Anthro 485 Human Biology of the Pacific

Houghton’s “Cold Adaptation Hypothesis”

Bergmann’s & Allen’s Rules

hypothermia: < 94°F (34 Celsius)
hyperthermia: >105-107°F (41-41 Celsius)

Bergmann's Rule (1847)

... within the same species of warm-blooded animals, populations having less bulky individuals are more often found in warm climates near the equator, while those with greater bulk, or mass, are found further from the equator in colder regions.”
Bergmann’s Rule

Comparison of different shaped box surface areas and volumes illustrating Bergmann’s rule

Bergmann’s Rule in Humans

- In extremely cold environments, a stocky body with short appendages would be more efficient at maintaining body heat because it would have relatively less surface area compared to body mass.

Negative correlation between environmental temperature and body mass in warm blooded animals
Allen’s Rule (1877): “Among warm-blooded animals, individuals in populations of the same species living in warm climates near the equator tend to have longer limbs than do populations living further away from the equator in colder environments.”

Comparison of different shaped box surface areas and volumes illustrating Allen’s rule

The East African Young Masai men
Heat Loss

- Radiation
- Evaporative cooling
  sweating

Polynesian Phenotype

‘Polynesians are (or were) large in size: relatively tall, large boned, and tending to corpulence.’ (Howells 1979:272)

‘Climate... does indeed seem to be the major regulatory factor for human body size and proportion’ (Houghton 1991:167)

‘this oceanic world can effectively be considered one of the coldest of global environments’ (Houghton 1990:29).
Nicola Van Dijk’s (1991) alternative model: diet, active selection of sexual partners, size as a status symbol, and certain rituals associated with food consumption.

Shephard (1991:244)

• We now recognize that any adaptation for example to an extreme of climate, persists only during exposure to the stressor, and disappears rapidly when the individual returns to a normal environment. Moreover, successful genetic adaptation has been to an average environment rather than the extreme.
Other Issues

- Obesity of Polynesians?
- Selective pressures of fishing expeditions?
- Geoff Irwin: voyaging
- Evolution of Polynesian phenotype?
- Diets of early Polynesians?

Van Dijk (1991) alternative multifactorial model

- A phenotype which incorporates genetic, cultural, ecological, and physiological factors
- A single stimulus was insufficient to account for the origin of the Polynesian phenotype
- A variety of factors needed

Van Dijk (1991)

- A variety of cultural influences including diet, active selection of sexual partners, size as a status symbol, and certain rituals associated with food consumption are all apparent in Polynesian societies. According to van Dijk these factors are responsible for the large size of the Polynesians as well as the differences in size seen within the islands.
Prehistoric Polynesian diet

ocean and reef resources, and root and tree crops in the traditional Polynesian diet, resulted in an adequate supply of protein and energy (taro, yams, coconut, bananas, breadfruit and the occasional pigs, chickens and dog, marine resources) [Barker et al. 1986]

Aesthetics of food

'The lives of all Polynesians ... rotated around one central theme - the production, distribution, and consumption of food ... a concern with food permeated Polynesian life at all levels of the social ladder in all social dimensions' (Kirch 1984:29).

to be regarded as perfect, a Polynesian woman must first of all be stout. The stouter the better.'Danielsson (1956:70)

The perfect woman must be fat - that is most imperative; her neck must be short ... She must have no waist, and if Nature has cursed her with that defect she must disguise it with draperies... her bust and hips and thighs must be colossal. The woman who possesses all these perfections will be esteemed chief like and elegant (Danielsson 1956:70).

The Effects of Diet and Disease

Endemic malaria
Van Dijk (1991)

• the large body size in Polynesians is the result of a nutritious diet combined with a sociocultural equation of large size with beauty and status.