

## Possible antimicrobial defense by free sugars on the epidermal surface of aquatic vertebrates

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Table A1. Lectin histochemistry results for the epidermis of fishes: cod *Gadus morhua*, marine trout *Salmo trutta trutta*, freshwater trout *Salmo trutta fario*, perch *Perca fluviatilis*. 0 = no reaction, 1 = very weak, 2 = weak, 3 = moderate, 4 = strong, 5 = very strong; **bold: strong reactions**

Lectins	Species	Str. superficiale	Str. spinosum (outer part)	Str. spinosum (inner part)	Str. basale	Goblet cells	Granular cells	Sacciform cells
PO-Con A-DAB	Cod	<b>2 to 3</b>	2	2	2 to 3	<b>3 to 4</b>	–	0
	Marine trout	<b>4 to 5<sup>a</sup></b>	<b>3 to 4<sup>a</sup></b>	2 to 3 <sup>a</sup>	2 to 3	1 to 2	<b>3 to 4</b>	–
	Freshw. trout	<b>4 to 5</b>	<b>3 to 4<sup>a</sup></b>	2 to 3	2 to 3	2	<b>4 to 5</b>	–
	Perch	1	0 to 1	0 to 1	0 to 1	0 to 3	–	0 to 3
PO-WGA-DAB	Cod	<b>4 to 5</b>	<b>4 to 5</b>	<b>2 to 4</b>	2 to 3	<b>5</b>	–	0
	Marine trout	<b>5</b>	<b>4</b>	3	2 to 3	1 to 3	2	–
	Freshw. trout	<b>4 to 5</b>	<b>3 to 4</b>	3	2 to 3	2	2 to 3	–
	Perch	<b>5</b>	<b>4 to 5</b>	<b>4</b>	<b>4</b>	2	–	<b>5</b>
PO-GSA-II-DAB	Cod	2	2	2 to 3	3	<b>3 to 4</b>	–	0
	Marine trout	2	0 to 1	0 to 1	0 to 1	0	1	–
	Freshw. trout	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	–
	Perch	<b>3</b>	<b>3 to 4</b>	3	2 to 3	2	–	0 to 1
PO-DBA-DAB	Cod	<b>4</b>	<b>3 to 4</b>	3	3	<b>4</b>	–	0
	Marine trout	<b>5</b>	<b>4 to 5</b>	2 to 3	2	2 to 3	2	–
	Freshw. trout	<b>4 to 5</b>	<b>3 to 4</b>	2 to 3	2 to 3	2	3	–
	Perch	<b>4</b>	<b>4</b>	<b>2 to 4<sup>a</sup></b>	2 to 3	2	–	<b>5</b>
PO-SBA-DAB	Cod	<b>4</b>	<b>3 to 4</b>	3	3	<b>4</b>	–	0
	Marine trout	<b>4 to 5</b>	<b>4</b>	2 to 3	2	3	1 to 2	–
	Freshw. trout	<b>4</b>	<b>3 to 4</b>	2 to 3	2 to 3	3	<b>4</b>	–
	Perch	<b>5</b>	<b>4 to 5</b>	<b>4</b>	<b>4</b>	<b>4 to 5</b>	–	<b>4 to 5</b>
PO-GSA-I-DAB	Cod	<b>4</b>	3	2	2 to 3	3	–	0
	Marine trout	<b>4 to 5</b>	<b>4</b>	2 to 3	2 to 3	3	<b>4</b>	–
	Freshw. trout	<b>4</b>	<b>3 to 4</b>	2 to 3	2 to 3	<b>4</b>	<b>3 to 4</b>	–
	Perch	<b>4 to 5</b>	<b>3 to 4</b>	3	2	2	–	<b>2 to 4</b>
PO-BPA-DAB	Cod	4	<b>3 to 4</b>	3	3	2 to 3	–	0
	Marine trout	4	<b>3 to 4</b>	3	2 to 3	<b>3 to 4</b>	<b>3 to 4</b>	–
	Freshw. trout	<b>3 to 4</b>	<b>3 to 4</b>	3	2 to 3	3	<b>4 to 5</b>	–
	Perch	<b>4 to 5</b>	<b>4</b>	<b>3 to 4<sup>a</sup></b>	<b>3 to 4</b>	2 to 3	–	3
PO-PNA-DAB	Cod	<b>3 to 4</b>	2 to 3	2	3	2	–	0
	Marine trout	<b>5</b>	<b>4</b>	<b>3 to 4</b>	3	<b>3 to 4</b>	2	–
	Freshw. trout	<b>3 to 4</b>	<b>4</b>	3	2	0	2 to 3	–
	Perch	<b>4 to 5</b>	<b>4</b>	<b>4</b>	2 to 3	2 to 3	–	<b>4</b>
PO-UEA-I-DAB	Cod	<b>3</b>	3	2 to 3	2 to 3	2 to 3	–	0
	Marine trout	2 to 3	1 to 2	1 to 2	1 to 2	0	2	–
	Freshw. trout	2 to 3	1 to 2	1	1	0	2 to 3	–
	Perch	<b>3 to 4</b>	3	3	2	2	–	1
PO-LFA-DAB	Cod	2 to 3	1 to 2	1	1 to 2	1	–	1 to 2
	Marine trout	2 to 3	2 to 3 <sup>a</sup>	2	2	0 to 1	2	–
	Freshw. trout	<b>3</b>	2 to 3	2	1	2 to 3	2 to 3	–
	Perch	<b>3</b>	2 to 3	2	2	2 to 3	–	2 to 3

