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Editorial

The Importance of Cooperation in Forensic Sciences: The Entomotoxicology

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INTRODUCTION

The continuous development of forensic sciences has given his contribution to the formation of different kind of highly skilled and specialized scientists who have to work together in order to help judicial authority and police to understand dynamics of a criminal event. These are experts in different fields of traditional sciences, such as chemistry, biology, physics, entomology, but they also need to go further through criminalistics. The combination of these kinds of knowledge allows to rightly perform the work in the crime scene, without interfering with others expert's work. Many different disciplines are focusing on the importance to co-work with experts in different fields in order to converge in unique direction, i.e. the positive solving of a judicial case.

Entomotoxicology

The Entomotoxicology is a fairly new discipline, based on the cooperation of forensic entomologists and the forensic chemists. This science is focused on the possibility to perform toxicological analysis using insects, feeding on decaying corpses, as unconventionally substrate instead of classical substrates as urine or blood. The toxicological analysis on necrophagous species of insects can be crucial for solving a judicial case, especially when conventional analysis are impossible to perform because of the condition or the absence of typical substrates. If a cadaver, or carrion, is found in an advanced stage of decomposition, is possible that biological fluids are no longer available for analysis, this fact is due to evaporation or percolation of fluids into the soil. The carrion insects, feeding on the corpse, could accumulate in the organism drugs or toxic substances taken by the subject or to which it was exposed in the moments preceding his death and the subsequent colonization [1]. The cadaver could also be considered as an ecosystem, where different species of insects and animals are involved in order to survive and reproduce; the bioaccumulation of the exogenous substances, for this reason, doesn't stop to the primary consumers of the food chain, flies and larvae from family *Calliphoridae* and *Muscidae*, but it would also be detected in secondary and tertiary consumers, such as other arthropods, e.g. *Histeridae* and *Silphidae,* preying and feeding maggots [2]. In addition to the toxicological information, whom should be considered during the determination of the possible causes of death, detecting drugs in insects, or in the substrate, could also be very important for the forensic entomologist for an accurate estimation of the post mortem interval (PMI): the time elapsed between the death and the finding of the cadaver. This interval depends on many factors, such as the approachability of the corpse and the temperatures, and can be estimated through the colonisation interval (CI), the time between the beginning of the colonisation by the insects and the moment when the cadaver is found. For this kind of determinations the entomologist has to consider the age of insects colonizing the corpse, based on the species and the dimensions. A great number of external factors, however, are involved in the aging and development of insects, such as the temperature and the presence of some contaminants in the substrate of nourishment.

Drugs effects on insects feeding on a cadaver

It has been experimentally shown, through many studies performed on different species of insects, how the presence of drugs in substrate can affect their dimensions and development [3]. Most of these studies are focusing on larvae, pupae, adults and residual forms from *Diptera*, an order of primary consumers of the food chain based on the decaying flash, and *Coleoptera*, secondary and tertiary consumers [4]. Over the years, in particularly from the 1970, the entomotoxicological studies were rapidly increased focusing on different kind of drugs: central system depressants, such as barbiturates [1], benzodiazepines and others tricyclic depressants [5], opiates, morphine and derivatives [6], stimulants and illicit drugs, e.g. cocaine [7] and recently methamphetamine [8], which had shown how the presence of this drug can affect the development of larvae and, if not considered, become a source of important errors in determining of PMI.

Analytical Methods

Different kinds of analytical methods have been used in order to perform these studies in dependence on the pursued sensibility or on the characteristics of the molecule detected; moreover is always necessary, according to studies previously performed, to choose accurately the right method and instrument to use, in order to have a quantitative extraction from chitinic substrates, as larvae or pupae, and an optimized detection for the analytes of interests. For this reason, through the years, many instruments were used for analysis and detection: ICP-MS was used for detecting metals, such as Pb, Ba, Sb from gunshot residues [9], while for the detection of licit and illicit drugs were used

both HPLC-MS [10] and GC-MS [8] In some cases the analyses performed on the larvae showed a sensitivity greater than conventional analyses [5].In addition, is important not to forget the aim of these studies: in order to make easier performing ~~of~~ such analyses and using them in legal proceedings is imperative to optimize and validate new analytical and extraction methods, based on both, species of insects and molecules detected [8].

CONCLUSIONS

Entomotoxicology is a rising and promising discipline, which also demonstrates the importance of having a close collaboration, in particular for what concern very broad scientific areas such as Forensic Science, between experts in different fields. Particularly, in that case, is necessary a very close co-work between forensic entomologists and forensic chemists in order to combine their knowledge and reach the common aim to figure out how the events causing a criminal fact were occurred.

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