

The effect of temperature appears to be such that the least urea excretion at the gill occurs in water of 9-10°C. This is the temperature of water in which the fish is found in greatest number. At higher or lower temperatures more urea is lost from the gill, the greatest temperature effect being seen at 1-3°C. Sustained temperatures of 0°C or lower were not tolerated. Temperatures above 14°C were not tested. At 1-3°C a distinct increase in urea loss is seen despite a profound bradycardia (4-10/min.) and consequent reduction in gill perfusion. We intend to repeat the hypothermia study with controlled perfusion rates.

Urea and Thiourea Excretion by Dogfish Kidney and Gill: Effect of Temperature

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Simultaneous renal clearances of urea, thiourea and inulin were determined in three adult, female dogfish. Reabsorption of filtered urea averaged 97% whereas on the average only 37% of filtered thiourea was reabsorbed.

The surface area of the dogfish gill was computed by micromasurement, treating the lamellae as rectangles. There were 13-14 lamellae/mm gill filament and we estimated a total surface area of 370 mm²/gm body weight.

A preparation for studying excretion at the gill of the intact dogfish was developed in which sea water from a cooled reservoir was pumped to the spiracles and returned by gravity through the gills to the reservoir. The fish is suspended in air by a plastic sling. In a successful preparation normal gill movements are continued for several hours. The temperature and composition of the perfusate can be varied at will.

In our most successful preliminary experiments urea excretion at the dogfish gill averaged 3, 4 mgs/kg B. W./hr. when the temperature of the perfusate was 13-14°C. Excretion rises markedly with increasing temperature of the perfusate and averaged 46 mgs/kg B.W./hr in two fish perfused at 21 and 22 °C. At perfusate temperatures of 2-5°C, in spite of the known effect of cold in reducing the physical diffusion of urea, excretion was maintained at normal or slightly increased values- average 10, 5 mgs/kg B.W./hr in three fish.

Gill excretion of injected thiourea seems to be of the same order as that of urea when each is calculated per unit difference in concentration gradient.

Thiourea excretion increases about twofold at perfusate temperatures of 21 - 22°C but, unlike urea, it is markedly reduced by cold. At perfusate temperatures of 5 - 2°C thiourea excretion was 1/3 and 1/4 respectively of its average normal (13-14°C).