<sup>a</sup> mainly interlamellar substances

Table A2. Lectin histochemistry results for the epidermis and skin glands of amphibians: aquatic caecilian *Ichthyophis kohtaoensis*, smooth newt *Triturus vulgaris*, edible frog *Rana esculenta*, South-African clawed toad *Xenopus laevis*. 0 = no reaction, 1 = very weak, 2 = weak, 3 = moderate, 4 = strong; **bold: strong reactions**

Lectins	Species	Epidermis				Skin glands	
		Str. corneum	Str. ganulosum	Str. spinosum	Str. basale	Mucus glands	Granular glands
PO-Con A-DAB	Caecilian	2 to 3	2 to 3	1 to 2	1 to 2	1 to 3	2 to 3
	Newt	1 to 3	1 to 3 <sup>a</sup>	1 to 3 <sup>a</sup>	1 to 3 <sup>a</sup>	1 to 2	1
	Frog	<b>3 to 4</b>	0	0	0	1 to 3	1
	Toad	2 to 3	0	0	0	1 to 3	1
PO-WGA-DAB	Caecilian	<b>3 to 4</b>	2	1 to 3 <sup>a</sup>	1 to 3 <sup>a</sup>	<b>3 to 4</b>	2 to 3
	Newt	1 to 3	1 – 3 <sup>a</sup>	1 to 3 <sup>a</sup>	1 to 3 <sup>a</sup>	<b>3 to 4</b>	1 to 2
	Frog	<b>3 to 4</b>	0 – 1	0	0	1 to 2	0 to 1
	Toad	0	1 to 3 <sup>a</sup>	1 to 3 <sup>a</sup>	1 to 3 <sup>a</sup>	<b>3 to 4</b>	1 to 2
PO-GSA-II-DAB	Caecilian	1 to 2	1 to 2	1 to 2	1 to 2	1 to 2	1 to 2
	Newt	1	1 to 2	1 to 3 <sup>a</sup>	1 to 2 <sup>a</sup>	1 to 2	1 to 2
	Frog	2	2 to 3 <sup>a</sup>	3 <sup>a</sup>	<b>3 to 4</b>	<b>1 to 4</b>	<b>3 to 4</b>
	Toad	1 to 2	2	1 to 3	1 to 3	1 to 3	2
PO-DBA-DAB	Caecilian	1 to 2	1 to 2	1 to 2	1	1 to 2	1 to 2
	Newt	1 to 2	<b>1 to 4<sup>a</sup></b>	<b>2 to 4<sup>a</sup></b>	<b>1 to 4<sup>a</sup></b>	1 to 2	1 to 2
	Frog	1 to 2	1 to 2 <sup>a</sup>	1 to 3 <sup>a</sup>	3 <sup>a</sup>	1 to 2	<b>3 to 4</b>
