Mitochondrial phenotypic flexibility in king penguins: influence of nutritional status and marine life.

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Abstract

Energy conservation is a key priority for organisms having to face stochastic shortages in resource supplies. Because mitochondrial bioenergetics constitute the functional link between environmental resources, whole body energy expenditure and animal performances (e.g. growth, locomotion, thermoregulation), these organelles may represent an important proximate factor that is responsible for energy savings during nutriment or oxygen shortage. We studied mitochondrial bioenergetics (oxidative phosphorylation activity, ATP synthesis efficiency, oxidative capacity) of skeletal muscle mitochondria from penguins during the course of fasting/refeeding and before/after nutritional emancipation periods. Bioenergetics analysis of skeletal muscle revealed that mitochondria from fasted or diving birds decrease the cost of ATP synthesis by minimizing the needs for energy substrates or oxygen. The mitochondrial energy transduction processes prove to be highly flexible, suggesting that birds would adjust the cost of mitochondrial metabolism in order to cope with their environmental constraints.

Keywords: mitochondria, bioenergetics, skeletal muscle, king penguin, diving, fasting

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