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Snake envenomation (ophitoxemia) of domestic animals in Croatia - risk factors

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AntiTox New 20624
(Beata Halassy)



Snake bite envenomation (gr.ophitoxemia)

... is the term that characterizes the clinical spectrum of snake bite envenomation.

- envenomation is a neglected public health problem in humane and veterinary medicine
- medical importance snake family in Europe: family *Viperidae*, subfamily *Viperinae*



head details – long-nosed viper, nose –
horned viper



head details– meadow viper, Orsini's
viper



head details– European viper, common
viper

Venomous snakes in Croatia

Common name	Species/subspecies	Subspecies in Croatia	Distribution in Croatia	Conservation status
nose-horned viper	<i>Vipera ammodytes</i> L. <i>V.a. ammodytes</i> <i>V.a. meridionalis</i> <i>V.a. montadoni</i> <i>V.a.transcaucasiana</i>	<i>V.a.ammodytes</i>	the whole Mediterranean part, Gorski Kotar, Lika, Kordun, SW Croatia - south slopes of Žumberak and Samobor hills, Medvednica, Strahinjščica, Ivanščica and Kalnik, Croatian Zagorje and Istria; Islands - only confirmed on Krk, Pag, Vir, Brač, Hvar, Korčula and Mljet	NT ¹
common European adder	<i>Vipera berus</i> L. <i>V.b. berus</i> <i>V.b. bosniensis</i> <i>V.b.sachalinensis</i> <i>V.b.nikolskii</i>	<i>V.b. berus</i>	the mountainous regions of Gorski Kotar and probably on the Velika and Mala Kapela	LC ²
		<i>V.b. bosniensis</i>	the lowlands of Croatia, in the lowlands of the large rivers(Sava, Drava, Mura and the Danube)	LC
meadow viper, (Ursini's viper)	<i>Vipera ursini</i> B. <i>V.u. macrops</i> <i>V.u. graeca</i> <i>V.u. moldavica</i> <i>V.u. rakosiensis</i>	<i>V. ursinii ssp. (Cro)</i>	strictly limited locations: South Velebit, Poštak, Lisac, Dinara, Troglav and Kamešnica	EN ³ , VU ⁴ /endemic

¹NT - near threatened species

²LC - last concern species

³EN - endangered species

⁴VU - vulnerable species

Vipera ammodytes L.

the largest and most medically important snake of southern Europe

- **Description:**

- **subspecies in Croatia – *Vipera ammodytes ammodytes* (Vaa)**
- max.total length 85 cm (male > female, max. 110 cm)
- characteristic: a single soft and flexible horn on the snout (in *Vaa* it points diagonally forward)
- colour pattern - from light grey to black and from yellow to dark brown with typical darker zig-zag dorsal pattern

- **Habitat:**

- dry, rocky hillsides with sparse vegetation, woodlands
- may be found from 0-1800 m a.s.l.

- **Feeding:**

- lizards, mammals, birds

- **Reproduction:**

- mating (april – may), eggs hatching (august-october) – ovoviviparous



Vipera berus L.

the most widespread and medically important snake in Europe

Description:

subspecies in Croatia – *Vipera berus berus* (*Vbb*) and *Vipera berus bosniensis* (*Vbbos*)

max. total length 60-70 cm (male < female)

characteristic: white supralabial scale

colour pattern - from very light colored specimens with darker zig-zag dorsal pattern to melanistic individuals

Habitat:

Vbb - rocky hillsides from 800-1600 m a.s.l.

Vbbos – wet habitats in the lowlands of the large rivers (0-400 m a.s.l.)

Feeding:

lizards, mammals, frogs, newts, and salamanders

Reproduction:

mating (april – may), eggs hatching (august-october) – ovoviviparous



Vipera ursinii L.

the smallest viper in Europe; it is not medically important

Description:

subspecies in Croatia – *V. ursinii* ssp. (CRO) – yet undescribed subspecies - endemic

max.total length 50 cm (male < female)

characteristic: looks like common adder with difference snout colour pattern - gray, tan, or yellowish with a dark undulating dorsal stripe

Habitat:

strictly limited locations on from 1000-1800 m a.s.l.

Feeding:

crickets, locusts, lizards

Reproduction:

mating (april – may), eggs hatching (august-october) – ovoviviparous



Lethal toxicity (LD₅₀ in µg), hemorrhagic activity (MHD in µg), average amount of venom yield, and fang length of venomous snake in of Croatia

	<i>V. ammodytes ammodytes</i>	<i>V. ursinii ssp. (CRO)</i>	<i>V. berus berus</i>	<i>V. berus bosniensis</i>
LD ₅₀ (µg)	4,4 - 13,7 ¹	37,01 ± 0,05 (n=3) ²	11,1 – 12,9 ³	9,15 – 11,1 ⁴
MHD (µg)	21,6 - 42,8	34,12 ± 4,75 (n=4)	> 12	> 50
fang lenth (mm)	8-12	2-2,5	4-6	4-6
venom yield (mg)	10-45	0,5-4	4-10	4-10

¹depending on the geographical location (as determined by HALASSY et al, 2011.)

