Dr. Michael Power

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Dr. Power received his Ph.D. in Anthropology from the University of California at Berkeley. Dr. Power is an animal scientist at the Smithsonian National Zoological Park where he is also the curator of the milk repository, a collection of milk samples from over 130 species of mammals.

He is also a senior research associate in the Research Department of the American College of Obstetricians and Gynecologist. A major focus of his research has been the effects of nutrition on reproduction, especially the effects of both maternal under and over nutrition on birth outcome and eventual adult physiology of offspring.

He has published multiple articles on digestion, energy metabolism, milk composition, and the development of pediatric obesity in a variety of species.

He has conducted studies on the knowledge and clinical practice of obstetrician-gynecologists on a number of topics, including their role in weight management and weight gain during pregnancy and encouraging breastfeeding postpartum.

Dr. Power is an organismal biologist with a strong evolutionary and comparative perspective. His focus is on whole animal physiology, and investigating the adaptive functions of animals' responses to differing circumstances.

He has coauthored, with Dr. Jay Schulkin, three books: The Evolution of Obesity, The Evolution of the Human Placenta, and Milk: The Biology of Lactation.

Evolution of lactation and adaptation in humans

Lactation is an ancient adaptation that defines mammals. The term 'mammal' derives from the Latin word for teat (mamma). The mammary gland is tissue unique to mammals. All mammal mothers, from the egg-laying duck-billed platypus to human beings, feed their offspring with the glandular secretion called milk. Milk is the first food for all neonatal mammals, and for many it is the sole food for most of infancy. No matter what the adult diet, carnivorous, herbivorous, or omnivorous, all mammals start life as lactivores.

A basic biological definition of milk is a glandular secretion produced by mammalian mothers to feed to their offspring. This simple definition encompasses a tremendous diversity of biological interactions. Milk is a biologically complex fluid that serves many adaptive functions. Species-appropriate nutrition is certainly delivered, but also far more. The list of bioactive molecules in milk continues to expand at a phenomenal rate as technology improves to enable milk to be fully analyzed. Immune factors, hormones, cytokines, enzymes, and even gene-regulating RNA molecules have joined the nutrients in the list of vital milk constituents. Milk allows mammalian mothers to signal biochemically to their offspring over an extended period, guiding the development of their young. Milk is an example of where the Lamarckian concept of acquired characteristics exists in nature. For example, much of an infant's immune function is initially provided by immunoglobulins in mother's milk that reflects her disease history. Milk also contains many oligosaccharides (long-chain, complex sugars) that are poorly if at all digested by mammalian digestive enzymes, and thus are not likely to be absorbed and metabolized by the infant. Instead, these complex sugars appear to have both prebiotic and antibiotic activity, encouraging the growth of commensal and symbiotic organisms and reducing the risk of infection by pathogens.

Human milk has evolved in response to the unique adaptive challenges that faced our ancestors. A fundamental difference between our babies and those of the great apes is the extent of brain growth after birth, fueled, at least in the past, by milk. Many authors have proposed that our milk composition must have changed in response to this new nutritional challenge. I will address the evidence for changes in milk composition driven by the needs of our large brains. I will also address the question of milk-brain interaction from the reverse perspective: Did the social and technological changes allowed by our increased brain capacity provide adaptive pressure on milk composition? The larger brains of our ancestors allowed different behaviors, some of which produced challenges as well as opportunity. The history of those challenges can be found in our milk.