESS              21. BASIDIA/ASCI SIZES
10 GEPM PORE                         22. MARGINAL CYSTIDIA
11 SPORE LENGTH                      23. FACIAL CYSTIDIA
12. SPORE BREADTH                    24 KOH CHRYSO CYSTIDIA

WHICH CHARACTERS DO YOU HAVE DATA FOR?
ENTER CHARACTER NUMBERS COMMA SEPARATED
=1,2,3,4,5


DATA FOR  5 CHARACTERS REQUIRED

IF NO SPECIES MATCH EXACTLY THE GIVEN DATA A CLOSE MATCH
CAN BE ATTEMPTED ON THE FOLLOWING CHARACTERS:-
          4. HABITAT
          5. TIME OF GROWTH
          9. SPORE WALL THICKNESS
         11. SPORE LENGTH
         12. SPORE BREADTH

PLEASE GIVE THE CHARACTER NUMBERS YOU REQUIRE(COMMA SEPARATED)
OR 0(ZERO) IF NO CLOSE MATCHING IS TO BE ATTEMPTED
=4
CLOSE MATCHING REQUIRED ON CHARACTERS    4,

1  SYMPTOMS
   --------
    1. GASTROENTERITIS AFTER 3HRS. NO FEVER, CYTOLITIC HEPATITIS
    2 MIN  15 HOURS AFTER INGESTION: GASTROENTERITIS INTENSE THIRST,
      POLYURIA THEN RENAL FAILURE
    3 AFTER ALCOHOL CONSUMPTION. FLUSHING FACE AND NECK, SWELLING,
      TINGLING OF HANDS; METALLIC TASTE, PALPITATIONS, HYPOTENSION,
      LATER NAUSEA AND SWEATING
    4. PERSPIRATION, SALIVATION, LACRYMATION, BLURRED VISION, ABDOMINAL
      CRAMPS, AFTER DIARRHOEA, CONSTRICTION OF PUPILS, FALL
      IN BLOOD PRESSURE, SLOW PULSE
    5 DIZZINESS, DRUNKENNESS, INCOORDINATION, STAGGERING, MUSCULAR
      CRAMPS, SPASMS, HYPERKINETIC ACTIVITY, DEEP SLEEP AND VISIONS
    6 MOOD CHANGING. UNMOTIVATED LAUGHTER HILARITY , MUSCLE WEAKNESS
      DROWSINESS, HALLUCINATIONS
    7 GASTROENTERITIS; VOMITING
    8 NAUSEA ,GASTROENTERITIS ,FEVER ,CRAMPS, HEADACHES ,CYTOLITIC OR
      HEMOLYTIC ACTION
OPTION NUMBER?
=5
OPTION 5

2  ONSET OF SYMPTOMS
   -----------------
         1. WITHIN 2HRS.
         2. 3 - 7 HRS.
         3. 8 - 14 HRS.
         4. AFTER 15 HRS.
OPTION NUMBER?
=1
OPTION 1 -- WITHIN 2HRS.
```

Figure 30 : Example of an Identification Using the "Near-miss Match" Facility. Case 3.

```
3  GEOGRAPHICAL DISTRIBUTION
   -------------------------
         1. N. TEMPERATE
         2. S. TEMPERATE
         3. SUBTROPICAL
         4 TROPICAL
         5 ENGLISH
         6. SCOTTISH
OPTION NUMBERS?
ENTEP DATA COMMA SEPARATED
=6
OPTIONS ACCEPTED --
         6 SCOTTISH

4  HABITAT
   -------
         1. GROUND IN CONIF. WOODS
         2. GROUND IN HARDWOODS
         3. GPOUND IN GRASS
         4. GROUND IN DUNG
         5. ON STUMPS
         6 OTHEPS
OPTION NUMBERS?
ENTER DATA COMMA SEPAPATED
=3
OPTIONS ACCEPTED --
         3. GROUND IN GRASS

 5  TIME OF GROWTH
    --------------
         1 SPRING
         2. SUMMEP
         3 AUTUMN
         4. WINTER
OPTION NUMBERS?
ENTER DATA COMMA SEPARATED
=2
OPTIONS ACCEPTED --
         2. SUMMER

PROGRAM RUNNING

THE FOLLOWING SPECIES MATCHES CLOSELY ON
      HABITAT

AMANITA PANTHERINA (FR.)SECR. UK FREQ 2.4 MUSCIMOL/IBOTENIC ACID  PROP.
TREATMENT:PREVENT ABSORPTION, INCR. EXCRETION, SYMPTOMATIC (PHYSOSTIGMIN
TAXON. JENKINS DT (1977) BIBLIO. MYCOLOGICA 57,1-126
CHEM. CATALFOMO & EUGSTER (1970) BULL. NARC. 22:4,33-41
MEDIC. WASER PG (1967) ETHNOPHARMAC. SEARCH .. ED. EFRON US PHSP 1645,41
INEBRIANT. DANGEROUS  EU; N.AM

THE FOLLOWING SPECIES MATCHES CLOSELY ON
      HABITAT

AMANITA MUSCARIA (L EX FR)HOOKER UK FREQ 12.3 MUSCIMOL/IBOTENIC ACID  TR
MENT:PREVENT ABS.,INCREASE EXCRETION, SYMPTOMATIC (PHYSOSTIGMINE)
TAXON. JENKINS DT (1977) BIBLIOTHECA MYCOLOGICA 57, 1-126
CHEM. CATALFOMO & EUGSTER (1970) BULL. NARC. 22:4, 33-41
MEDIC. WASER PG (1967) ETHNOPHARMAC SEARCH...ED EFRON,US PHSP 1645,413-3
INEBRIANT, DANGEROUS  EU; ASIA; N.AM.

THE FOLLOWING SPECIES MATCHES CLOSELY ON
      HABITAT
**MORE(YES OR NO)?
=YES

AMANITA GEMMATA (FR)BERT.  EUROPE.EDIBLE,US:SUSPECT IBOTENIC A/MUSCIMOL
S.AM:DEADLY! TREATMENT:SYMPTOMATIC IF SYMPTOMS ONSET>8HOURS+WATER,ELEC-
TROLYTES,BLOOD BALANCE,HYPERTONIC GLUC.INF.PENICILLIN,THIOCTIC ACID,EXCH
TRANSF. TAXON JENKINS DT(1977) BIBLIOT.MYCOL 57,1-126 CHEM CHILTON &OTT
(1976)LLOYDIA 39:2,3,150-157 MED. SEE AMANITA PHALLOIDES FOR S.AM.  EU;N.