	Toad	1 to 2	<b>1 to 4</b>	1 to 3	1 to 2	1 to 2	1 to 2
PO-SBA-DAB	Caecilian	2 to 3	2	1 to 2	1 to 2	2	3
	Newt	1 to 2	1 to 2	1 to 2	1 to 2	1 to 2	1 to 2
	Frog	1 to 2	1 to 2 <sup>a</sup>	1 to 3 <sup>a</sup>	3 <sup>a</sup>	1 to 2	3
	Toad	1 to 2	1 to 3	1 to 3	1 to 2	1 to 2	1 to 2
PO-GSA-I-DAB	Caecilian	<b>3 to 4</b>	3	1 to 2	2	<b>2 to 4</b>	<b>3 to 4</b>
	Newt	1 to 2	1 to 2	<b>2 to 4<sup>a</sup></b>	<b>1 to 4<sup>a</sup></b>	1 to 2	1 to 2
	Frog	3	2 to 3	2 to 3	2 to 3	<b>3 to 4</b>	<b>3 to 4</b>
	Toad	2 to 3	1 to 3	1 to 3	1 to 3	<b>3 to 4</b>	<b>3 to 4</b>
PO-BPA-DAB	Caecilian	1 to 2	2	1 to 2	1 to 3	2 to 3	<b>3 to 4</b>
	Newt	1 to 2	2 to 3 <sup>a</sup>	<b>2 to 4<sup>a</sup></b>	2	3	2
	Frog	<b>3 to 4</b>	1	1	1	1 to 2	1 to 2
	Toad	<b>2 to 4</b>	2	2	1 to 2	3	3
PO-PNA-DAB	Caecilian	1 to 3	1 to 2	1 to 2	1 to 2	3	3
	Newt	1 to 2	1 to 2	<b>1 to 4<sup>a</sup></b>	2 <sup>a</sup>	<b>3 to 4</b>	2
	Frog	1	2	2	2	2 to 3	<b>2 to 4</b>
	Toad	1 to 2	0	0	0	2	2
PO-UEA-I-DAB	Caecilian	1	2 to 3 <sup>a</sup>	2	2 to 3 <sup>a</sup>	2	1 to 3
	Newt	<b>3 to 4</b>	<b>1 to 4<sup>a</sup></b>	<b>3 to 4<sup>a</sup></b>	<b>3 to 4<sup>a</sup></b>	2 to 3	1 to 2
	Frog	1 to 2	2 to 3 <sup>a</sup>	2 to 3 <sup>a</sup>	<b>3 to 4</b>	2 to 3	1 to 3
	Toad	1 to 2	2 to 3	2 to 3	2 to 3	2 to 3	1 to 2
PO-LFA-DAB	Caecilian	1 to 3 <sup>a</sup>	2 to 3 <sup>a</sup>	1 to 2	1 to 2	<b>2 to 4</b>	<b>2 to 4</b>
	Newt	0 to 1	2 to 3 <sup>a</sup>	2 to 3 <sup>a</sup>	2 to 3 <sup>a</sup>	2 to 3	1 to 2
	Frog	0 to 2	2 to 3 <sup>a</sup>	2 to 3 <sup>a</sup>	3 <sup>a</sup>	<b>2 to 4</b>	1 to 3
	Toad	0 to 1	2 to 3 <sup>a</sup>	2 to 3	2 to 3	2 to 3	1 to 3

