How the Dogfish Shark Copes with High Environmental Ammonia

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Marine elasmobranchs such as the spiny dogfish *Squalus acanthias* (*suckleyi*) are ureotelic, retaining urea for osmoregulation, and exhibiting very low gill permeability to both urea and ammonia. Their responses to high environmental ammonia (HEA) have not been characterized previously. However recently, elasmobranchs have been shown to express Rhesus (Rh) glycoproteins, which play a key role in the responses of ammoniotelic teleost fish to high environmental ammonia (HEA). When exposed to HEA (1200 μmol L^{-1} NH_4HCO_3, pH 7.7), sharks initially took up ammonia but were able to re-establish excretion against a concentration gradient by 36-48 h, reducing blood total ammonia levels below environmental concentrations, and exhibiting only a slight blood acid-base disturbance. A blood-to-water PNH_3 gradient in favour of excretion was maintained. Urea excretion was greatly stimulated, suggesting conversion of ammonia taken up from the environment into urea by the ornithine-urea cycle. Notably, the mRNA expression of Rhbg in the gill was down-regulated, as seen in some marine teleosts during HEA, suggesting a barrier function. Ammonia infusion experiments, together with mRNA measurements of other transporters, cast additional light on these responses (NSERC Discovery).