NO SPECIES MATCH SUPPLIED DATA EXACTLY


END OF PROGRAM
```

Figure 30 (end).

3.4.2.4. Identification of Mixtures.

Where mixtures are concerned, the problem is more complex and good sense has to be applied if an optimum result is to be obtained.

If only one species in the mixture is toxic, the problem is relatively simple - i.e. one type of medical and chemical characters is observed - the ecological characters should also be known, at least in relation to the time of growth and the geographical distribution. If microscopical characters are present, different features from different species will be present and mixed. If all the data are used together, they may describe a non existant and quite extraordinary mushroom! The study, therefore, has to be limited to a single type of microscopical characters, the obvious choice being the 8 characters based on the spore (i.e. spore colour under the microscope, shape, surface, wall thickness, germ pore, length, breadth and print): they can all be observed on one single spore which clearly comes from a single species.

Where mixtures are concerned, different spores are observed and each type of spore should be studied separately with the other characters (medical, chemical or ecological) and relevant results obtained

Mixtures of two or more toxic species may create more difficult problems which can hardly be solved at the present time, even with a team of specialists because the cumulative effects of different toxins administered together are not known. A separate study of different spores,with possibly some discernable clinical symptoms, may lead to useful results, but no experimental data is available so far and further discussion would be purely speculative.

Microscopical characters other than the spores could be used in this context in a minority of cases, when a particularly striking feature is observed, such as a special type of cystidia. The choice of characters to be used in such cases is to be left to the best judgement of the user of the key.

CHAPTER IV : DATA COLLECTION

IV. DATA COLLECTION.

4.1. Poisonous and Hallucinogenic Mushrooms: a World List.

The world list of poisonous and hallucinogenic mushrooms (Table 3) has been compiled from literature sources of all types, ranging from major works mentioned earlier in this thesis to the most obscure underground publications. A number of comments are required when one sees such a list of 432 names (Table 3).

Firstly, some obvious and well known poisonous mushrooms seem to be absent from the list. This is exemplified by Lepiota morgani, Lepiota helveola and Entoloma lividum. These names are widely used in the literature, but are invalid or illegal taxonomical names as described by British authorities (Dennis et al. 1960). Their correct and/or accepted names are used, i.e. Chlorophyllum molybdites, Lepiota brunneoincarnata and Entoloma sinuatum respectively.

The second comment stems from the size of the list. Most textbooks mention five to ten deadly poisonous mushrooms and possibly another 40 to 50 species being in some degree dangerous out of approximately 10'000 mushroom species described. These latest figures would

seem perfectly realistic to the present author and certainly the number of poisonous species would not go much above the hundred mark if all the listed species were to be thoroughly investigated. This discrepancy can be readily explained if one takes into account that the literature survey relates to"mycophagic" as well as notoriously "mycophobic" countries. Some species have only once been reported to be poisonous and this as long ago as the end of the last century. Such reports are subsequently repeated in modern books without any further checks. Most of the time voucher specimen have not been kept and it is impossible to be certain that the mushroom identification, made at the time, was accurate. When one sees how dubious some of the identifications were in Switzerland between 1966-1976, a country well organised in that field (Bornet, 1980), it would not be surprising to learn that a number of these records of toxicity are unfounded.

Mushrooms are notoriously difficult to digest, and some individuals can easily suffer from indigestion with them. Some mushrooms are known to contain antibiotics (e.g. Armillaria mellea) and susceptible people have been known to suffer from allergic reactions. By contrast, if, for example, one suffers an allergic reaction to strawberries, nobody will start thinking,

never mind publishing, that strawberries are toxic. Unfortunately, this is what has happened with mushrooms. In mycophobic countries, because of the special historical status that mushrooms have occupied as being "evil, putrid, etc" (Wasson, 1968), it is easy to understand that they have readily been assumed to be toxic.

Other species, still reported to be poisonous by some, such as Amanita citrina, have been shown to be innocuous. A. citrina was believed to be a form of the related Death Cap (Amanita phalloides)until extensive experiments by Chauvin (1922) in the 1920's showed otherwise, but its smell and flavour of old potatoes do not make it palatable.

Some other species are claimed to be poisonous mainly because of their foul taste and/or smell. Cultural, or rather gastronomical differences, can be seen even within European communities. Species reported as suspect in Britain are used as spices and condiments in other countries (Italy, Hungary, etc). This is true for many acrid or peppery Russula and Lactarius, which with the exception of a few notorious species are not poisonous. In this respect, literature from one country sometimes indicates a species as good and edible, whereas it is reported as poisonous and suspect in another (e.g. Amanita

excelsa has a two "knife and fork" crosses in Kühner and Romagnesi (1953), a standard and celebrated French reference book, whereas in British guides it ranges from harmless but best avoided, to poisonous!

Another comment relates to the hallucinogenic species. Since Hofmann et al. (1958) discovered psilocybin in a Mexican mushroom, Psilocybe mexicana, literally hundreds of mushrooms have been claimed to be hallucinogenic, often without any supporting chemical evidence other than the blueing flesh of the specimens described. These claims, when critically examined, might prove to be correct, but until then, doubts remain. Some analyses on newly described Australian species demonstrate this point (Margot & Watling, 1980). Out of four blueing species of Psilocybe submitted for analysis, only two proved positive for the presence of psilocybin (see 4.2.3.) Recently, critical reviews by Guzmàn (1978) on the genus Psilocybe have also shown that many hallucinogenic species, described as new separate species in the last twenty years, are in fact synonymous (e.g. Psilocybe zapotecorum = P. candidipes = P. bolivarii).

Lastly, a number of species are excellent when consumed, provided they are first cooked, dried or parboiled and the water discarded. This is important

because they contain heat labile and/or water soluble toxins. This is the case of Amanita rubescens, Gyromitra esculenta, Morchella species, etc, all regularly eaten by the present author and his friends without ill-effects!

Many other species listed have been eaten in reasonable quantities by the author over the past four years without ever experiencing even the slightest tummy up-set. (Agaricus silvicola, Amanita rubescens, A. vaginata, Clitocybe clavipes, C. nebularis, Coprinus atramentarius, Gyromitra esculenta, Hygrophoropsis aurantiaca, Morchella esculenta, Pholiota squarrosa (tough!), Suillus granulatus, Tricholomopsis rutilans).

It is quite clear from what precedes that the size of the above world list of poisonous or suspect mushrooms is grossly inflated, mainly because of prejudice, and that extensive toxicological work is required to reduce that list to truly poisonous species.

On the other hand, some yet undescribed toxic species may well come to light in the next few years as floras of Africa, Asia and the Australasian continent are completed.

TABLE 3 : World List of Mushrooms Known or Suspected to be Poisonous with an Indication of the Symptoms they Elicit, their Toxins (Where Known) and their Distribution in Britain, when Found in Britain.

Abbreviations: - Symptoms: AP = Amanita Poisoning CG = Cortinarius Poisoning
MU = Muscarinic IP = Ibotenic acid/Muscimol Poisoning
HA = Hallucinogenic GE = Gastroenteritic
GP = Gyromitrin Poisoning CP = Coprine Poisoning

Toxins : CY = Cyclopeptides OR = Orellanine CO = Coprine
GY = Gyromitrin MC = Muscarin IM = Ibotenic Acid/Muscimol
PS = Psilocybin and Analogs. A question mark indicates that the toxin is suspected or unknown.
A symptom followed by a question mark indicates a doubtful toxicity.

Distribution : B = British E = English and Welsh S = Scottish

Names and Authors : as accepted by British Authorities (Dennis, Orton and Hora, 1960)

Species		Symptoms	Toxin	Distribution
Agaricus	albolutescens Zeller	GE	?	
A.	hondensis Murr.	GE	?	
A.	perdicina Pilàt	GE	?	
A.	phaelepidotus (Møll.)Møll.	GE	?	E
A.	placomyces Peck	GE	?	
A.	silvicola (Vitt.)Peck	GE	?	B
A.	xanthodermus Gen.	GE	?	B
Amanita	alliiodora Pat.	AP?	CY?	
A.	ameghinoi (Speg.)Sing.	?	?	
A.	aspera (Fr.)Gray	?	?	E
A.	bingensis (Beeli)Heim	AP?	CY?	
A.	bisporigera Atk.	AP	CY	
A.	brunnescens Atk.	GE?	?	
A.	chlorinosma (Peck apud Aust.)Lloyd	GE?	?	

Species	Symptoms	Toxin	Distribution
Amanita citrina Gray	HA?	PS?	B
A. cokeri (Gilb. & Kühn.)Gilb.	IP?	IM?	
A. cothurnata Atk.	IP	IM	
A. crenulata Peck	IP?	IM?	
A. echinocephala (Vitt.)Quél.	?	?	E
A. excelsa (Fr.)Kum.	?	?	B
A. flavoconia Atk.	GE?	?	
A. flavorubescens Atk.	GE?	?	
A. frostiana (Peck)Sacc.	IP?	IM?	
A. gemmata (Fr.)Gill.	?	?	B
A. muscaria (L. ex Fr.)Hook.	IP	IM	B
A. ocreata Peck	AP	CY	
A. pantherina (DC ex Fr.)Secr.	IP	IM	B
A. parcivolvata (Peck)Gilb.	GE?	?	

Species	Symptoms	Toxin	Distribution	
Amanita phalloides (Vaill. ex Fr.)Secr.	AP	CY	B	
A. porphyria (Alb. & Schw. ex Fr.)Secr.	?	?	B	
A. preissei (Fr.)Sacc.	GE?	?		
A. regalis (Fr.)Sacc.	IP	IM	B	
A. robusta Beeli	AP?	CY?		
A. rubescens ((Pers.)Fr.)Gray	hemolytic	?	B	(only raw)
A. smithiana Bas	IP	IM		
A. solitaria (Bull. ex Fr.)Secr.	IP?	IM?	B	
A. spinosa Bouriquet	AP?	CY?		
A. spreta Peck	GE?	?		
A. suballiacea (Murr.)Murr.	AP	CY		
A. tainaomby Heim	AP?	CY?		
A. tenuifolia Murr.	AP	CY		
A. vaginata (Bull. ex Fr.)Vitt.	hemolytic	?	B	(only raw)

Species		Symptoms	Toxin	Distribution
Amanita	verna (Bull. ex Fr.)Vitt.	AP	CY	B
A.	virosa Secr.	AP	CY	B
A.	vittadinii (Mor.)Vitt.	?	?	
A.	volvata (Peck)Martin	GE?	?	
Anellaria	(Panaeolus) phalaenarum (Fr.)Quél.	HA	PS?	
A.	semiovata (Sow. ex Fr.)Pears. & Dennis	HA?	PS?	B
Boletus	calopus Fr.	MU	MC?	B
B.	eastwoodiae (Murr.)Sacc. & Trotter	GE?	?	
B.	kumaeus Heim	HA	?	
B.	luridus Schaeff. ex Fr.	MU	MC?	B
B.	manicus Heim	HA	?	
B.	miniatoolivaceus Frost	GE?	?	
B.	nigerrimus Heim	HA	?	
B.	pulcherrimus Thiers & Halling	GE?	?	

Species		Symptoms	Toxin	Distribution
Boletus	purpureus Pers.	GE?	?	E
B.	queletii Schulz.	GE?	?	E
B.	albidus Roques	GE?	?	B
B.	reayi Heim	HA	?	
B.	rufo-aureus Meyr.	GE?	?	
B.	satanas Lenz	GE	?	B
B.	splendidus Martin	GE?	?	
B.	subvelutipes Peck	GE?	?	
Chlorophyllum	molybdites (Meyer ex Fr.)Mass.	GE	?	
Clitocybe	acromelalga Ichimura	MU	MC?	
C.	angustissima (Lasch.)Kum.	MU	MC	E
C.	candicans (Pers. ex Fr.)Kum.	MU	MC	B
C.	cerussata (Fr.)Gill.	MU	MC	B
C.	clavipes (Pers. ex Fr.)Kum.	CP?	CO?	B

Species	Symptoms	Toxin	Distribution
Clitocybe dealbata (Sow. ex Fr.)Kum.	MU	MC	B
C. diatreta (Fr.)Kum.	MU	MC?	B
C. ericetorum (Bull.)Quél.	MU	MC?	B
C. festiva Favre	MU	MC	
C. gracilipes Lam.	MU	MC?	
C. marginella Harmaja	MU	MC?	
C. nebularis (Batsch. ex Fr.)Kum.	GE?	?	B
C. nuoljae Lam.	MU	MC	
C. phyllophila (Fr.)Kum.	MU	MC	B
C. rivulosa (Pers. ex Fr.)Kum.	MU	MC	B
C. serotina Lam.	MU	MC	
C. suaveolens (Schum. ex Fr.)Kum.	MU?	MC?	B
C. truncicola (Peck)Sacc.	MU	MC?	
C. venenata Heim	MU	MC?	

Species		Symptoms	Toxin	Distribution
Conocybe	cyanopus (Atk.)Kühn.	HA	PS	B(?)
C.	filaris (Fr.)Kühn.	AP	CY	B
C.	mairei Kühn.	?	?	B
C.	siligineoides Heim	HA	PS	
C.	smithii Wat.	HA	PS	
Copelandia	cambodginiensis Ola'h & Heim	HA	PS	
C.	chlorocystis Sing. & Weeks	HA	PS	
C.	cyanescens (Berk.& Br.)Sing.	HA	PS	
C.	mexicana Guz.	HA?	PS?	
C.	papilionacea Malç. & Bertault	HA?	PS?	
C.	tropicalis Ola'h	HA	PS	
Coprinus	acuminatus (Romag.)Ort.	CP?	CO?	B
C.	africanus Peg.	CP?	CO?	
C.	atramentarius (Bull. ex Fr.)Fr.	CP	CO	B

Species		Symptoms	Toxin	Distribution
Coprinus	erethistes Heim	CP	CO?	
C.	insignis Peck	CP?	CO?	E
C.	micaceus (Bull. ex Fr.)Fr.	?	CO?	B
C.	quadrifidus Peck	CP?	CO?	
C.	romagnesianus Sing.	CP?	CO?	B
C.	variegatus Peck	CP?	CO?	
Cortinarius	aureifolius Peck	?	OR?	E
C.	bolaris (Pers. ex Fr.)Fr.	?	OR?	B
C.	brunneofulvus Fr. s Bres.	?	OR?	E
C.	bulliardii (Fr.)Fr.	?	OR?	E
C.	callisteus (Fr.)Fr.	?	OR?	B
C.	cinnabarinus Fr.	?	OR?	E
C.	cinnamomeofulvus Hry	?	OR?	
C.	cinnamomeus (L. ex Fr.)Fr.	?	OR?	B

Species	Symptoms	Toxin	Distribution
Cortinarius cotoneus Fr.	?	OR?	E
C. elegantior Fr. ex Fr.	?	OR?	B
C. fluorescens Horak	?	OR?	
C. gentilis (Fr.)Fr.	CG	OR?	B
C. limonius (Fr. ex Fr.)Fr.	CG	OR?	B
C. malicorius Fr.	?	OR?	B
C. orellanoides Hry	CG	OR?	E
C. orellanus Fr.	CG	OR	E
C. phoeniceus (Bull.)Mre	?	OR?	B
C. puniceus Ort.	?	OR?	E
C. rubicundus (Rea)Pears.	?	OR?	B
C. sanguineus (Wulf. ex Fr.)Fr.	?	OR?	B
C. saniosus (Fr.)Fr.	?	OR?	B
C. semisanguineus (Fr.)Gill.	?	OR?	B

Species		Symptoms	Toxin	Distribution
Cortinarius	speciosissimus Kühn. & Romag.	CG	OR	S
C.	splendens Hry	CG	OR?	
C.	subfusipes Hry	?	OR?	
C.	tophaceoides Mos.	?	OR?	
C.	tophaceus (Fr.)Fr.	?	OR?	E
C.	traganus (Fr. ex Fr.)Fr.	?	OR?	B
C.	uliginosus Berk.	?	OR?	B
C.	venenosus Kawamura	?	OR?	
Entoloma	nidorosum (Fr.)Quél.	GE	?	B
E.	niphoides Romag.	GE	?	B
E.	rhodopolium (Fr.)Kum.	GE	?	B
E.	sinuatum (Bull. ex Fr.)Kum.	GE	?	B
E.	strictum (Peck)Sacc.	GE	?	
E.	vernum Lundell	GE	?	B
+ numerous other species of Entoloma		GE	?	B

Species		Symptoms	Toxin	Distribution
Galerina	autumnalis (Peck)Sing. & Sm.	AP	CY	B
G.	fasciculata Hongo	AP	CY	
G.	marginata (Fr.)Kühn.	AP	CY	B
G.	sulciceps (Berk.)Sing.	AP	CY?	
G.	venenata Sm.	AP	CY	
Gomphus	bonarii (Morse)Sing.	GE	?	
G.	floccosus (Schw.)Sing.	GE	?	
G.	kauffmanii Sm.	GE	?	
Gymnopilus	aeruginosus (Peck)Sing.	HA	PS	
G.	luteus (Peck)Hesler	HA	PS	
G.	junionus (Fr.)Ort.	HA?	PS?	B
G.	purpuratus (Cooke & Mass.)Sing.	HA	PS	
G.	validipes (Peck)Hesler	HA	PS	
G.	viridans Murr.	HA	PS	

Species		Symptoms	Toxin	Distribution
Gyromitra	ambigua (Karst.)Harmaja	GP	GY	
G.	apiculata (McKnight)Harmaja	GP	GY	
G.	brunnea Underwood	GP	GY	
G.	californica (Phill.)Raitviir	GP	GY	
G.	caroliniana (Bosc. ex Fr.)Fr.	GP	GY	
G.	curtipes Fr.	GP	GY	
G.	esculenta Pers. ex Fr.	GP	GY	B
G.	fastigiata (Krombh.)Rehm.	GP	GY	
G.	gigas (Krombh.)Cooke	GP	GY	
G.	infula (Schaeff. ex Pers.)Quél.	GP	GY	B
G.	martinii Donadini & Astier	GP	GY	
G.	megalospora Donadini & Riousset	GP	GY	
Hebeloma	crustuliniforme (Bull. ex St Amans)Quél.	GE	?	B
H.	fastibile (Pers.ex Fr.)Kum.	GE	?	B

Species	Symptoms	Toxin	Distribution
Hebeloma mesophaeum (Pers.)Quél.	GE	?	B
H. sinapizans (Paulet ex Fr.)Gill.	GE	?	B
+ numerous other suspect Hebeloma species	GE	?	B
Helvella acetabula (Linn. ex St Amans)Quél.	GP	GY?	B
H. crispa Fr.	GP	GY?	B
H. elastica Bull.	GP	GY?	B
H. lacunosa Fr.	GP	GY?	B
H. leucomelanea (Pers.)Nann.	GP	GY?	B
H. sphaerospora (Peck)Imai	GP	GY?	
Hygrocybe conica (Scop. ex Fr.)Kum.	GE	?	B
H. nigrescens (Quél.)Kühn.	GE	?	B
Hygrophoropsis aurantiaca (Fr.)Mre apud Martin-Sans	MU?	MC?	B

Species		Symptoms	Toxin	Distribution
Hypholoma	fasciculare (Huds. ex Fr.)Quél.	GE	?	B
H.	popperianum Sing.	HA?	PS?	
H.	sublateritium (Fr.)Quél.	GE?	?	B
Inocybe	albodisca Kühn.	MU	MC	E
I.	asterospora Quél.	MU	MC	B
I.	brunnea Quél.	MU	MC	B
I.	cincinnata (Fr.)Quél.	MU	MC	B
I.	corydalina Quél.	MU?	MC?	E
I.	decipientoides Peck	MU	MC	
I.	dulcamara (Alb. & Schw. ex Pers.)Kum.	MU	MC	B
I.	eutheles (Berk. & Br.)Quél.	MU	MC	B
I.	fastigiata (Schaeff. ex Fr.)Quél.	MU	MC	B
I.	fibrosa (Sow. ex Berk.)Gill.	MU	MC	E
I.	flocculosa (Berk.)Sacc.	MU	MC	B

Species	Symptoms	Toxin	Distribution
Inocybe friesii Heim	MU	MC	B
I. gausapata Kühn.	MU	MC	
I. geophylla (Sow. ex Fr.)Kum.	MU	MC	B
I. griseolilacina Lge	MU	MC	B
I. hirtella Bres.	MU	MC	E
I. hystrix (Fr.)Karst.	MU	MC	B
I. lacera (Fr.)Kum.	MU	MC	B
I. lanuginella (Schr.)Lge	MU	MC	B
I. lanuginosa (Bull. ex Fr.)Kum.	MU	MC	B
I. lucifuga (Fr.)Kum.	MU	MC	E
I. maculata Boud.	MU	MC	B
I. mixtilis (Britz.)Sacc.	MU	MC	B
I. napipes Lge	MU	MC	B
I. oblectabilis (Britz.)Sacc.	MU	MC	E

Species	Symptoms	Toxin	Distribution
Inocybe obscura (Pers. ex Pers.)Gill.	MU	MC	B
I. obscuroides Ort.	MU	MC	E
I. pallidipes Ell. & Ever.	MU	MC	E
I. patouillardii Bres.	MU	MC	E
I. perlata (Cke)Sacc.	MU	MC	E
I. posterula (Britz.)Sacc.	MU	MC	B
I. praetervisa Quél.	MU	MC	B
I. pudica Kühn.	MU	MC	B
I. queletii Mre & Kühn.	MU	MC	
I. sambucina (Fr.)Quél.	MU	MC	B
I. terrifera Kühn.	MU	MC	B
I. umbrina Bres.	MU	MC	B
I. xanthomelas Bours. & Kühn.	MU	MC	B

Species	Symptoms	Toxin	Distribution
Lactarius blennius (Fr.)Fr.	GE?	?	B
L. chrysorheus Fr.	GE?	?	B
L. fuliginosus (Fr.)Fr.	GE?	?	B
L. glaucescens Crossland	GE?	?	B
L. helvus (Fr.)Fr.	GE?	?	B
L. lignyotus Fr.	GE?	?	E
L. pyrogalus (Bull. ex Fr.)Fr.	GE?	?	B
L. representanaeus Britz.	GE?	?	B
L. rufus (Scop. ex Fr.)Fr.	GE?	?	B
L. scrobiculatus (Scop. ex Fr.)Fr.	GE?	?	B
L. torminosus (Schaeff. ex Fr.)Gray	GE	?	B
L. trivialis (Fr. ex Fr.)Fr.	GE?	?	B
L. turpis (Weinm.)Fr.	GE?	?	B
L. uvidus (Fr. ex Fr.)Fr.	GE?	?	B

Species		Symptoms	Toxin	Distribution
Lactarius	vellereus (Fr.)Fr.	GE?	?	B
L.	zonarius (Bull. ex St Amans)Fr.	GE?	?	B
Lepiota	aspera (Pers. in Hof. ex Fr.)Quél.	AP	CY	
L.	brunneoincarnata Chod. & Martin	AP	CY	E
L.	brunneolilacea Bon & Boiffart	AP	CY	
L.	bucknallii (Berk. & Br.)Sacc.	AP?	CY?	E
L.	castanea Quél.	AP	CY	E
L.	clypeolaria (Bull. ex Fr.)Kum.	AP?	CY?	E
L.	clypeolarioides Rea	AP	CY	E
L.	cortinarius Lge	AP?	CY?	
L.	cristata (Fr.)Kum.	AP?	CY?	B
L.	echinella Quél. & Bernard	AP?	CY?	E
L.	felina (Pers. ex Fr.)Karst.	AP?	CY?	E
L.	friesii (Lasch.)Quél.	AP	CY	B

Species	Symptoms	Toxin	Distribution	
Lepiota fulvella Rea	AP?	CY?	B	
L. fuscovinacea Møll. & Lge	AP?	CY?	E	
L. grangei (Eyre)Lge	AP?	CY?	E	
L. griseovirens Mre	AP	CY	E	
L. heimii Locq.	AP	CY		
L. hetieri Boud.	AP	CY	E	
L. kühneri Huijsm.	AP?	CY?	E	
L. ignivolvata Bousset & Joss.	AP	CY		
L. josserandii Bon & Boiffard	AP	CY		
L. langei Locq.	AP	CY		
L. leucothites (Vitt.)Ort.	AP?	CY?	E	
L. lilacea Bres.	AP?	CY?	E	
L. locanensis Espinosa	AP	CY?		
L. lutea ss Guégen	AP?	CY?	B	in glasshouses

Species	Symptoms	Toxin	Distribution	
Lepiota microsperma Locq.	AP	CY		
L. ochraceofulva Ort.	AP	CY	E	
L. pseudofelina Lge	AP	CY	B	
L. pseudohelveola Kühn.	AP?	CY?	E	
L. pseudolilacea Huijsm.	AP?	CY?	E	
L. rhodorhiza Romag. & Locq.	AP?	CY?	E	
L. rufipes Morgan	AP?	CY?		
L. scobinella (Fr.)Gill.	AP?	CY?	E	
L. setulosa Lge	AP?	CY?	E	
L. subincarnata Lge	AP	CY	E	
L. tomentella Lge	AP?	CY?	E	
Leucocoprinus badhamii (Berk. & Br.)Mos.	AP?	CY?	B	in glasshouses
L. bresadolae (Schulz.)Mos.	AP?	CY?	B	" "
L. cepaespites (Sow. ex Fr.)Pat.	AP?	CY?	B	" "

Species		Symptoms	Toxin	Distribution		
Lycoperdon	marginatum Vitt.	HA	?			
L.	mixtecorum Heim	HA	?			
Macrolepiota	venenata Bon	GE	?			
Morchella	angusticeps Peck	GP?	GY?		(only raw)	
M.	crassipes Krombh.	GP?	GY?		"	"
M.	deliciosa Fr.	GP?	GY?		"	"
M.	esculenta St Amans	GP?	GY?	B	"	"
M.	semilibera DC ex Fr.	GP?	GY?		"	"
Nolanea	hirtipes (Schum. ex Fr.)Kum.	GE?	?	B		
N.	mammosa (L. ex Fr.)Quél.	GE?	?	B		
N.	murraii (Berk. & Curt.)Sing.	GE?	?			
N.	sericea (Bull. ex Mérat)Ort.	GE	?	B		
N.	staurospora Bres.	GE?	?	B		
+ numerous other Nolanea and Leptonia species		GE?	?	B		

Species		Symptoms	Toxin	Distribution
Omphalotus	illudens Schw.	MU?	MC?	
O.	olearius (DC ex Fr.)Sing.	MU?	MC?	
O.	subilludens Murr.	MU?	MC?	
Panaeolus	africanus Ola'h	HA	PS	
P.	ater (Lge)Kühn. & Romag.	HA?	PS?	B
P.	campanulatus (Bull. ex Fr.)Quél.	HA?	PS?	B
P.	castaneifolius (Murr.)Sm.	HA?	PS?	B
P.	fimicola (Fr.)Gill.	HA?	PS?	B
P.	foenisecii (Pers. ex Fr.)Mre	HA	PS?	B
P.	microsporus Ola'h & Cailleux	HA	PS?	B
P.	papilionaceus (Bull. ex Fr.)Quél.	HA	PS?	B
P.	retirugis (Fr.)Gill.	HA?	PS?	B
P.	sphinctrinus (Fr.)Quél.	HA?	PS?	B
P.	subbalteatus (Berk. & Br.)Sacc.	HA	PS	B

Species	Symptoms	Toxin	Distribution
Paxillus involutus (Batsch. ex Fr.)Fr.	hemolytic	?	B
Pholiota squarrosa (Müller ex Fr.)Kum.	GE?	?	B
Psathyrella sepulchralis Sing.,Sm. & Guz.	HA?	PS?	
Psilocybe aeruginomaculans Höhn.	HA	PS?	
P. aztecorum Heim	HA	PS	
P. baeocystis Sing. & Sm.	HA	PS	
P. banderillensis Guz.	HA?	PS?	
P. bolivarii Guz.=zapotecorum Heim	HA	PS	
P. brunneocystidia Guz. & Horak	HA?	PS?	
P. caerulescens Murr.	HA	PS	
P. caerulipes (Peck)Sacc.	HA	PS	
P. callosa (Fr. ex Fr.)Quél.	HA?	PS?	
P. candidipes Sing. & Sm.=zapotecorum Heim	HA	PS	
P. collybioides Sing. & Sm.	HA	PS	

Species	Symptoms	Toxin	Distribution
Psilocybe coprinifacies (Roll.)Pouz.	HA	PS?	
P. cordispora Heim	HA?	PS?	
P. cubensis (Earle)Sing.	HA	PS	
P. cyanescens Wakef.	HA	PS	B
P. eucalypta Guz. & Wat.	HA	PS	
P. fagicola Heim & Cailleux	HA	PS	
P. fimetaria (Ort.)Wat.	HA?	PS?	B
P. galindii Guz.	HA?	PS?	
P. goniospora (Berk. & Br.)Sing.	HA?	PS?	
P. heimii Guz.	HA?	PS?	
P. herrerae Guz.	HA?	PS?	
P. hoogshagenii Heim	HA	PS	
P. inconspicua Guz. & Horak	HA?	PS?	
P. kumaenorum Heim	HA	PS	

Species	Symptoms	Toxin	Distribution
Psilocybe liniformans Guz. & Bas	HA?	PS?	
P. mammillata Murr.	HA?	PS?	
P. mexicana Heim	HA	PS	
P. montana (Fr.)Quél.	HA?	PS?	B
P. naematoliformis Guz.	HA?	PS?	
P. neocaledonica Guz. & Horak	HA?	PS?	
P. nova-zelandiae Guz. & Horak	HA?	PS?	
P. nothofagensis Guz. & Horak	HA?	PS?	
P. papuana Guz. & Horak	HA?	PS?	
P. pelliculosa (Sm.)Sing. & Sm.	HA	PS	
P. plutonia (Berk. & Cke)Sacc.	HA?	PS?	
P. quebecensis Ola'h & Heim	HA	PS	
P. rzedowskii Guz.	HA?	PS?	
P. semilanceata (Fr.)Kum.	HA	PS	B

Species		Symptoms	Toxin	Distribution
Psilocybe	serbica Mos. & Horak	HA	PS	
P.	silvatica (Peck)Sing. & Sm.	HA	PS	
P.	singeri Guz.	HA?	PS?	
P.	squamosa (Pers. ex Fr.)Quél.	HA?	PS?	B
P.	strictipes Sing. & Sm.	HA	PS	
P.	stuntzii Guz. & Ott	HA	PS	
P.	subaeruginascens Höhn.	HA	PS	
P.	subaeruginosa Clel.	HA	PS	
P.	uxpanapensis Guz.	HA?	PS?	
P.	venenata (Imai)Imazeki & Hongo	HA	PS?	
P.	veraecrusis Guz. & Ortiz	HA?	PS?	
P.	wassonii Heim	HA	PS	
P.	weldenii Guz.	HA?	PS?	
P.	yungensis Sing. & Sm.	HA	PS	
P.	zapotecorum Heim	HA	PS	

Species	Symptoms	Toxin	Distribution
Ramaria aurea (Fr.)Quél.	GE	?	E
R. flava (Schaeff. ex Fr.)Quél.	GE	?	
R. formosa (Fr.)Quél.	GE	?	
R. gelatinosa (Coker)Corner	GE	?	
R. lutea (Vitt.)Schild	GE	?	
R. mairei Donk.	GE	?	
R. pallida Schaeff. ex Fr.	GE	?	
Russula agglutinata Heim	HA?	?	
R. emetica Fr.	GE	?	B
R. fallax Kaufm.	GE?	?	B
R. foetens Fr.	GE?	?	B
R. fragilis (Pers. ex Fr.)Fr.	GE?	?	B
R. kirinea Heim	HA	?	
R. maenadum Heim	HA	?	

Species		Symptoms	Toxin	Distribution
Russula	mairei Sing.	GE?	?	B
R.	nondorbingi Sing.	GE	?	
R.	pseudomaenadum Heim	HA	?	
R.	sardonia Fr.	GE?	?	B
R.	urens Romell apud Mre ex Sing.	GE?	?	
Sarcosphaera	crassa (Santi ex Stendel)Pouz.	GE	?	
S.	eximia (Dur. & Lév.)Mre	GE	?	
Scleroderma	cepa	GE	?	E
S.	citrinum Pers.	GE	?	B
Stropharia	aeruginosa (Curt. ex Fr.)Quél.	HA?	PS?	B
S.	coronilla (Bull. ex Fr.)Quél.	HA?	PS?	B
S.	cyanea Tuomikoski	HA?	PS?	B
S.	ferrii Bres.	HA?	PS?	B
S.	hornemannii (Fr. ex Fr.)Lund. & Nannf.	?	?	B

Species		Symptoms	Toxin	Distribution
Suillus	granulatus (Fr.)Kuntze	GE?	?	B
Tricholoma	acerbum (Bull. ex Fr.)Quél.	GE	?	E
T.	albobrunneum (Pers. ex Fr.)Kum.	GE	?	E
T.	album (Schaeff. ex Fr.)Kum.	GE	?	B
T.	atrosquamosum (Chevallier)Sacc.	GE	?	B
T.	bressadolanum Clç	GE	?	
T.	helviodor Pilàt & Svrček	GE	?	B
T.	irinum (Fr.)Bigel. = Lepista	GE	?	B
T.	josserandii Bon	GE	?	
T.	luridum (Schaeff. ex Fr.)Quél.	GE	?	
T.	muscarium Kawamura	GE	?	
T.	pardinum Quél.	GE	?	
T.	pessundatum (Fr.)Quél.	GE	?	B
T.	saponaceum (Fr.)Kum.	GE?	?	B

Species		Symptoms	Toxin	Distribution
Tricholoma	scalpturatum (Fr.)Quél.	GE	?	B
T.	sejunctum (Sow. ex Fr.)Quél.	GE	?	B
T.	sulphurescens Bres.	GE	?	E
T.	sulphureum (Bull. ex Fr.)Kum.	GE	?	B
T.	ustale (Fr. ex Fr.)Kum.	GE	?	B
T.	venenata Atk.	GE	?	
T.	virgatum (Fr. ex Fr.)Kum.	GE	?	B
Tricholomopsis	platyphylla (Pers. ex Fr.)Sing.	GE?	?	B
T.	rutilans (Schaeff. ex Fr.)Sing.	GE?	?	B
Tylopilus	felleus (Bull. ex Fr.)Karst.	GE	?	B
Verpa	bohemica (Krombh.)Schroet.	GE	?	
Volvariella	media (Schum. ex Fr.)Sing.	GE?	?	E
V.	parvula (Weinm.)Ort.	GE?	?	B

4.2. Survey in Scotland.

In the world list (Table 3), a column is used to indicate whether a species is found in England (E), Scotland (S) only or throughout Britain (B).

A first survey of the mushrooms found in Scotland was published in 1879 by the Rev. Stevenson. Over the years, these records have been extended, and specimens have been collected and deposited at the Royal Botanic Garden in Edinburgh as a reference or voucher collection. This was used, with the most appreciated assistance of Dr. Roy Watling, to draw up the list of Scottish records used in the above world list.

During the past four years, some areas of Scotland have been surveyed with a view to building a collection of poisonous and hallucinogenic mushrooms and related species at the Forensic Science Unit, so that further toxicological investigations could be initiated.

4.2.1. Geographical Data.

Two areas have been thoroughly surveyed, one centres in and around Glasgow and the other in North Perthshire principally around Pitlochry and Blairgowrie.

The detailed coordinate data of the collection areas are listed in Table 4, using standard 1:50'000 Ordnance Survey Maps of Britain.

Few specimens have been collected isolatedly in other areas or by other people than the present author. Collectors' name or topographical data is specified on the label of each specimen or on the collection card which accompanies each sample. Figure 31 illustrates an example of a collection card, with all its information completed. The ecological data are filled at the time of collection and additional data are subsequently recorded if the identification is doubtful, or if the sample's features vary from standard features as described in the literature for the given species.

The collection held at Strathclyde University includes, at present, 354 specimens of which 223 are of suspect or poisonous species. They are listed in Table 5 with their reference collection number and the locality they originated from. It is worth noting that some samples included here are of unknown toxicity (they have never been reported to be poisonous, but they are included because they belong to genera which have numerous poisonous species e.g. Leptonia incana, various Hypholomas, etc).

TABLE 4 : Topographic Data of Areas Surveyed to Build up a Collection of Scottish Poisonous and Hallucinogenic Mushrooms to be Kept at Strathclyde University.

Locality	Coordinates	Abbreviation
1) Glasgow Area	Ordnance Survey (OS) Map Sheet 64 (1976) 1: 50'000	
Strathclyde University	65600/59750 within a 50 m circle	SU
Botanic Garden (walkway)	67400/56800 to 68200/56750	BG
Gartnavel Hospital	68100/55100 to 67900/54800	GH
Pollock Park	61700/55000 to 62300/55200	PP
Mugdock Woods (along path)	75500/55400 to 77000/53800	MW
Mugdock Reservoir	76400/55400 to 75750/56800	MR
Low Craigton	75300/54250 to 76000/52900	LC
Golf Course	74600/56400 to 74000/56900	GC
Milngavie West	73700/53300 to 74500/53400	MT
	OS Sheet 71 (1976)	
Corehouse	41400/87700 to 42200/87900 and 40600/88250	CO
Hamilton High Park	54000/73700 to 53500/73400	HH

Table 4 (continued):

Locality	Coordinates	Abbreviation
2) Pitlochry-Blairgowrie Area	OS Sheet 53 (1976) 1:50'000	
Dunkeld Hermitage (nature trail)	42300/01300 to 41700/00050	DH
Loch of the Lowes	44600/05400 to 44000/04500 and 44600/04750	LL
Loch Bog	42500/19000 to 41700/18500	LB
Blackcraig Forest (path)	52300/11000 to 52000/10600	BF
Standing Stones	56900/09200 to 57750/09250	SS
	OS Sheet 52 (1976) 1:50'000	
Falls of Balnaguard	51800/94250 to 50900/93900	FB
	OS Sheet 43 (1976) 1:50'000	
Killicrankie (West of Road)	62800/91200 to 61750/91200	KC
Dalreoch	62500/06200 to 61300/07000	DA
Kindrogan Woods	62600/05900 to 62200/04700 and 63400/04350	KW

Table 4 (continued):

Locality	Coordinates	Abbreviation
Straloch	63500/03550 to 64100/03300 and 63600/03000	SL
Lin of Dee	89600/08000 to 89800/07900	LD
Glen Shee (Chair Lift)	77300/13400 within a 100 m circle	GS
Davan	63500/04150 to 63250/03900	DV

TABLE 5 : List of Suspect or Poisonous Species Collected and Kept in the Forensic Science Unit, Strathclyde University. (Abbreviations refer to Table 5)

Species	Collection No.	Locality
Amanita citrina	166	Comrie
A. excelsa	56;180;219	MT;LC;GC
A. fulva	8	MW
A. muscaria	172	Road B846
A. pantherina	121;244	SL;SL
A. porphyria	182	MW
A. rubescens	9;26;54	MW;PP;MT
A. umbrinolutea	117	SL
Anellaria semiovata	18;122	Loch Thom;SL
	262	SS
Boletus calopus	176	LC
Clitocybe clavipes	250	BF
Clitocybe dealbata	191	CO
Conocybe lactea	25	SU
C. tenera	216	Road A811
Cortinarius anomalus	253	LL
C. aureifolius	305	KW
C. bicolor	203	Road A8003
C. cinnamomeobadius	261;294	DV; LL
C. cinnamomeolutescens	313;329	DH;KW

TABLE 5 (continued):

Species		Collection No.	Locality
Cortinarius	cinnamomeus	223;229;248	GC;GC;BF
		304;328	KW;DH
C.	cinnamomeus var.conformis	299	DV
C.	cinnamomeus complex	307;308;309	KW;KW;KW
		310;311;312	KW;KW;KW
		314;315;316	KW;KW;KW
		317;318;319	KW;KW;KW
		320;321;322	KW;KW;KW
		323;324;325	KW;KW;KW
		326;330	KW;DH
C.	croceifolius	306	KW
C.	croceoconus	292	BF
C.	cyanites	247	BF
C.	elatior	220	GF
C.	flexipes	249	DH
C.	hemitrichus	288	Barry Links
C.	lepidopus	86	DA
C.	mucosus	255	LD
C.	paleaceus	221	GC
C.	pallidipes	303	Glenesk
C.	palustris	285	Barry Links

TABLE 5 (continued) :

Species		Collection No.	Locality
Cortinarius	pseudosalor	220	GC
C.	purpureobadius	258	FB
C.	sanguineus	224;233	GC;GC
C.	semisanguineus	264;331; 334;337	Merrone Woods; DH;DH;LD
C.	speciosissimus	155;351;354; 353	LD;I.Alexander Rossdhu;ibid.
C.	sphagneti	260;280	LL;LB
C.	tabularis	88;183	DA;MW
Entoloma	clypeatum	269	BG
E.	majaloides	282	LB
E.	sericatum	133;301	FB;SS
Gymnopilus	junionus	204	Kilbernie
G.	penetrans	125;188	SL;CO
Hebeloma	sinapizans	267	Merrone Woods
Hygrophoropsis	aurantiaca	58	MT
Hygrocybe	conicus	92	DA
Hypholoma	capnoides	144;254	BF;DH
H.	elongatum	283	LB
H.	fasciculare	4;17;32;106	MW;?;PP;DA
		177;189;197	LC;CO;Road
		225;246	A8003;MW;KW
H.	marginatum	143;242;242	BF;BF;DH
		341	HH

TABLE 5 (continued):

Species		Collection No.	Locality
Hypholoma	radicosum	291	BF
H.	sublateritium	186;234	CO;Ross Priory
Inocybe	agardhii	286	Barry Links
I.	asterospora	174	MW
I.	brunnea	298	BF
I.	calamistrata	199	Road A8003
I.	dulcamara	112;287	SL;Barry L.
I.	dunensis	289	Barry Links
I.	fastigiata	124;181;201;218	SL;MW;BG;A811
		227;241;272	KW;KW;GC
I.	geophylla	202;232;296	BG;GC;BF
		332	DH
	var.alba	295	BF
	var.lilacina	333	DH
	var.lateritia	297	BF
	var.violacea	340	HH
I.	hystrix	91	DA
I.	lacera	270;273;290	GC;GC;Barry L.
I.	lanuginella	173;209	MW;Barrhead
I.	lanuginosa	281	LB
I.	longicystis	31	PP
I.	mixtilis	275	CO

TABLE 5 (continued) :

Species		Collection No.	Locality
Inocybe	napipes	271;274	GC;Lairg
I.	pudica	226;240	KW;KW
I.	sambucina	279	SL
I.	subnudipes	293	BF
I.	umbrina	265;300	SS;BF
I.	spp.	79	MT
I.	spp.	193;194	BG;BG
Lactarius	torminosus	116	SL
Lepiota	cristata	276;327;339	DA;KW;HH
Leptonia	incana	134	FB
Nolanea	sericea	44;101	SU;DA
N.	staurospora	118;147	SL;LL
Panaeolus	acuminatus	98	DA
P.	foenisecii	42;82;208;212	SU;DA;SU;MR
		214;217	Case 1;A811
P.	papilionaceus	102;126	DA;FB
P.	retirugis	213	Barrhead
P.	rickenii	211	Barrhead
P.	speciosus	126;259	DA;SS
P.	sphinctrinus	62;87;107	MW;DA;DA
P.	subbalteatus	22;352	SU;Wat.herb.
P.	spp.	230	A811

TABLE 5 (continued) :

Species		Collection No.	Locality
Psilocybe	coprophila	84;113	SL;DA
P.	inquilina	146	LL
P.	montana	41;145;158	SU;LL;SL
P.	semilanceata	68;114;171;205	SU;SL;?;Kil-
		206;207;228	bernie;GC;?;
		231;243;302	Ross Priory;SU
		335;336;344	SL;SS;DA;LD;SU
Russula	emetica	263	LD
R.	emeticella	115	SL
R.	mairei	137	BF
Stropharia	aeruginosa	348	France
S.	albocyanea	157;257	KW;KW
S.	albonitens	347	France
S.	coronilla	349;350	France
S.	cyanea	111;123;185;342	KW;SL;CO;HH
S.	ferrii	345;346	Tyrol;France
S.	inuncta	159	KW
S.	pseudocyanea	110	KW
S.	semiglobata	3;60;93;164	MW;MW;DA;BF
Tricholoma	argyraceum	245	BF
T.	saponaceum	168	Comrie
T.	sulfureum	338	KC

4.2.2. Microscopical Data.

All the above samples have been analysed microscopically to help to build up the data bank used in the identification programme. The experimental data have been compared with literature data, where available and any variations or doubtful identifications have been submitted for confirmation to Dr. Watling of the Royal Botanic Garden in Edinburgh (e.g. *Inocybe umbrina*, collection card No. 265; Figure 31).

Exception has to be made for the group of collections made under the collective name of "*Cortinarius cinnamomeus* complex". These specimens were all collected within two days and it was clear, at the time, that possibly as many as eleven different species were present. They could not all be fitted into the presently described species belonging to this complex and clearly, there is an interesting taxonomic problem as well as chemical research to be undertaken since Greer (1980) showed the possible presence of orellanine in *Cortinarius cinnamomeus*.

Slide made

COLLECTION CARD No. 265

LOCALITY Standing Stone Kindrogan DATE 21 - 9 - 79

HABITAT nr. pine but some dung present too (rabbit/hare?)

CAP Ø 50mm. date brown marked umbo purplish date
innately fibrillose ps

GILLS linear to ventricose, dentate pale brown to rusty
margin rusty, adnate emarginate ?inflexed

STEM 50 x 10-13 no bulb but slightly clavate
snuff brown to cigar brown up to the apex paler at base

FLESH white no special smell

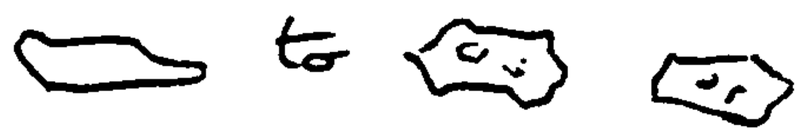
CHEMICAL TEST

REF. No.

Recto

MICROSCOPICAL CHARACTERS

SPORES nodulose marked 7.0-8.5 x 5-5.5 nodules not very



BASIDIA 4 spores 32-40 x 5-8

CAP FLESH

GILL TISSUE Reg.

CAP SURFACE

CYSTIDIA marginal cystidia thin walled never crested
some 50 - 75µ x 5-10
some shorter bulkier

IDENTITY facial crested. 60-80 x 12.5
Inocybe umbrinella
Inocybe close to boltonii macroscopically

but closer to lanuginella microscopically although quite differen
(see range 11.5 (!)

Verso

Figure 31 : Example of a Collection Card and its Data.

4.2.3. Chemical Data.

4.2.3.1. Hallucinogenic Species.

At the early stages of this project, because of the bearing of the results on the drug abuse problem and possible legislative controls on hallucinogenic mushrooms, a group of suspect fungi belonging to the Strophariaceae were to be investigated. This was further expanded to include species of the genus Panaeolus (Coprinaceae) claimed by some authors to contain psilocybin and analogues; claims put in doubts by many others!

French samples of Stropharia were generously donated by Dr. A. Gérault and a number of Australian species of Psilocybe were given for analysis by Dr. Roy Watling.

Screening for the presence of the known hallucinogens psilocybin, psilocin, baeocystin and nor-baeocystin was carried out using standard chemical techniques detailed in the appendix (6.2.4.) with some interesting and some puzzling results, which deserve further investigation, now that a fairly extensive collection is available.

Standard psilocin, psilocybin, N-methyl-tryptamine, N,N-dimethyl-tryptamine and bufotenine were provided by the Home Office Central Research Establishment in Aldermaston. Psilocybe semilanceata was used as the standard for baeocystin, after its presence had been demonstrated in that mushroom by Repke and Leslie (1977).

Voucher specimens have been deposited at the Royal Botanic Garden in Edinburgh, and results have been published (Margot & Watling, 1981). These results are summarised in Table 6.

4.2.3.2. Discussion.

Psilocybe eucalypta, only recently described by Guzmàn and Watling (1978), proves to be a new hallucinogenic mushroom growing in Australia. The other two Australian species, suspected of being hallucinogenic because of their blueing properties, Psilocybe australiana and P. subaeruginosa proved negative for known mushroom hallucinogens, and so did the yet undescribed Psilocybe species from New Zealand. These results have to be considered critically since only one analysis was allowed due to the limited amounts of sample available (a fragment of a single carpophore ranging from 10 to 30 mg) and variation between collections are known to

TABLE 6 : Results of the Analysis of some Strophariaceae and Coprinaceae Species by TLC* with Regard to the Presence of the Hallucinogens Psilocybin (PS), Psilocin (P) and Baeocystin (B). Unknown (U) Indole Compounds Reacting Towards Acidic p-Dimethylaminobenzaldehyde (p-DAB) are Indicated.

+++ : over 0.30 % (w/w dry weight) ++ : over 0.10 % + : traces

Species	Collection No.	Date	PS	P	B	U	Notes
Psilocybe australiana	Wat.10962	1974	-	-	-	-	Wat.: Watling Herbarium
P. coprophila	84;113	1978	-	-	-	++	in Edinburgh,
P. cubensis	Wat.10816	1974	+	-	-	-	Royal Botanic
	Wat.10823	1974	+	-	-	-	Garden.
	Wat.10778	1974	+	-	-	-	PM. : P. Margot,
P. cyanescens	Wat.11361	1978	+++	(+)	+	-	collection
P. eucalypta	Wat.10631	1974	++	-	-	++	before 1978
P. inquilina	PM11177;146	1977/8	-	-	-	++	
P. montana	41;145;158	1978	-	-	-	+++	

*TLC : Thin Layer Chromatography

Table 6 (continued) :

Species	Collection No.	Date	PS	P	B	U	Notes
Psilocybe semilanceata	Wat.13127;68	1977/8	+++	+	++	++	
	114;205;228	1978/9					
P. subaeruginosa	Clel.13251	?	-	-	-	-	Clel.: Cleland's
P. spp.	Taylor 477	1969	-	-	-	-	Collection
Stropharia aeruginosa	348	1978	-	-	-	++	legit Gérault
S. albocyanea	157;257	1978/9	-	-	-	++	
S. albonitens	347	1974	-	-	-	++	legit Gérault
S. coronilla	349;350	1978	-	-	-	++	" "
S. cyanea	111;123;185	1978	-	-	-	++	
	PM311076	1976	-	-	-	++	
S. ferrii	345;346	1970/1	-	-	-	+	" "
S. inuncta	159	1978	-	-	-	++	

Table 6 (continued) :

Species	Collection No.	Date	PS	P	B	U	Notes
Stropharia pseudocyanea	PM91077;110	1977/8	-	-	-	++	
	PM231077		-	-	-	++	
	PM251077		-	-	-	++	
S. semiglobata	PM011177;3	1977/8	-	-	-	++	
	60;93;164	1978	-	-	-	++	
Hypholoma fasciculare	4;17;32	1978	-	-	-	-	
Panaeolus foenisecii	42;82;208;212	1978/9	-	-	-	+++	at least 2 compounds
P. retirugis	213	1979	-	-	-	+++	at least 3 compounds
P. rickenii	211	1979	-	-	-	++	" " 2 compounds
P. subbalteatus	352	1976	++	-	-	+	
	22	1978	-	-	-	++	

occur. Recently, Perkal et al.(1980), with considerably larger samples, reported the presence of psilocybin in Psilocybe subaeruginosa using high performance liquid chromatography (HPLC). They also showed that the concentration of the drug varied considerably in different specimens. It could not be detected in one sample, using an ultra-violet detector, and ranged up to 0.21 % in others. Using a fluorescence detector, it was possible to measure trace amounts of psilocybin in the former. A factor which could influence these results is the time. The sample analysed at Strathclyde University came from Cleland's collections (spanning from the beginning of the century to the 1950's) i.e. it was at least twenty years old at the time of analysis. Similarly, the Psilocybe species originating from New Zealand was collected in 1969, ten years before analysis. Ageing experiments carried out in the Forensic Science Unit showed that the concentration of a solution of psilocybin in methanol decreased by about 25 % in 8 months, whereas psilocin almost totally disappeared during the same time period. The above discrepancies could therefore be explained by the time lag between collection and analysis.

None of the Stropharia species analysed contained any known mushroom hallucinogens, even though abundant samples were repeatedly analysed. Stropharia cyanea

had previously been found to contain psilocybin (Margot, 1977), but this could not be confirmed. This poses the problem of chemical strains (or species?) within genera, or of chemical variations during the life cycle of a mushroom.

Only extensive studies on single species could bring an answer to this problem and this is outwith the scope of the present thesis. In view of the above results, it is concluded that the Stropharia species analysed are devoid of the hallucinogens psilocybin, psilocin and baeocystin.

Hypholoma fasciculare, confirming previous results (Margot, 1977) does not contain any indole alkylamine or in any detectable levels with standard chemical techniques.

Panaeolus species have been claimed , for a long time and by many, to be hallucinogenic. This has been confirmed by some analysts and disclaimed by others. Panaeolus foenisecii is listed as a hallucinogenic species containing psilocybin in all underground guides. All the results obtained demonstrate the contrary view.

Psilocybin was found in only one sample, Panaeolus subbalteatus (collection No. 352), provided by Dr. Watling

following a case of poisoning which occurred in Edinburgh (Watling, 1977). Another sample of the same species (collection No.22) did not contain psilocybin. This would confirm Ola'h's observations (1969) that chemical strains exist within the genus Panaeolus. He divided Panaeolus species into "psilocybian", "latent psilocybian" and "non psilocybian" groups. It is worth noting that P. foenisecii is reported by Ola'h to be latent psilocybian, whereas P. subbalteatus is psilocybian, thus contradicting the present results.

On the other hand, all Panaeolus species, and especially P. retirugis, analysed were shown to contain compounds reacting similarly to psilocybin and analogues with 5 % acidic p-dimethylaminobenzaldehyde (p-DAB), but having different chromatographic behaviour to the standards used. One of the compounds had an R_f value close to that of psilocin, in all the chromatographic systems investigated. This compound was possibly the same as that found in all the Stropharia.

The widespread publicity about the hallucinogenic properties of Panaeolus species may be well founded, but the effect may be due to yet uncharacterised hallucinogens related to the known psilocybin and its analogues.

4.2.3.3. Cortinarius Species.

After a serious case of poisoning involving Cortinarius speciosissimus in Scotland (Watling, 1980; Short et al., 1980), chemical analysis of C. cinnamomeus (collections No. 223, 229 and 248), C. sanguineus (233), C. semisanguineus (264), as well as samples of C. speciosissimus from the scene of the poisoning were undertaken.

Compounds with similar chemical behaviour to that reported to orellanine (Antkowiak and Gessner, 1979) were found in all the samples, mainly in C. speciosissimus and C. cinnamomeus, and, to a lesser degree, in the other species. This confirms the suspicion that C. cinnamomeus may join the group of deadly poisonous Cortinarii. This contradicts most popular guides which describe this mushroom as "harmless", "best avoided" or"edibility unknown"!!

A clear warning that this species may indeed be deadly will be issued in the Bulletin of the British Mycological Society. Further studies are required because these and related species are widespread and common throughout Scotland.

4.3 Data Bank Collection.

From the world list of reported poisonous and hallucinogenic mushrooms, 223 are selected and included in the data bank of the present programme. Species known to be poisonous are included first, followed by British species suspected to be poisonous as well as foreign species for which a complete set of data was available. A computer read-out of the data retrieval and coded diagnostic data is listed. (Table 7)

4.3.1. Recapitulative Table of the Characters and States Used for Data Collection and Storage.

1. Symptoms : 1) gastroenteritis after 8 hours, no fever, cytolitic hepatitis.

2) minimum 15 hours after ingestion: gastroenteritis, intense thirst, polyuria, then renal failure.

3) after alcohol consumption: flushing face and neck, swelling, tingling of hands; metallic taste, palpitations, hypotension, later nausea and sweating.

4) perspiration, salivation, lacrymation, blurred vision, abdominal cramps, diarrhoea, constriction of pupils, fall in blood pressure, slow pulse.

5) dizziness, drunkenness, incoordination, staggering, muscular cramps, spasms, hyperkinetic activity, deep sleep and visions.

6) mood changing, unmotivated laughter, hilarity; muscle weakness, drowsiness, hallucinations.

7) gastroenteritis; vomiting

8) gastroenteritis after 5 hours; fever; cytolitic and haemolitic action; headaches.

2. Onset of symptoms : 1) within 2 hours

2) 3 to 8 hours

3) 8 to 12 hours

4) typically over 15 hours

3. Geographical Distribution : 1) North temperate

2) South temperate

3) subtropical

4) tropical

5) English

6) Scottish

4. Habitat : 1) ground in coniferous woods

2) ground in hardwoods

3) ground in grass

4) ground in dung

5) on stumps

6) others

5. Time of growth : 1) spring

2) summer

3) autumn

4) winter

6. Spore colour under the microscope : 1) clear - amyloid

- inamyloid

- dextrinoid

- uncertain

6. continued

2) pale brown

3) pale pink

4) dark - resistant

- dissolves

- uncertain

7. Spore shapes : 1) globose

2) ellipsoid

3) angular

4) various

8. Spore surface : 1) smooth

2) rough

3) ridged

9. Spore wall thickness : 1) thin

2) thick

10. Germ pore : 1) present

2) absent

11. Spore length : 1) less than 6 μm

2) 6 - 8 μm

3) 8 - 10 μm

4) 10 - 12 μm

5) 12 - 17 μm

6) more than 17 μm

12. Spore breadth : 1) - less than 4 µm
- 4 - 6 µm
- 6 - 8 µm
- 8 - 10 µm
- more than 10 µm

13. Colour of the spore print : 1) white
2) pink
3) brown
4) black

14. Toxins : 1) cyclopeptides
2) orellanine
3) muscarine
4) hallucinogens
5) muscimol/ibotenic acid
6) coprine
7) others
8) gyromitrin

15. Duration of symptoms : 1) weeks if not death
2) 2 to 4 hours
3) up to 6 hours
4) 6 to 24 hours
5) few days

16. Pileus trama : 1) homoiomerous

2) heteromerous

17. Gill trama : 1) regular

2) inverse

3) bilateral

4) irregular

5) absent

18. Cuticle structure : 1) cellular

2) filamentous

3) absent

19. Clamp connections : 1) present

2) absent

20. Basidium or ascus: number of spores : 1) 2 spores

2) 4 spores

3) others

21. Basidia/asci sizes : 1) small (up to 35 μm)

2) medium (35 to 55 μm)

3) large (over 55 μm)

22. Marginal cystidia : 1) present : - small : - cylindrical

- medium - lageniform

- large - ampulliform

- utriform

- metuloid

- uncertain

2) absent

23. Facial cystidia : same states as for character 22

24. Chrysocystidia : 1) present

2) absent