<sup>a</sup> single cells and intercellular substances

Table A3. Lectin histochemistry results for the epidermis of aquatic mammals: northern fur seal *Callorhinus ursinus*, common seal *Phoca vitulina*, otter *Lutra lutra*, Capybara *Hydrochoerus hydrochaeris*. 0 = no reaction, 1 = very weak, 2 = weak, 3 = moderate, 4 = strong; **bold: strong reactions**

Lectins	Species	Str. corneum	Str. granulosum	Str. spinosum	Str. basale
PO-Con A-DAB	Fur seal	0 to 3 <sup>a</sup>	1 to 2	1 to 2	1 to 2
	Common seal	0 to 2 <sup>a</sup>	0 to 3	0 to 2	0 to 2
	Otter	0 to 3	0 to 3	0 to 2	0 to 2
	Capybara	<b>1 to 4<sup>a</sup></b>	<b>2 to 4</b>	<b>2 to 4</b>	2 to 3
PO-WGA-DAB	Fur seal	<b>0 to 4<sup>a</sup></b>	1 to 2	1 to 2	1 to 2
	Common seal	1 to 3 <sup>a</sup>	2 to 3	2 to 3	2 to 3
	Otter	0 to 3 <sup>a</sup>	2 to 3	2 to 3	1 to 2
	Capybara	<b>2 to 4<sup>a</sup></b>	<b>3 to 4</b>	3	2
PO-GSA-II-DAB	Fur seal	1 to 2 <sup>a</sup>	1 to 2	1 to 2	1 to 2
	Common seal	1 to 2 <sup>a</sup>	1 to 2	1 to 2	1 to 2
	Otter	0 to 1	1	1	0
	Capybara	1 to 2	1 to 3	2	1 to 2
PO-DBA-DAB	Fur seal	<b>1 to 4<sup>a</sup></b>	0 to 2	0 to 2	0 to 2
	Common seal	0 to 3 <sup>a</sup>	0 to 3	0 to 3	0 to 3
	Otter	0 to 3 <sup>a</sup>	0 to 3	0 to 2	0 to 2
	Capybara	<b>1 to 4<sup>a</sup></b>	3	2 to 3	1 to 2
PO-SBA-DAB	Fur seal	1 to 2 <sup>a</sup>	1 to 2	1 to 2	1 to 2
	Common seal	0 to 2 <sup>a</sup>	1 to 3	1 to 3	1 to 3
	Otter	0 to 2 <sup>a</sup>	1 to 3	1 to 3	1 to 2
	Capybara	<b>2 to 4<sup>a</sup></b>	<b>3 to 4</b>	2 to 3	2
PO-GSA-I-DAB	Fur seal	<b>1 to 4<sup>a</sup></b>	1 to 2	1 to 2	1 to 2
	Common seal	1 to 2 <sup>a</sup>	1 to 3	1 to 3	1 to 3
	Otter	1 to 3 <sup>a</sup>	1 to 3	1 to 2	1 to 2
	Capybara	<b>1 to 4<sup>a</sup></b>	<b>2 to 4</b>	2 to 3	2 to 3
PO-BPA-DAB	Fur seal	<b>2 to 4<sup>a</sup></b>	1 to 2	1 to 2	1 to 2
	Common seal	0 to 2 <sup>a</sup>	1 to 3	1 to 3	1 to 3
	Otter	0 to 2 <sup>a</sup>	1	1	1
	Capybara	2 to 3 <sup>a</sup>	<b>3 to 4</b>	2 to 3	1 to 2
PO-PNA-DAB	Fur seal	<b>2 to 4<sup>a</sup></b>	1 to 2	1 to 2	1 to 2
	Common seal	1 to 3 <sup>a</sup>	1 to 3	1 to 3	1 to 3
	Otter	1 to 3 <sup>a</sup>	1 to 3	1 to 3	1 to 2
	Capybara	<b>3 to 4<sup>a</sup></b>	<b>3 to 4</b>	3	2 to 3
PO-UEA-I-DAB	Fur seal	<b>2 to 4<sup>a</sup></b>	1 to 3	1 to 3	1 to 2
	Common seal	1 to 2 <sup>a</sup>	1 to 3	1 to 3	1 to 3
	Otter	1 to 2 <sup>a</sup>	1 to 3	1 to 2	1 to 2
	Capybara	0 to 2	2 to 3	2	2
PO-LFA-DAB	Fur seal	1 to 2	1 to 2	1 to 2	1 to 2
	Common seal	1 to 2	<b>1 to 4</b>	<b>1 to 4</b>	<b>1 to 4</b>
	Otter	0 to 1	0 to 1	0 to 1	0 to 1
	Capybara	1 to 2	<b>2 to 4</b>	1 to 2	1 to 2

<sup>a</sup> mainly interlamellar substances

Table A4. Lectin histochemistry results for the skin glands of aquatic mammals: northern fur seal *Callorhinus ursinus*, common seal *Phoca vitulina*, otter *Lutra lutra*, Capybara *Hydrochoerus hydrochaeris*. 0 = no reaction, 1 = very weak, 2 = weak, 3 = moderate, 4 = strong, 5 = very strong; **bold: strong reactions**

