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LDH ISOENZYME DISTRIBUTION IN THE SPINY DOGFISH (Squalus acanthias)

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Lactate dehydrogenase (LDH) is thought to be a tetramer composed of "H" and "M" molecules, with five distinct isoenzymes demonstrable by electrophoresis of serum and other tissues of most vertebrates. The isoenzymes with predominant "M" monomers (LDH-4 and LDH-5) are relatively insensitive to pyruvate inhibition and thereby stimulate lactate production and anaerobic glycolysis. The "H" monomers are more sensitive to inhibition by pyruvate so that they encourage aerobiosis. LDH can be considered a pivotal enzyme between these two major pathways of energy production.

Knowing that Squalus acanthias is strongly dependent on aerobic metabolism, we were interested in the LDH isoenzyme pattern in this species reported by Rasmussen and Rasmussen (Sharks, Skates and Rays, The Johns Hopkins Press, 1967, p. 361). They indicated that the pattern consisted solely of two bands migrating together cathodally, thus mimicking, at least electrophoretically, human LDH-5, the "anaerobic" isoenzyme.

LDH isoenzyme patterns of serum and tissue homogenates from Squalus acanthias were determined by the technique of electrophoresis on agarose gel films and fluorometric measurements of NADH formed from NAD with lactate supplied in excess.

This technique demonstrated that in addition to the major LDH isoenzymes which migrated cathodally, dogfish plasma, muscle, and kidney also contained at least two small but reproducible isoenzyme peaks which migrated anodally, as do the "aerobic" LDH isoenzymes of human serum, as depicted in Figure 1.

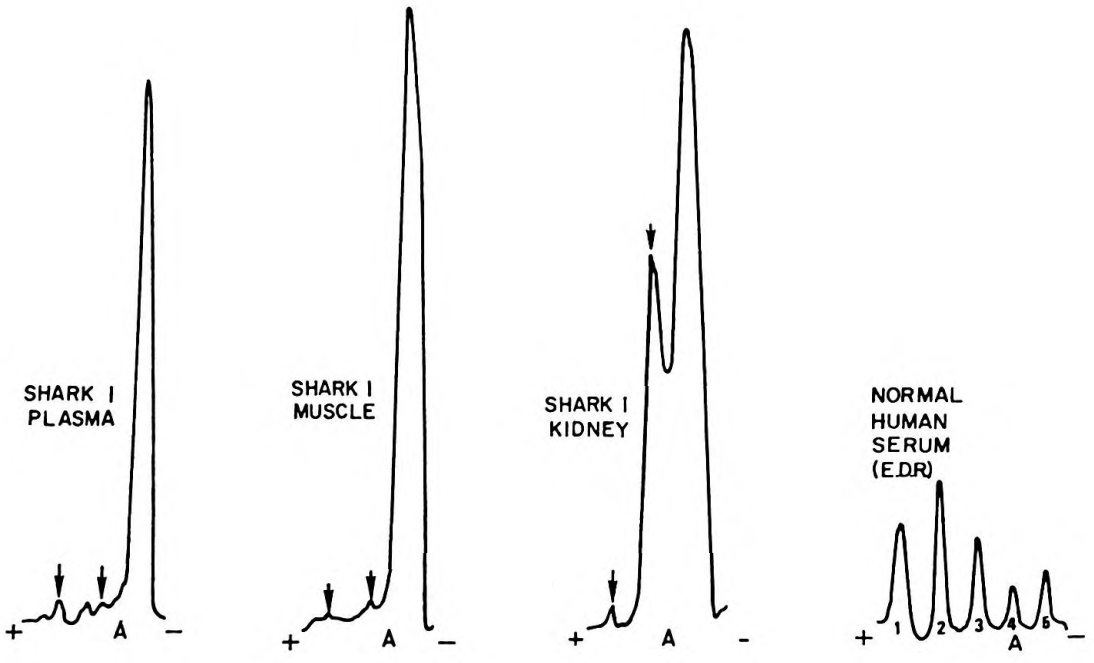

Figure 1. Lactic dehydrogenase isoenzyme electrophoresis patterns of several shark tissues and normal human serum. Arrows designate isoenzyme peaks with identical electrophoretic mobilities. "A" designates point of application.