```
    6PSILOCYBE SUBAERUGINASCENS HOHN PSILOCYBIN/INDOL HALL PROPOSED TREATMENT
  4 PREVENT ABSORPTION,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POS
    DIAZEPAM,CHLORPROMAZINE  TAXON SINGER & SMITH (1958) MYCOLOGIA 50,271-272
  7 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572  MED LINCOFF & MITC
    (1977) TOX & HALLUC. MUSHROOM POISONING ,VAN NOSTRAND REINHOLD,NY
  9 HALLUCINOGEN,UPSETTING  E.& S.E. ASIA
     41  5  0  2  3 -1  2  1  2  3  0  1  0  1  0  2  2  3  3  2  0  0  1  0 -1  2
     0  1  0  0  0 -1  2  1  2  0  0 -1  2  1  2  1
    6PSILOCYBE SUBAERUGINOSA CLEL PSILOCYBIN/INDOL HALL PROPOSED TREATMENT:
 10 PREVENT ABSORPT,ENHANCE EXCRETI,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSI
    DIAZEPAM,CHLORPROMAZINE  TAXON CLELAND JB (1934) HANDBOOK FLORA & FAUNA SOUTH
 12 AUSTRALIA,ADELAIDE CHEM.PERKAL ET AL.(1980)J.CHROMATOG.196,180-84 MED
    LINCOFF & MITCHEL (1977)TOX & HALLUC. MUSHROOM POISONING, VAN NOSTRAND R. NY
 14 HALLUCINOGEN,UPSETTING  AUST.
     35  5  0  1 -1  2  1  2  0  3  0  1  0  1  0  4  2  3  3  2  0  0  1  0  1  1
     0  0  1  0 -1  2  0  1  1  1
    SCORTINARIUS ORELLANUS (FR.)FR.  ORELLANINE TREATMENT:SYMPTOMATIC
 16 REF. TAXON. ORTON PD  CORTINARIUS II  THE NATURALIST  APRIL 1958 P120
       CHEM. ANTKOWIAK & GESSNER (1979) TETRAHEDRON L. 21,1931-34
 18    MEDIC. GERAULT & GIRRE (1977)BUL.SOC.MYCOL.FRANCE,93,373-405
    DEADLY  EU & S. EU
 20  41  1  3 -1  2  0  4 -1  2  0  1 -1  2  1  2  1  1  1  1  1 -1  2  2  3 -1  2
     2  2  2  1  3  0  3  1  0  1  1  0  1  0  1  1
    SCORTINARIUS SPECIOSISSIMUS KUHN.& ROMAG.  ORELLANINE TREATMENT:SYMPTOMATIC
 22 TAXON. ORTON PD (1958) CORTINARIUS II THE NATURALIST,APRIL,119
 24 CHEM. ANTKOWIAK& GESSNER (1979) TETRAHEDRON L. 21,1931-34
       MEDIC.GERAULT & GIRRE (1977)BUL.SOC.MYCOL.FRANCE 93,373-405
 26 DEADLY  EU & N. EU
     41  1  3 -1  2  0  5  0 -1  2  1  2  1  0  1  1  1 -1  2  2  3 -1  2  2  3  2
     1  0  0  0  1  0  1  1  0 -1  2  0  1  0  1  1
    6AMANITA PANTHERINA (FR.)SECR. UK FREQ 2.4 MUSCIMOL/IBOTENIC ACID  PROP.
 28 TREATMENT:PREVENT ABSORPTION, INCR. EXCRETION, SYMPTOMATIC (PHYSOSTIGMINE)
    TAXON. JENKINS DT (1977) BIBLIO. MYCOLOGICA 57,1-126
 30 CHEM. CATALFOMO & EUGSTER (1970) BULL. NARC. 22:4,33-41
    MEDIC. WASER PG (1967) ETHNOPHARMAC. SEARCH .. ED. EFRON US PHSP 1645,41
 32 INEBRIANT, DANGEROUS  EU; N.AM
     32  4  0 -1  3  0  4  5  1 -1  2  1  2  0  1  1  0  0  1  3  2  0  4  3  0  1
     1  1  1  1  1  1  1
    5AMANITA PHALLOIDES (FR)SECR. UK FREQ 5.5 CYCLOPEPTIDES  TREATMENT: WATER,
 34 ELECTROLYTE & BLOOD BALANCE,HYPERTONIC GLUCOSE INF.,PENICILLIN,THIOCTIC ACID,
    EXCHANGE TRANSFUSION  TAXON. AMMIRATI ET AL (1977) MYCOLOGIA 69,1095-1108
 36 CHEM.& MED. BERTELLI,FOURNIER ET AL (1977) ED.  CURRENT PROBLEMS IN CLIN
    BIOCHEM 7, H.HUBER,BERN,STUTGART,VIENNA   DEADLY  EU; N. AM.;AUST
 38  35  0  2 -1  3  0  4  5  1 -1  2  1  2  0  3  0  0  0  1  2 -1  2  2  3  0  0
     0  0  1  1  1  1  1  1  1
    5AMANITA VERNA (BULL EX FR)PERS EX VITT UK FREQ 2.4 CYCLOPEPTIDES  TREATMENT
 40 WATER,ELECTROLYTES,BLOOD BALANCE,HYPERTONIC GLUCOSE INF,PENICILLIN,THIOCTIC
    ACID,EXCHANGE TRANSFUSIONS  TAXON. MOSER (1978)KL. KRYPTOG.FLORA IIB/2,FIS-
 42 CHER,STUT. CHEM &MED BERTELLI,FOURNIER ET AL ED.(1977) CURRENT PROBLEMS IN
    CLIN. BIOCHEM. 7  H. HUBER,BERN,STUTT.,VIENNA  DEADLY  EU; N. AM.
 44  38  0  2 -1  3  0  4  5  1 -1  2  0  1  0  0  0  0  0  1 -1  2  1  2 -1  2  2
     3  0  0  0  0  1  1  1  1  1  1  1  1
    6AMANITA MUSCARIA (L EX FR)HOOKER UK FREQ 12.3 MUSCIMOL/IBOTENIC ACID  TREAT--
 46 MENT:PREVENT ABS.,INCREASE EXCRETION, SYMPTOMATIC (PHYSOSTIGMINE)
    TAXON. JENKINS DT (1977) BIBLIOTHECA MYCOLOGICA 57, 1-126
 48 CHEM. CATALFOMO & EUGSTER (1970) BULL. NARC. 22:4, 33-41
    MEDIC. WASER PG (1967) ETHNOPHARMAC SEARCH...ED EFRON,US PHSP 1645,419-3
 50 INEBRIANT, DANGEROUS  EU; ASIA; N.AM.
     41  4  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  0  1  1  0  0  1 -1  2  2  3
     -1  2  2  3  0  4  3  0  1  1  1  1  1  1  1  1
    5AMANITA BISPORIGERA ATK.  CYCLOPEPTIDES  TREATMENT:WATER,ELECTROLYTE &
 52 BLOOD BALANCE,HYPERTONIC GLUCOSE INF.,PENICILLIN,THIOCTIC ACID,EXCHANGE
    TRANSFUSION  TAXON. HEIM R(1957)REV MYCOL 22,208-217
 54 CHEM.& MEDIC  ED. BERTELLI ET AL.(1977) CURRENT PROBLEMS IN CLINICAL
    BIOCHEM. 7  H.HUBER,BERN,STUTT.,VIENNA  DEADLY  N. AM.
     31  0  2  0  1  1  0  0  0  0  0  1 -1  2  1  2 -1  2  2  3  0  0  0  0  1  1
     1  0  1  1  1  1
```

Table 7 : List of the Collection of Data Stored in the Data Bank

```
   6AMANITA OCREATA PECK  CYCLOPEPTIDES  TREATMENT:WATER,ELECTROLYTES,BLOOD
BALANCE,HYPERTONIC GLUCOSE INF.,PENICILLIN,THIOCTIC ACID,EXCHANGE TRANS-
FUSION  TAXON.AMMIRATI & AL (1977) MYCOLOGIA 69,1095-1108
CHEM. MORGEN ET AL (1976) LLOYDIA 39:5,368-375   MEDIC. BERTELLI ET AL
(1977) CURRENT PROBLEMS IN CLIN. BIOCHEM. 7  HUBER,BERN,STUTT.,VIENNA
DEADLY  N. AM.
 31  0  2  2  1  0  0  0  1  0  0  1 -1  2  3  4 -1  2  3  4  6  0  0  0  1  1
  1  1  1  1  1  1
   6AMANITA REGALIS FR. MUSCIMOL/IBOTENIC ACID  TREATMENT:PREVENT ABSORPTION
INCREASE EXCRETION,SYMPTOMATIC (PHYSOSTIGMINE)   TAXON. MOSER M (1978) KLEINE
KRYPTOG.FLORA,FISCHER,STUT. CHEM. CATALFOMO & EUGSTER (1970)
BULL. NARC 22:4,33-41   MEDIC. WASER PG (1967) EFRON ET AL ED.
ETHNOPHARMAC. SEARCH... US PHSP 1645  419-439   INEBRIANT, DANGEROUS N.EU.
 34  4  0 -1  2  0  5  0  2  0  1  1  0  0  1 -1  2  2  3 -1  2  2  3  0  4  3
  0  1  1  0  1  1  1  1  1
   6ENTOLOMA NIPHOIDES ROMAG UK FREQ 0.4 TOX UNKNOWN PROPOSED TREATMENT SYMP-
TOMATIC TAXON KUHNER &POMAGNESI (1953) FLORE ANALYTIQUE   MASSON CIE  PARIS
CHEM  HEROUT V (1968) PLANTA MED. SUPL 90-98
MED  TYLER V JR (1963) PROGRESS IN CHEM TOX 1,339-384
DANGEROUS TO UPSETTING  EU
 41  6  0 -1  3  0  4  5 -1  2  2  5  0  2  2  0  0  1 -1  3  1  2  3 -1  2  1
  2  1  6 -1  2  3  4  0  0  1  0  1  1  1  1  1
   6ENTOLOMA RHODOPOLIUM (FR)KUMMER UK FREQ 3.6 TOX UNKNOWN  TREATMENT:SYMPTO-
MATIC TAXON  KUHNER &ROMAGNESI (1953) FLORE ANALYTIQUE... MASSON CIE PARIS
CHEM HEROUT V (1968) PLANTA MED SUPL 90-98
MED TYLER V JR (1963) PROGRESS IN CHEM TOX 1,339-384
UPSETTING TO DANGEROUS  EU
 31  6  0 -1  3  0  4  5  1  2  2  2  0  0  1  2  2  1  6 -1  2  3  4  0  0  1
  0  1  0  1  1  1
   6ENTOLOMA SINUATUM (BULL EX FR)KUMMER UK FREQ 0.4 TOX UNKNOWN PROPOSED TREAT-
MENT:SYMPTOMATIC  TAXON  KUHNER & ROMAGNESI (1953) FLORE ANALYTIQUE... MASSON
CIE PARIS  CHEM  HEROUT V (1968) PLANTA MED SUPL 90-98
MED  TYLER V JR (1963) PROGRESS IN CHEM TOX 1,339-384
UPSETTING TO DANGEROUS  EU;N.AM.
 40  6  0 -1  3  0  4  5  1 -1  2  1  2  2  2  0  0  1  2 -1  2  2  3  1  6 -1
  2  3  4  0  0  1  0  1 -1  2  1  2  1  1  1
   6ENTOLOMA VERNUM LUNDELL  TOX UNKNOWN  TREATMENT:SYMPTOMATIC
TAXON KUHNER & ROMAGNESI (1953) FLORE ANALYTIQUE... MASSON CIE PARIS
CHEM HEROUT V (1968) PLANTA MED SUPL 90-98
MED  AYER F (1974) SCHWEIZ Z PILZKUNDE 89:2,17-19
UPSETTING TO DANGEROUS  EU
 34  6  0 -1  3  0  4  5 -1  2  2  5  0  2  2  0  0  1  2  2  1  6 -1  2  3  4
  0  0  1  0  1  0  1  1  1
   6AGARICUS PHAEOLEPIDOTUS MOELL  TOX UNKNOWN  TREATMENT:SYMPTOMATIC
TAXON  MOSER M (1978) KLEINE KRYPTOGAMENFLORA IIB/2 FISCHER STUTT. NY
CHEM. NONE
MED LINCOFF &MITCHEL (1977) TOXIC & HALL. MUSHROOM POIS..VAN NOSTRAND
REINHOLD NY 197-198   UPSETTING  EU
 39  6  0 -1  2  0  4 -1  2  1  2 -1  2  1  2  3  0  1  0  1  0  0  0  3  6  1
  0  0  1  1  1  0  0 -1  2  0  1  2  1  1
   6AGARICUS PLACOMYCES PECK UK FREQ 3.2 TOX UNKNOWN PROPOSED TREATMENT:
SYMPTOMATIC TAXON MOSER M (1978) KLEINE KRYPTOGAMENFLORA IIB/2 FISCHER STUTT. NY
CHEM. NONE
MED LINCOFF &MITCHEL (1977) TOXIC & HALLU. MUSHROOM POISONING VAN
NOSTRAND REINHOLD NY  197-198   UPSETTING  EU;  N. AM.
 40  6  0 -1  3  0  4  5 -1  2  2  1  1  3  0  1  0  1  0 -1  2  0  1  0  3  6
  1  0  0  1  1  1  0  0 -1  2  1  2  2  1  1
   6AGARICUS XANTHODERMUS GEN UK FREQ 2.0 TOX UNKNOWN  PROPOSED TREATMENT:
SYMPTOMATIC TAXON MOSER M (1978) KLEINE KRYPTOGAMENFLORA IIB/2 FISCHER STUTT. NY
CHEM. NONE
MED LINCOFF &MITCHEL (1977) TOXIC & HALLUCINOGENIC MUSHROOM POISONING
VAN NOSTRAND REINHOLD  NY  197-198   UPSETTING  EU
 41  6  0 -1  3  0  4  5 -1  3  3  1  2 -1  2  1  2  3  0  1  0  1  0 -1  2  0
  1  0  3  6  1  0  0  1  1  1  0  0  0  2  1  1
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Table 7 (continued)

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  6AMANITA CRENULATA PECK  IBOTENIC ACID/MUSCIMOL TREATMENT:PREVENT ABSOR-
PTION,INCREASE EXCRETION,SYMPTOMATIC (PHYSOSTIGMINE)  TAXON.JENKINS DT
(1977) BIBLIOTHECA MYCOL.57,1-126  CHEM CATALFOMO.EUGSTER (1970) BULL..
NARC.22:4,33-41 MED.BUCK R.W (1965) NEW ENG. J MED. 272,475-476
WASER PG (1967)ETHNOPHARM. SEARCH...ED EFRON ET AL  US PHSP 1645  419-39
INEBRIANT, DANGEROUS  N. AM.
 31  4  0  0 -1  2  0  1  2  0  1  0  0  0  1 -1  2  1  2  3  0  4  3  0  1  1
  1  1  1  1  1  1
  5AMANITA GEMMATA (FR)BERT.  EUROPE:EDIBLE,US:SUSPECT IBOTENIC A/MUSCIMOL
S.AM:DEADLY: TREATMENT:SYMPTOMATIC IF SYMPTOMS ONSET>8HOURS*WATER,ELEC-
TROLYTES,BLOOD BALANCE,HYPERTONIC GLUC.INF.PENICILLIN,THIOCTIC ACID,EXCH
TRANSF. TAXON JENKINS DT(1977) BIBLIOT.MYCOL 57,1-126 CHEM CHILTON &OTT
(1976)LLOYDIA 39:2,3,150-157 MED. SEE AMANITA PHALLOIDES FOR S.AM. EU;N.AM.
 42  4  0 -1  3  0  4  5 -1  2  3  1 -1  3  0  1  2  0  1  1  0  0  1 -1  2  2
  3  2  0  4  3  0  1  1  0  1 -1  2  1  2  1  1  1
  6AMANITA FROSTIANA (PECK)SACC  SUSPECT:IBOTENIC ACID/MUSCIMOL TREATMENT:
PREVENT ABSORPTION,INCREASE EXCRETION,SYMPTOMATIC (PHYSOSTIGMINE)
TAXON JENKINS DT (1977) BIBLIOTHECA MYCOL.57,1-126  CHEM CATALFOMO &
EUGSTER (1970)BULL.NARC.22:4,33-41 MED.COKER WC(1917) J ELISHA MITCH SOC
33:1&2,1-88 OR WASER PG (1967) EFRON ET AL.ED. ETHNOPHARMAC SEARCH...
US PHSP 1645, 419-439  SUSPECT INEBRIANT, DANGEROUS  N. AM.
 37  4  0  0 -1  2  0  1 -1  2  1  2  0  1  0  0  0  1 -1  2  1  2 -1  2  2  3
  0  4  3  0  1  1  0  1  1  1  1  1
  4MACROLEPIOTA VENENATA BON  UNKNOWN  TREATMENT:SYMPTOMATIC
TAXON  & MED. BON ET AL (1979) DOCUMENTS MYCOL.9:35, 13-21
CHEM. NONE
UPSETTING  S. EU.
 36  6  0  0 -1  2  2  3 -1  2  1  2  0  2  1  0  1  0  3  2  0  6  1  0  0  0
  1  1 -1  2  0  1  0  1  0  1  1
  4HYPHOLOMA FASCICULARE (HUDS EX FR)KUMMER  49.4  UNKNOWN  TREATMENT:SYMP-
TOMATIC  TAXON  MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2 FISCHER STUT
CHEM NISHIHARA ET AL (1958) OOSHIDA ENG REV 9:1,36-38
MED HERBICH ET AL (1966) ARCHIV TOXIKOL 21,318-320  DANGEROUS  EU;ASIA;N.AM.
 41  6  2 -1  3  0  4  5  4 -1  4  3  1  2  3  3  1  1  0  1  0  1  0  3  6  4
  0  0  1  0  1  0  0  0  2  0 -1  2  0  1  2  0
  6PSILOCYBE AZTECORUM HEIM  PSILOCYBIN/INDOLE HALL. TREATMENT:PREVENT ABSO
TION,ENHANCE EXCRETION,RESTRAIN FROM SELF DESTRUCTIVE BEHAV. QUIET ?DIA-
ZEPAM,?CHLORPROMAZINE  TAXON HEIM & WASSON (1958) LES CHAMPIGNONS HALL.
DU MEXIQUE. MUSEUM NAT. HIST. NATU, PARIS  CHEM HOFMANN ET AL (1958) IN
HEIM & WASSON MED.LINCOFF &MITCHEL (1977) TOXIC AND HALL.. VAN NOSTRAND
NY  HALLUCINOGEN, UPSETTING  C.AM.
 34  5  0  2 -1  2  0  2 -1  2  1  2  3  0  1  0  1  0 -1  2  3  4  2  3  3  2
  0  0  1  0  3  0  0 -1  2  0  1  1  1  1
  6PSILOCYBE BAEOCYSTIS SING/SM  PSILOCYBIN/INDOLE HALL. TREATMENT:PREVENT
ABSORPTION,ENHANCE EXCRETION, RESTRAINT SELF DESTRUCTIVE BEHAVIOUR,QUIET
POSS. DIAZEPAM,CHLORPROMAZINE  TAXON SINGER &SMITH (1958) MYCOLOGIA 50,
141  CHEM LEUNG & PAUL (1968) J PHARM SCI 57,1667-1671 .MED LINCOFF &
MITCHELL (1977) TOXIC AND HALLUC. MUSHROOM POISONING VAN NOSTRAND R  NY
HALLUCINOGEN,UPSETTING  N.AM.
 30  5  0  0  4  1  3  0  1  0  1  0 -1  2  3  4  2  3  3  2  0  0  1  0  1  0
  0  0  2  1  1
  6PSILOCYBE CAERULESCENS MURR  PSILOCYBIN/INDOLE HALLUC. TREATMENT:PREVENT
ABSORPTION,ENHANCE EXCRETION,RESTRAINT SELF DESTRUCTIVE BEHAV. POSS.
DIAZEPAM,CHLORPROMAZINE  TAXON SINGER &SMITH (1958) MYCOLOGIA 50,262-303
CHEM HOFMANN ET AL (1959) HELV CHIM ACTA 42,1557-1572  MED  LINCOFF &
MITCHELL (1977) TOXIC & HALLUC. MUSHROOM POISONING,VAN NOSTRAND R,NY
HALLUCINOGEN,UPSETTING  C.AM.; N.AM.
 34  5  0  2 -1  3  1  2  3 -1  2  0  1  3  0  1  0  1  0  1  1  3  3  2  0  0
  1  0  1  0  0  0  2  1  1
  6PSILOCYBE CAERULIPES (PECK)SACC  PSILOCYBIN/INDOLE HALL  TREATMENT:PRE-
VENT ABSORPTION,ENHANCE EXCRETION,RESTRAINT SELF DESTRUCT. BEHAV.,QUIET,POSS.
DIAZEPAM,CHLORPROMAZINE  TAXON SINGER & SMITH (1958) MYCOLOGIA 50,262-30
CHEM HOFMANN ET AL (1959)HELV CHEM ACTA 42,1557-1572  MED LINCOFF &MITCH
(1977)TOXIC AND HALLUC. MUSHROOM POISONING VAN NOSTRAND R, NY
HALLUCINOGEN,UPSETTING  N.AM.
 33  5  0  0  4 -1  2  1  2  3  0  1  0  1  0 -1  2  1  2  1  3  3  2  0  0  1
  0  1  0  0  0  2  1  1
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Table 7 (continued)

6PSILOCYBE CANDIUIPES SING &SM. PSILOCYBIN/INDOLE HALL. TREATMENT:PREVENT
ABSORPTION,ENHANCE EXCRETION,RESTRAIN SELF DESTRUCT.BEHAV.,QUIET,POSS.
DIAZEPAM,CHLORPROMAZINE TAXON SINGER &SMITH (1958) MYCOLOGIA 50,141
CHEM HOFMANN ET AL (1959) HELV CHIM ACTA 42,1557-1572 MED LINCOFF &MITC
(1977)TOXIC & HALLUC. MUSHROOM POISONING, VAN NOSTRAND R, NY
HALLUCINOGEN, UPSETTING C.AM.
32 5 0 2 -1 2 2 3 2 3 0 1 0 1 0 1 0 3 3 2 0 0 1 0 1 0
0 0 1 0 0 0 1
6PSILOCYBE CUBENSIS (EARLE)SING PSILOCYBIN/INDOL HALLU. TREATMENT:PREVENT
ABSORPTION,ENHANCE EXCRETION,RESTRAIN SELF DESTRUCT.BEHAV.,QUIET,POSS.
DIAZEPAM,CHLORPROMAZINE TAXON SINGER (1948)SYDOWIA 2,37 &40-41 CHEM
HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &MITCHELL
(1977)TOXIC ANU HALLUCI.MUSHROOM POISONING, VAN NOSTRAND R.,NY
HALLUCINOGEN, UPSETTING SUBTROPICAL;TROPICAL; N.AM;C.AM;S.AM
40 5 0 -1 3 0 1 2 3 -1 3 0 1 2 3 0 1 0 1 0 4 -1 2 3 4 3
3 2 0 0 1 0 1 0 0 0 1 0 0 2 1
6PSILOCYBE CYANESCENS WAKEF PSILOCYBIN/INDOLE HALL. TREATMENT:PREVENT
ABSORPTION,ENHANCE EXCRETION,RESTRAIN SELF DESTRUCT BEHAV.,QUIET,POSS.
DIAZEPAM,CHLORPROMAZINE TAXON WAKEFIELD (1946)TRANS BRIT MYCOL SOC 29,
115-143 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LIN-
COFF &MITCHEL (1977)TOXIC AND HALLUC.MUSH.POISONING ,VAN NOSTRAND R,NY
HALLUCINOGEN, UPSETTING EU
42 5 0 -1 3 0 4 5 2 2 3 0 1 0 1 0 -1 2 2 3 -1 2 1 2 3 3
2 0 0 1 0 1 0 0 3 -1 2 1 2 0 0 1 1
6PSILOCYBE EUCALYPTA GUZ & GAT PSILOCYBIN/INDOLE HALLU. PROPOSED TREATMENT
PREVENT ABSORPTION,ENHANCE EXCRETION,RESTRAIN SELF DESTRUCT BEHAV,POSSIB.
DIAZEPAM,CHLORPROMAZINE TAXON GUZMAN &WATLING (1978) NOTES ROY BOT GD E
36,179-210 CHEM MARGOT & WATLING (1980) TRANS BRIT MYCOL SOC
MED LINCOFF &MITCHEL (1977) TOX & HALLUC. MUSHROOM POISONING,VAN NOSTRAND
HALLUCINOGEN, UPSETTING AUST.
41 5 0 1 -1 2 2 5 0 3 0 1 0 1 0 -1 2 2 3 2 3 3 2 0 0 1
0 1 -1 2 0 1 0 0 -1 2 1 2 0 0 1 1
6PSILOCYBE CORDISPORA HEIM PSILOCYBIN/INDOLE HALL. PROPOSED TREATMENT:
PREVENT ABSORP.,ENHANCE EXCRET.,RESTRAIN SELF DESTRUCT BEHAV, QUIET
POSS.DIAZEPAM,CHLORPROMAZINE TAXON HEIM &WASSON (1958) CHAMP.HALLUC.
MEXIQUE MUS. NAT.HIST.NATU 7 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA
42,1557-1572,MED.LINCOFF & MITCHEL (1977) TOX.&HALLU. MUSH..,VAN NOSTRAND
HALLUCINOGEN, UPSETTING C.AM.
36 5 0 2 -1 2 2 4 1 3 0 1 0 1 0 -1 2 1 2 -1 2 0 1 3 3 2
0 0 1 0 1 0 0 0 2 1 1
6PSILOCYBE FAGICOLA HEIM/CAIL. PSILOCYBIN/INDOL HALL. PROPOSED TREATMENT:
PREVENT ABSORP,ENHANCE EXCRET.,RESTRAIN SELF DESTRUCT BEHAV.,QUIET,POSSI
DIAZEPAM,CHLORPROMAZINE TAXON HEIM &CAILLEUX (1959) REV. MYCOL 24,437
CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITC
(1977) TOX AND HALLUC. MUSHROOM POISONING, VAN NOSTRAND R, NY
HALLUCINOGEN, UPSETTING C.AM
33 5 0 2 1 1 3 0 1 0 1 0 -1 2 0 1 -1 2 0 1 3 3 2 0 0 1
0 1 0 0 0 1 1 1
6PSILOCYBE FIMETARIA (ORT)WAT PSILOCYBIN/INDOL HALL. PROPOSED TREATMENT:
PREVENT ABSORP.,ENHANCE EXCRET.,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSI
DIAZEPAM,CHLORPROMAZINE TAXON ORTON (1964)NOTES ROY BOT GD EDIN 26,59-6
CHEM HOFMANN ET AL (1959) HELV CHIM ACTA 42,1557-1572 MED LINCOFF &
MITCHEL (1977) TOX & HALLUC. MUSHROOM POISONING,VAN NOSTRAND R, NY
HALLUCINOGEN, UPSETTING EU
34 5 0 -1 3 0 4 5 3 2 3 0 1 0 1 0 -1 2 3 4 2 3 3 2 0 0
1 0 1 0 0 0 1 1 1
6PSILOCYBE HOOGHSHAGENI HEIM PSILOCYBIN/INDOL HALL. PROPOSED TREATMENT:
PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.
DIAZEPAM,CHLORPROMAZINE TAXON HEIM &WASSON (1958)CHAMP.HALL.MEXIQUE
MUS.NAT.HIST.NATU 7,167-169 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,
1557-1572 MED LINCOFF &MITCHEL(1977) TOX.HALL.MUSH.POISONING,VAN NOS.
NY HALLUCINOGEN, UPSETTING C.AM.
35 5 0 2 -1 2 1 2 1 3 0 1 0 1 0 1 1 3 3 2 0 0 1 0 1 0
0 -1 2 0 1 1 0 0 2 1

Table 7 (continued)

6PSILOCYBE KUMAENORUM HEIM PSILOCYBIN/INDOL HALL. PROPOSED TREATMENT: PREVENT ABSORP.,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB DIAZEPAM,CHLORPROMAZINE TAXON HEIM (1967)MUS NAT HIST NAT 7,186-188 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCH (1977)TOX.&HALL MUSH.POISONING,VAN NOSTRAND R, NY HALLUCINOGEN, UPSETTING NW GUINEA

33 5 0 3 2 1 3 0 1 0 1 0 -1 2 0 1 -1 2 0 1 3 3 2 0 0 1 0 1 0 0 1 1 1

6PSILOCYBE MEXICANA HEIM PSILOCYBIN/INDOL HALL. PROPOSED TREATMENT: PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB. DIAZEPAM,CHLORPROMAZINE TAXON HEIM &WASSON (1958)CHAMP.HALL.MEXIQUE, MUS.NAT.HIST.NATU.7,129-137 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42, 1557-1572 MED.LINCOFF &MITCHEL (1977)TOX & HALL.MUSH.POISONING,VAN NOS. HALLUCINOGEN, UPSETTING C.AM.

