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Forensic Relevance of The Suicide Tree "Cerebra Odollam"

Review Article

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Abstract

Cerbera odollam is a powerful toxic plant that is responsible both for suicide and homicide. The seeds are excessively toxic, containing cerberin as the main active cardenolide. Cerberin is difficult to detect in autopsies and its taste can be masked with strong spices. Therefore it is often used in homicide and suicide especially in India. Pathologists would not be able to identify Cerbera poisoning unless there is evidence the victim had eaten the plant. In this article we want to highlight the recent incidence of poisoning, present analytical techniques used as well the recent advances in identification of the cereberin toxin.

Keywords: Suicide; Homicide; Cerbera Odollam; Cerberin; Analytical Techniques.

Introduction

Cerbera odollam is a tree belonging to the poisonous Apocynaceae family, which includes the yellow and common oleanders [1]. The kernels of C. odollam contain cerberin, a potent cardenolide glycoside belonging to the cardiac glycoside family of toxins that includes digoxin [1, 2]. The poison blocks the calcium ion channels in heart muscle, causing disruption of the heart beat. This is most often fatal. Fatal dose is kernel of one fruit and the fatal period is about 1-2 days [2].

Cerbera odollam, which grows across India and south-east Asia, is used by more people to commit suicide than any other plant [3]. Forensic toxicologists in India and France who have conducted a review of deaths caused by plant-derived poisons warn that doctors, pathologists and coroners are failing to detect how often it is used to murder people [4].

A lot of work has been reported on toxicology of plants but only a few work has been done specially on poisonous plants study in terms of forensic context [2,3]. A plant dubbed the suicide tree kills many more people in Indian communities than was previously thought [4].

Poisoning Deaths from Cerbera Odollam

The seeds of cerbera odallam have a long history as a poison in Madagascar. The poison was responsible for the death of 2% of the population (3000 people per year, 50,000 per generation) of the central province of Madagascar. The use of ritual poison in Madagascar was abolished in 1861 by King Radama II. However, it is believed that this practice may still occur in remote areas of the island [5].

A team led by Yvan Gaillard of the Laboratory of Analytical Toxicology in La Voulte-sur-Rhône, France, documented more than 500 cases of fatal Cerbera poisoning between 1989 and 1999 in the south-west Indian state of Kerala alone. Half of Kerala's plant poisoning deaths, and one in 10 of all fatal poisonings, are put down to Cerbera. But the true number of deaths due to Cerbera poisoning in Kerala could be twice that, the team estimates, as poisonings are difficult to identify by conventional means [5, 6]. A 2004 study found that it's responsible for roughly a death per week in Kerala, most of them suicides. Researchers believe that more people have taken their own life using othalanga than any other plant in the world. In fact, women make up most of the victims of the "suicide tree," according to the 2004 study of the toxic plant [1]. In 2012, seven young women at an academy in

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Kerala reportedly tried to kill themselves by eating fruit from "the suicide tree". Recently in May 2015, again in the state of kerala another death was added to the suicide tree's account, a teenage athlete who consumed the fruit as part of an apparent suicide pact with her three roommates [7].

Forensic Dilema in Identification of the Toxin and the Recent advances in Analytical Techniques Available for Identification of the Poison

The structure of Cerberin makes difficult for their assay in mixtures and even more difficult in complex matrices such as biological fluids or tissues, mainly if low-cost methods are available. The detection of cerberin in human body fluids is very difficult using conventional analytical methods [3].

The first analytical procedure to date was developed by Malathy and Krishnamoorthy using thin layer chromatography [1, 3]. The authors successfully applied their method in several cases of odollam poisoning by comparing the chromatograms of various autopsy tissue extracts to extracts obtained from the odollam kernel [8]. Then they used high-performance liquid chromatography coupled with tandem mass spectrometry for the screening of a wide variety of poisons of plant origin [1]. This very powerful method enabled them to document a number of cases of homicide using plants, some of which would otherwise have gone unnoticed [7-9].

Most forensic science laboratories in India perform TLC assays for detecting active principles of Cerbera odollam, which is a common suicidal agent in some parts of the country, especially Kerala [10, 11]. There have been instances where a positive report for Cerbera odollam has been furnished, when no such history of ingestion was available. In some of these cases there was history of ingestion of cassava (Manihot esculenta), which is a staple food in some of the communities in Kerala. An earlier study had shown that the active principles of the two plants (one edible and other poisonous) could exhibit similar TLC profiles leading to confusion [10].