²measured only for the collection sample from the Poštak

³measured for *in house* standard of the Institute of Immunology Inc., Zagreb

⁴measured only for pooled samples of venom from location Šumeće, Slavonski Brod

Major proteins family in viper venom

Enzymes from Snake Venom :

- secreted phospholipases A₂ (sPLA₂) – groups IA, IIA
- metalloproteinases (SVMPs)
- serine proteases
- L-amino acid oxidase(LAAO)
- acetylcholinesterase

Catalytically inactive :

- disintegrin
- vascular endothelium growth factor-VEGF
- cystein rich protein-CRISP
- etc.

139 protein dots,
only 38 identified

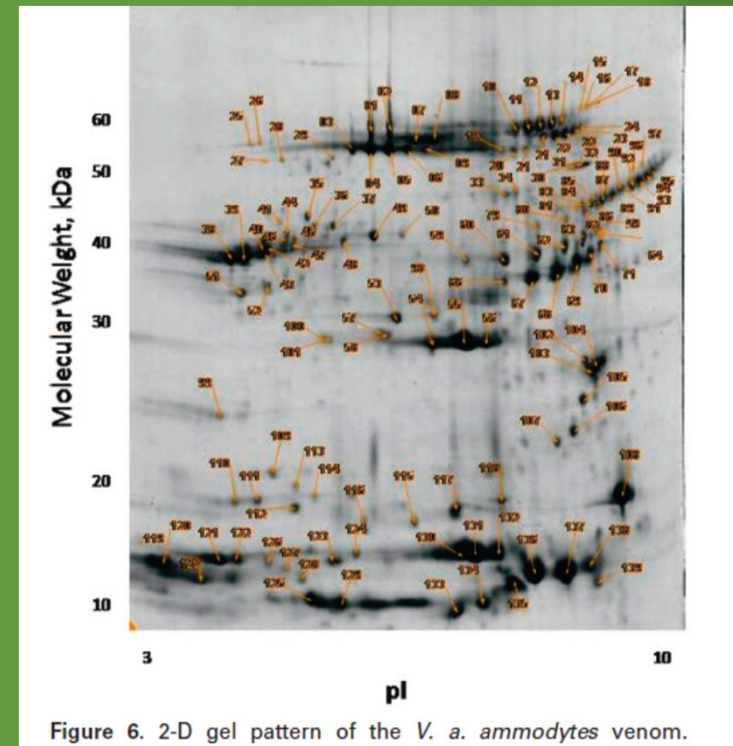
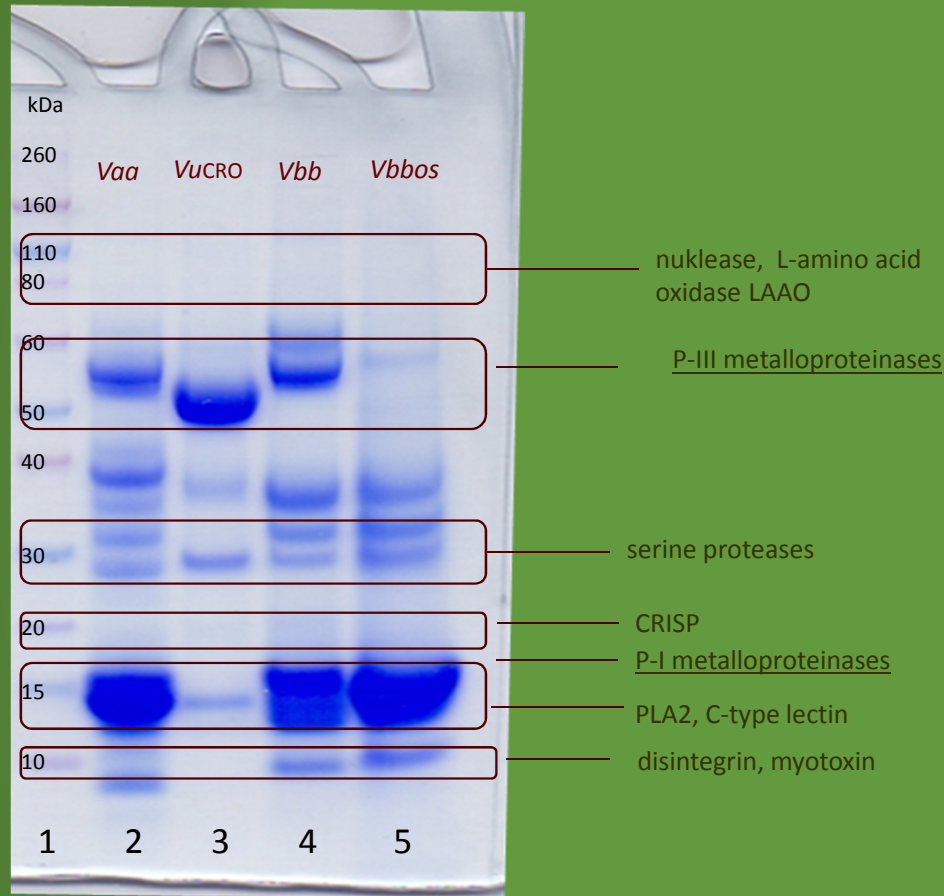