38 5 0 2 2 -1 2 1 2 3 0 1 0 1 0 -1 2 2 3 2 3 3 2 0 0 1 0 1 -1 2 0 1 3 3 2 0 0 1 0 1 0 0 0 1 1 1

6PSILOCYBE MIXAENSIS HEIM PSILOCYBIN/INDOL HALL. PROPOSED TREATMENT: PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT.BEHAV,QUIET,POSSIB DIAZEPAM,CHLORPROMAZINE TAXON HEIM &WASSON (1958)CHAMP.HALL.MEXIQUE MUS.NAT.HIST.NATU.7,169-171 CHEM HOFMANN ET AL(1959)HELV CHIM ACTA 42, 1557-1572 MED LINCOFF &MITCHEL (1977)TOX HALLU.MUSH.POISONING,VAN NOST. NY HALLUCINOGEN, UPSETTING C.AM.

36 5 0 2 -1 2 1 2 1 3 0 1 0 1 0 -1 2 0 1 -1 2 0 1 3 3 2 0 0 1 0 1 0 0 0 1 1 1

6PSILOCYBE MONTANA (FR)QUEL PSILOCYBIN/INDOLE HALL PROPOSED TREATMENT: PREVENT ABSORP.,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB DIAZEPAM,CHLORPROMAZINE TAXON ORTON (1969)NOTES ROY BOT GD EDIN,29:1,75-127 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &MITCHEL (1977) TOX & HALLU. MUSHROOM POISONING, VAN NOSTRAND R,NY HALLUCINOGEN, UPSETTING EU;N.AM

43 5 0 -1 3 1 1 -1 2 2 5 -1 2 1 2 3 0 1 0 1 0 -1 2 0 1 -1 2 0 1 3 3 2 0 0 1 0 1 0 0 6 1 1 1

6PSILOCYBE PELLICULOSA (SM)SING/SM PSILOCYBIN/INDOLE HALL. PROPOSED TREATMENT:PREVENT ABSORP,ENHANCE EXCRE,RESTRAIN SELF DESTRUCT BEHAV,QUIET POSSIB.DIAZEPAM,CHLORPROMAZINE TAXON SINGER&SMITH (1958)MYCOLOGIA 50,280-281 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &MITCHEL (1977)TOX & HALL.MUSHROOM POISONING,VAN NOSTRAND R,NY HALLUCINOGEN, UPSETTING N.AM.

42 5 0 0 -1 2 0 5 -1 2 1 2 3 0 1 0 1 0 -1 2 2 3 -1 2 1 2 3 3 2 0 0 1 0 1 0 0 -1 2 0 1 1 1 1

6PSILOCYBE QUEBECENSIS OLA'H/HEIM PSILOCYBIN/INDOLE HALLU. PROPOSED TREAT PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB. DIAZEPAM,CHLORPROMAZINE TAXON OLA'H & HEIM (1967)C.R.ACAD SCI D 264,1601-1603 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &MITCH (1977)TOX & HALLU.MUSHROOM POISONING,VAN NOSTRAND R,NY HALLUCINOGEN, UPSETTING N.AM.

38 5 0 0 -1 2 2 5 -1 2 1 2 3 0 0 0 1 0 -1 2 2 3 2 3 3 2 0 0 1 0 1 0 0 1 1

6PSILOCYBE SEMILANCEATA (FR)KUM UK FREQ 5.9 PSILOCYBIN/INDOL HALL. PROPOSED TREATMENT PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET POSSIB DIAZEPAM,CHLORPROMAZINE TAXON VON MICHAELIS (1977) Z PILZK 43,305-310 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCHEL (1977)TOX & HALLUC. MUSHROOM POISONING,VAN NOSTRAND R,NY HALLUCINOGEN, UPSETTING EU; N.AM.

34 5 0 -1 3 0 4 5 2 -1 2 1 2 3 0 1 0 1 0 4 2 3 3 2 0 0 1 0 1 0 0 1 1 1

6PSILOCYBE SEMPERVIVA HEIM/GAIL PSILOCYBIN/INDOLE HALLU.PROPOSED TREATMEN PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB DIAZEPAM,CHLORPROMAZINE TAXON HEIM (1958)REV MYCOL 23,352 CHEM HOFMANN ET AL(1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &MITCHEL (1977)TOX & HALLUC. MUSHROOM POISONING,VAN NOSTRAND R,NY HALLUCINOGEN, UPSETTING C.AM.

33 5 0 2 2 1 3 0 1 0 1 0 -1 2 1 2 1 3 3 2 0 0 1 0 1 0 0 0 1 1 1

Table 7 (continued)

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   6PSILOCYBE SERBICA MOS/HOR PSILOCYBIN/INDOLE HALL. PROPOSED TREATMENT:
 5 PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV;QUIET,POSSIB
   DIAZEPAM,CHLORPROMAZINE TAXON MOSER &HORAK (1968)Z PILZKUNDE 34,137-144
   CHEM HOFMANN ET AL(1959)HELV CHIM ACTA 42,1557-1572  MED LINCOFF &MITCHEL
   (1977) TOX & HALLUC. MUSHROOM POISONING,VAN NOSTRAND R,NY
   HALLUCINOGEN, UPSETTING  EU
    47  5  0  0 -1  2  3  1 -1  2  1  2  3  0  1  0  1  0 -1  2  2  3 -1  2  1  2
     3  3  2  0  0  1  0 -1  2  0  1  0  0  0  2  0 -1  2  0  1  1  1
   6PSILOCYBE SILVATICA (PK)SING/SM PSILOCYBIN/INDOL HALL.PROPOSED TREATMENT
 6 PREVENT ABSORP,ENHANCE EXCRET.RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
   DIAZEPAM,CHLORPROMAZINE  TAXON SINGER &SMITH (1958) MYCOLOGIA 50,277-278
 9 CHEM HOFMANN ET AL(1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &MITCHE
   (1977) TOX &HALLUC. MUSHROOM POISONING, VAN NOSTRAND R, NY
10 HALLUCINOGEN, UPSETTING EU
    39  5  0  0 -1  2  0  1  2  3  0  1  0  1  1 -1  2  1  2 -1  2  1  2  3  3  2
     0  0  1  0  2  0  0 -1  2  0  1  2  1  1
   6PSILOCYBE STRICTIPES SING/SM  PSILOCYBIN/INDOL HALL PROPOSED TREATMENT:
14 PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
   DIAZEPAM,CHLORPROMAZINE TAXON SINGER &SMITH (1958) MYCOLOGIA 50,288-289
16 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCH
   (1977) TOX AND HALL.MUSHROOM POISONING, VAN NOSTRAND R,NY
18 HALLUCINOGEN, UPSETTING  N.AM
    36  5  0  0  0  2  3  0  1  0  1  0 -1  2  2  3 -1  2  1  2  3  3  2  0  0  1
     0  1  0  0 -1  2  0  1  2  1  1
   6PSILOCYBE STUNTZII GUZ/OTT PSILOCYBIN/INDOL HALL.PROPOSED TREATMENT:
22 PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
   DIAZEPAM,CHLORPROMAZINE  TAXON GUZMAN & OTT (1976) MYCOLOGIA 68,1261-126
24 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572  MED LINCOFF &MITCH
   (1977) TOX & HALLU. MUSHROOM POISONING, VAN NOSTRAND R, NY
26 HALLUCINOGEN, UPSETTING  N.AM.
    40  5  0  0 -1  2  1  2 -1  3  0  1  2  3  0  1  0  1  0 -1  2  2  3 -1  2  1
     2  3  3  2  0  0  1  0  1  0  0  0  1  1  1
   6PSILOCYBE YUNGENSIS SING/SM PSILOCYBIN/INDOL HALL PROPOSED TREATMENT:
30 PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
   DIAZEPAM,CHLORPROMAZINE  TAXON SINGER & SMITH (1958) MYCOLOGIA 50,142
32 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &MITCHE
   (1977) TOX & HALLUC. MUSHROOM POISONING, VAN NOSTRAND REINHOLD, NY
34 HALLUCINOGEN, UPSETTING  C.AM.
    33  5  0  2  4  1  3  0  1  0  1  0  0 -1  2  0  1  3  3  2  0  0  1  0  1  0
36   0  0 -1  2  1  2  1  1
   6PSILOCYBE WASSONII HEIM  PSILOCYBIN/INDOLE HALLU. PROPOSED TREATMENT:
38 PREVENT ABSORPT,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
   DIAZEPAM,CHLORPROMAZINE  TAXON HEIM &WASSON (1958) MUS NAT HIST NATUR,7
40 PARIS  CHEM HOFMANN ET AL(1958) HELV CHIM ACTA 42,1557-1572 MED LINCOFF
   & MITCHEL (1977)TOX & HALLU MUSHROOM POISONING, VAN NOSTRAND REINHOLD,NY
42 HALLUCINOGEN,UPSETTING  C.AM.
    33  5  0  2  2 -1  2  1  2  3  0  1  0  1  0 -1  2  1  2  1  3  3  2  0  0  1
     0  1  0  0  0  1  1  1
   6PSILOCYBE ZAPOTECORUM HEIM PSILOCYBIN/INDOLE HALLU PROPOSED TREATMENT:
46 PREVENT ABSORPT,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
   DIAZEPAM,CHLORPROMAZINE  TAXON HEIM &WASSON (1958)MUS NAT HIST NATU,7,14
48 153. PARIS CHEM HOFMANN ET AL(1958)HELV CHIM ACTA 42,1557-1572 MED LINCO
   &MITCHEL (1977) TOX & HALLU MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
50 HALLUCINOGEN,UPSETTING  C.AM
    35  5  0  2 -1  2  2  5  1  3  0  1  0  1  0  1 -1  2  0  1  3  3  2  0  0  1
52   0  1  0  0  6  1  0  0  1  1
   6INOCYBE ALBODISCA PECK UK FREQ 0.4 MUSCARINE PROPOSED TREATMENT:PREVENT
54 ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
   TAXON PECK (1898)ANN REP NY ST MUS 51,290  CHEM CATALFOMO & EUGSTER
56 (1970) HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977) TOX & HALLUC
   MUSHROOM POISONING,VAN NOSTRAND REINHOLD, NY..
58 UPSETTING TO DANGEROUS  S.EU;N.AM
     50  3  0 -1  2  0  4 -1  3  0  1  2 -1  2  1  2  1  3  0  0  1 -1  2  1  2  1
60   2  2  3  0  0  1  0  1  0  0  2 -1  2  1  2  0 -1  2 -1  2 -1  2 -1  2  1
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Table 7 (continued)

62 6INOCYBE ASTEROSPORA QUEL UK FREQ 9.1 MUSCARINE PROPOSED TREATMENT:PRE-
VENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIV
64 TAXON HEIM (1931)LE GENRE INOCYBE LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU;N.AM
2 50 3 0 -1 3 0 4 5 1 2 1 3 0 1 1 -1 2 2 3 -1 2 2 3 2 2 3
0 0 1 0 1 1 0 -1 2 1 2 -1 2 2 4 0 -1 2 1 2 -1 2 2 4 1
4
6INOCYBE BRUNNEA QUEL UK FREQ 0.4 MUSCARINE PROPOSED TREATMENT:PREVENT
6 ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
8 EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
10 UPSETTING TO DANGEROUS EU.
52 3 0 -1 3 0 4 5 -1 3 0 1 2 -1 2 0 1 1 1 0 0 1 -1 3 2 3
12 4 -1 2 1 2 2 2 3 0 0 1 0 1 0 0 2 -1 2 2 4 0 2 -1 2 2
4 1
14 6INOCYBE CINCINNATA (FR)QUEL UK FREQ 2.8 MUSCARINE PROP. TREATMENT:PRE-
VENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
16 TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
18 TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU;N.AM;N.AF
20 42 3 0 -1 4 0 2 4 5 -1 2 0 1 2 1 1 0 0 1 2 1 2 2 3 0 0
1 0 1 0 0 2 -1 2 0 4 0 2 -1 2 0 4 1
22 6INOCYBE CORYDALINA QUEL UK FREQ 1.2 MUSCARINE PROPOSED TREATMENT:PREVENT
ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
24 TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
26 TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS S.EU;N.AM
28 40 3 0 -1 2 0 4 1 2 1 1 0 0 1 -1 2 1 2 1 2 2 3 0 0 1 0
1 0 0 1 -1 2 1 4 0 1 -1 2 1 4 1
30 6INOCYBE DULCAMARA (ALB &SCHW EX PERS)KUM UK FREQ 3.2 MUSCARINE PROP.
TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS
32 SUPPORTIVE TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CA-
TALFOMO & EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHE
34 (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU;N.AF
36 33 3 0 -1 4 0 2 4 5 0 -1 3 0 1 2 1 1 0 0 1 2 1 2 2 3 0
0 1 0 1 1 1 1 1
38 6INOCYBE EUTHELES BK & BR UK FREQ 2.0 MUSCARINE PROPOSED TREATMENT:PRE-
VENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIV
40 TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHELL
42 (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU;N.AM
44 38 3 0 -1 3 0 4 5 -1 2 0 2 -1 2 1 2 1 1 0 0 1 2 1 2 2 3
0 0 1 0 1 0 0 2 1 0 2 1 1
46 6INOCYBE FASTIGIATA (SCH EX FR)QUEL UK FREQ 17.0 MUSCARINE PROPOSED TREAT
MENT:PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,
48 SUPPORTIVE TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS
CHEM CATALFOMO & EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF &
50 MITCHEL (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU:N.AF:N.AM;S.AM
52 47 3 0 -1 4 0 2 4 5 -1 3 2 3 5 -1 2 1 2 1 1 0 0 1 -1 2 3
4 -1 2 1 2 2 2 3 0 0 1 0 1 -1 2 1 2 0 2 0 1 1
54 6INOCYBE FLOCCULOSA (BK)SACC UK FREQ 4.3 MUSCARINE PROPOSED TREATMENT:PRE
VENT ABSORP,ENHANCE EXCRET, ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTI
56 TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
58 TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS N.EU;N.AM
60 45 3 0 -1 4 0 2 4 5 1 -1 2 1 2 1 1 0 0 -1 -1 2 2 3 1 2 2
3 0 0 1 0 1 0 0 -1 2 1 2 1 0 -1 2 1 2 1 1

Table 7 (continued)

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 62   6INOCYBE FIBROSA (SOW)BRES MUSCARINE PROPOSED TREATMENT:PREVENT ABSORP-
    TION,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
 64 TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
    EUGSTER (1970)HELV CHIM ACTA 53:4,848-851  MED LINCOFF & MITCHEL (1977)
    TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
    UPSETTING TO DANGEROUS EU;N.AM
 66  41  3  0 -1  2  0  4  0 -1  2  1  2  1  3  0  0  1 -1  2  1  2  1  2  2  3  0
      0  1  0  1  0  0  2 -1  2  4  0  2 -1  2  4  1
 68   6INOCYBE FRIESII HEIM  MUSCARINE PROPOSED TREATMENT:PREVENT ABSORP,ENHANCE
    EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE TAXON HEIM (1931)
 70 LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO & EUGSTER (1970)HELV
    CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977) TOX & HALLUC MUSHROOM
 72 POISONING,VAN NOSTRAND REINHOLD,NY
    UPSETTING TO DANGEROUS  EU;N.AF
 74  45  3  0 -1  4  0  2  4  5  0  1  1  1  0  0  1 -1  2  2  3 -1  2  1  2  2  2
      3  0  0  1  0  1  0  0  2 -1  2  1  4  0  2 -1  2  1  4  1
 76   6INOCYBE GEOPHYLLA (SOW EX FR)KUM UK FREQ 17.0 MUSCARINE PROPOSED TREAT-
    MENT:PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,
 78 SUPPORTIVE TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM
    CATALFOMO & EUGSTEP (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF &
 80 MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
    UPSETTING TO DANGEROUS  EU;N.AM;N.AF;N.ASIA
 82  50  3  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  1  1  0  0  1  2  1  2  2  3
      0  0  1  0  1  0  0 -1  2  1  2 -1  2  1  4  0 -1  2  1  2 -1  2  1  4  1
 84
      6INOCYBE GRISEOLILACINA LGE UK FREQ 2.4 MUSCARINE PROPOSED TREATMENT:PRE-
 86 VENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
    TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
 88 EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
    TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
 90 UPSETTING TO DANGEROUS  N.EU
    38  3  0 -1  3  0  4  5 -1  2  1  2  2  1  1  0  0  1 -1  2  2  3  1  2  2  3
 92   0  0  1  0  1  0  0  2  2  0  2  2  1
      6INOCYBE HIRTELLA BRES UK FREQ 1.2 MUSCARINE PROPOSED TREATMENT:PREVENT
 94 ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
    TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
 96 EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
    TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
 98 UPSETTING TO DANGEROUS  EU;N.AF;N.AM
    51  3  0 -1  3  0  2  4 -1  3  0  1  2 -1  2  1  2  1  1  0  1  1 -1  2  2  3
100  -1  2  1  2  2  2  3  0  0  1  0  1  0  0  2 -1  2  1  4  0  2 -1  2  1  4
      1
102   6INOCYBE HYSTRIX (FR)KARST UK FREQ 4.3 MUSCARINE PROPOSED TREATMENT:PRE-
    VENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
104 TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
    EUGSTEP (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
106 TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
    UPSETTING TO DANGEROUS  EU;N.AM
108  49  3  0 -1  3  0  4  5  1 -1  2  1  2  1  1  0  0  1 -1  2  2  3 -1  2  1  2
      2  2  3  0  0  1  0  1  0  0  2 -1  3  1  2  4  0  2 -1  3  1  2  4  1
110   6INOCYBE LACERA (FR)KUM UK FREQ 4.7 MUSCARINE PROPOSED TREATMENT:PREVENT
    ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
112 TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
    EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
114 TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
    UPSETTING TO DANGEROUS  EU;N.AF;N.AM
116  43  3  0 -1  4  0  2  4  5 -1  2  0  1 -1  3  0  1  2  1  1  0  0  1 -1  2  3
      4  1  2  2  3  0  0  1  0  1  0  0  2  1  0  2  1  1
118   6INOCYBE LANUGINELLA (SCHRI)GE  MUSCARINE PROPOSED TREATMENT:PREVENT ABSO
    ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
120 TAXON PEARSON (1954)THE NATURALIST 117-139  CHEM CATALFOMO & EUGSTER
    (1970)HELV CHIM ACTA 53:4,848-851  MED LINCOFF & MITCHEL (1977)
122 TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
    UPSETTING TO DANGEROUS  EU;N.AF
124  48  3  0 -1  4  0  2  4  5  2 -1  2  1  2  1  1  0  0  1 -1  2  2  3 -1  2  1
      2  2  2  3  0  0  1  0  1  0  0  1 -1  2  2  4  0  1 -1  2  2  4  1
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Table 7 (continued)

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6INOCYBE LANUGINOSA (BUL EX FR)KUM UK FREQ 3.6 MUSCARINE PROPOSED TREATMENT
PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPOR
TIVE TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO
& EUGSTER (197J)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU;N.AM
 47  3  0 -1  3  0  4  5  0 -1  2  0  1  1  3  0  0  1  2  1  2  2  3  0  0  1
  0  1  0  0 -1  2  0  1 -1  2  1  4  0 -1  2  0  1 -1  2  1  4  1
  6INOCYBE LUCIFUGA (FR)QUEL UK FREQ 0.4 MUSCARINE PROPOSED TREATMENT:PRE-
VENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL(1977)
TOX AND HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU;N.AF
 49  3  0 -1  3  0  2  4  0 -1  2  1  2  1  1  0  1  1 -1  2  2  3 -1  2  1  2
  2  2  3  0  0  1  0  1  0  0  2 -1  3  1  2  4  0  2 -1  3  1  2  4  1
  6INOCYBE MACULATA BOUD UK FREQ 4.7 MUSCARINE PROPOSED TREATMENT:PRE-
VENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACT A 53:4,848-851 MED LINCOFF & MITCHEL.(1977)
TOX & HALLUC MUSHROOM POISONING, VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU;N.AM
 39  3  0 -1  3  0  4  5  1 -1  2  1  2  1  1  0  1  1 -1  2  2  3  1  2  2  3
  3  0  1  0  1  0  0 -1  2  0  1  0  1  1
  6INOCYBE MIXTILIS (BRITZ)SAC SS KUHN UK FREQ 2.4 MUSCARINE PROPOSED TREAT
MENT:PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,
SUPPORTIVE TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM
CATALFOMO & EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF &
MITCHEL (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU;N.AM
 50  3  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  1  3  0  0  1 -1  2  1  2 -1
  2  1  2  2  2  3  0  0  1  0  1  0  0  1 -1  2  2  4  0  1 -1  2  2  4  1

  6INOCYBE NAPIPES LGE UK FREQ 8.7 MUSCARINE PROPOSED TREATMENT:PREVENT
ABSORP,ENHANCE SECRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM.CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED. LINCOFF & MITCHEL (1977)
TOX AND HALLUC. MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU
 38  3  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  1  3  0  0  1  2  1  2  2  3
  0  0  1  0  1  0  0  2  2  0  2  2  1
  6INOCYBE OBLECTABILIS (BRITZ)SACC MUSCARINE PROPOSED TREATMENT:PREVENT
ABSORP,ENH NCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
TAXON PEARSON (1954)THE NATURALIST OCT-DEC,117-140 CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
TOX AND HALLUC MUSHROOM POISONING, VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU;N.AM
 46  3  0 -1  2  0  4  1 -1  2  1  2  1  3  0  0  1 -1  2  2  3 -1  2  1  2  2
  2  3  0  0  1  0  1  0  0 -1  2  1  2  2  0 -1  2  1  2  2  1
  6INOCYBE OBSCUROIDES ORT MUSCARINE PROPOSED TREATMENT:PREVENT ABSORPT,
ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
TAXON ORTON (1960)TRANS BRIT MYCOL SOC 43,276-277  CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851  MED LINCOFF & MITCHEL (1977)
TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS EU
 40  3  0 -1  2  0  4  1 -1  2  1  2  1  1  0  0  1  2  1  2  2  3  0  0  1  0
  1  0  0  2 -1  2  1  4  0  2 -1  2  1  4  1
  6INOCYBE PALLIDIPES ELL & EV  MUSCARINE PROPOSED TREATMENT:PREVENT
ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851  MED LINCOFF & MITCHEL (1977)
TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD, NY
UPSETTING TO DANGEROUS EU;N.AM
 49  3  0 -1  2  0  4  1 -1  2  1  2  1  1  0  0  1 -1  2  2  3  1  2  2  3  0
  0  1  0  1  0  0 -1  2  1  2 -1  2  0  2  0 -1  2  1  2 -1  2  0  2  1
  6INOCYBE OBSCURA (FR EX PERS)GILL UK FREQ 0.4 PROPOSED TREATMENT:
PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,
SUPPORTIVE TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS
CHEM CATALFOMO & EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MRD
LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
NY   UPSETTING TO DANGEROUS EU
 46  3  0 -1  3  0  4  5  1 -1  2  1  2  1  1  0  0  1 -1  2  2  3  1  2  2  3
  0  0  1  0  1  0  0  2 -1  3  1  2  4  0  2 -1  3  1  2  4  1
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Table 7 (continued)

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  6INOCYBE PATOUILLARDI BRES MUSCARINE PROPOSED TREATMENT:PREVENT
ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851  MED LINCOFF & MITCHEL (1977)
TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS  EU;N.AM
 44  3  0 -1  2  0  4  1 -1  2  1  2  1  1  0  1  1 -1  2  3  4 -1  2  1  2  2
  2  3  0  0  1  0  1 -1  2  0  1  0 -1  2  1  2  0  1  1
  6INOCYBE PERLATA (UKE)SACC MUSCARINE PROPOSED TREATMENT:PREVENT
ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS  EU
 38  3  0 -1  2  0  4 -1  2  1  2 -1  2  1  2  1  1  0  0  1 -1  2  2  3  2  2
  2  3  0  0  1  0  1  0  0  1  0  1  1
  6INOCYBE POSTERULA (BRITZ)SACC UK FREQ 1.2 PROPOSED TREATMENT:PRE-
VENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUP-
PORTIVE TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM
CATALFOMO & EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF &
MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS  EU
 53  3  0 -1  3  0  4  5 -1  2  3  1 -1  3  0  1  2  1  1  0  0  1  2  1  2  2
  3  0  0  1  0  1  0  0 -1  2  1  2 -1  3  0  1  2  0 -1  2  1  2 -1  3  0
  1  2  1
  6INOCYBE PRAETERVISA QUEL UK FREQ 3.2 PROPOSED TREATMENT:PREVENT
ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS  CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851  MED LINCOFF & MITCHEL (1977)
TOX AND HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS  EU;N.AM;N.AF
 51  3  0 -1  3  0  2  4 -1  3  0  1  2  1  1  3  0  0  1 -1  3  1  2  3 -1  2
  1  2  2  2  3  0  0  1  0  1  0  0  2 -1  3  1  2  4  0  2 -1  3  1  2  4
  1
  6INOCYBE PUDICA KUHN UK FREQ 2.4 PROPOSED TREATMENT:PREVENT ABSORP,
ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
TOX AND HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS  EU
 49  3  0 -1  3  0  4  5  0 -1  2  1  2  1  1  0  0  1  2  1  2  2  3  0  0  1
  0  1  0  0 -1  2  1  2 -1  3  1  2  4  0 -1  2  1  2 -1  3  1  2  4  1
  6INOCYBE QUELETII MRE & K MUSCARINE PROPOSED TREATMENT:PREVENT ABSORP
ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS, SUPPORTIVE
TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
TOX AND HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS  S.EU;AFR.
 52  3  0 -1  2  0  2 -1  2  3  1 -1  2  1  2  1  1  0  3  1 -1  2  2  3  2  2
  2  3  0  0  1  0  1  0  0 -1  2  1  2 -1  2  1  4  0 -1  2  1  2 -1  2  1
  4  1
  6INOCYBE SAMBUCINA (FRIQUEL MUSCARINE PROPOSED TREATMENT:PREVENT ABSORP,
ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE TAXON HEIM
(1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO & EUGSTER (1970)
HELV CHIM ACTA 53:4,848-851  MED LINCOFF & MITCHEL (1977) TOX AND HALLUC
MUSHROOM POISONING, VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS  EU
 47  3  0 -1  3  0  4  5 -1  2  0  2 -1  2  1  2  1  1  3  0  0  1 -1  2  2  3  1
  2  2  3  0  0  1  0  1  0  0  2 -1  2  1  4  0  2 -1  2  1  4  1
  6INOCYBE UMBRINA BRES UK FREQ 4.3 MUSCARINE PROPOSED TREATMENT:PREVENT
ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS, SUPPORTIVE
TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHELL (1977)
TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
UPSETTING TO DANGEROUS  EU;N.AM
 55  3  0 -1  3  0  4  5 -1  2  0  1 -1  2  0  1  1  3  0  0  1 -1  2  1  2  1
  2  2  3  0  0  1  0  1  0  0 -1  2  1  2 -1  3  1  2  4  0 -1  2  1  2 -1
  3  1  2  4  1
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Table 7 (continued)

