ATROPINE IN MUSHROOMS

THERAPEUTIC IMPLICATIONS

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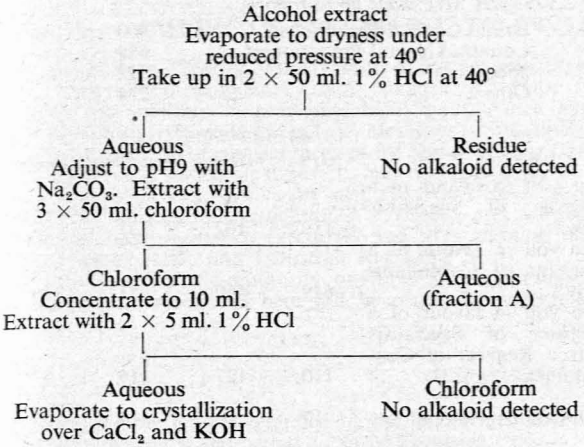
The fungi *Amanita muscaria* and *A. pantherina* are the commonest toxic species in the Western Cape, possibly in the whole of South Africa.[1] Treatment of poisoning by these varieties is usually based on the assumption that muscarine is the chief poison involved. However, attention has frequently been drawn to the fact that the neurological signs, confusion delirium, convulsions and dilatation of the pupil are inexplicable on this hypothesis; on the other hand they resemble the effects of atropine overdosage.[2, 3, 4] Kobert invoked an unidentified tropine pharmacologically resembling atropine, which he termed 'pilzatropin', while de la Rivière referred to 'myceto-atropine'. According to Ainsworth [5] nervous symptoms 'are generally attributed to muscaridine'.

The therapeutic significance of this atropine-like substance was emphasized recently;[4] the administration of atropine to antagonize symptoms due to so-called muscarine poisoning would be inadvisable if neurological signs due to 'myceto-atropine' were predominant.

PRESENT INVESTIGATION

In an attempt to characterize the alkaloids 1·0 kg. each of *A. muscaria* and *A. pantherina* were gathered in the

pine woods in the vicinity of the University of Cape Town during the early winter. After being dried at 60° they were extracted with 96% alcohol in the Soxhlet apparatus for 72 hours, and subsequently worked up according to the following scheme:



The crystalline yield from *A. muscaria* was 1·1 mg., and from *A. pantherina* 1·8 mg. In both cases reactions were obtained with several alkaloidal reagents; however, ferricyanide was not reduced, as would be expected of a betaine such as muscarine. The properties are compared in Table I with l-hyoscyamine. The material in both

TABLE I

	A. pantherina	*A. muscaria*	l-*Hyoscyamine*[6]
Melting point	107·5°	108°	108·5°
Crystalline form	Colourless needles	Colourless needles	Silky needles
Melting point of aurichloride	164°	163°	165°
Rf	0·7	0·7	0·72
Vitali's test	Positive	Positive	Positive
Bio-assay (rabbit pupil dilatation)	1·0 microgram active	Not tested	±0·5 microgram

cases was studied by paper chromatography with the solvent n-butanol 86 parts with 14 of acetic acid, saturated with water. The spots were developed with iodine vapour. The yields appeared homogeneous, Rf 0·7.

Fraction A from both species gave the reactions of a betaine, and probably contained muscarine.

Discussion

The alkaloids obtained from *A. muscaria* and *A. pantherina* were not distinguishable from l-hyoscyamine by the tests performed. This substance is the commonest naturally-occurring alkaloid of the tropane group.[6] While not ignoring the occurrence of geographical variation in alkaloidal content of mushrooms,[7] it appears that Kobert's 'pilzatropin' is in fact l-hyoscyamine, and that the neurological signs due to poisoning by mushrooms of the species studied are due to this alkaloid.

Atropine is the racemic (dl) form of l-hyoscyamine, and in its peripheral effects possesses about half the activity of the latter.

It has therefore been confirmed that atropine should not be used indiscriminately in the treatment of poisoning by *A. muscaria* and *A. pantherina;* the relative severity of atropine-like and muscarine-like effects should be assessed, and appropriate therapy administered.

SUMMARY

Two poisonous mushrooms abundant in the Cape, *Amanita muscaria* and *A. pantherina*, have been studied chemically and a substance with the properties of l-hyoscyamine isolated.

Certain of the features of poisoning produced by these fungi are probably due, not to muscarine, but to l-hyoscyamine. This should be borne in mind when assessing cases for treatment, as administration of atropine would aggravate the degree of poisoning.

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