

## THE THEORETICAL DESCRIPTION FOR MUSCIMOL COO(OH)-ASSISTED ELECTROCHEMICAL DETERMINATION IN MUSHROOM PULP AND BIOLOGICAL LIQUIDS

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Muscimol (Fig. 1) is the most toxic compound of *Amanita muscaria* mushroom. It is an ibotenic acid derivative, formed by its decarboxylation and it is considered 1000 times as toxic as the proper ibotenic acid:

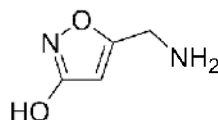


Fig. 1. Muscimol

It is a biogenic amine with mainly depressant, sedative and hallucinogenic biological action, acting as a GABA-agonist [1 – 2]. It was used for some time in epilepsy investigation, but the study was discontinued. Taking this into account, muscimol determination in mushroom pulp and biological liquids is really actual, and the electrochemical methods may give an efficient solution to this case.

As for now, no electrochemical methods to detect muscimol has been reported. Nevertheless, possessing electroactive moieties (isoxazolic ring, methylaminogroup) such an electrochemical detection may be carried out by either cathodic or anodic way.

In the last case, cobalt (III) oxyhydroxide may be used. It is a semiconducting material, similar to titanium dioxide, but far more electroactive. Both CoO/CoO(OH) and CoO(OH)/CoO<sub>2</sub> redox pairs may be used for this purposes, and the first pair may detect selectively muscimol, and the second one may detect muscimol in the presence of other ibotenic acid derivatives – the proper ibotenic acid and muscazone, due to the high potential of CoO(OH)/CoO<sub>2</sub> redox pair.

Two correspondent mathematical models have been developed and analyzed for muscimol determination. It has been shown that, despite of the enhance of the probability of the oscillatory behavior, the electroanalytical process will be efficient, and the linear dependence interval is foreseen to be wide.

### References

- [1] M. Voynova, A. Shkondrov, I. Krasteva, M. Kondeva-Burdina, *Pharmacia*, 68(2021), 147  
F.I. Rampolli, P. Kamler, C.C. Carlino, F. Bedussi, *Eur. J. Case Rep. Int. Med.*, 8(2021)