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    6INOCYBE XANTHOMELAS KUHN & BOURS UK FREQ 0.4 MUSCARINE PROP. TREATMENT:
  4 PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPOR-
    TIVE TAXON HEIM (1931)LE GENRE INOCYBE,LECHEVALIER,PARIS CHEM CATALFOMO &
  8 EUGSTER (1970)HELV CHIM ACTA 53:4,848-851  MED LINCOFF & MITCHEL (1977)
    TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
 10 UPSETTING TO DANGEROUS  EU;N.AM
     53  3  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  1  3  0  0  1  3 -1  2  2  3
 12   2  2  3  0  0  1  0  1  0  0 -1  2  1  2 -1  2  1  2  0 -1  2  1  2 -1  2
      1  2  1
 14   6GYMNOPILUS AERUGINOSUS (PK)SING PSILOCYBIN/INDOLE HALLUC PROP. TREATMENT
    PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.
 16 DIAZEPAM,CHLORPROMAZINE TAXON HESLER (1969) N AM SPP OF GYMNOPILUS,HAFNE
    PUB,NY,LON CHEM HATFIELD ET AL (1978)LLOYDIA 41,140-144  MED LINCOFF &
 18 MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
    HALLUCINOGEN, UPSETTING  N.AM.
 20  38  5  0  0  4 -1  3  0  1  2  1  1  1  1  1 -1  2  1  2  1  2  3  2  0  0  1
      0  1  0  0 -1  2  0  1  2  0  0  2  1
 22   6GYMNOPILUS LUTEUS (PK)HESLER PSILOCYBIN/INDOLE HALLUC PROP.TREATMENT:
    PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.
 24 DIAZEPAM,CHLORPROMAZINE TAXON HESLER (1969)N AM SPP GYMNOPILUS,HAFNER PU
    NY,LON CHEM HATFIELD ET AL (1978)LLOYDIA 41,140-144    MED LINCOFF & MIT-
 26 CHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
    HALLUCINOGEN, UPSETTING  N.AM.
 28  31  5  0  0  4  1  1  1  1  1  1 -1  2  1  2  1  2  3  2  0  0  1  0  1  0  0
      0  2  0  0  2  1
 30   6GYMNOPILUS JUNIONUS (FR)ORT PSILOCYBIN/INDOLE HALLUC PROP.TREATMENT:
    PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.
 32 DIAZEPAM,CHLORPROMAZINE TAXON HESLER (1969)N AM SPP GYMNOPILUS,HAFNER PU
    NY,LON CHEM HATFIELD ET AL (1978)LLOYDIA 41,140-144  MED LINCOFF & MIT-
 34 CHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
    HALLUCINOGEN, UPSETTING  EU;N.AM.
 36  44  5  0 -1  3  0  4  5 -1  2  1  4 -1  2  1  2  1  1  1  1  1  2  1  2  3  2
      0  0  1  0 -1  2  0  1  0  0 -1  2  0  1  2  0  0  2  1
 38   6GYMNOPILUS VALIDIPES (PK)HESLER PSILOCYBIN/INDOLE HALLUC PROP.TREATMENT:
    PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.
 40 DIAZEPAM,CHLORPROMAZINE TAXON HESLER (1969)N AM SPP GYMNOPILUS,HAFNER PU
    NY,LON  CHEM HATFIELD ET AL (1978)LLOYDIA 41,140-144 MED LINCOFF & MITCHEL
 42 (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
    HALLUCINOGEN, UPSETTING  N.AM.
 44  37  5  0  0  5 -1  2  1  2  1  1  1  1  0 -1  2  1  2  1  2  3  2  0  0  1  0
     -1  2  0  1  0  0  0  2  0  0  2  1
 46   6GYMNNOPILUS VIRIDANS MURR PSILOCYBIN/INDOLE HALLUC PROP. TREATMENT:
    PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.
 48 DIAZEPAM,CHLORPROMAZINE  TAXON HESLER (1969)N AM SPP GYMNOPILUS,HAFNER P
    NY,LON CHEM HATFIELD ET AL (1978)LLOYDIA 41,140-144  MED LINCOFF & MITCHEL
 50 (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
    HALLUCINOGEN, UPSETTING  N.AM.
 52  32  5  0  0  5  2  1  1  1  1  1 -1  2  1  2  1  2  3  2  0  0  1  0  1  0  0
      0 -1  2  1  2  1  1
 54   6GALERINA AUTUMNALIS (PK)SING/SM CYCLOPEPTIDES PROPOSED TREATMENT:WATER,
    ELECTROLYTE,BLOOD BALANCE,HYPERTONIC GLUCOSE INF,PENICILLIN,THIOCTIC
 56 ACID,EXCHANGE TRANSFUS. TAXON SINGER &SMITH (1964)GENUS GALERINA EARLE,
    HAFNER ,NY,LON CHEM TYLER ET AL (1963)LLOYDIA 26,154-157 MED BERTELLI ET
 58 AL (1977)ED. CURRENT PROBLEMS IN CLIN BIOCHEM 7,HUBER,BERN,STUTT,VIENNA
    DEADLY  EU;N.AM.
 60  47  0  2 -1  3  0  4  5  1  2  1  1  1  1  1 -1  2  2  3 -1  2  1  2  2  0  0
      0  0  1  0  1  0  0 -1  2  1  2  1  0 -1  2  1  2 -1  2  1  2  1
 62   5GALERINA MARGINATA (FR)KUHN CYCLOPEPTIDES PROP,TREATMENT:WATER,ELECTROLY
    BLOOD BALANCE,HYPERTONIC GLUCOSE INF,PENICILLIN,THIOCTIC ACID,EXCHANGE
 64 TRANSFUSION TAXON SINGER & SMITH (1964)GENUS GALERINA EARLE,HAFNER PUB,N
    LON CHEM TYLER ET AL(1963)LLOYDIA 26,154-157 MED BERTELLI ET AL ED.(1977
    CURRENT PROBLEMS IN CLIN BIOCHEM 7,HUBER,BERN,STUTT,VIENNA   DEADLY  EU;N.AM
     47  0  2 -1  3  0  4  5  0 -1  2  1  2  1  1  1  1  1 -1  2  2  3  1  2  0  0
      0  0  1  0  1  0  0  1 -1  2  1  2  0 -1  2  1  2 -1  2  1  2  1
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Table 7 (continued)

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    6GALERINA VENENATA SMITH CYCLOPEPTIDES PROPOSED TREATMENT:WATER,ELECTRO-
 4  LYTE,BLOOD BALANCE,HYPERTONIC GLUCOSE INF.,PENICILLIN,THIOCTIC ACID,EXCH
    TRANSFUSION TAXON.SINGER & SMITH (1964)GENUS GALERINA EARLE,HAFNER PUB.N
 6  LON CHEM TYLER ET AL(1963)LLOYDIA 26,154-157 MED BERTELLI ET AL.EDS (197
    CURRENT PROBLEMS IN CLIN BIOCHEM 7, HUBER,BERN,STUTT,VIENNA
 8  DEADLY  N.AM
     46  3  2  0  2 -1  2  2  3  1  1  1  1  1 -1  2  2  3  2  2  0  0  0  0  1  0
10    1  0  0 -1  2  1  2 -1  2  1  2  0 -1  2  1  2 -1  2  1  2  1
    6COPRINUS ATRAMENTARIUS (BUL EX FR)FR UK FREQ 9.1 COPRINE PROPOSED TREATMENT:
12  STOP ALCOHOL CONSUMP!PROPANONOL IF CARDIAC ARRYTHM.,ISOTONIC FLUIDS FOR HYPO-
    TENSION TAXON ORTON & WATLING (1979)BRIT.FUNGUS FLORA,2 COPRINACEAE,HMSO EDIN.
14  CHEM HATFIELD,SCHAUMBERG (1975) LLOYDIA 38:6,489-496  MED LINCOFF & MITCHEL
    (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY
16  UPSETTING, CONDITIONAL  COSMOP.
     52  2  0 -1  6  0  1  2  3  4  5 -1  2  2  4 -1  2  1  2  3  1  1  0  0  0 -1
18    2  2  3  1  3  5  1  0  0  0  1  1  0  0 -1  3  0  1  2 -1  2  0  2  0  2
      0  1
20    6PANAEOLUS FOENISECII (PERS EX FR)MRE UK FREQ 13.5 INDOLE HALLUC.PROPOSED
    TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET
22  POSSIB DIAZEPAM,CHLORPROMAZINE TAXON OLA'H (1969)GENRE PANAEOLUS,REV MYCOL
    MEM HORS SERIE CHEM HOFMANN ET AL(1959)HELV CHIM ACTA 42,1557-1572
24  MED LINCOFF & MITCHEL(1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R
    NY   HALLUCINOGEN, UPSETTING COSMOPOLITAN
26   44  5  0 -1  6  0  1  2  3  4  5  2 -1  2  1  2  3 -0  1 -1  1  0 -4 -1  2  2
       3  3  3  2  0  0  0  0  1  0  0  0 -1  3  1  2  3  1  1
28    6COPRINUS INSIGNIS PECK UK FREQ 0.4 SUSPECT COPRINE PROPOSED TREATMENT:STOP
    ALCOHOL CONSUMP! PROPANOLOL IF CARDIAC ARRHYTHM,ISOTONIC FLUIDS FOR HYPO-
30  TENSION TAXON ORTON & WATLING (1979)BRIT.FUNGUS FLORA 2 COPRINACEAE,HMSO EDIN.
    CHEM. HATFIELD,SCHAUMBERG (1975)LLOYDIA 38:6,489-496 MED LINCOFF & MITCHEL
32  (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY..
    UPSETTING, CONDITIONAL  N.AM;EU
34   48  2  0 -1  2  0  4 -1  2  2  4 -1  2  1  2  3  1  1  1  0  0 -1  2  3  4  2
       3  5  1  0  0  0  0  1  0  0 -1  3  0  1  2  2  0  2 -1  2  0  1  1
36    6COPRINUS MICACEUS (BULL EX FR)FR UK FREQ 17.4 SUSPECT COPRINE PROPOSED
    TREATMENT: STOP ALCOHOL CONSUMP.!PROPANOLOL IF CARDIAC ARRHYTHM,ISOTONIC
38  FLUIDS FOR HYPOTENSION TAXON ORTON & WATLING (1979)BRIT.FUNGUS FLORA,2 COPRIN-
    ACEAE,HMSO EDIN. CHEM HATFIELD & SCHAUMBERG (1975)LLOYDIA 38:6,489-496 MED
40  LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,
    NY   UPSETTING,CONDITIONAL  COSMOPOLITAN
42   53  2  0 -1  6  0  1  2  3  4  5 -1  2  1  3 -1  4  0  1  2  3  3  1  1  0  0
       0 -1  2  1  2  1  3  5  1  0  0  0  0  1  0  0 -1  2  1  2  2  0  2 -1  2
44     1  2  1
      6COPRINUS AFRICANUS PEGLER SUSPECT COPRINE PROPOSED TREATMENT: STOP
46  ALCOHOL CONSUMP! PROPANOLOL IF CARDIAC ARRHYTHM,ISOTONIC FLUIDS FOR HYPO-
    TENSION TAXON PEGLER (1966) PERSOONIA 4,82  CHEM HATFIELD & SCHAUMBERG
48  (1975)LLOYDIA 38:6,489-496 MED LINCOFF & MITCHEL (1977) TOX & HALLUC
    MUSHROOM POISONING,VAN NOSTRAND REINHOLD, NY..
50  UPSETTING, CONDITIONAL  AFR.
     41  2  0  3  1  0  3  1  1  0  1  0 -1  2  0  1 -1  2  0  1  3  5  1  0  0  0
52     0  1  0  0  2 -1  2  1  2  0  2 -1  2  1  2  1
      6CUPRINUS ALUMINATUS (ROMAG)ORT UK FREQ 1.2 SUSPECT COPRINE PROPOSED
54  TREATMENT:STOP ALCOHOL CONSUMP! PROPANOLOL IF CARDIAC ARRYTHM,ISOTONIC
    FLUIDS FOR HYPOTENSION TAXON ORTON (1969)NOTES ROY BOT GD EDIN 29,86-93
56  CHEM HATFIELD & SCHAUMBERG (1975)LLOYDIA 38:6,489-496 MED LINCOFF &
    MITCHEL (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY.
58  UPSETTING, CONDITIONAL  EU
     49  2  0 -1  3  0  4  5 -1  3  1  4  5 -1  2  1  2  3  1  1  0  1  0  2  1  3
60     5  1  0  0  0  0  1  0  0 -1  2  1  2 -1  2  0  2  0 -2 -1  2  0  2  1
      6PSILOCYBE MERDARIA (FR)RICK  PSILOCYBIN/INDOLE HALLUC. PROPOSED TREATMEN
62  PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.
    DIAZEPAM,CHLORPROMAZINE TAXON PEGLER (1977)PRELIM AGARIC FLORA E.AFRICA,HMSO
64  LON CHEM HOFMANN ET AL(1959)HELV CHIM ACTA 42,1557-1572   MED LINCOFF &
    MITCHEL (1977) TOX AND HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,N
    NY   HALLUCINOGEN, UPSETTING  COSMOPOLITAN
      43  5  0 -1  5  0  2  3  4  5  3 -1  3  0  1  2  3  0  1  0  1  0 -1  2  3  4
 ?    -1  2  2  3  3  3  2  0  0  1  0  1  0  0  0  1  1  1
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Table 7 (continued)

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   6PANAEOLUS ATER (LGE)K & R UK FREQ 1.2 PSILOCYBIN/INDOLE HALLUC.PROPOSED
 4 TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUI
   POSSIB.DIAZEPAM,CHLORPROMAZINE TAXON HORA (1957)THE NATURALIST JUL-SEP 7
 6 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572  MED LINCOFF & MIT-
   CHEL(1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY...
 9 HALLUCINOGEN, UPSETTING  EU
    44  5  0 -1  3  0  4  5  2 -1  3  0  1  2  3  0  1  0  1  0 -1  2  3  4  2  3
10   3  2  0  0  0  0 -1  3  0  1  2  0  0  0 -1  0  0  1  0
   6PANAEOLUS CAMPANULATUS (BULL EX FR)QUEL UK FREQ 3.6 PSILOCYBIN/INDOLE HALLU
12 PROPOSED TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BE-
   HAV,QUIET POSSIB DIAZEPAM,CHLORPROMAZINE TAXON MOLLER FH (1945)FUNGI OF THE
14 FAEROES,MUNKSGAARD,COPENH. CHEM HOFMANN ET AL(1959)HELV CHIM ACTA 42,1557-1572
   MED LINCOFF & MITCHEL (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY
16 HALLUCINOGEN SUSPECT, UPSETTING  COSMOPOLITAN
    46  5  0 -1  6  0  1  2  3  4  5  3 -1  2  1  2  3  0  1  0  1  0  4 -1  2  3
18   4  3  3  2  0  0  0  0  1  0  0 -1  2  0  1 -1  2  1  2  1  1
   6PANAEOLUS CASTANEIFOLIUS (MURR) SM PSILOCYBIN/INDOLE HALLUC.PROPOSED
20 TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,
   QUIET,POSSIB DIAZEPAM,CHLORPROMAZINE TAXON OLA'H G(1968)REV MYCOL 33,284-290
22 685 CHEM HOFMANN ET AL(1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MIT-
   CHEL.(1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY..
24 HALLUCINOGEN SUSPECT, UPSETTING  EU;N.AM.
    37  5  0 -1  3  0  4  5  2 -1  2  1  2  3  1  1  1  1  0  4 -1  2  2  3  3  3
26   2  0  0  0  0  1  0  0  0  1  1  1
   6PANAEOLUS FIMICOLA (FR)GILL PSILOCYBIN/INDOLE HALLUC PROPOSED TREATMENT:
28 PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
   DIAZEPAM,CHLORPROMAZINE TAXON PEGLER (1977)PRELIM AGARIC FLORA E.AFRICA,
30 HMSO,LON CHEM HOFMANN ET AL(1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF
   & MITCHEL (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY...
32 SUSPECT HALLUCINOGEN, UPSETTING  COSMOPOLITAN
    49  5  0 -1  5  0  2  3  4  5 -1  2  2  3 -1  3  0  1  2  3  0  1  0  1  0 -1
34   2  3  4 -1  2  2  3  3  3  2  0  0  0  0  1  0  0  0 -1  2  1  3  1  1
   6PANAEOLUS PAPILIONACEUS (BUL EX FR)QUEL UK FREQ 1.2 INDOLE HALLUC PROPOS
36 TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELFDESTRUCT BEHAV,QUIE
   POSSIB DIAZEPAM,CHLORPROMAZINE TAXON PEGLER (1977)PRELIM AGARIC FLORA E.
38 AFRICA,HMSO,LON CHEM HOFMANN ET AL(1959)HELV CHIM ACTA 42,1557-1572 MED
   LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,N
40 NY, SUSPECT HALLUCINOGEN, UPSETTING  COSMOPOLITAN
    47  5  0 -1  6  0  1  2  3  4  5 -1  2  2  3 -1  3  0  1  2  3  0  1  0  1  0
42   4  3  3  3  2  0  0  0  0  1 -1  2  0  1  0 -1  2  0  1  0  1  1
   6PANAEOLUS RETIRUGIS (FR)GILL UK FREQ 0.4 INDOLE HALLUC.SUSPECT PROPOSED
44 TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUI
   POSSIB DIAZEPAM,CHLORPROMAZINE TAXON HORA (1957)THE NATURALIST JUL-SEPT
46 77-88 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &
   MITCHEL (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY.
48 SUSPECT HALLUCINOGEN, UPSETTING  EU
    43  5  0 -1  3  0  4  5 -1  2  2  3 -1  2  1  2  3  0  1  0  1  0  4 -1  2  2
50   3  3  3  2  0  0  0  0 -1  2  0  1  0  0  0  0  1  1
   6PANAEOLUS SPHINCTRINUS (FR)QUEL UK FREQ 11.5 SUSPECT INDOLE HALLUC.
52 PROPOSED TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BE-
   HAV.QUIET POSSIB DIAZEPAM,CHLORPROMAZINE TAXON PEGLER (1977)PRELIM AGARIC
54 FLORA E. AFRICA,HMSO,LON CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572
   MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
56 R.,NY.  SUSPECT HALLUCINOGEN, UPSETTING  COSMOPOLITAN
    51  5  0 -1  6  0  1  2  3  4  5 -1  2  2  3 -1  3  0  1  2  3  0  1  0  1  0
58   4 -1  2  3  4  3  3  2  0  0  0  0 -1  2  0  1  0  0  0 -1  3  0  1  2  1
     1
60   6PANAEOLUS SUBBALTEATUS (BERK & BR)SACC UK FREQ 1.2 INDOLE HALLUC? PROP
   TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET
62 POSSIB DIAZEPAM.CHLORPROMAZINE TAXON HORA (1957)THE NATURALIST JUL-SEP 77-88
   CHEM HOFMANN ET  AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &MITCH
64 (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY...
   SUSPECT HALLUCINOGEN, UPSETTING  COSMOPOLITAN
    51  5  0 -1  6  0  1  2  3  4  5 -1  2  2  3 -1  3  0  1  2  3  0  1  0  1  0
     4 -1  2  2  3  3  3  2  0  0  0  0 -1  2  0  1  0  0  0 -1  3  0  1  2  1
2    1
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Table 7 (continued)

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   6ANELLARIA PHALAENARUM (FR)QUEL SUSPECT HALLUC/INDOLES PROPOSED TREATMENT
 4 PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.
   DIAZEPAM,CHLORPROMAZINE TAXON HORA (1957) THE NATURALIST,JUL-SEP 77-88
 6 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCH
   (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY...
 8 SUSPECT HALLUCINOGEN, UPSETTING  EU;N.AM
    42  5  0 -1  3  0  4  5  3 -1  2  1  2  3  0  1  0  1  0 -1  2  4  5 -1  2  3
10    4  3  3  2  0  0  0  0  1  1  0  1  0  0  1  0  0
   6ANELLARIA SEMIOVATA (SOW EX FR)PEARS & DENNIS UK FREQ 5.9 SUSPECT INDOLE
12 HALLUC.PROPOSED TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF
   DESTRUCT BEHAV,QUIET,POSSIB DIAZEPAM,CHLORPROMAZINE TAXON HORA (1957)THE
14 NATURALIST JUL-SEP,77-88 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA,42,1557-1572
   MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REI
16 NY.  SUSPECT HALLUCINOGEN, UPSETTING  EU;N.AM
    50  5  0 -1  3  0  4  5  3 -1  3  0  1  2  3  0  1  0  1  0 -1  2  4  5 -1  2
18    3  4  3  3  2  0  0  0  0  1  1  0  0  0  0 -1  2  1  2 -1  3  0  1  2  0

20   6COPELANDIA CAMBODGINIENSIS OLA°H/HEIM INDOLE HALLUC PROPOSED TREATMENT:
   PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
22 DIAZEPAM,CHLORPROMAZINE TAXON OLA°H G(1968)REV MYCOL 33,284-290
   CHEM HOFMANN ET AL (1959)HE  V CHIM ACTA 42,1557-1572 MED LINCOFF & MITC
24 (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY..
   HALLUCINOGEN, UPSETTING  S.E.ASIA
26  49  5  0 -1  2  2  3  3 -1  3  0  1  2  3  0  1  0  1  0 -1  2  2  3  3  3
      2  0  0  0  0  1  0  0  0 -1  2  0  1  0 -1  2  1  2 -1  3  0  1  3  1
28   6COPELANDIA CYANESCENS (BERK & BR)SING INDOLE HALLUC PROPOSED TREATMENT:
   PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
30 DIAZEPAM,CHLORPROMAZINE TAXON SINGER R (1960)LILLOA 30,124-126
   CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCH
32 (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY...
   HALLUCINOGEN, UPSETTING  PANTROPICAL
34  50  5  0 -1  2  2  3  3 -1  3  0  1  2  3  0  1  0  1  0  4 -1  3  2  3  4  3
      3  2  0  0  0  0  1  0  0  0 -1  2  0  1  0 -1  2  1  2 -1  1  1  2  4  1
36
   6COPELANDIA TROPICALIS OLA°H INDOLE HALLUC. PROPOSED TREATMENT:PREVENT
38 ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.DIAZEPAM
   CHLORPROMAZINE TAXON OLA°H (1968)REV MYCOL 33,284-290 CHEM HOFMANN ET
40 AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCHEL (1977)
   TOX & HALLUC MUSHROOM POISONING, VAN NOSTRAND REINHOLD,NY...
42 HALLUCINOGEN, UPSETTING  AFRICA.ASIA
    48  5  0  3  3 -1  3  0  1  2  3  0  1  0  1  0  3 -1  2  2  3  3  3  2  0  0
44    0  0 -1  2  0  1  0  0  0 -1  2  0  1  0 -1  2  1  2 -1  2  2  4  1
   6PANAEOLUS AFRICANUS OLA°H  INDOLE HALLUC. PROPOSED TREATMENT:PREVENT
46 ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.DIAZEPAM
   CHLORPROMAZINE TAXON OLA°H (1968)REV MYCOL 33,284-290
48 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MIT-
   CHEL(1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY...
50 HALLUCINOGEN, UPSETTING  AFR.
    39  5  0  3  3 -1  2  0  1  3  0  1  0  1  0 -1  2  3  4 -1  2  3  4  3  3  2
52    0  0  0  0 -1  2  0  1  0  0  0  0  1  0
   6PANAEOLUS MICROSPORUS OLA°H &AILLEUX INDOLE HALLUC.PROPOSED TREATMENT:
54 PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
   DIAZEPAM,CHLORPROMAZINE TAXON OLA°H G (1968) REV MYCOL 33,284-290
56 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCH
   (1977) TOX AND HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY...
58 SUSPECT HALLUCINOGEN, UPSETTING  AF
    45  5  0  3  3 -1  2  0  1  3  0  1  0  1  0 -1  2  1  2  1  3  3  2  0  0  0
60    0  1  0  0 -1  2  0  1 -1  3  0  1  2  0  0 -1  2  0  1  1
   6PSILOCYBE BANDERILLENSIS GUZ INDOLE HALLUC PROPOSED TREATMENT:PREVENT
62 ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.DIAZEPAM
   CHLORPROMAZINE TAXON GUZMAN (1978)NOVA HEDWIGIA 29,625-664 CHEM HOFMANN
64 ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCHEL (1977) TOX
   & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY...
   HALLUCINOGEN, UPSETTING MEX
    38  5  0  2  1  1  3  0  1  0  1  0 -1  2  1  2 -1  2  0  1  3  3  2  0  0  1
 2    0  1  0  0  0  1  0  0 -1  2  1  2  1
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Table 7 (continued)

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 6PSILOCYBE HEIMII GUZ INDOLE HALLUC PROPOSED TREATMENT:PREVENT ABSORP,
4 ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV;QUIET,POSSIB DIAZEPAM,CHLOR-
  PROMAZINE TAXON GUZMAN (1978) NOVA HEDWIGIA 29,625-664 CHEM HOFMANN ET
6 AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCHEL (1977) TOX
  & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY...
8 HALLUCINOGEN, UPSETTING  MEX
   37  5  0  2  1  1  3  0  1  0  1  0  1  0  3  3  2  0  0  1  0  1  0  0  0 -1
10  4  0  1  2  3  0  0 -1  2  1  2  1
   6PSILOCYBE GALINDII GUZ INDOLE HALLUC PROPOSED TREATMENT:PREVENT ABSORP,
12 ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV;QUIET,POSSIB DIAZEPAM,
  CHLORPROMAZINE TAXON GUZMAN (1978) NOVA HEDWIGIA,29,625-664 CHEM HOFMANN
14 ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF,& MITCHEL (1977)
  TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY...
16 HALLUCINOGEN, UPSETTING  MEX
   38  5  0 -1  2  2  3 -1  2  0  2  1  3  0  1  0  1  0 -1  2  2  3  2  3  3  2
18  0  0  1  0  1  0  0  0  1  0  0  1  1
   6PSILOCYBE HERRERAE GUZ INDOLE HALLUC PROPOSED TREATMENT:PREVENT ABSORP,
20 ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET;POSSIB DIAZEPAM,CHLOR-
  PROMAZINE, TAXON GUZMAN (1978) NOVA HEDWIGIA 29,625-664 CHEM HOFMANN ET
22 AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCHEL (1977) TOX &
  HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY...
24 HALLUCINOGEN, UPSETTING  MEX
   35  5  0  2 -1  2  1  4  1  3  0  1  0  1  0  0  0  3  3  2  0  0  1  0  1  0
26  0  0  1  0  0 -1  2  1  2  1
   6PSILOCYBE RZEDOWSKII GUZ INDOLE HALLUC PROPOSED TREATMENT:PREVENT ABSORP
28 ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB DIAZEPAM,CHLOR-
  PROMAZINE TAXON GUZMAN (1978) NOVA HEDWIGIA 29,625-664 CHEM HOFMANN ET A
30 (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCHEL (1977) TOX & HAL
  MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY...
32 HALLUCINOGEN, UPSETTING  MEX
   32  5  0  2  1  1  3  0  1  0  1  0  1  0  3  3  2  0  0  1  0  1  0  0  0  2
34  0  0 -1  2  1  2  1
   6PSILOCYBE VERAECRUCIS GUZ & ORTIZ INDOLE HALLUC PROPOSED TREATMENT:PREVE
36 ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB DIAZEPAM
  CHLORPROMAZINE TAXON GUZMAN (1978) NOVA HEDWIGIA 29,625-664 CHEM HOFMANN
38 ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCHEL (1977) TOX
  & HALLUC MUSHROOM POISONING,VAN NOSTRAND REINHOLD,NY,...
40 HALLUCINOGEN, UPSETTING  MEX
   38  5  0  3  1  1  3  0  1  0  1  0  1 -1  2  0  1  3  3  2  0  0  1  0  1  0
42  0  0 -1  2  1  2  0  0 -1  2  1  2  1
   5CORTINARIUS GENTILIS (FR)FR UK FREQ 0.4 SUSPECT ORELLANINE PROPOSED TREAT-
44 MENT SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA II8/2 FISCHER
  STUT.NY CHEM ANTKOWIAK & GESSNER (1979) TETRAHEDRON L. 21,1931-34 MED FLAMMER
46 R (1980) DIFFERENTIALDIAGNOSE DER PILZVERGIFTUNGEN,FISCHER,STUTT,NY
  DEADLY  EU
48  37  1  3 -1  3  0  4  5  0 -1  2  1  2  1  1  1  1  1 -1  2  1  2 -1  2  1  2
   2  1  0  0  0  1  0  1  1  1  1  1
50  5CORTINARIUS LIMONIUS (FR EX FR)FR ORELLANINE SUSPECT  PROPOSED TREATMENT
  SYMPTOMATIC TAXON MOSER M (1979) KLEINE KRYPTOGAMENFLORA IIB/2 FISCHER,
52 STUT.NY CHEM ANTKOWIAK & GESSNER (1979) TETRAHEDRON L. 21,1931-34 MED FLAMMER
  (1980) DIFFERENTIALDIAGNOSE DER PILZVERGIFTUNGEN,FISCHER,STUTT. NY
54 SUSPECT DEADLY,  EU
   37  1  3 -1  3  0  4  5  0 -1  2  1  2  1  1  1  1  1 -1  2  1  2 -1  2  1  2
56  2  1  0  0  0  1  0  1  1  1  1  1
   5CORTINARIUS CYANITES FR UK FREQ 0.4 SUSPECT ORELLANINE PROPOSED TREATMEN
58 SYMPTOMATIC TAXON MOSER M (1978) KLEINE KRYPTOGAMENFLORA II8/2, STUTT,NY
  CHEM ANTKOWIAK & GESSNER (1979) TETRAHEDRON L. 21,1931-34 MED FLAMMER R
60 DIFFERENTIALDIAGNOSE DER PILZVERGIFTUNGEN,FISCHER,STUTT.NY.
  SUSPECT DEADLY  EU
62  33  1  3 -1  3  0  4  5  1 -1  2  1  2  1  1  1  1  1  2  1  2  1  0  0  0  1
   0  1  0  0  0  0  1  1
64  4CORTINARIUS ORELLANOIDES HRY  ORELLANINE SUSPECT PROPOSED TREATMENT:SYM-
  TOMATIC TAXON ORTON PD (1976)KEW BULL 31:3,707-721  CHEM ANTKOWIAK & GESSNER
  (1979) TETRAHEDRON L. 21,1931-34 MED. GERAULT & GIRRE (1977) BULL SOC
  MYCOL FRANCE 93,373-405  SUSPECT DEADLY  EU
   37  1  3 -1  3  0  4  5  1 -1  2  1  2  1  1  1  1  1 -1  2  2  3 -1  2  2  3
    2  1  0  0  0  1  0  1  1  1  1  1
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Table 7 (continued)

