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WARM ACCLIMATION MAY INCREASE WATER PERMEABILITY IN ISOLATED GILLS FROM ANTARCTIC FISH

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Antarctic fish live in the coldest seawater and have some of the highest serum osmolalities (580 mOsm/kg) of any marine teleost. Warm acclimation of the Antarctic fish Trematomus bernacchii from their environmental control temperature of -1.5C to +4C results in a 25% decrease in serum osmolality, a three-fold increase in gill Na/K-ATPase activity and a three fold increase in seawater drinking rate The trigger for these changes in these osmoregulatory responses to warm acclimation are unknown but may be due to changes in water permeability across the gills at +4C. Gills were isolated and ligated with suture from T. bernacchii acclimated at -1.5C and placed in seawater at -1.5C and at +4C to determine if there is a change in water efflux from the isolated gill. The gills were blotted dry and weighed every 10 minutes. After the experiment the dry weight of the gill was determined and the percent loss in weight was determined by comparing the initial weight of the gill with the subsequent 10 min weights corrected for the dry weight of the gill. The extent of water loss from the -1.5C fish was 37.1%±1.4 (SEM, n=11 gills) which was significantly different ($p<0.01$) from the extent of water loss in +4C fish which was 45.2%±2.9 (n=6). The cellular mechanism underlying the change in efflux is currently under investigation. The greater extent of water loss of water from the warmer gills suggests that one of the immediate responses of the gills of T. bernacchii to warm acclimation is an increase in water permeability which may lead to an increase in drinking rate and an increase in gill Na/K-ATPase activity. This change in permeability may represent the trigger for the changes in Antarctic fish osmoregulation and represent a barrier to seawater influx at -1.5C. Supported by NSF-OPP0229462.