Snake venom proteomics, immunoreactivity and toxicity neutralization studies for the asiatic mountain pit vipers, ovophis convictus, ovophis tonkinensis, and hime habu, ovophis okinavensis

ABSTRACT

Snakebite envenomation is a serious neglected tropical disease, and its management is often complicated by the diversity of snake venoms. In Asia, pit vipers of the Ovophis species complex are medically important venomous snakes whose venom properties have not been investigated in depth. This study characterized the venom proteomes of Ovophis convictus (West Malaysia), Ovophis tonkinensis (northern Vietnam, southern China), and Ovophis okinavensis (Okinawa, Japan) by applying liquid chromatography-tandem mass spectrometry, which detected a high abundance of snake venom serine proteases (SVSP, constituting 40–60% of total venom proteins), followed by phospholipases A2, snake venom metalloproteinases of mainly P-III class, L-amino acid oxidases, and toxins from other protein families which were less abundant. The venoms exhibited different procoagulant activities in human plasma, with potency decreasing from O. tonkinensis > O. okinavensis > O. convictus. The procoagulant nature of venom confirms that consumptive coagulopathy underlies the pathophysiology of Ovophis pit viper envenomation. The hetero-specific antivenoms Gloydius brevicaudus monovalent antivenom (GbMAV) and Trimeresurus albolabris monovalent antivenom (TaMAV) were immunoreactive toward the venoms, and cross-neutralized their procoagulant activities, albeit at variably limited efficacy. In the absence of species-specific antivenom, these hetero-specific antivenoms may be useful in treating coagulotoxic envenomation caused by the different snakes in their respective regions.