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 4   SCORTINARIUS SPLENDENS HRY SUSPECT ORELLANINE PROPOSED TREATMENT:SYMPTOMA
    TAXON MOSER M (1978) KLEINE KRYPTOGAMENFLORA IIB/2,FISCHER,STUTT.NY.
 6  CHEM ANTKOWIAK & GESSNER (1979) TETRAHEDRON L. 21,1931-34 MED FLAMMER R
    (1980) DIFFERENTIALDIAGNOSE DER PILZVERGIFTUNGEN, FISCHER,STUT.NY.
 8  SUSPECT DEADLY  EU
     34  1  3 -1  3  0  4  5  1 -1  2  1  2  1  1  1  1  1 -1  2  2  3  1  2  1  0
10    0  0  1  0  1  1  1  1  1
     6CONOCYBE CYANOPUS (ATK)KUHN UK FREQ 0.4 PSILOCYBIN/INDOLE HALLUCINOGEN
12  PROPOSED TREATMENT:PREVENT ABSORPTION;ENHANCE EXCRET,RESTRAIN SELF DESTR
    BEHAV,QUIET,POSSIB DIAZEPAM,CHLORPROMAZINE TAXON BENEDICT ET AL (1967)
14  LLOYDIA 30,150-157 CHEM BENEDICT ET AL (1962) LLOYDIA 25,156-159 MED LIN
    &MITCHEL (1977) TOX &  HALLUC MUSHROOM POISONING,VAN NOSTRAND R, NY
16  HALLUCINOGEN, UPSETTING  N.AM,EU
     33  5  0 -1  3  0  4  5  2 -1  2  1  2  1  1  0  1  0  1  1  2  3  2  0  0  0
18    0  1  0  0  1  2  1  1
     6CONOCYBE FILARIS (FR)KUHN UK FREQ 1.6 CYCLOPEPTIDES PROPOSED TREATMENT:
20  WATER,ELECTROLYTE &BLOOD BALANCE,HYPERTONIC GLUCOSE INF.,,PENICILLIN,
    THIOCTIC ACID,EXCHANGE TRANSFUSION TAXON KUHNER R (1935)ENCYCLOP.MYCOL,
22  PARIS 7 CHEM BRADY ET AL (1975)LLOYDIA 38,172-179 MED BERTELLI,FOURNIER
    ET AL (1977)CURRENT PROBLEMS IN CLIN BIOCHEM 7, HUBER,BERN,STUT.VIENNA
24  DEADLY  EU;N.AM.
     51  0  2 -1  3  0  4  5 -1  2  1  2 -1  2  1  2  1  1  0  1  0 -1  2  2  3 -1
26    2  1  2  2  0  0  0  0  0  0 -1  2  0  1  0  0 -1  2  0 -1 -1  2  1  2  1
      1
28   6CONOCYBE SILIGINEOIDES HEIM PSILOCYBIN/INDOLE HALLUC PROPOSED TREATMENT:
    PREVENT ABSORPTION,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POS
30  DIAZEPAM,CHLORPROMAZINE TAXON HEIM (1956) COMPTES RENDUS ACAD.SC.242,1390
    CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &MITCHE
32  (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R, NY
    HALLUCINOGEN,UPSETTING  MEX
34   35  5  0  2  4  1  1  1  0 -1  0  4 -1  2  2  3  2  3  2  0  0  0  0  0  0  0
     -1  2  0  1 -1  2  2  3  1  1
36   5CONOCYBE SMITHII WATL PSILOCYBIN/INDOLE HALLUC PROPOSED TREATMENT:PREVEN
    ABSORPTION,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB.
38  DIAZEPAM,CHLORPROMAZINE TAXON & CHEM BENEDICT ET AL (1967) LLOYDIA 30,
    150-157 MED LINCOFF & MITCHEL (1977) TOX & HALLUC MUSHROOM POISONING,
40  VAN NOSTRAND R,NY.  HALLUCINOGEN,UPSETTING  N.AM.
     41  5  0  0 -1  2  2  5 -1  2  0  1  1  1  0  1  0 -1  2  1  2  1  2  3  2  0
42    0  0  0  1  0  0 -1  2  0  1 -1  2  1  2  1  1
     5HYGROPHORUS CONICUS (SCOP EX FR)FR UK FREQ 10.3  UNKNOWN PROPOSED
44  TREATMENT:SYMPTOMATIC TAXON.MOELLER FH (1945) FUNGI OF THE FAEROES,
    MUNKSGAARD,COPENH. CHEM.NONE
46  MED.FLAMMER R (1980) DIFFERENTIALDIAGNOSE DER PILZVERGIFTUNGEN,FISCHER,
    STUT.NY.  UPSETTING  EU;N.AM
48   49  6  0 -1  4  0  2  4  5  2 -1  3  1  2  3  0  1  1  0  0  1 -1  3  1  2  3
     -1  2  1  2  0  6  3  0  0  1  0 -1  2  0  1  1  1  0  1 -1  2  0  1  1
50   5HYGROPHORUS NIGRESCENS (QUEL)QUEL  UK FREQ 6.7  UNKNOWN  PROPOSED
    TREATMENT:SYMPTOMATIC TAXON.PEGLER  (1977)PRELIM AGARIC FLORA OF E.
52  AFRICA,HMSO.LON CHEM NONE
    MED FLAMMER R (1980) DIFFERENTIALDIAGNOSE DER PILZVERGIFTUNGEN,FISCHER
54  STUT.NY.  UPSETTING  COSMOPOLITAN
     45  6  0 -1  6  0  1  2  3  4  5  2 -1  3  1  2  0  1  1  0  0  1 -1  2  2  3
56    1  0  6  3  0  0  1  0  1  1  1  0  1 -1  2  0  1  1
     6CLITOCYBE ANGUSTISSIMA (LASCH)KUM UK FREQ 0.4 MUSCARINE PROPOSED TREAT-
58  MENT:PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,
    SUPPORTIVE TAXON KUHNER & POMAGNESI (1977)COMPLEMENT FLORE ANALYTIQUE,
60  MASSON,PARIS CHEM.CATALFOMO & EUGSTER (1970)HELV CHIM ACTA 53:4,848-851
    MED LINCOFF & MITCHEL (1977) TOX & HALLUC.MUSHROOM POISONING,VAN NOSTRAN
62  REIN.,NY  UPSETTING TO DANGEROUS EU
     34  3  0 -1  2  0  4 -1  2  1  2 -1  2  1  2  0  1  1  0  0  1  0  0  0  2  3
64    0  0  1  0  1  0  1  1  1
     6CLITOCYBE CANDICANS (PERS EX FR)KUM UK FREQ 0.4 MUSCARINE PROPOSED TREAT-
    MENT PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUP
    PORTIVE TAXON HARMAJA H (1969)KARSTENIA 10,5-168  CHEM CATALFOMO &
 2  EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
    TOX & HALLUC MUSHROOM POISONING, VAN NOSTRAND R.,NY UPSETTING TO DANGER-
 4  OUS  EU
      38  3  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  0  1  1  0  0  1 -1  2  0  1
 6     0  0  2  3  0  0  1  0  1  3  1  1  1
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Table 7 (continued)

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    6CLITOCYBE CERUSSATA (FR)KUM UK FREQ 1.2 MUSCARINE PROPOSED TREATMENT:
 8  PREVENT ABSORP,ENHANCE EXCRET, ATROPINE UNTIL CESSATION SECRETIONS TAXON
    BIGELOW H E (1965)LLOYDIA 28:2,139-180 CHEM CATALFOMO & EUGSTER (1970)
10  HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)TOX & HALLUC
    MUSHROOM POISONING, VAN NOSTRAND R.,NY  UPSETTING TO DANGEROUS EU ;N.AM.
12
     36  3  3 -1  3  0  4  5 -1  3  0  1  2 -1  2  1  2  0  1  1  0  0  1  0  0  0
14    2  3  0  0  1  0  1  0  1  1  1
    6CLITOCYBE DEALBATA (SOW EX FR)KUM MUSCARINE PROPOSED TREATMENT:PREVENT
16  ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
    TAXON HARMAJA H (1969) KARSTENIA 10,5-168 CHEM CATALFOMO & EUGSTER
18  (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)TOX &
    HALLUCINOGENIC MUSHROOM POISONING,VAN NOSTRAND R.,NY UPSETTING TO
20 DANGEROUS  EU;N.AM
     32  3  0 -1  3  0  4  5  2 -1  2  1  2  0  1  1  0  0  1  0  0  0  2  3  0  0
22    1  0  1  0  1  1  1
    6CLITOCYBE DIATRETA (FR EX FR)KUM MUSCARINE PROPOSED TREATMENT:PREVENT
24  ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
    TAXON RICKEN A (1914)DIE BLATTERPILZE CHEM CATALFOMO &
26  EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
    TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY UPSETTING TO
28  DANGEROUS EU
     32  3  0 -1  3  0  4  5  0 -1  2  1  2  0  1  1  0  0  1  0  0  0  2  3  0  0
30    1  0  1  0  1  1  1
    6CLITOCYBE ERICETORUM BULL EX QUEL MUSCARINE PROPOSED TREATMENT:
32  PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPOR
    TIVE TAXON HARMAJA H (1969)KARSTENIA 10,5-168 CHEM CATALFOMO &
34  EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
    TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R.NY UPSETTING TO
36  DANGEROUS  EU
     32  3  0 -1  3  0  4  5  2 -1  2  1  2  0  1  1  0  0  1  0  0  0  2  3  0  0
38    1  0  1  0  1  1  1
    6CLITOCYBE FESTIVA FAVRE MUSCARINE PROPOSED TREATMENT:PREVENT ABSORP
40  ENHANCE EXCRET, ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
    TAXON FAVRE (1955)CHAMPIGNONS PARC NAT.SUISSE,LIESTAL CHEM CATALFOMO &
42  EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
    TOX & HALLUC MUSHROOM POISUNING,VAN NUSTRAND R,NY UPSETTING TO
44  DANGEROUS,EU
     34  3  0  0  1 -1  2  1  2  0  1  1  0  0  1 -1  2  0  1 -1  2  0  1  0  2  3
46    0  0  1  0  1  0  1  1  1
    6CLITOCYBE PHYLLOPHILA (FR)KUM UK FREQ 0.8 MUSCARINE PROPOSED TREATMENT:
48  PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,
    SUPPORTIVE TAXON BIGELOW H E (1965)LLOYDIA 28:2,139-180 CHEM CATALFOMO &
50  EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF & MITCHEL (1977)
    TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY UPSETTING TO
52  DANGEROUS  EU;N.AM.
     32  3  0 -1  3  0  4  5  0 -1  2  1  2  0  1  1  0  0  1  0  0  0  2  3  0  0
54    1  0  1  0  1  1  1
    6CLITOCYBE PITHYOPHILA (SECR)GILL  MUSCARINE PROPOSED TREATMENT:PREVENT
56  ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
    TAXON MOSER (1978)KLEINE KRYPTOG.FLORA IIB,2 FISCHER,STUTT. CHEM.
58  CATALFOMO & EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF &
    MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY
60  UPSETTING TO DANGEROUS  EU
     32  3  0 -1  3  0  4  5  0 -1  2  1  2  0  1  1  0  0  1  1  1  0  2  3  0  0
62    1  0  1  0  1  1  1
    6CLITOCYBE RIVULOSA (PERS EX FR)KUM UK FREQ 2.4 MUSCARINE PROPOSED TREAT-
64  MENT:PREVENT ABSORP,ENHANCE SECRET,ATROPINE UNTIL CESSATION SECRETIONS
    SUPPORTIVE TAXON KUHNER & ROMAGNESI (1977)COMPLEMENT FLORE ANALYTIQUE,
    MASSON,PARIS CHEM CATALFOMO & EUGSTER (1970)HELV CHIM ACTA 53:4,848-851
    MED LINCOFF & MITCHEL (1977) TOX & HALLUC MUSHROOM POISONING,VAN
 2  NOSTRANO,R.NY  UPSETTING TO DANGEROUS  EU
     32  3  0 -1  3  0  4  5  1 -1  2  1  2  0  1  1  0  0  1  0  0  0  2  3  0  0
 4     1  0  1  0  1  1  1
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Table 7 (continued)

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   6CLITOCYBE SUAVEOLENS (SCHUM EX FR)KUM  UK FREQ 1.2  MUSCARINE PROPOSED
 8 TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,ATROPINE UNTIL CESSATION SECRET-
   IONS,SUPPORTIVE TAXON HARMAJA H (1969)KARSTENIA 10,5-168
48 CHEM CATALFOMO & EUGSTER (1970)HELV CHIM  ACTA 53:4,848-851 MED LINCOFF &
   MITCHEL (1977)TOX AND HALLUC MUSHROOM POISONING,VAN NOSTRAND R. NY
10 UPSETTING TO DANGEROUS  EU
    35  3  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  0  1  1  0  0  1  1  0  0  2
12   3  0  0  1  0  1  0  1  1  1
   3TRICHOLOMOPSIS PLATYPHYLLA (PERS EX FR)SING UK FREQ 13.1 UNKNOWN TREAT-
14 MENT SYMPTOMATIC TAXON SMITH A H (1960)BRITTONIA 12,41-76 CHEM NONE
   MED GOOS & SHOOP (1980)MYCOLOGIA 72,433-435  UPSETTING  EU:N.AM
16  42  6  0 -1  5  0  1  2  4  5  4 -1  2  1  2  0  1  0  0  0  1  1  2  0  6  3
     0  0  1  0  1 -1  2  0  1  0 -1  2  1  2  2  1  1
18   5TRICHOLOMA ALBOBRUNNEUM (PERS EX FR)KUM UK FREQ 3.6  UNKNOWN,SUSPECT
   TREATMENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMEN FLORA,IIB
20 2,FISCHER,STUTT CHEM NONE
   MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
22 R,NY  UPSETTING  EU:N.AM
    32  6  0 -1  3  0  4  5  0 -1  2  1  2  0  1  1  0  0  1  0  0  0  6  3  0  0
24   1  1  1  0  1  1  1
   4TRICHOLOMA BUFONIUM (PERS EX FR)QUEL UNKNOWN TREATMENT:SYMPTOMATIC
26 TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2,FISCHER,STUTT CHEM NON
   MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
28 R,NY  UPSETTING  EU:N.AM.
    38  6  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  0  1  1  0  0  1 -1  2  2  3
30   1  0  6  3  0  0  1  0  1  1  1  1  1
   4TRICHOLOMA HELVIODOR PIL & SVRC UNKNOWN TREATMENT:SYMPTOMATIC
32 TAXON PILAT & SVRCEK (1946)STUD BOT CSL 7,2-8 CHEM NONE
   MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
34 R,NY..  UPSETTING  EU
    35  6  0 -1  3  0  4  5  0 -1  2  1  2  0  1  0  0  0  1  0 -1  2  0  1  0  6
36   3  0  0  1  0  1  0  1  1  1
   4TRICHOLOMA PARDINUM QUEL UNKNOWN TREATMENT:SYMPTOMATIC
38 TAXON MOSER M (1978)KLEINE KRYPTOG.FLORA IIB/2,FISCHER,STUTT. CHEM NONE
   MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
40 R,NY  UPSETTING TO DANGEROUS  EU:N.AM
    34  6  0  0 -1  2  0  1 -1  2  1  2  0  1  1  0  0  1  2 -1  2  1  2  0  6  3
42   0  0  1  0  1  1  1  1  1
   4TRICHOLOMA PESSUNDATUM (FR)QUEL UK FREQ 0.8 UNKNOWN,SUSPECT TREATMENT:
44 SYMPTOMATIC TAXON BON M (1967)BUL SOC MYCOL FR 83,324-335 CHEM NONE
   MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM INTOXICATION,VAN NOST-
46 RAND R,NY... UPSETTING  EU
    32  6  0 -1  3  0  4  5  0 -1  2  1  2  0  1  1  0  0  1  0  0  0  6  3  0  0
48   1  1  1  0  1  1  1
   5TRICHOLOMA SEJUNCTUM (SOW EX FR)QUEL UK FREQ 2.4 UNKNOWN SUSPECT TREAT-
50 MENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOG.FLORA IIB/2,FISCHER,
   STUTT. CHEM.NONE
52 MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
   R,NY  UPSETTING  EU
54  35  6  0 -1  3  0  4  5  0 -1  2  1  2  0  1  1  0  0  1  0  1  0  6  3  0  0
     1  1  1 -1  2  0  1  1  1  1
56   5TRICHOLOMA SULPHUREUM (BUL EX FR)KUM UK FREQ 6.7 UNKNOWN TREATMENT:
   SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOG.FLORA IIB/2 FISCHER,STUTT
58 CHEM NONE
   MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING, VAN NOSTRAN
60 R,NY  UPSETTING  EU
    38  6  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  0  1  1  0  0  1 -1  2  2  3
62   1  0  6  3  0  0  1  0  1  1  1  1  1
   5TRICHOLOMA VIRGATUM (FR EX FR)KUM UK FREQ 2.0 UNKNOWN TREATMENT:
64 SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB.2 FISCHER,
   STUTT CHEM NONE
   MED LINCOFF & MITCHEL (1977) TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAN
   R,NY UPSETTING EU:N.AM
 >  40  6  0 -1  3  0  4  5  0 -1  2  1  2  0  1  1  0  0  1  1  1  0  6  3  0  0
     1  1  1 -1  2  0  1  0  0 -1  2  1  2  1  1
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Table 7 (continued)

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 4   SCOPELANDIA CHLOROCYSTIS WEEKS & SING PSILOCYBIN/INDOLE HALLUC PROP-
    OSED TREATMENT:PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT
 6  BEHAV,QUIET,POSSIB.DIAZEPAM,CHLORPROMAZINE TAXON/CHEM WEEKS ET AL
    (1979)J.NAT. PRODUCTS 42,469-474 MED LINCOFF & MITCHEL (1977) TOX AND
 8  HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY HALLUCINOGEN,UPSETTING N.AM
     50  5  0 -1  2  0  2  2 -1  2  1  2  3  0  1  0  1  0  3 -1  2  2  3  3  3  2
10    0  0  0  1  0  0  0 -1  2  0  1 -1  2  2  4  0 -1  2  0  1 -1  2  2  4  1

12   4CHLOROPHYLLUM MOLYBDITES (MEYER EX FR)MASSEE UNKNOWN PROPOSED TREATMENT:
    SYMPTOMATIC TAXON PEGLER D (1977)PRELIM AG RIC FLORA E. AFRICA,HMSO,LOND
14  CHEM.EILERS & NELSON (1974)TOXICON 12,557-563 MED BLAYNEY ET AL (1980)
    WESTERN J. MED 132,74-77  UPSETTING TO DANGEROUS N.AM;AFR;S.AM;C.AM.
16   44  6  0 -1  2  2  3  2 -1  4  0  1  2  3  0  2  0  0  1  0 -1  2  2  3  2  0
     6  3  0  0  1  1  1  0  0 -1  2  0  1 -1  2  0  2  1  1

19   5CORTINARIUS AUREIFOLIUS PECK SUSPECT ORELLANINE TREATMENT:SYMPTOMATIC
    TAXON AMMIRATI & GILLIAM (1975)NOVA HEDW BEIH.51,39-52 CHEM ANTKOWIAK
20  & GESSNER (1979)TETRAHEDRON L 21,1931-34
    MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405
22  DEADLY? N.AM
     33  1  3 -1  2  0  4  0 -1  2  1  2  1  1  1  1  1  3  1  2  1  0  0  0  1  0
24    1  1  1  1  1
     4CORTINARIUS BRUNNEOFULVUS FR.S BRES SUSPECT ORELLANINE TREATMENT:SYMP-
26  TOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2 FISCHER,
    STUTT. CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934
28  MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU
     36  1  3 -1  2  0  4  1 -1  2  1  2  1  1  1  1  1 -1  2  2  3 -1  2  2  3  2
30    1  0  0  0  1  0  1  1  1  1  1
     4CORTINARIUS BOLARIS (PERS EX FR)FR UK FREQ 3.2 SUSPECT ORELLANINE
32  TREATMENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA,IIB/2
    FISCHER,STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34
34  MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU
     31  1  3 -1  3  0  4  5  1 -1  2  1  2  1  0  1  1  1  1  1  2  1  0  0  0  1
36    0  1  1  1  1  1
     4CORTINARIUS CINNABARINUS FR SUSPECT ORELLANINE TREATMENT:SYMPTOMATIC
38  TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2 FISCHER,STUTT
    CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934
40  MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU;N.AM
     35  1  3 -1  2  0  4  1 -1  2  1  2  1  1  1  1  1  2  1  2  1  0  0  0  1  0
42    1 -1  2  0  1  0  1  0  1  1
     4CORTINARIUS BULLIARDII (FR)FR SUSPECT ORELLANINE TREATMENT:SYMPTOMATIC
44  TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2,FISCHER,STUTT.
    CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934
46  MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU
     36  1  3 -1  2  0  4  1 -1  2  1  2  1  1  1  1  1 -1  2  2  3  1  2  1  0  0
48    0  1  0  1 -1  2  0  1  1  1  1
     4CORTINARIUS CALLISTEUS (FR)FR UK FREQ 0.4 SUSPECT ORELLANINE TREATMENT:
50  SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2 FISCHER,
    STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934
52  MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU
     39  1  3 -1  3  0  4  5  0 -1  2  1  2  1  0  1  1  1  2  2  2  1  0  0  0  1
54    0  1 -1  2  0  1  0 -1  2  0  1  0  1  1
     4CORTINARIUS CINNAMOMEUS (L EX FR) UK FREQ 2.0 SUSPECT ORELLANINE
56  TREATMENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2
    FISCHER,STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934
58  MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU N.AM
     37  1  3 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  1  1  1  0  1  1  1  2  1  0
60    0  0  1  0  1 -1  2  0  1  1  1  1
     4CORTINARIUS CUTONEUS FR UK FREQ 0.4 SUSPECT ORELLANINE TREATMENT:SYMPTO-
62  MATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2 FISCHER,STUTT
    CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934 MED GERAULT
64  & GIRRE (1977)BUL SOC MYCOL FR 93,373-405  DEADLY? EU
     41  1  3 -1  2  0  4  1 -1  2  1  2  1  0  1  1  1 -1  2  1  2  2  2  1  0  0
       0  1  0  1 -1  2  0  1  0 -1  2  0  1  0  1  1
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Table 7 (continued)

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  4CORTINARIUS MALICORIUS  FR UK FREQ 1.6 SUSPECT ORELLANINE TREATMENT:
2 SYMPTOMATIC TAXON MOSER M(1978)KLEINE KRYPTOGAMENFLORA IIB/2 FISCHER,
  STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934
4 MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU
   34  1  3 -1  3  0  4 59  0 -1  2  1  2  1  1  1  1  1 -1  2  0  1  0  2  1  0
6    0  0  1  0  1  1  1  1  1
  4CORTINARIUS PHOENICEUS (BUL)MRE SUSPECT ORELLANINE TREATMENT:SYMPTOMATIC
8 TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2,FISCHER,STUTT.
  CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934 MED GERAULT &
10 GIRRE (1977)BUL SOC MYCOL FR 93,373-405  DEADLY?  EU
   37  1  3 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  1  1  1  1  1  1  0  2  1  0
12   0  0  1  0  1 -1  2  0  1  1  1  1
  4CORTINARIUS PUNICEUS ORT  SUSPECT ORELLANINE TREATMENT:SYMPTOMATIC
14 TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2 FISCHER,STUTT.
  CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-1934 MED GERAULT
16 & GIRRE (1977)BUL SOC MYCOL FR 93,373-405  DEADLY?  EU
   36  1  3 -1  2  0  4 -1  2  0  1 -1  2  1  2  1  1  1  1  1 -1  2  1  2  1  2
18   1  0  0  0  1  0  1  0  1  1  1
  4CORTINARIUS RUBICUNOULUS (REA)PEARS UK FREQ 1.2 SUSPECT ORELLANINE
20 TREATMENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2
  FISCHER,STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34
22 MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU
   44  1  3 -1  3  0  4  5  1 -1  2  1  2  1  1  1  1  1 -1  2  0  1  2  1  0
24   0  0  1  0  1  0  0 -1  2  0  1  0  0 -1  2  0  1  0  1
  4CORTINARIUS SANGUINEUS (WULF EX FR)FR UK FREQ 0.4 SUSPECT ORELLANINE
26 TREATMENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2
  FISCHER,STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34
28 MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405  DEADLY?  EU
   34  1  3 -1  3  0  4  5  0 -1  2  1  2  1  1  1  1  1 -1  2  1  2  1  2  1  0
30   2  0  1  0  1  0  1  1  1
  4CORTINARIUS SEMISANGUINEUS (FR)GILL UK FREQ 4.0 SUSPECT ORELLANINE
32 TREATMENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2
  FISCHER,STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34
34 MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405  DEADLY? EU:N.AM
   31  1  3 -1  3  0  4  5  0 -1  2  1  2  1  1  1  1  1  1  1  2  1  0  0  0  1
36   0  1  0  1  1  1
  4CURTINARIUS TOPHACEUS (FR)FR SUSPECT ORELLANINE TREATMENT:SYMPTOMATIC
38 TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2,FISCHER STUTT.
  CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34 MED GERAULT &
40 GIRRE (1977)BUL SOC MYCOL FR 93,373-405  DEADLY?  EU
   39  1  3 -1  2  0  4  1 -1  2  1  2  1  1  1  1  1 -1  2  1  2 -1  2  1  2  2
42   1  0  0  0  1  0  1 -1  2  0  1  1  1  1
  4CORTINARIUS TOPHACEOIDES MOS SUSPECT ORELLANINE TREATMENT:SYMPTOMATIC
44 TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2 FISCHER,STUTT
  CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34 MED
46 GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405  DEADLY? EU
   30  1  3  0  0 -1  2  1  2  1  0  1  1  1  1  2  2  1  0  0  0  1  0  1 -1  2
48   0  1  1  1  1
  4CORTINARIUS TRAGANUS (FR EX FR)FR UK FREQ 1.2 SUSPECT ORELLANINE TREAT-
50 MENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2
  FISCHER,STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34
52 MED GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU
   33  1  3 -1  3  0  4  5  0 -1  2  1  2  1  1  1  1  1  2  1  2  1  0  0  0  1
54   2  1  1  0  0  0  1  1
  4CORTINARIUS ULIGINOSUS BERK UK FREQ 1.6 SUSPECT ORELLANINE TREATMENT:
56 SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2 FISCHER
  STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34 MED
58 GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405  DEADLY? EU
   31  1  3 -1  3  0  4  5  1 -1  2  1  2  1  1  1  1  1  2  1  2  1  0  0  0  1
60   0  1  1  1  1  1
  4CORTINARIUS SANIOSUS (FR)FR UK FREQ 0.4 SUSPECT ORELLANINE TREATMENT:
62 SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB,2 FISCHER
  STUTT CHEM ANTKOWIAK & GESSNER (1979)TETRAHEDRON L 21,1931-34 MED
64 GERAULT & GIRRE (1977)BUL SOC MYCOL FR 93,373-405 DEADLY? EU
   37  1  3 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  1  1  1  1  1  2  1  2  1  0
    0  0  1  0  1 -1  2  0  1  1  1  1
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Table 7 (continued)

