Corresponding author:
Carlos Martínez del Rio
Department of Zoology and Physiology
University of Wyoming
Laramie, WY 82071-3166
Corvallis, OR 97330
307-766-2623 voice
307-766-5625 fax
cmdelrio@uwyo.edu

Running Heading: The dynamics of isotopic incorporation

How fast and how faithful – the dynamics of isotopic incorporation into animal tissues

CARLOS MARTÍNEZ DEL RIO *[1] AND SCOTT A. CARLETON[2]

[1]*Department of Zoology and Physiology, University of Wyoming, Laramie, WY 82071-3166*

[2]*Cooperative Fish & Wildlife Research Unit, University of Wyoming, Laramie, WY 82071*

The interpretation of isotopic data gathered in the field demands knowing the rate at which isotopes are incorporated into different tissues of a species, and the discrimination factor between tissues and diet. These two quantities are estimated in diet-shift laboratory experiments whose results are interpreted using simple mathematical models, which we describe here. The simplest of these models assumes that each tissue can be represented as a well-mixed single compartment that obeys first-order kinetics. Fitting this model to experimental incorporation data allows estimating discrimination factors and the instantaneous rate of isotopic incorporation, λ (the reciprocal of λ, $1/\lambda$, equals the average residence time, τ, of an atom in the tissue). In one-compartment models the magnitude of λ equals the sum of catabolic turnover and mass-specific growth rate. Available data suggests that the magnitude of λ scales with body mass to an exponent equal to -1/4 and differs between endotherms and ectotherms. We outline suggestions for the design and analysis of isotopic incorporation experiments and suggest that an increased data set of species and tissues can allow field researchers to estimate rates of incorporation from body size and growth rate data.

Key words: diet, incorporation, isotopic turnover, stable isotopes

*Correspondent: *cmdelrio@uwyo.edu*

[01/03/10 draft for Special Feature on stable isotopes in mammalogy for Journal of Mammalogy]