Lionfish envenomations in Poland

14 injuries caused by lionfish Pterois volitans (L) kept in home aquariums were noted over a time period of 3 years. All the punctures occurred in the victims’ hands. Intense pain and systemic findings observed in 11 patients. Envenomations had a mild course, the patients were treated for their symptoms. Toxicology information centers have also recorded 3 cases of exposure to tank-bred lionfish in which typical envenomation symptoms did not appear. Those cases were probably what is referred to as “empty stings”, in which no toxin is injected into the victim’s body. Empty stings are known to be made by snakes, which can consciously inject no venom, while for lionfish, the lack of exposure to venom was probably caused by the structure of the venom organ in which there was no channel to deliver the venom.

Introduction

The production of toxic substances by fish is by no means rare. A venom or a toxin is generally defined as a substance, or more frequently a mixture of chemical compounds, produced by a living organism, actively excreted, toxic to other organisms, used to scare enemies away and/or to obtain food, or released after the death from the decomposing body [4,5]. Poisons found among fish are classified as chemical weapons. Some fish can actively inject these substances into their victims using organs composed of:
- glands or complexes of cells
- venom ducts (sometimes absent);
- venom fangs or fin rays.

The number of poisonous fish is estimated at 500, while venomous ones number over 2,000. Unfortunately, fish toxins, unlike those of snakes, amphibians, spiders and scorpions, have not been researched in detail so far. This is due to the difficulty in obtaining the appropriate extracts of fish venoms that would have high thermal lability [4,5].

Among all toxic fish, the following are distinguished:
- actively venomous fish including those that are actively poisonous, which produce a venom and have developed a venom organ in the form of spikes, and passively poisonous, whose bodies contain toxic elements;
- crypto-toxic fish, e.g. those whose blood or serum is toxic.

The majority of species possessing venoms, including the most dangerous ones, live in tropical waters, but the rapid, widespread popularity of aquariums means that almost any species of fish can be bought for keeping in home freshwater and marine tanks, also in Poland [7, 8]. Worldwide statistics indicate that every year, there are between 40 and 50 thousand cases of exposure to fish venom. Envenomation with fish venom constitutes a separate group of envenomations, even if only due to the different diagnostic procedure [5]. Toxicology centers forecast a great growth in the number of cases of such exposure in the coming years due to the exploding fashion to keep tropical fish in home aquariums [3]. This communication reports the observation of 14 human beings injured by lionfish in Poland.

Materials and methods

The author identified and documented 14 injuries caused by lionfish over an 3 years period in Poland. In every analyzed case, account was taken of the structure of the venom organ, the composition of the toxin and their impact on the course of the envenomation. The patient was assessed by a toxicologist. Patients were followed up to record clinical manifestations associated with the envenoming and its complications. In addition, special examinations were conducted at the toxicology lab, as well as a complete blood test, the assessment of the homeostasis, electrolytes, a urine analysis and an ECG.
The patients were also interviewed about their aquariums and the course of the exposure.

Results
Toxicology centers in Poland observed 14 exposures to lionfish kept in home aquariums. The envenomation most frequently occurred during tank tending and fish feeding. Victims were usually young and male 16-42 years. The wounds, without any laceration, were on the left hand in three victims, right hand in 11. Wounds were accompanied with very severe pain and swelling, typical for such cases. The clinical manifestations of envenoming were similar in 11 cases: extreme pain associated with the site of injury. Systemic effects such as vomiting, fever and sweating have been recorded in 11 cases. Envenomations had a mild course, the patients were treated for 3-4 days. The tests conducted – full blood morphology, homeostasis assessment, electrolytes, urine analysis and ECG – did not exhibit major deviations from the norm. In all cases, the aquarists were aware of the threat posed by the fish they kept. We have also captured 3 cases where, regardless of the exposure to the lionfish, the characteristic symptoms of the envenomation such as the severe pain and swelling did not occur. The victims described their exposure as "scratches". In this cases the patients were clinically observed, antibiotics and tetanus prophylaxis was also given.

Discussion
Fish skin in general contains only single-cell glands which excrete a mucus or a serum. The number of glands, their appearance and type of excreted substance are very varied and constitute a typical feature of particular systematic units [1]. In some fish species, single-celled glands may be collected into larger complexes and form organs that resemble multi-cellular venom glands of terrestrial animals. Cartilaginous and bony fish have concentrations of venom cells located on various parts of the body, and even if they are surrounded with connective tissue sheath, they do not have a common outlet [1,5]. In addition, there are larger, strengthened fin rays which form long and thick spines, sometimes with sharp ends, which can be blocked once the animal has bristled. Envenomation occurs through mechanical pressure on the spine, which tears the integumentary sheath encasing the spine, permitting the venom to escape into the wound [4,5,8,9]. The problem with extracting particular venoms and their sensitivity to temperature make it very difficult to research their action. So far, the composition of only some has been determined [4]. Since 1990, the number of people keeping exotic house pets has grown steadily in Europe, resulting in both a greater range of imported venomous species and an increasing number of envenomations in private homes [3]. Today, a wide variety of dangerous pets, including poisonous fish, are readily available for purchase. Envenomation cases frequently recorded in Poland were exposures to lionfish. These enchantingly beautiful fish of tropical and subtropical waters move majestically in their natural environment. This appearance has made them extremely popular in home marine tanks. They grow up to 30 cm long. Large pectoral fins whose rays are joined with a membrane only at the root can be spread wide like wings; long rays of the first dorsal fin can also stick out separately. The venom organ consists of 12 or 13 (sometimes even up to 18) rays of the first dorsal fin, the rays of pelvic fins and the anal fin. The pectoral fins are not connected to venom cells. The elongated rays of pelvic fins and of the first dorsal fin have no groove, so when the rays of these fins are pressed, the venom is ejected at their root [2,4]. Breeders frequently feed lionfish by hand. The venom of P. volitans acts on the adrenergic and cholinergic muscarin receptors, block calcium channels and inhibit sodium and potassium flow [2]. The course of the envenomation depended on several factors: fish species and age, the amount of venom entering the victim's body – the strength with which the venomous spine was pushed into the victim's body, as well as the age and weight of the victim. Symptoms of lionfish envenomation resemble those of other fish of the family Scorpaenidae [2, 6, 4]. The injury accompanied by particular oedema and extreme pain associated with the site of injury. Systemic effects such as vomiting, fever and sweating have been recorded. In our study in 11 cases typical symptoms with systemic manifestations was observed, we did not observe cutaneous necrosis. The body parts pricked were the fingers or the hand. Treatment consisted of hot water application, pain management, use of antibiotics and tetanus prophylaxis. Additionally toxicology information centers have also recorded 3 cases of exposure to tank-bred lionfish in which typical envenomations symptoms did not appear. The victims described their exposure as "scratches" and did not report any pain sensations. There were also no systemic symptoms characteristic for lionfish envenomation. Those cases were probably what is referred to as "empty stings", in which no toxin is injected into the victim's body. Empty stings are known to be made by snakes, which can consist of epididymal venom glands, while for lionfish, the lack of exposure to venom was probably caused by the structure of the venom organ in which there was no channel to deliver the venom [5]. What was important for the course of the observed envenomations was that it was always fingers that were pricked.

References