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   5BOLETUS CALOPUS FR UK FREQ 5.1 UNKNOWN MUSCARINE SUSPECT TREATMENT:
 2 SYMPTOMATIC TAXON WATLING R (1970)BRITISH FUNGUS FLORA 1,HMSO EDINB.
   CHEM. NONE
 4 MEDIC.LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
   RAND R. NY  UPSETTING  EU;N.AM
 6  47  3  0 -1  3  0  4  5 -1  2  0  1  1 -1  1  0  0  1  4  1  2  2  3  0  1  1
      1  1  1  0 -1  2  0  1 -1  2  0  1  0 -1  2  0  1 -1  2  0  1  1
 8   48OLETUS SATANAS LENZ UK FREQ 0.8 UNKNOWN TREATMENT:SYMPTOMATIC
   TAXON WATLING R (1970)BRITISH FUNGUS FLORA 1,HMSO EDINBURGH CHEM NONE
10 MED LINCOFF & MITCHEL (1977) TOX AND HALLUC MUSHROOM POISONING,VAN
   NOSTRAND R, NY  UPSETTING  EU;N.AF;N.AM
12  48  6  0 -1  3  0  4  5  1  1  1  1  0  0  1 -1  2  3  4  1  2  6  3  0  1  1
      1  1  1  0 -1  2  0  1 -1  3  0  1  2  0 -1  2  0  1 -1  2  0  1  1
14   6OMPHALOTUS OLEARIUS SING. SUSPECT MUSCARINE PROPOSED TREATMENT:PREVENT
   ABSORP,ENHANCE EXCRET, ATROPINE UNTIL CESSATION SECRETIONS,SUPPORTIVE
16 TAXON PEGLER (1977)PRELIM AGARIC FLORA E.AFRICA,HMSO LONDON CHEM
   CATALFOMO & EUGSTER (1970)HELV CHIM ACTA 53:4,848-851 MED LINCOFF &
18 MITCHEL (1977)TOX & HALLUC. MUSHROOM POISONING, VAN NOSTRAND R. NY
   UPSETTING TO DANGEROUS  C.EU;N.AM;AFRICA
20  42  3  0 -1  4  0  1  2  3  4 -1  2  1  2  0  1  0  0  0  1 -1  2  0  1 -1  2
      0  1  0  2  3  0  3  1  0 -1  2  1  2  0  1  1  1
22   4HEBELOMA CRUSTULINIFORME (BUL EX ST AM)QUEL UK FREQ 11.1 UNKNOWN TREAT-
   MENT:SYMPTOMATIC TAXON BUCHET (1970)BUL SOC LINN LYON 39,1-132 CHEM NONE
24 MED LINCOFF & MITCHEL(1977) TOX & HALLUC MUSHROOM POISONING,VAN
   NOSTRAND R,NY.. UPSETTING  EU;N.AM;AFRICA
26  44  6  0 -1  5  0  2  3  4  5 -1  2  0  1 -1  2  1  2  1  1  1  0  1  3 -1  2
      1  2  2  6  3  0  0  1  0  1  1  0  1 -1  2  0  1  1  1
28   4HEBELOMA FASTIBILE (PERS EX FR)KUM UK FREQ 0.8 UNKNOWN TREATMENT:
   SYMPTOMATIC TAXON BUCHET (1970)BUL SOC LINN LYON 39,1-132 CHEM NONE
30 MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN
   NOSTRAND R,NY..  UPSETTING  N.AM;EU;AF
32  42  6  0 -1  6  0  1  2  3  4  5  0 -1  2  0  1  1  1  1  0  1 -1  2  2  3  2
      2  6  3  0  0  1  0  1  1  0  1 -1  2  0  1  1  1
34   4HEBELOMA MESOPHAEUM (PERS)QUEL UK FREQ 4.0 UNKNOWN TREATMENT:SYMPT-
   OMATIC TAXON BUCHET (197.)BUL SOC LINN LYON 39,1-132 CHEM NONE
36 MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN
   NOSTRAND R,NY..  UPSETTING  EU;N.AM;AF
38  38  6  0 -1  5  0  2  3  4  5  0 -1  2  1  2  1  1  1  0  1  2  1  2  6  3  0
      0  1  0  1  1  0  1 -1  2  0  1  1  1
40   4HEBELOMA SINAPIZANS (PAUL EX FR)GILL UNKNOWN TREATMENT:SYMPTOMATIC
   TAXON BUCHET (1970) BUL SOC LINN LYON 39,1-132 CHEM NONE
42 MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
   R,NY  UPSETTING  EU;N.AM
44  39  6  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  1  1  1  0  1  3  2  2  6  3
      0  0  1  0  1  1  0  1 -1  2  0  1  1  1
46   6GYROMITRA ESCULENTA (PERS EX PERS)FR GYROMITRIN TREATMENT:PREVENT
   ABSORP,ENHANCE EXCRET,SUPPORTIVE,PYRIDOXINE HCL,IV GLUCOSE,IF FREE
48 HEMOGLOBIN UP:DIURESIS TAXON MOSER M(1963)KLEINE KRYPTOGAMENFLORA IIA
   FISCHER,STUTT CHEM PYYSALO H (1976)Z LEBENSM UNTERS FORSCH 160,325-9
50 MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
   RAND R,NY  DANGEROUS EATEN RAW; EDIBLE COOKED  EU;N.AM
52  35  7  1 -1  3  0  4  5 -1  2  0  1  0  0  1  1  0  0  1  5 -1  2  3  4  0  7
      0  0  4  2  0  2  1  1  1  1
54   6GYROMITRA INFULA (SCHAEFF EX PERS)QUEL GYROMITRIN TREATMENT:PREVENT
   ABSORP,ENHANCE EXCRET,SUPPORTIVE,PYRIDOXINE HCL,IV GLUCOSE,IF FREE HE/ZO
56 GLOBIN UP:DIURESIS TAXON MOSER M (1963)KLEINE KRYPTOGAMENFLORA IIA
   FISCHER,STUTT. CHEM PYYSALO H (1976)Z LEBENSM UNTERS FORTSCH 160,325-9
58 MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
   RAND R,NY..  DANGEROUS RAW;EDIBLE COOKED  EU
60  38  7  1 -1  3  0  4  5 -1  2  0  4 -1  2  1  2  0  1  1  0  0  1  5 -1  2  2
      3  0  7  0  0  4  2  0  2  1  1  1  1
62   6HELVELLA CRISPA FR GYROMITRIN SUSPECT TREATMENT:PREVENT ABSORP,ENHANCE
   EXCRET,SUPPORTIVE,PYRIDOXINE HCL,IV GLUCOSE,IF FREE HEMOGLOBINE:DIURESIS
64 TAXON DISSING H (1966)GENUS HELVELLA IN EU,DANSK BOTANIC COPENHAGEN
   CHEM PYYSALO H (1976)Z LEBENSM UNTERS FORTSCH 160,325-9
   MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING, VAN NOSTRAN
   R,NY... DANGEROUS RAW;EDIBLE COOKED  EU
 7  35  7  1 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  0  1  1  0  0  1  5  4  0  7
      0  0  4  2  0  2  1  1  1  1
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Table 7 (continued)

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| 4    6MORCHELLA ESCULENTA ST AM SUSPECT GYROMITRIN TREATMENT:PREVENT ABSORP
     ENHANCE EXCRET,SUPPORTIVE,PYRIDOXINE HCL,IV GLUCOSE,IF FREE HEMOGLOBIN
  6  UP:DIURESIS TAXON MOSER M (1963)KLEINE KRYPTOGAMENFLORA -IIA,FISCHER,STUT
     CHEM PYYSALO H (1976)Z LEBENSM UNTERS FORTSCH 160,325-9
  8  MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
     RAND R,NY.. EU  DANGEROUS RAW:EDIBLE COOKED SUSPECT?
 10   32  7  1 -1  3  0  4  5 -1  2  2  5  0  0  0  1  0  0  1  5  4  0  7  0  0  4
      2  0  2  1  1  1  1
 12    5TYLOPILUS FELLEUS (FR)KARST UK FREQ 4.7 UNKNOWN TREATMENT:SYMPTOMATIC
     TAXON WATLING R (1970)BRITISH FUNGUS FLORA 1,HMSO,EDINBURGH
 14  CHEM NONE
     MED LINCOFF & MICHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
 16  R,NY.. UPSETTING  EU;N.AM
      44  6  0 -1  3  0  4  5  1 -1  2  1  2  2  1  0  0  1 -1  2  3  4  1  1  6  3
 18    0  1  1  1  1  1  0 -1  2  0  1  1  0 -1  2  0  1  1  1
      5PAXILLUS INVOLUTUS (BATSCH EX FR)FR UK FREQ 30.9 UNKNOWN TREATMENT:
 20  SYMPTOMATIC TAXON WATLING R (1970)BRITISH FUNGUS FLORA 1,HMSO EDINBURGH
     CHEM NONE
 22  MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
     R,NY..  HEMOLYTIC? EDIBLE TO DANGEROUS? EU;N.AM
 24   47  6  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  1  1  0  0  1  2  1  2  6  4
      3  1  1  0  1 -1  2  0  1  0 -1  2  1  2  1  0 -1  2  1  2  1  1
 26    5HYGROPHOROPSIS AURANTIACA (FR)MRE UK FREQ 13.9 SUSPECT MUSCARINE?EDIBLE
     TREATMENT:SYMPTOMATIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2
 28  FISCHER,STUTT.CHEM CATALFOMO & EUGSTER (1970)HELV CHIM ACTA 53:4,848-51
     MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
 30  R,NY.. UPSETTING  EU;N.AM;AF
      42  3  0 -1  4  0  1  4  5 -1  2  0  1 -1  2  1  2  0  2  1  0  0  1 -1  2  0
 32    1 -1  2  0  1  0  2  3  0  1  1  0  1  0  1  1  1
      6LACTARIUS TORMINOSUS (SCHAEFF EX FR)GRAY UK FREQ 7.5 UNKNOWN TREATMENT:
 34  SYMPTOMATIC TAXON PEARSON (1950)NATURALIST JULY-SEP,81-100 CHEM NONE
     MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
 36  RAND R,NY.. UPSETTING  EU;N.AM
      35  6  0 -1  3  0  4  5  1 -1  2  1  2  0  0  1  2  0  1  2  2  0  6  3  1  3
 38    1  1  1 -1  2  0  1  1  1  1
      4LACTARIUS CHRYSORRHEUS FR UK FREQ 4.3 UNKNOWN TREATMENT:SYMPTOMATIC
 40  TAXON PEARSON (1950)NATURALIST,JULY-SEP,81-100 CHEM NONE
     MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND
 42  R,NY... UPSETTING EU;N.AM
      35  6  0 -1  3  0  4  5  1 -1  2  1  2  0  0  0  2  0  1  1  2  0  6  3  1  3
 44    1  1  1 -1  2  0  1  1  1  1
      4LACTARIUS GLAUCESCENS CROSS UK FREQ 0.4 UNKNOWN TREATMENT:SYMPTOMATIC
 46  TAXON PEARSON (1950)NATURALIST,JULY-SEP,81-100 CHEM NONE
     MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
 48  RAND,R,NY...  UPSETTING  EU
      38  6  0 -1  3  0  4  5  1 -1  2  1  2  0  0  0  2  0  1  1 -1  2  1  2  0  6
 50    3  1  3  1  1  1 -1  2  0  1  1  1  1
      4LACTARIUS HELVUS FR UK FREQ 2.4 UNKNOWN TREATMENT:SYMPTOMATIC
 52  TAXON PEARSON (1950)NATURALIST,JULY-SEP 81-100 CHEM NONE
     MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
 54  RAND R,NY.. UPSETTING  EU;N.AM
      38  6  0 -1  3  0  4  5  0 -1  2  1  2  0  0  1  2  0  1  2 -1  2  1  2  0  6
 56    3  1  3  1  1  1 -1  2  0  1  1  1  1
      4LACTARIUS REPRESENTANAEUS BRITZ UK FREQ 0.4 UNKNOWN TREATMENT:SYMPTOM-
 58  ATIC TAXON PEARSON (1950)NATURALIST,JULY-SEP,81-100 CHEM NONE
     MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
 60  RAND R,NY... UPSETTING  EU;N.AM
      35  6  0 -1  3  0  4  5  0 -1  2  1  2  0  0  0  2  0  1 -1  2  2  3  3  0  6
 62    3  1  3  1  1  1  1  1  1  1
      4LACTARIUS RUFUS (SCOP)FR UK FREQ 22.6 UNKNOWN TRE TMENT:SYMPTOMATIC
 64  TAXON PEARSON (1950)NATURALIST,JULY-SEP,81-100 CHEM NONE
     MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
     RAND R,NY... UPSETTING  EU;N.AM
      35  6  0 -1  3  0  4  5  0 -1  2  1  2  0  0  1  2  0  1  2  2  0  6  3  1  3
  2   1  1  1 -1  2  0  1  1  1  1
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Table 7 (continued)

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   4LACTARIUS SCROBICULATUS (SCOP)FR  UNKNOWN TREATMENT:SYMPTOMATIC
TAXON PEARSON (1950)NATURALIST,JULY-SEP,81-100 CHEM NONE
MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
RAND R,NY..  UPSETTING  EU;N.AM
 35  6  0 -1  3  0  4  5  0 -1  2  1  2  0  0  1  2  0  1  2  2  0  6  3  1  3
  1  1  1 -1  2  0  1  1  1  1
   4LACTARIUS UVIDUS FR UK FREQ 3.2 UNKNOWN TREATMENT:SYMPTOMATIC
TAXON PEARSON (1950)NATURALIST,JULY-SEP,81-100 CHEM NONE
MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN
NOSTRAND R,NY... UPSETTING  EU,N.AM
 32  6  0 -1  3  0  4  5  1 -1  2  1  2  0  0  1  2  0  1  3  3  0  6  3  1  3
  1  1  1  1  1  1  1
   5RUSSULA EMETICA FR UK FREQ 14.3 UNKNOWN TREATMENT:SYMPTOMATIC
TAXON RAYNER RW (1974)BRITISH SPP RUSSULA,B.MYCOL SOC,CAMBRIDGE
CHEM NONE
MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN
NOSTRAND R,NY... UPSETTING  EU;N.AM
 40  6  0 -1  5  0  2  3  4  5  0 -1  2  1  2  0  0  1  2  0  1 -1  2  2  3 -1
  2  2  3  0  6  3  1  3  1  1  1  1  1  1  1
   5RUSSULA FOETENS FR UK FREQ 19.0 SUSPECT UNKNOWN TREATMENT:SYMPTOMATIC
TAXON RAYNER RW (1974)BRITISH SPP RUSSULA,BR.MYCOL SOC,CAMBRIDGE
CHEM NONE
MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN
NOSTRAND,R,NY... UPSETTING  EU;N.AM
 38  6  0 -1  3  0  4  5 -1  2  0  1 -1  2  1  2  0  0  0  1  0  1  2 -1  2  2
  3  0  6  3  1  3  1  1  1  1  1  1  1
   5RUSSULA FRAGILIS (PERS EX FR)FR UK FREQ 15.0 SUSPECT UNKNOWN
TREATMENT:SYMPTOMATIC TAXON RAYNER RW (1974)BRITISH SPP RUSSULA,BR.MYCOL
SOC,CAMBRIDGE CHEM NONE
MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN
NOSTRAND R,NY... UPSETTING  EU
 37  6  0 -1  5  0  2  3  4  5 -1  2  0  1 -1  2  1  2  0  0  1  2  0  1  2  2
  0  6  3  1  3  1  1  1  1  1  1  1
   5RUSSULA MAIREI SING UK FREQ 19.8 SUSPECT UNKNOWN TREATMENT:SYMPTOMATIC
TAXON RAYNER RW (1974)BRITISH SPP RUSSULA,B MYCOL SOC,CAMBRIDGE
CHEM NONE
MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN
NOSTRAND R,NY... UPSETTING  EU
 35  6  0 -1  3  0  4  5  1 -1  2  1  2  0  0  0  2  0  1  1  2  0  6  3  1  3
  1  1  1 -1  2  0  1  1  1  1
   5RUSSULA SARDONIA FR UK FREQ 5.9 SUSPECT UNKNOWN TREATMENT:SYMPTOMATIC
TAXON RAYNER RW (1974)BRITISH SPP RUSSULA,B MYCOL SOC,CAMBRIDGE
CHEM NONE
MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN
NOSTRAND R,NY.... UPSETTING  EU
 38  6  0 -1  3  0  4  5  0 -1  2  1  2  0  0  0  2  0  1 -1  2  1  2  2  0  6
  3  1  3  1  1  1 -1  2  0  1  1  1  1
   5LEPIOTA BRUNNEOINCARNATA CHOD & MARTIN CYCLOPEPTIDES PROPOSED TREATMENT:
WATER,ELECTROLYTES,BLOOD BALANCE,HYPERTONIC GLUCOSE INF,PENICILLIN,
THIOCTIC ACID,EXCHANGE TRANSFUSION TAXON MOSER M (1978)KLEINE KRYPTO-
GAMENFLORA IIB/2 FISCHER,STUTT CHEM & MED BERTELLI ,FOURNIER ET AL
(1977)CURRENT PROBLEMS IN CLIN BIOCHEM 7,HUBER STUTT... DEADLY  EU
 41  0  2 -1  3  0  2  4 -1  2  1  2 -1  2  1  2  0  2  1  0  0  1 -1  2  1  1
  2  1  0  0  0  0  0  0  0  1  0  0  0  0  1  1
   5LEPIOTA CASTANEA QUEL UK FREQ 1.6 CYCLOPEPTIDES PROPOSED TREATMENT:WATER
ELECTROLYTE & BLOOD BALANCE,HYPERTONIC GLUCOSE INF,PENICILLIN,THIOCTIC
ACID,EXCHANGE TRANSFUSION TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA
IIB,2 FISCHER,STUTT CHEM & MED BERTELLI ET AL (1977)CURRENT PROBLEMS
IN CLIN BIOCHEM 7,HUBER,STUTT..  DEADLY  EU
 43  0  2 -1  3  0  2  4 -1  2  0  1 -1  2  1  2  0  2  1  0  0  1 -1  2  2  3
 -1  2  0  1  0  0  0  0  0  1  0  1  1  0  0  0  1  1
   5LEPIOTA CLYPEOLARIOIDES REA UK FREQ 0.4 CYCLOPEPTIDES PROPOSED TREATMENT
WATER,ELECTROLYTE & BLOOD BALANCE,HYPERTONIC GLUCOSE INF,PENICILLIN
THIOCTIC ACID,EXCHANGE TRANSFUSION TAXON MOSER M (1978)KLEIN KRYPTOG-
AMENFLORA,IIB/2,FISCHER,STUTT. CHEM & MED BERTELLI ET AL (1977)CURRENT
PROBLEMS IN CLIN BIOCHEM 7,HUBER STUTT.. DEADLY  EU
 34  0  2 -1  3  0  2  4  0 -1  2  1  2  0  2  1  0  0  1  1  1  0  0  0  0  0
  0  0  1  0  0  0  0  1  1
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Table 7 (continued)

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   SLEPIOTA CRISTATA (BOLT EX FR)KUM UK FREQ 10.7 SUSPECT CYCLOPEPTIDES
 * PROPOSED TREATMENT:WATER,ELECTROLYTE & BLOOD BALANCE,HYPERTONIC GLUCOSE
 * INF,PENICILLIN,THIOCTIC ACID,EXCHANGE TRANSFUSION TAXON MOSER M (1978)
 * KLEINE KRYPTOGAMENFLORA IIB/2,FISCHER,STUTT CHEM & MED BERTELLI ET AL
   (1977)CURRENT PROBLEMS IN CLIN BIOCHEM 7,HUBER,STUTT  DEADLY? EU;N.AM
 * 36  0  2 -1  5  0  2  3  4  5  2 -1  2  1  2  0  2  1  0  0  1  1  0  0  0  0
     0  0  0  1  0  0  0  0  1  1
   SLEPIOTA FELINA (PERS EX FR)KARST UK FREQ 2.0 CYCLOPEPTIDES PROPOSED
   TREATMENT:WATER,ELECTROLYTE & BLOOD BALANCE,HYPERTONIC GLUCOSE INFUSION
 * PENICILLIN,THIOCTIC ACID,EXCHANGE TRANSFUSION TAXON MOSER M (1978)KLEINE
   KRYPTOGAMENFLORA IIB/2,FISCHER,STUTT..CHEM & MED BERTELLI ET AL (1977)
 * CURRENT PROBLEMS IN CLIN BIOCHEM 7,HUBER,STUTT.. DEADLY  EU
   34  0  2 -1  3  0  2  4  0 -1  2  1  2  0  2  1  0  0  1  1  0  0  0  0  0  0
 * 0  0  1  0  0  0  0  1  1
   SLEPIOTA FUSCOVINACEA MOLL & LGE UK FREQ 0.4 CYCLOPEPTIDES PROPOSED
   TREATMENT:WATER,ELECTROLYTE,BLOOD BALANCE,HYPERTONIC GLUCOSE INFUSION
   PENICILLIN,THIOCTIC ACID,EXCHANGE TRANSFUSION TAXON MOSER M (1978)
   KLEINE KRYPTOGAMENFLORA IIB/2,FISCHER,STUTT  CHEM & MED BERTELLI ET AL
   (1977)CURRENT PROBLEMS IN CLIN BIOCHEM 7,HUBER,STUTT.. DEADLY  EU
 * 37  0  2 -1  3  0  2  4 -1  2  1  2 -1  2  1  2  0  2  1  0  0  1  0  0  0  0
     0  0  0  0  1  1  0  0  0  0  1  1
 * SLEPIOTA GRISEOVIRENS MRE CYCLOPEPTIDES PROPOSED TREATMENT:WATER,
   ELECTROLYTE & BLOOD BALANCE,HYPERTONIC GLUCOSE INF,PENICILLIN,THIOCTIC
 * ACID,EXCHANGE TRANSFUSION TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA
   IIB/2,FISCHER,STUTT  CHEM & MED BERTELLI ET AL (1977)CURRENT PROBLEMS
 * IN CLIN BIOCHEM 7,HUBER,STUTT...  DEADLY  EU
   37  0  2 -1  3  0  2  4 -1  2  0  1 -1  2  1  2  0  2  1  0  0  1  1  0  0  0
 * 0  0  0  0  0  1  0  0  0  0  1  1
   SLEPIOTA METIERI BOUD UK FREQ 0.8 CYCLOPEPTIDES PROPOSED TREATMENT:WATER
 * ELECTROLYTE & BLOOD BALANCE,HYPERTONIC GLUCOSE INF,PENICILLIN,THIOCTIC
   ACID,EXCHANGE TRANSFUSION TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA
 * IIB/2,STUTT FISCHER CHEM & MED BERTELLI ET AL (1977)CURRENT PROBLEMS IN
   CLIN BIOCHEM 7,HUBER STUTT...  DEADLY  EU
 * 40  0  2 -1  3  0  2  4 -1  2  0  1 -1  2  1  2  0  1  1  0  0  1  0  0  0  0
     0  0  0  0  0  1  0  0  0 -1  2  1  3  1  1
   SLEPIOTA OCHRACEOFULVA ORT CYCLOPEPTIDES PROPOSED TREATMENT:WATER,ELEC-
   TROLYTE & BLOOD BALANCE,HYPERTONIC GLUCOSE INF.,PENICILLIN,THIOCTIC ACID
 * EXCHANGE TRANSFUSION TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2
   FISCHER,STUTT. CHEM & MED BERTELLI ET AL (1977)CURRENT PROBLEMS IN
 * CLIN BIOCHEM 7,HUBER,STUTT... DEADLY  EU
   43  0  2 -1  3  0  2  4 -1  2  0  1 -1  2  1  2  0  2  1  0  0  1 -1  2  1  2
 * -1  2  0  1  0  0  0  0  0  0  0  1  0  0  0  0  1  1
   SLEPIOTA PSEUDOFELINA LGE CYCLOPEPTIDES PROPOSED TREATMENT:WATER,ELEC-
 * TROLYTE & BLOOD BALANCE,HYPERTONIC GLUCOSE INF,PENICILLIN,THIOCTIC ACID
   EXCHANGE TRANSFUSION MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2
 * FISCHER,STUTT CHEM & MED BERTELLI ET AL (1977)CURRENT PROBLEMS IN CLIN
   BIOCHEM 7,HUBER,STUTT..  DEADLY, EU
 * 38  0  2 -1  4  0  2  4  5 -1  2  0  1 -1  2  1  2  0  2  1  0  0  1  2  0  0
     0  0  0  0  0  0  1  0  0  0  0  1  1
 * SLEPIOTA SUBINCARNATA LGE CYCLOPEPTIDES PROPOSED TREATMENT:WATER,ELEVTRO-
   LYTE & BLOOD BALANCE,HYPERTONIC GLUCOSE INF,PENICILLIN,THIOCTIC ACID,
 * EXCANGE TRANSFUSION TAXON PEGLER (1977)PRELIM AGARIC FLORA E. AFRICA
   HMSO,LON CHEM & MED BERTELLI ET AL (1977)CURRENT CONTENT IN CLIN BIOCHEM
 * 7,HUBER,STUTT... DEADLY  EU;AF
   44  0  2 -1  4  0  2  3  4 -1  2  0  1 -1  2  1  2  0  2  1  0  0  1 -1  2  0
 * 1 -1  2  0  1  0  0  0  0  0  0  0  1  0  0  0  0  1  1
   GLEUCOCORINUS BADHAMII UK & BR UK FREQ 0.4 (GLASSHOUSE) CYCLOPEPTIDE
 * SUSPECT PROPOSED TREATMENT:WATER,ELECTROLYTE & BLOOD BALANCE,HYPERTONIC
   GLUCOSE INF,PENICILLIN,THIOCTIC ACID,EXCHANGE TRANSFUSION TAXON MOSER
 * M (1978)KLEINE KRYPTOGAMENFLORA IIB/2,FISCHER,STUTT CHEM & MED BERTELLI
   ET AL (1977)CURRENT PROBLEMS IN CLIN BIOCHEM 7,HUBER,STUTT...DEADLY
   COSMOPOLITAN
   49  0  2 -1  6  0  1  2  3  4  5  1 -1  2  1  2  0  1  1  0  1  0 -1  2  0  1
 * -1  2  0  1  3  0  0  0  0  0  1  1  0  0 -1  2  0  1 -1  2  0  2  1  1
```

Table 7 (continued)

```
    5NOLANEA SERICEA (BUL EX MER)ORT UK FREQ 6.7 UNKNOWN TREATMENT:SYMPTOMA-
  1 TIC TAXON MOSER M (1978)KLEINE KRYPTOGAMENFLORA IIB/2,FISCHER,STUTT.
    CHEM NONE
  6 MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
    RAND,NY... UPSETTING  EU
  9  34  6  0 -1  3  0  4  5  2 -1  2  1  2  2  2  0  0  1 -1  2  1  2  2  1  6  3
       3  0  1  0  1  0  1  1  1
 10   6COPELANDIA MEXICANA GUZ PSILOCYBIN/INDOLE HALLUC TREATMENT:PREVENT ABSOR
    ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET, POSSIB DIAZEPAM,
 13 CHLORPROMAZINE TAXON GUZMAN G (1978)BOL SOC MEX MIC 12,27-31 CHEM
    HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCHEL
 14 (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY..
    HALLUCINOGEN,UPSETTING  C.AM
 17  46  5  0  2 -1  2  2  3  2  3  0  1  0  1  0 -1  2  1  2  2  3  3  2  0  0  0
       0  1 -1  2  0  1  0  0 -1  3  1  2  4  0  1 -1  3  1  2  4  1
 20   6PSILOCYBE UXPANAPENSIS GUZ PSILOCYBIN/INDOLE HALLUC TREATMENT:PREVENT
    ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIBLY DIAZE-
 23 PAM,CHLORPROMAZINE TAXON GUZMAN G(1979)BEIH SYDOWIA 8,168-181 CHEM
    HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCHEL
 24 (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY..
    HALLUCINOGEN,UPSETTING  MEX
 27  42  5  0  3  1  1  3  0  1  0  1  0 -1  2  0  1 -1  2  0  1  3  3  2  0  0  1
       0  1  0  0  0 -1  3  1  2  3  0  0 -1  2  1  2  0
 30   6PSILOCYBE NAEMATOLIFORMIS GUZ PSILOCYBIN/INDOLE HALLUC SUSPECT TREATMENT
    PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
 33 DIAZEPAM,CHLORPROMAZINE TAXON GUZMAN G (1979)BEIH SYDOWIA 8,168-181
    CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 52,1557-1572 MED LINCOFF &
 34 MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY..
    HALLUCINOGEN UPSETTING  MEX
 37  40  5  0  3  1  1  3  0  1  0  1  0  0 -1  2  0  1  3  3  2  0  0  1  0  1  0
       3  0 -1  3  1  2  4  0  0 -1  3  1  2  4  0
 40   6PSILOCYBE SINGERI GUZ SUSPECT PSILOCYBIN/INDOLE HALLUC TREATMENT:PREV-
    ENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
    DIAZEPAM,CHLORPROMAZINE TAXON GUZMAN G (1979)BEIH SYDOWIA 8,168-181
    CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &
 44 MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY...
    HALLUCINOGEN,UPSETTING,  MEX
 47  36  5  0  3  1  1  3  0  1  0  1  0  0 -1  2  0  1  3  3  2  0  0  1  0  1  0
       0  0  1  0  0 -1  3  1  2  4  1
 50   6PSILOCYBE WELDENII GUZ SUSPECT PSILOCYBIN/INDOLE HALLUC TREATMENT:PREVEN
    ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB DIAZEPAM
 53 CHLORPROMAZINE TAXON GUZMAN G (1979)BEIH SYDOWIA 8,168-181 CHEM HOFMANN
    ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCHEL (1977)
 56 TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY.. HALLUCINOGEN,
    UPSETTING  MEX
 57  41  5  0  3  1  1  3  0  1  0  1  0 -1  2  0  1 -1  2  0  1  3  3  2  0  0  1
       0  1  0  0  0 -1  2  1  2  0  0 -1  2  1  2  0
 60   6PSILOCYBE NEOCALEDONICA GUZ & HOR SUSPECT INDOLE HALLUC TREATMENT:PREVEN
    ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB DIAZE-
 63 PAM,CHLORPROMAZINE TAXON GUZMAN & HORAK (1978)BEIH SYDOWIA 31,44-54
    CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &
 64 MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY..
    HALLUCINOGEN,UPSETTING?  NEW CALEDONIA
 67  38  5  0  3 -1  2  1  4  3  3  0  1  0  1  0  0  1  3  3  2  0  0  1  0  1  0
       0  0 -1  2  1  2  0  0 -1  2  1  2  0
 70   6PSILOCYBE BRUNNEOCYSTIDIATA GUZ & HOR SUSPECT INDOLE HALLUC TREATMENT:
    PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSS-
 73 IB DIAZEPAM,CHLORPROMAZINE TAXON GUZMAN & HORAK (1978)BEIH SYDOWIA 31,
    44-54 CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1552-1572
 76 MED LINCOFF & MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOST-
    RAND,R,NY.. HALLUCINOGEN,UPSETTING?  NW GUINEA
 79  45  5  0  3 -1  2  1  4 -1  3  0  2  3  3  0  1  0  1  0  1 -1  2  0  1  3  3
       2  0  0  1  0  1  3  0  0 -1  5  0  1  2  3  4  0  0  2  1
```

Table 7 (continued)

