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Whales, lifespan, phospholipids and the cause and cure for cataracts

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Our study addresses the question why do rats get cataracts at two years, dogs at eight years and whales do not get cataracts for over 200 years? The cholesterol and phospholipid content of bow head whale lenses were measured using ¹H and ³¹P NMR spectroscopy, respectively. Lens lipid structure was measured using FTIR spectroscopy. Whale lens lipid phase transitions were compared to the lipid phase transitions of rabbit, guinea pig, bovine, camel and human lenses. The major phospholipids of the whale lens were sphingolipid which composed 60 to 100% of the total phospholipid. The average molar cholesterol/phospholipid ratio for all four samples was similar 10 moles cholesterol per mole phospholipid. There was a linear correlation between the percentage of lens sphingolipid and lens lipid hydrocarbon chain order until about 60% sphingolipid. The percentage of lens sphingolipid correlated with the lens lipid phase transition temperature. The expected lifespan of the bowhead whale (200 y) and the percentage of whale lens sphingolipid fit well in the correlation between the percentage of lens sphingolipid and expected lifespan measured for other species. In conclusion, bowhead whale lens membranes have a high sphingolipid content that confers resistance to oxidation, allowing these lenses to stay clear for a relatively longer time than is the case in many other species. If human lenses could be made to have a lipid composition similar to bowhead whales, like the whale, one could hope humans would not develop cataracts for over 200 years.

Biography

Douglas Borchman is a Professor of Ophthalmology and Visual Sciences at University of Louisville. He is also an adjunct Professor in Department of Chemistry, and Physiology and Biophysics. He completed his PhD in Chemistry at Wayne State University and is the author of over 100 peer reviewed articles. He was a Principal or Co-investigator of seven major peer awarded grants totaling over 10 million dollars to study cataract and dry eye. His 1st and last major NIH grants scored in the top 5% and 2% of the nation, respectively. He has given over 250 scientific presentations around the world.

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