		Peripheral cells	Central cells	Sebum	Excretory duct cells	Secretory cells	Luminal secretion	Myoepith. cells	Excretory duct cells
PO-Con A-DAB	Fur seal	1 to 2	1 <sup>a</sup>	1 to 2	1	0 to 3	<b>1 to 4</b>	1	1 to 2
	Common seal	1 to 3	1 <sup>a</sup>	2	1	<b>2 to 5</b>	<b>2 to 4</b>	1 to 2	3
	Otter	0	1	1	1	<b>2 to 5</b>	<b>2 to 4</b>	1	1 to 2
	Capybara	1	1	1 to 2	1	2	2	1	1
PO-WGA-DAB	Fur seal	1 to 2	1 to 3 <sup>a</sup>	1 to 2	1 to 2	<b>2 to 4</b>	<b>2 to 4</b>	1 to 2	1 to 2
	Common seal	1 to 3	2 to 3 <sup>a</sup>	1 to 3	1 to 3	<b>2 to 4</b>	1 to 3	1 to 3	1 to 3
	Otter	1 to 2	2 to 3	1 to 2	1 to 2	<b>2 to 4</b>	1 to 3	1 to 2	1 to 2
	Capybara	1 to 2	1 to 2	1 to 2	1	2 to 3	1 to 2	1	1
PO-GSA-II-DAB	Fur seal	1 to 2	1 to 2 <sup>a</sup>	1 to 2	1 to 2	1 to 2	1	1	1 to 2
	Common seal	1 to 3	1 to 2 <sup>a</sup>	1 to 3	1 to 2	1 to 2	1	1 to 2	1 to 2
	Otter	1 to 2	1 to 2	1 to 2	1 to 2	1 to 2	1	1 to 2	1
	Capybara	1 to 2	1 to 2	1 to 2	1 to 2	2 to 3	1	1	1
PO-DBA-DAB	Fur seal	1 to 3	1 to 3 <sup>a</sup>	1 to 2	1 to 2	2 to 3	1	1	2
	Common seal	1 to 3	1 to 3 <sup>a</sup>	1 to 3	1 to 3	2 to 3	2	1 to 2	2 to 3
	Otter	1 to 2	1 to 2	1 to 2	1 to 2	2	1	1	1
	Capybara	1 to 2	1 to 2	1 to 2	1 to 2	2	1	1	1
PO-SBA-DAB	Fur seal	1 to 2	1 to 2 <sup>a</sup>	1 to 2	1 to 2	2 to 3	1 to 3	1	1 to 2
	Common seal	1 to 2	1 to 2 <sup>a</sup>	1 to 2	1 to 2	<b>3 to 4</b>	<b>3 to 4</b>	1	1 to 2
	Otter	1 to 2	1 to 2	1 to 2	1 to 2	3	3	1	1
	Capybara	1 to 2	1 to 2	1 to 2	1 to 2	2 to 3	1 to 3	1	1
PO-GSA-I-DAB	Fur seal	1 to 2	1 to 2 <sup>a</sup>	1 to 2	1 to 2	2 to 3	1	1	1
	Common seal	1 to 2	1 to 2 <sup>a</sup>	1 to 3	1 to 2	<b>2 to 4</b>	1	1	1 to 2
	Otter	1 to 2	1 to 2	1 to 2	1 to 2	2 to 3	1	1	1
	Capybara	1	1	1	1	1 to 2	1	1	1
PO-BPA-DAB	Fur seal	1 to 2	<b>2 to 4<sup>a</sup></b>	1 to 2	1 to 2	<b>3 to 4</b>	1 to 3	1 to 2	1 to 2
	Common seal	1 to 3	1 to 2 <sup>a</sup>	1 to 3	1 to 2	<b>4</b>	1 to 3	1 to 2	1 to 3
	Otter	1 to 2	1 to 2	1	1	2 to 3	1 to 2	1	1
	Capybara	2	1 to 2	1	1	2 to 3	1 to 2	1	1
PO-PNA-DAB	Fur seal	2	1 to 3 <sup>a</sup>	1 to 2	1 to 2	<b>3 to 4</b>	1 to 4	1 to 2	1 to 2
	Common seal	1 to 2	1 to 2 <sup>a</sup>	1 to 3	1 to 2	<b>3 to 5</b>	1 to 3	1 to 2	<b>1 to 4</b>
	Otter	2	1 to 2	1 to 2	1	<b>3 to 4</b>	1 to 3	1 to 2	1 to 2
	Capybara	1	1 to 2	1 to 2	1	2 to 3	1 to 2	1	1
PO-UEA-I-DAB	Fur seal	1 to 2	1 to 2 <sup>a</sup>	1 to 2	1 to 2	<b>3 to 4</b>	1 to 2	1 to 2	1 to 2
	Common seal	1 to 3	1 to 2 <sup>a</sup>	1 to 3	1 to 2	<b>3 to 5</b>	1 to 2	1 to 2	1 to 2
	Otter	1 to 2	1 to 2	1 to 2	1 to 2	<b>3 to 4</b>	1 to 2	1	1
	Capybara	1 to 2	1 to 2	1 to 2	1 to 2	<b>3 to 4</b>	1 to 2	1	1
PO-LFA-DAB	Fur seal	1	1 <sup>a</sup>	1 to 2	1 to 2	0 to 3	1 to 2	1 to 2	1 to 2
	Common seal	to 2	1 to 2 <sup>a</sup>	1 to 3	1 to 2	<b>3 to 5</b>	1 to 2	1 to 2	1 to 3
	Otter	1 to 3	1	1	1	0 to 2	1 to 2	0 to 1	1 to 2
	Capybara	0	1	1	1	1	1	1	1
		0							

<sup>a</sup> cell membranes and intercellular substances