```
  6PSILOCYBE NOTHOFAGENSIS GUZ & HOR SUSPECT INDOLE HALLUC TREATMENT:
PREVENT ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB
DIAZEPAM,CHLORPROMAZINE TAXON GUZMAN & HORAK (1978)BEIH SYDOWIA 31,44-54
CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &
MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTR.R,NY...
HALLUCINOGEN,UPSETTING?  NW GUINEA
 30  5  0  3 -1  2  1  4  2  3  0  1  0  1  0  0  8  3  3  2  0  0  1  0  1  0
  0  0  2  1  1
  6PSILOCYBE PAPUANA GUZ & HOR SUSPECT INDOLE HALLUC TREATMENT:PREVENT
ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB DIAZE-
PAM,CHLORPROMAZINE TAXON GUZMAN & HORAK (1978)BEIH SYDOWIA 31,44-54
CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &
MITCHEL (1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND,R,NY..
HALLUCINOGEN,UPSETTING?  NW GUINEA
 31  5  0  3  1 -1  2  2  3  3  0  1  0  1  0 -1  2  0  1 -1  2  0  1  3  3  2
  0  0  1  0  1  0  0  0 -1  2  1  2  1  1
  6PSILOCYBE INCONSPICUA GUZ & HOR INDOLE HALLUC SUSPECT TREATMENT:PREVENT
ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB DIAZE-
PAM,CHLORPROMAZINE TAXON GUZMAN & HORAK (1978)BEIH SYDOWIA 31,44-54
CHEM HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF &
MITCHEL (1977)TOX & HALLUC MSURHOOM POISONING,VAN NOSTRAND,R,NY...
UPSETTING,HALLUCINOGEN?  NEW GUINEA
 33  5  0  3  1  3  3  0  1  0  1  0 -1  2  0  1  0  3  3  2  0  0  1  0  1  0
  0  0 -1  2  1  2  1  1
  6PSILOCYBE NOVAZELANDIAE GUZ & HOR SUSPECT HALLUC.INDOLE TREATMENT:PREVEN
ABSORP,ENHANCE EXCRET,RESTRAIN SELF DESTRUCT BEHAV,QUIET,POSSIB DIAZEPAM
CHLORPROMAZINE TAXON GUZMAN & HORAK (1978)BEIH SYDOWIA 31,44-54 CHEM
HOFMANN ET AL (1959)HELV CHIM ACTA 42,1557-1572 MED LINCOFF & MITCHEL
(1977)TOX & HALLUC MUSHROOM POISONING,VAN NOSTRAND R,NY.. UPSETTING,
HALLUCINOGEN?  NW ZEALAND
 34  5  0  1  1  2  3  0  1  0  1  0  3 -1  2  0  1  3  3  2  0  0  1  0  1  0
  0  0 -1  3  1  2  4  1  1
```

Table 7 (end).

CHAPTER V. : CONCLUSION.

The first and almost unique question which always arises in case of toxicological emergency is "What did cause the intoxication?". A question which, despite two centuries of mycotoxicology and specialised training in some countries, still cannot be satisfactorily answered in a great majority of cases of mushroom poisoning.

The task, in itself, seems straightforward and strikingly simple: poisonous species have to be recorded and permanent or stable characteristic features selected and used in a manner which allows a rapid identification. It needs a multidisciplinary approach as well as an understanding of the practical requirements for an efficient management of mushroom poisoning.

The almost unlimited storage facilities of computers indicated that they are the ideal tool for storing and retrieving data. The completely interractive facilities that they offer are the most sophisticated type of identification methods yet available because they can be used while the identification of a specimen is in progress. Any classical identification or diagnostic key can be programmed into modern computers which can suit the most stringent requirements, within the limits of logic, and

provide a quick and reliable answer. Full advantage of these facilities have been taken to suit a number of obligatory (e.g. multi-access facility, because of the fragmentary nature of the samples usually submitted for identification) as well as desirable requirements (e.g. the use of English in a form of dialogue with the machine), to make the key efficient, useful, and, at the same time, easy to operate by even untrained personel.

The data matrix is made up of 223 species of mushrooms selected from a world list of 432 suspected or poisonous species, because 1) they are known to be poisonous, 2) they are British species suspected to be poisonous or 3) they are non British species suspected to be poisonous and a complete set of identification features were available from literature sources.

The characters used for identification have been selected because they are, preferably, easy to observe and, at the same time, provide potentially useful information in the identification process. A total of twenty four characters have been selected, showing a choice of 127 possible states or options. Only a limited number of characters may be used for most

practical purposes and still provide a useful result.

Each taxon is defined by a combination of the 127 possible states described in this thesis and the data is further complemented by nine features which are retrieved as essential information to users, when an identification is obtained. Therefore, each taxon is described by a set of 136 combined data and the total information stored in the data bank is of 30'328 data which can be easily altered or extended at any time.

These data have been checked, complemented or expanded by microscopical and chemical analysis while the data bank was built. Significant results were obtained with the analysis of a number of species of the Strophariaceae and Coprinaceae families. The presence of controlled hallucinogenic drugs (psilocybin and derivatives) was confirmed in Scottish samples of Psilocybe semilanceata and P. cyanescens. It was also confirmed in Australian specimens of P. cubensis and identified for the first time in P. eucalypta.

Samples of Stropharia , Hypholoma and Panaeolus did not contain any of the known mushroom hallucinogens, except for one sample of Panaeolus subbalteatus submitted for analysis after an intoxication occurred in Edinburgh.

Other results were obtained in this laboratory by Greer (1980) on species of Cortinarius analysed for the presence of orellanine. These results urgently warrant further research. The deadly, still uncharacterised, toxin orellanine was tentatively identified in Scottish specimens of Cortinarius speciosissimus, and in lesser concentration in the more common C. cinnamomeus, C. sanguineus and C. semisanguineus.

At the time of writing this thesis, the key is as complete as is necessary and practical. It should provide an important tool for toxicologists dealing with emergency cases and forensic scientists employed in the identification of drugs with abuse potential. This is still a long way from providing all the answers, and a lot more work is necessary if solutions to the questions of the pharmacokinetic, the analysis in body fluids, etc of the different toxins, are required. Throughout the thesis, suggestions are made where further research is needed and selected questions are raised and should be the catalyst to further fruitful research.

The programme has some shortcomings and users are advised against its indiscriminate use. It is primarily designed to identify a limited number of mushroom species

(up to about 300) which are poisonous or suspect, out of the 10'000 or so described in the mycological literature. For each poisonous species, there may be as many as 10 non poisonous closely related species showing the same characters and options selected here. Therefore, only if any evidence of toxicity is present can the identification be accurate. A mushroom sample collected in the field identified solely on the basis of its microscopical and ecological characters may be poisonous. The key indicates only which poisonous species it can be!

All poisonous mushrooms are not yet known, and definite cases of poisoning may occur where no identification is obtained. When such a case arises, samples should immediately be forwarded to specialists and the new information thus made available used to augment the data stored.

Finally, the key is not intended to replace the specialist, but it is an attempt to provide selected specialist's information to the practising scientist. It has been tested on a number of occasions with a data bank of about 100 species. Selected notoriously difficult species (in the genus Inocybe) were readily and correctly identified in the presence of an expert

mycologist, Dr. R. Watling from the Royal Botanic Garden in Edinburgh.

This programmed key is presented as a cornerstone to the management and diagnosis of mushroom poisoning based on interdisciplinary sources ranging from anamnestic, clinical, ecological, microscopical to chemical information.

Cortinarius cinnamomeus collected

by the author

Original watercolour

by R. Furlong.

CHAPTER VI : APPENDIX.

VI. APPENDIX.

In the investigation of microscopical characters (2.2.2.1.1.) a number of reagents are used because they give useful information, are easy to prepare and are readily available to most scientists. The composition of such reagents for investigating microscopical features for inclusion into the data bank are described.

Analysis for the different mushroom toxins is outlined.

6.1. Reagents.

6.1.1. Melzer's Reagent.

Mycologists have found in Melzer's reagent a convenient standard solution for the study of the Agaricales. Used in a standard fashion, it always produces identical results, no matter the age or the method of drying of the sample.

Composition:	KI	1.5 g	
	I_2	0.5 g	
	H_2O	20.0 g	
	$Cl_3CCH(OH)_2$	22.0 g	(chloral hydrate)

The microscopical preparation must first be wetted in conc. ammonia for a few seconds, the ammonia is then removed before applying an excess of Melzer's solution. An amyloid reaction is a grayish blue to black colouration of the element observed (here: clear spores under the microscope 2.2.2.1.1.9.) and a dextrinoid reaction is expressed by a brown to purple brown colouration. (Singer, 1975).

6.1.1. Various Reagents.

All the microscopical preparations are made in a 3 % (v/v) aqueous solution of ammonia, unless a specific reagent is mentioned.

Acetocarmine: boil 45 % (v/v) acetic acid with excess carmine for ½ hour, filter and dilute with 45 % (v/v) ethanol. Add two drops of ferric hydroxide to every 50 mls of solution (germ pore 2.2.2.1.1.14.).

Ammonia: 75 % (v/v) aqueous solution (chrysocystidia 2.2.2.1.1.18.4.)

Cresyl blue : dilute aqueous solution (approx. 3-5 %; germ pore, 2.2.2.1.1.14. and clamp connection, 2.2.2.1.1.15.).

Sulphuric acid : 50 % (v/v) or concentrated (colour resistance of dark spores, 2.2.2.1.1.9.)

Reference for further useful reagents: Henderson et al., 1969.

6.2. Analyses of the Toxins.

6.2.1. Cyclopeptides.

In fatal cases of Amanita phalloides intoxication, the amatoxins (Figure 18, pp.107) are the sole cause of death. The phallotoxins do not contribute to human poisoning. The most commonly used method for the detection of amatoxins is their reaction with cinnamic aldehyde (1 ml in 100 ml of methanol) and hydrochloric acid fumes. A rapid and sensitive high performance thin layer chromatographic method has been developed by Stijve and Seeger (1979) which enabled them to determine α-, β- and γ-amanitin in crude methanolic extracts of mushrooms. The detection limits are 50 ng for all the amanitins.

This is favoured over adsorption chromatography on Sephadex LH 20 followed by thin layer chromatography or amino-acid analysis as reported by Faulstich et al. (1974),

inhibition of RNA polymerase as advocated by Cochet-Meilhac and Chambon (1974) or radioimmunoassay (Faulstich, 1979).

A spot test for amatoxins has been developed by Wieland (Faulstich, 1979). Crushed mushroom juice containing amatoxins developed with 8N hydrochloric acid on newspaper gives a prussian blue colour. This assay may be used to detect amanitins in all deadly poisonous mushrooms.

6.2.2. Orellanine.

Orellanine is efficiently extracted into methanol after a first treatment with petroleum ether, "defatting" the mushroom. Good resolution of a number of yet unidentified fluorescent compounds is obtained, using thin layer chromatography on silica gel plates and a variety of eluents. A cyclo-hexane : ethyl acetate (3 : 1 v/v) solvent was found to give the best resolution by Greer (1980). No reagent give a sensitive reaction to orellanine and consequently ultra-violet fluorescence is recommanded.

Standard extracts of Cortinarius orellanus or C. speciosissimus may be used as reference until the structure of orellanine is characterised.

6.2.3. Muscarine.

Isolation of muscarine involves a large number of operations and all chromatographic estimations have to be carried out on partially enriched material isolated as a mixture of Reineckate salts of a group of quaternary ammonium compounds.

Good qualitative and quantitative results were obtained by Cunningham (1975) using derivatisation before gas chromatographic analysis. Defatted ethanolic extracts of mushrooms are purified on an alumina column eluted with methanol. Muscarine is demethylated with sodium benzene thiolate to its volatile nor-base, nor-muscarine. Nor-muscarine is separated from the reaction mixture with chloroform. Concentrated extracts are injected onto a 1 % Carbowax 20M gas chromatographic column at 130°C and detection is obtained by flame ionisation. Dimethylaminoethyl benzoate is recommanded as an internal standard.

6.2.4. Hallucinogens : Psilocybin and Analogues.

Defatted methanolic extracts of mushrooms give a fairly pure mixture of the indole hallucinogens psilocybin and baeocystin. A lengthy soxhlet extraction is proposed

in the literature, but it was found that 3 methanolic extractions gave just as good a result. No psilocybin could be detected in the third extract.

Several techniques have been used to analyse for psilocybin, psilocin and baeocystin in extracts of mushrooms.

Thin layer chromatography is a powerful analytical tool, best separation being obtained on silica gel G employing a solvent of butanol : acetic acid : water (2 : 1 : 1 v/v). Psilocin (R_f 0.52; 10 ng) and psilocybin (R_f 0.33; 15 ng) can be dectected using acidic para-dimethylaminobenzaldehyde (p-DAB) as the chromogenic reagent.

UV spectrophotometry: psilocin has an A^1_1 = 297 in methanol at λ = 267 nm and psilocybin an A^1_1 = 206 in methanol at λ = 268 nm

IR spectrophotometry: peaks are listed in order of decreasing intensity. Psilocin: 817; 1340; 1470; 1258 and 1041 and 3250; 1233 cm^{-1} . Psilocybin : 920; 1100; 1040; 1347; 1060; 748 and 960 and 1178 cm^{-1}.

High performance liquid chromatography: Perkal et al. (1980) recommend a system based on an ion exchange column of Whatman Partisil SCX 10, using a mobile phase

of methanol : water (20 : 80 v/v) containing 0.2 % of ammonium phosphate and 0.1 % KCl. Detection is by UV and fluorescence.

Psilocin and psilocybin have been analysed on a 1.5 % SE-30 (chromosorb W) gas chromatographic column by Repke et al. (1977).

6.2.5. Isoxazole Derivatives.

Ibotenic acid and muscimol are extracted from mushrooms with 50 to 75 % (v/v) ethanol and separated by thin layer chromatography using butanol : acetic acid : water (12 : 3 : 5 v/v) as solvent and ninhydrin as the chromophoric reagent.

Electrophoresis has also been proposed by Chilton and Ott (1976).

6.2.6. Coprine.

Coprine will extract into water but no rapid screening method has been described in the literature. The method of isolation described (Hatfield & Schaumberg, 1975) requires that the water extract is fractionated using anion exchange, silica-gel dry-column and Sephadex G-10 gel filtration chromatography. The compound reacts with ninhydrin.

6.2.7. Gyromitrin.

Gyromitrin and its analogues are volatile toxins which are readily distilled and analysed by gas liquid chromatography. Pyysalo (1975) proposes the use of FFAP capillary columns and mass spectrometric detection.

The Ehrlich reagent, dimethylaminobenzaldehyde, has been used for detection of gyromitrin on chromatograms. (List & Luft, 1968).

BIBLIOGRAPHY.

AINSWORTH, G. C. (1976) INTRODUCTION TO THE HISTORY OF MYCOLOGY Cambridge Univ. Press, Cambridge,Lon.,NY, Melbourne;

ANTKOWIAK, W. Z. & GESSNER, W. P. (1979) The Structure of Orellanine and Orelline Tetrahedron L. 21, 1931-34;

ANTKOWIAK, W. Z. & GESSNER, W. P. (1980) Personal communication, May;

ARIETTI, N. & TOMASI, R. (1969) I FUNGHI VELENOSI Edagricole, 2nd 1975, Bologna;

BORNET, A. (1980) INTOXICATIONS PAR CHAMPIGNONS AUTRES QUE L'AMANITE PHALLOIDE Thèse de doctorat du Centre Suisse d'Information Toxicologique et de l'Institut de Médecine légale de l'Université de Zürich, Zürich;

BUKU, A., WIELAND, T., BODENMULLER, H. & FAULSTICH, H. (1980) Amaninamide, a New Toxin of Amanita virosa Mushrooms Experientia 36, 33-34;

CATALFOMO, P. & EUGSTER, C. H. (1970) Amanita muscaria: Present Understanding of its Chemistry Bull. Narc. 22:4, 33-41;

CHAUVIN, M. (1922) Amanita citrina (Schaeff.) = A. mappa (Fr.) et sa variété alba ne paraissent pas vénéneuses Bull. Soc. Mycol. Fr. fasc. 4;

CHILTON, W. S. & OTT, J. (1976) Toxic Metabolites of Amanita pantherina, A. cothurnata, A. muscaria and other Amanita Species Lloydia 39:2&3, 150-157;

COCHET-MEILHAC, M. & CHAMBON, P. (1974) Mechanism of the Inhibition of RNA Polymerases B by Amatoxins Biochim. Biophys. Acta 353, 160-184;

CUNNINGHAM, L. V. (1975) Microanalytical Determination of Muscarine in Amanita muscaria (L. ex Fr.)Hooker by Gas Chromatography PhD Thesis, University of Connecticut;

DENNIS, R. W. G., ORTON, P. D. & HORA, F. B. (1960) New Check List of British Agarics and Boleti Trans. Br. Mycol. Soc. 43, Supplement 1-224. Reprint (1974) Cramer, Lehre, Bibliotheca Mycologica 42;

EUGSTER, C. H. (1969) Chemie der Wirkstoffe aus dem Fliegenpilz (Amanita muscaria) Fortschr. Chem. Org. Naturstoffe 27, 261-321;

EUGSTER, C. H. & WASER, P. G. (1954) Zur Kenntniss des Muscarins Experientia 10, 298-300;

FAULSTICH, H. (1979) New Aspects of Amanita Poisoning Klin. Wochenschr. 57, 1143-1152;

FAULSTICH, H., BUKU, A., BODENMULLER, H. & WIELAND, T. (1980) Virotoxins: Actin-binding Cyclic Peptides of Amanita virosa Mushrooms Biochem. 19, 3334-3343;

FAULSTICH, H., GEORGOPOULOS, D., BLOCHING, M. & WIELAND, T. (1974) Analysis of the Toxins of Amanitin-containing Mushrooms Z. Naturforsch. 29c, 86-88;

FAYOD, V. (1889) Prodrome d'une histoire naturelle des Agaricinés Ann. Sci. Nat. Paris, série 7, 9, 181-411;

FLAMMER, R. (1980) DIFFERENTIALDIAGNOSE DER PILZVERGIFTUNGEN Fischer V., Stuttgart, NY;

FRIES, E. M. (1821-32) SYSTEMA MYCOLOGICUM, SISTENS FUNGORUM ORDINES, GENERA ET SPECIES 3 vol., Griefswald, Lund;

GERAULT, A. (1976) LES CHAMPIGNONS SUPERIEURS ET LEURS INTOXICATIONS Thèse de Doctorat d'état en pharmacie Université de Rennes, Rennes;

GERAULT, A. & GIRRE, L. (1977) Mise au point sur les intoxications par les champignons supérieurs Bull. Soc. Mycol. Fr. 93:3, 373-405;

GOOD, R., MULLER, G. F. R. & EUGSTER, C. H. (1965) Isolierung und Charakterisierung von Prämuscimol und Muscazon aus Amanita muscaria (L. ex Fr.)Hooker Helv. Chim. Acta 48:4, 927-930;

GREER, F. M. (1980) CHEMICAL INVESTIGATIONS ON THE TOXINS OF CORTINARIUS SPECIOSISSIMUS AND RELATED MUSHROOM SPECIES MSc Thesis, Forensic Science Unit, Strathclyde University, Glasgow;

GRZYMALA, S. (1957) Massenvergiftung durch den Orangefuchsigen Hautkopf Z. Pilzk. 35, 249-261;

GUZMAN, G. (1978) Further Investigations of the Mexican Hallucinogenic Mushrooms with Descriptions of New Taxa and Critical Observations on Additional Taxa Nova Hedwigia 29, 625-663;

GUZMAN, G. & WATLING, R. (1978) Studies in Australian Agarics and Boletes. 1: Some Species of Psilocybe Notes Royal Bot. Garden, Edinburgh 36, 179-210;

HATFIELD, G. M. & SCHAUMBERG. J. P. (1975) Isolation and Structural Studies of Coprine, the Disulfiram-like Constituent of Coprinus atramentarius Lloydia 38, 489-496;

HAWKSWORTH, D. L. (1974) MYCOLOGIST'S HANDBOOK CAB, Kew;

HEIM, R. (1957) Sur les Psilocybes hallucinatoires des Aztèques et sur le microendémisme des Agarics utilisés par les Indiens du Mexique à des fins divinatoires. Comptes Rendus Ac. Sci. 245, 1761-1765;

HEIM, R. (1963) CHAMPIGNONS TOXIQUES ET HALLUCINOGENES Boubée, 2nd 1978 , Paris;

HEIM, R. & WASSON, G. (1958) LES CHAMPIGNONS HALLUCINOGENE DU MEXIQUE Muséum National d'histoire naturelle, Paris;

HENDERSON, D. M., ORTON, P. D. & WATLING, R. (1969) BRITISH FUNGUS FLORA. AGARICS AND BOLETI : INTRODUCTION HMSO, Edinburgh;

HENRY, R. (1931) CONSIDERATIONS ANCIENNES ET NOUVELLES SUR LES INTOXICATIONS FONGIQUES Péquignot, Besançon;

HOFMANN, A., HEIM, R., BRACK, A. & KOBEL, G. (1958) Psilocybin, ein psychotroper Wirkstoff aus dem mexikanischen Rauschpilz Psilocybe mexicana Heim Experientia 14, 107-109;

HOFMANN, A., HEIM, R., BRACK, A., KOBEL, H., FREY, A., OTT, H., PETRZILKA, T. & TROXLER, F. (1959) Psilocybin und Psilocin Helv. Chim. Acta 42,1557-1572;

HØILAND, K. (1978) The Genus Psilocybe in Norway Norw. J. Bot. 25, 111-122;

HULMI, S., SIPPONEN, P., FORSSTROM, J. & VILSKA, J. (1974) Mushroom Poisoning Caused by Cortinarius speciosissimus Duodecim 90, 1044-1050;

KUHNER, R. & ROMAGNESI, H. (1953) FLORE ANALYTIQUE DES CHAMPIGNONS SUPERIEURS, Masson et Cie, Paris

LARGENT, D., JOHNSON, D. & WATLING, R. (1977) HOW TO IDENTIFY MUSHROOMS TO GENUS III : MICROSCOPIC FEATURES Mad River Press, Eureka Cal.;

LEUNG, A. Y. & PAUL, A. G. (1968) Baeocystin and Norbaeocystin: New Analogs of Psilocybin from Psilocybe baeocystis J. Pharm. Sci. 57, 1667-1671;

LINCOFF, G. & MITCHEL, D. H. (1977) TOXIC AND HALLUCINOGENIC MUSHROOM POISONING Van Nostrand Reinhold, NY, Cinc., Atl., Dal., SF, Lon., Tor., Melb.;

LIST, P. H. & LUFT, P. (1968) Gyromitrin, das Gift der Frühjahrslorchel, Gyromitra (Helvella) esculenta Fr. Arch. Pharmazie 301, 294-305;

LYNEN, F. & WIELAND, U. (1937) Uber die Giftstoffe des Knollenblätterpilzes IV. Kristallisation von Phalloidin Justus Liebigs Ann. Chem. 533, 93-99;

MARGOT, P. (1977) POISONOUS AND HALLUCINOGENIC MUSHROOMS MSc Thesis, Forensic Science Unit, Strathclyde University, Glasgow;

MARGOT, P. (1979) On-line Identification Program of Poisonous and Hallucinogenic Mushrooms in OLIVER, J. Ed. (1980) FORENSIC TOXICOLOGY 221-235, Croom Helm Ltd, Lon.;

MARGOT, P., FARQUHAR, G. & TILSTONE, W. J. (1980) Application to Macro- and Micro-computers of an Identification Programme for Poisonous and Hallucinogenic Mushrooms of Forensic Interest Ed. MAEHLI, A. In press. First Scandinavian Meeting of Forensic Science, Linköping;

MARGOT, P. & WATLING, R. (1981) Studies in Australian Agarics and Boletes II. Further Studies in Psilocybe Trans. Brit. Mycol. Soc. In press;

MARTIN-SANS, E. (1929) L'EMPOISONNEMENT PAR LES CHAMPIGNONS Le Chevalier, Paris;

MISUSE OF DRUGS ACT (1971) HMSO, Lon.

MITCHEL, D. H. (1980) Amanita Mushroom Poisoning, Ann. Rev. Med. 31, 51-57;

MOFFAT, A. C. (1980) Forensic Pharmacognosy - Poisoning with Plants J. Forens. Sci. Soc. 20, 103-109;

MOSER, M. (1978) KLEINE KRYPTOGAMENFLORA IIb/2. DIE ROHRLINGE UND BLATTERPILZE 4th, Fischer, Stutt.,NY;

MULLER, G. F. R. & EUGSTER, C. H. (1965) Muscimol, ein pharmakodynamisch wirksamer Stoff aus Amanita muscaria Helv. Chim. Acta 48:4, 910-926;

NIEMINEN, L. (1976) THE NEPHROTOXICITY OF CORTINARIUS SPECIOSISSIMUS GATHERED IN FINLAND. AN EXPERIMENTAL STUDY IN THE RAT Research Center Lääke - Medipolar Turku, Finland. Zoophysiological Laboratory, Institute of Biology and Department of Forensic Medicine, University of Turku, Finland.;

OLA'H, G. M. (1969) LE GENRE PANAEOLUS Rev. Mycol., Mémoire Hors série 10, Faris;

ORTON, F. D. (1964) Notes on British Agarics II Notes Royal Bot. Garden, Edinburgh 26, 43-65;

ibid. (1969) Notes on British Agarics III Notes Royal Bot. Garden, Edinburgh 29, 75-127;

ibid. (1972) Notes on British Agarics IV Notes Royal Bot. Garden, Edinburgh 32, 135-150;

ibid. (1976) Notes on British Agarics V Kew Bull. 31:3, 709-721;

ibid. (1976) Notes on British Agarics VI Notes Royal Bot. Garden, Edinburgh 35, 147-153;

ORTON, P. D. & WATLING, R. (1979) BRITISH FUNGUS FLORA. AGARICS AND BOLETI 2. COPRINACEAE: COPRINUS HMSO Edinburgh;

PANKHURST, R. J. (1978) BIOLOGICAL IDENTIFICATION Edward Arnold, Lon.;

PAULET, J. J. (1793) TRAITE DES CHAMPIGNONS, 2 vol. Paris;

PERKAL, M., BLACKMAN, G. L., OTTREY, A. L. & TURNER, L. K. (1980) Determination of Hallucinogenic Components of Psilocybe Mushrooms Using High-performance Liquid Chromatography J. Chromatog. 196, 180-184;

PYYSALO, H. (1975) Some New Toxic Compounds in False Morels, Gyromitra esculenta Naturwissensch. 62:8,395.;

RAMSBOTTOM, J. (1953) MUSHROOMS AND TOADSTOOLS Collins, Lon.;

RAYNER, R. W. (1974) KEYS TO THE BRITISH SPECIES OF RUSSULA Br. Mycol. Soc. 2nd, Cambridge;

RAYNER, R. W. (1979) The Frequencies with which Basidiomycetes Species Other than Rusts and Smuts, Have Been Recorded on British Mycological Society Forays. Bull. Br. Mycol. Soc. 13:2, 110-125;

RELEASE PUBLICATIONS LTD (1979) HALLUCINOGENIC MUSHROOMS A RELEASE GUIDE, Release, Lon.;

REPKE, D. B. & LESLIE, D. T. (1977) Baeocystin in Psilocybe semilanceata J. Pharm. Sci. 66:1, 113-114;

REPKE, D. B., LESLIE, D. T., MANDELL, D. M. & KISH, N. G. (1977) GLC-MS Analysis of Psilocin and Psilocybin J. Pharm. Sci. 66, 743-744;

RUMACK, B. H. & SALZMAN, E. Eds. (1978) MUSHROOM POISONING : DIAGNOSIS AND TREATMENT CRC Press, West Palm Beach, Flo.;

SARTORY, A. & MAIRE, L. (1921) LES CHAMPIGNONS VENENEUX Le François, Paris;

SCHMIEDEBERG, O. & KOPPE, R. (1869) Das Muscarin Vogel, Leipzig;

SHORT, A. I. K., WATLING, R., MACDONALD, M. K. & ROBSON, J. S. (1980) Poisoning by Cortinarius speciosissimus Lancet 2: 8201, 942-943;

SINGER, R. (1975) THE AGARICALES IN MODERN TAXONOMY Cramer, Vaduz, FL 3rd;

SINGER, R. & SMITH, A. H. (1958) New Species of Psilocybe Mycologia 50, 142-143;

SINGER, R. & SMITH, A. H. (1958) Mycological Investigations on Teonanacatl, the Mexican Hallucinogenic Mushrooms Part II Mycologia 50, 262-303;

STEVENSON, J. (1879) MYCOLOGIA SCOTICA Cryptogamic Society of Scotland, Edin.;

STIJVE, T. & ROSCHNIK, R. (1974) Mercury and Methyl Mercury Content of Different Species of Fungi Trav. Chim. Aliment. Hyg. 65, 209-220;

STIJVE, T. & SEEGER, R. (1979) Determination of α-, β-, γ-amanitin by High Performance Thin Layer Chromatography in Amanita phalloides (Vaill. ex Fr.) Secr. Z. Naturforsch. 34c, 1133-1138;

WASSON, G. (1968) SOMA, DIVINE MUSHROOM OF IMMORTALITY Harcourt Brace Jovanovich, NY;

WATLING, R. (1967) Notes on some British Agarics Notes Royal Bot. Garden, Edinburgh 28, 39-52;

ibid. (1970) BRITISH FUNGUS FLORA, AGARICS AND BOLETI 1. BOLETACEAE: GOMPHIDIACEAE: PAXILLACEAE HMSO, Edin.;

ibid. (1972) Notes on British Agarics II Notes Royal Bot. Garden, Edinburgh 31, 359-363;

ibid. (1976) Validation of Two Species of Coprinus Notes Royal Bot. Garden, Edinburgh 35, 153-154;

WATLING, R. (1978) Relationship Between the Development of Higher Plant and Fungal Communities, Fungal Successions Ecology Group Meeting Bull Br. Mycol. Soc. 12:2, 123-127;

ibid. (1980) Orellanin Poisoning in Britain Bull. Br. Mycol. Soc. 14:1, 63.;

ibid. (1977) A Panaeolus Poisoning in Scotland Mycopath. 61:3, 187-190;

WIELAND, T. & FAULSTICH, H. (1978) Amatoxins, Phallotoxins, Phallolysins and Antamanide: the Biologically Active Components of Poisonous Amanita Mushrooms. CRC Critical Review Biochem. 5:3, 185-260;

WIELAND, H. & HALLERMAYER, R. (1941) Uber die Gifstoffe des Knollenblätterpilzes VI. Amanitin, das Hauptgift des Knollenblätterpilzes Justus Liebigs Ann. Chem. 548, 1-7;

WIELAND, T. & WIELAND, O. (1972) The Toxic Peptides of Amanita Species In MICROBIAL TOXINS: vol 8 : FUNGAL TOXINS, ed. KADIS, S., CIEGLER, A. & AJL, S.J. AP, NY 249-280;

WISEMAN, J. S. & ABELES, R. H. (1979) Mechanism of Inhibition of Aldehyde Dehydrogenase by Cyclopropanone Hydrate and the Mushroom Toxin Coprine Biochem. 18:3 427-435.