

ABSTRACT

Differences in the composition of cell membranes are considered to be the physiological mechanism responsible for different metabolic rates, life span and consequently, different life-histories. The membrane pacemaker theory suggests that higher membrane unsaturation may be an important factor responsible for higher metabolic rate and shorter life span of organisms. The alternative hypothesis, on the other hand, assumes that membranes can function as structural antioxidants, and thus that higher membrane unsaturation may be associated with longer life span. The aim of this work was to test how changes in the fatty acid composition of membranes depends on body size, latitude and altitude, within which different life-histories and metabolic rate were observed. Temperate and tropical lowland songbird species were chosen for the models testing the effect of latitude, and only tropical species of songbirds were chosen for the models testing the effect of altitude. Part of the work was molecular sex determination. Using gas chromatography and mass spectrometry, the amount of individual fatty acids contained in red blood cell phospholipids was obtained from blood samples.

The results showed that the composition of the membranes in most cases correlates with body size, which also correlates with almost all traits determining life-histories. Within the latitude gradient, higher membrane unsaturation was found in tropical areas where rather slow life-histories were observed. At higher altitudes, a lower membrane unsaturation was observed, even though the animals here have a rather higher metabolic rate. The results of this work do not support the membrane pacemaker theory, but rather an alternative antioxidant theory.

Keywords: latitude, altitude, fatty acid, membrane, metabolism, life span, life-histories