This was furthur substantiated by the study in Amrita institute of medical sciences, TLC patterns of the glycosides present in Cerbera odollam and Manihot esculenta were studied, and it was found that the results were similar to those of the other study. In order to develop an alternative method, which could be applied in suspected cases of Cerbera odollam poisoning, to avoid miscarriage of justice in medicolegal cases, HPLC was performed on the samples, which indicated that it could differentiate between the two [11].

This also suggests that some cases put down to suicide may actually have been murders. Although the kernels of the tree have a bitter taste, this can be disguised if they are crushed and mixed with spicy food. They contain a potent heart toxin called cerberin, similar in structure todigoxin, found in the foxglove [9, 10].

Only one method is reported so far for the determination of cerberin by UPLC-MS method [10, 11]. Unfortunately, the assay methods are not handy in smaller medical facilities, as they require sophisticated devices, procedures and highly trained staff [8, 9]. Recently a simple colorimetric method was performed for the determination of cerberin in rat plasma. Visible spectro-photometric determination of cerberin in rat plasma was done which could be tested on human plasma in the future [13].

Discussion

Cases of death caused by plants are certainly rare, but the example of Cerbera odollam (50 deaths on average a year recorded in the Indian state of Kerala alone) shows that such fatalities can be underestimated or unidentified due to the lack of analytical investigation as well as the lack of knowledge on the part of medical investigators. In cases of homicide by poisoning, biological proof very often represents the only substantive piece of evidence. Without analytical schema for the identification of such compounds as cerberin in post-mortem tissues and fluids, a cause of death may be overlooked, especially in countries far from the natural habitat of such plant material. For although one may imagine the importation of this poison into the west to be limited, some western cities have significant Indian, Malagasy or south-east Asian populations, each importing their own pharmacopoeia, myths and beliefs.

Conclusion

To conclude while not all of Nature's poisons are available to us next door, they are certainly accessible world wide via the World Wide Web. Times are changing, and it's keeping all toxicologist on their toes. Hopefully in the future better analytical methods for the toxin "cerberin" detection can help the law enforcement agencies in poisoning cases.

References

[1]. Gaillard Y, Krishnamoorthy A, Bevalot F (2004) Cerbera odollam: a 'suicide tree' and cause of death in the state of Kerala, India. J Ethnopharmacol. 95(2-3):123-126.
[2]. De Maleissye J (1991) Histoire du poison.
[3]. S Khajja, Mukesh Sharma, Rajveer Singh, Girish K, Mathur Khajja, et al., (2011) Forensic Study of Indian Toxicological Plants as Botanical Weapon (BW): A Review. J Environment Analytic Toxicol.1: 4.
[4]. James Randerson (2004) 'Suicide tree' toxin is 'perfect' murder weapon. New Scientist. 95: 123.
[5]. Rau MA (1940) Studies in the Apocynaceae. Journ Indian Bot Soc 19: 33-44.
[6]. Pichon M (1948) Classification des Apocynacees: V. Cerberoidees. VI. Genre "Tabernaemontana." Notulae Syst Mus Hist Nat Paris. 13: 212-224.
[7]. Teenager Dies in India After Eating Toxic Fruit, May 2015. http://www.nytimes.com/2015/05/08/world/asia/teenager-dies-in-india-after-eating-toxic-fruit.htm.
[8]. Chen KK, Steldt FA (1942) Cerberin and cerberoside, the cardiac principles of Cerbera odollam. J Pharm Exp Ther. 76(2): 167-174.
[9]. Hien TTM, Navarro-Delmasure C, Vy T (1991) Toxicity and Effects of the Central Nervous System of a Cerbera-Odollam Leaf Extract. J Ethnopharmacol. 34(2-3): 201-206.
[10]. Yamauchi T, Abe F, Wan ASC (1987) Cardenolide Monoglycosides from the Leaves of Cerbera-Odollam and Cerbera-ManghasCerbera III. Chem Pharm Bull. 35: 2744-2749.
[11]. Carlier J, Guitton J, Bevalot F, Fanton L, Gaillard Y (2014) The principal toxic glycosidic steroids in cerberamanghas L. seeds: identification of cerberin, nerifolin, tanhinin and deacetyltanghinin by UHPLC-HRMS/MS, quantification by UHPLC-PDA-MS. J chromatogr B. 962(1): 1-8.
[12]. Ramakrishnan UK, Pillay VV, Arathy SL (2014) Forensic Implications of Viscera Analysis in Death due to Cerbera odollam Poisoning.Toxicol Int. 10(1): 23- 27.
[13]. SS Prasanth, A Rajasekaran (2015) Visible spectro-photometric determination of cerberin in rat plasma. J App Pharma Sci. 5(3): 109-112.