

FATTY ACID TRANSPORT IN ANTARCTIC NOTOTHENIOID FISH – EVIDENCE FOR COLD ADAPTATION?

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Notothenioid fish are the dominant fauna of the Southern Ocean and show substantial morphological and ecological adaptation to the near freezing waters they inhabit. They also possess a number of unique physiological and biochemical characteristics including production of antifreeze, reduced blood viscosity and high levels of tissue lipids. While lipids are used by notothenioids to maintain buoyancy in the absence of a swim bladder, they have a second equally important role as the primary oxidative fuel. These two competing demands for lipids may have resulted in changes to both the lipid transport and lipid metabolism systems of notothenioids, in comparison with those of other vertebrates. Long-chain fatty acids (LCFA) are crucial intermediates in lipid metabolism and in most vertebrates, LCFA, released from lipids by enzymatic action, are transported by albumin. In this study plasma, from a variety of notothenioid fish was analysed using agarose gel electrophoresis, [¹⁴C]palmitic acid binding, SDS-PAGE, two dimensional electrophoresis and ultracentrifugation to assess the LCFA transport system of notothenioids. The plasma protein profiles showed significant differences between species but there was high reproducibility between individuals of the same species. While agarose gel electrophoresis showed that all the species examined had major acidic palmitate-binding bands, these were generally of a diffuse nature and two-dimensional electrophoresis and ultracentrifugation revealed that the palmitate binding proteins were high density lipoproteins (HDL). There was no evidence for albumin in notothenioid plasma, in line with an earlier study on the Antarctic toothfish. The loss of albumin may be another means of reducing blood viscosity, beneficial given the temperatures toothfish inhabit.