Figure 6. 2-D gel pattern of the *V. a. ammodytes* venom.

Georgieva D et al.
Journal of Proteome Research 2008;
7: 866-886.

Comparison of different snake venoms from Croatia



Line:

1. molecular weight standards(kDa)
2. *V. ammodytes ammodytes* (*Vaa*)
3. *V. ursinii ssp.var. Croatia* (*VuCRO*)
4. *V. berus berus* (*Vbb*)
5. *V. berus bosniensis* (*Vbbos*)

Protein identification by mass spectrometry (peptide mass fingerprint and MS/MS); each lane contains 40 μ g of venom; SDS-PAGE of venoms was performed under reducing conditions (basic protein families are marked according to Maskessy, S.P. (2010))

Data from Ministry of Environment and Energy,
Directorate for nature protection - damages
claims caused by protected species

region	perpetrator	2015	2016	2017	Damages claims
Lika-Senj Country	nose-horned viper	0	1	1	2
Zadar region	nose-horned viper	7	0	6	13
Total score		7	1	7	15






Survey results

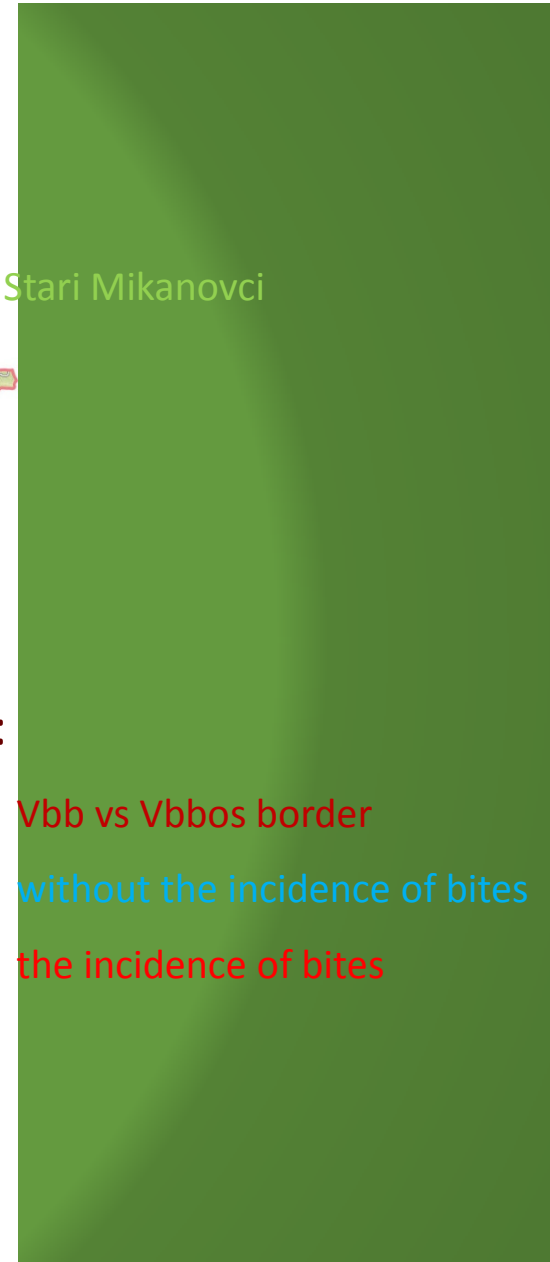
epidemiological study of the occurrence of snake bites in domestic and companion animals in Croatia

animals	number
dog	59
sheep	14
cat	4
cow	1
horse	1



legend:

-  Vbb vs Vbbos border
-  without the incidence of bites
-  the incidence of bites



Conclusion:

- the clinical picture of snake venom envenomation in domestic animals is difficult to detect
- most medically important snake in Europe is *V. berus berus*, but the nose-horned viper is the most dangerous and medically important snake in South Europe (Croatia), both for human and for veterinary medicine
- the questionnaire showed there is no evidence of snake bite by *Vipera berus* in Croatia
- there is no published data or case report of *Vipera ammodytes* snake bite in domestic or companion animals

thank you
for your attention



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