

Preparing for venomous snake bites in Europe

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The most common venomous snake in Europe is the *Vipera berus* or common European adder, while no extremely venomous snakes are free-living in nature. At present, exotic venomous snakes are in Europe only found in captivity (zoo or as a pet). Toxicity by venomous snakes can be characterized by three major features as follows: cytotoxic (swelling and tissue damage in the bite area), neurotoxic (paralysis or other nervous system injuries) or hemotoxic (blood clot disturbances). Treatment is mainly supportive, with administration of antivenom (immunoglobulins) for specific indications. Different publications point out that European medical staff (paramedics, nurses and physicians) do not have the needed education and experience for proper and adequate treatment of venomous snake bites [1–5].

In the retrospective case series by Hermansen *et al.*, 36% of the patients developed moderate to severe toxicity after envenomation by *Vipera berus*, while 15% required ICU admission. In their study, the most common complaints on admission were pain, gastrointestinal symptoms, syncope, discoloration and edema. Though the fact that timely antivenom administration reduces symptoms and length of stay, only 10 patients out of 219 (5%) received antivenom [1].

As discussed during the 2019 European Emergency Medicine Congress, climate change has an increasing impact on incidence and presentations of natural poisonings (mushrooms, palytoxin, tetrodotoxin and ciguatera poisoning). Additionally, as the temperature is rising the habitat of snakes, including venomous species, could shift or enlarge within Europe, even more towards the Northern hemisphere [6].

Exotic venomous snakes kept in captivity are an additional risk, especially those kept as pets. For venomous snakes kept in zoos, treatment strategies, including antivenom stocking and administration indications, are largely established. Exotic venomous snakes kept as pets pose a bigger risk. Most often, there are no stocked antivenoms, and the owners have not thought about the risks associated with a venomous bite from their pet. With climate change, an additional risk arises that escaped or liberated venomous snakes could survive or settle themselves in nature in Europe [7–10].

The treatment of venomous snakebites is supportive, with early administration of antivenom (if available) in specialized hospitals. With the presence of *Vipera berus* in most European countries, we advocate a proper education of medical staff on correct prehospital and hospital treatment, including the use of antivenom (Viperfav) in an early stage (grade II). The stocking of antivenom against European vipers seems to be well organized and established, but the stocking strategy varies among different countries [9,11,12].

Nevertheless, in our opinion, we currently are not adequately prepared to treat patients suffering from venomous exotic snakebites in Europe. The number of patients is limited, but one can expect a rise in patients due to climate change and the rise in captive exotic venomous snakes, mainly due to a rise in domestic pets. Not only seems education for medical staff to be lacking, but there is also no central registry organizing the distribution of stocking antivenom stocks for exotic venomous snake bites in Europe is scattered, which means that availability of it is. As some exotic snakes can be extremely venomous, an adequate, timely and fast administration of antivenom is essential, sometimes even life saving.

Given the high cost of antivenom, the short shelf life, acquisition issues and storage standards, centralizing stocks of antivenoms for venomous snakes seems the way forward. The Netherlands, France and recently Belgium, have centralized their national stocks of antivenoms for exotic venomous snakes. The European Society for Emergency Medicine (EUSEM) and the European Association of Poisons Centres and Clinical Toxicologists (EAPCCT) could take the lead in formalizing this concept. The national or local Poison Centres should be aware of the stocking place and the different antivenoms, so they could guide the medical staff towards the nearest, adequate antivenom. If needed, a centralized European database can be created [11,13].

Nowadays, there is only limited and scattered data on the number of venomous snakebites in Europe, including the associated mortality and morbidity. We, therefore, propose a central European registry for venomous snakebites, detailing at least the incidence of snake

bites, involved snake species, mortality, morbidity and antivenom use.

Climate change will change the natural poisonings in Europe, with the first signs already being visible. A rise in venomous snakebites can be expected throughout the whole of Europe, and as emergency physicians, we have to be prepared. The EUSEM and EAPCCT can play an important role in organizing adequate education and training for emergency physicians and setting up centralized antivenom stocks.

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Conflicts of interest

There are no conflicts of interest.

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