# Physiological study of sodium salt reception in the skin epithelium

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## Summary

Toads do not drink orally, but obtain water by osmotic flow across their skin. When dehydrated, desert toads exhibit stereotyped hydration behavior in which they press their ventral skin onto a moist surface. However, dehydrated toads avoid surfaces moistened with hyperosmotic NaCl and KCl solutions. These observations made us to study physiological mechanism for the toads to discriminate salt solutions. In immobilized toads (*B. alvarius*) spinal nerves innervating the ventral skin responded to a NaCl solution applied on the skin at threshold around 200mM. Latency of the response was slow such as 2-3 seconds and decreased with increase of stimulus concentration. These characteristics are compatible to our previous demonstration with fluorescent dye diI that spinal nerve endings and putative receptor cells innervated by the spinal nerves were located in the deeper layer of the skin epidermis, if these structures are transduction sites. The response to NaCl was significantly reduced by amiloride (10 μM), a blocker for $Na^+$ channels responsible for epithelial ion transport and salt taste transduction. In behavioral experiments, avoidance of a NaCl solution was also reduced by adding amiloride to the solution. Therefore, $Na^+$ ions flow into possible transduction sites through amiloride-sensitive $Na^+$ channels that are known to exist in the toad skin. The ability of toads to detect hypertonic salt solutions in their environment reveals a previously unknown chemosensory function for spinal nerves in anuran amphibians.