

## Section I

# Neurobiologic Foundations of Appetite and Eating: Basic and Applied Studies

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**T**he regulation of appetite and eating is an extremely complex process. The decision to eat or not to eat is based on the interaction of a variety of external and internal cues. Overriding all else is the availability of food: During a famine there are few fat people! Food availability interacts with social attitudes and the knowledge of the value of the available food-stuffs. Thus, survival for the moose on the shores of Lake Superior depends on the knowledge that it needs to graze not only on the high-energy-containing deciduous leaves but also on aquatic plants to obtain its salt requirements. The central role of social mores in the regulation of feeding is demonstrated by the sharing of food as a gesture of peace by the hunter-gatherer and typified by the modern business lunch. The next process in the decision to eat involves the hedonic qualities (sight, smell, and taste) of the food. We all have eaten our fill in a restaurant but found it impossible to refuse those extra calories we clearly don't need when the waiter wheels the dessert cart in front of us. The applied studies in this section deal predominantly with the factors enhancing or decreasing the acceptability of a particular food.

Thus, with the increasing affluence of a society, overeating becomes a natural way of life. At first this is accepted as a just reward for hard work, as in Isaiah 55:2: "...and let your soul delight itself with fatness." However, with time, the organism becomes aware that gluttony and obesity are just as detrimental to species survival as was the marasmic status. This leads to the

need to develop a variety of inhibitory systems to decrease food intake.

Basic animal studies have tended to concentrate on these inhibitory factors, and this is reflected by the general content of the chapters in this section on basic studies. Early studies spent much time debating the role of different absorbed nutrients as appetite regulator. This led to the development of a variety of "appetostat" theories in which various authors vied to establish their nutrient (eg, glucose, fatty acids, amino acids, or purines) as the factor responsible for inhibiting feeding (the Holy Grail Hypothesis).

More recently it has become clear that a variety of gastrointestinal hormones that are released during a meal are capable of decreasing food intake. Whether these peptide hormones are true satiety agents or merely produce a mild state of aversion if being hotly debated. However, it seems reasonable to suggest that in the end it will prove to be an interaction of these hormones and the physicochemical properties of the absorbed nutrients that leads to the termination of a single meal. In addition, the state of glycogen repletion or depletion of the liver, the production of energy (heat) by tissues such as brown fat, and the effect of fat depots on the circulating concentration of fatty acids and insulin all appear to be capable of modulating feeding.

Finally, all this information needs to be coordinated, and the organism has to make the decision whether to eat. This integrative process appears to take place within the central nervous system (predominantly but not entirely in the hypothalamus). There is growing evidence

that this integrative process involves a variety of neurotransmitters (monoamines, neuropeptides, prostaglandins, and amino acids) interacting on a backdrop of hypothalamic interneurons. The putative role of these neurotransmitters is discussed in two of the chapters in the basic studies section.

If after reading the chapters on the Neurobiologic Foundations of Appetite and Eating the neophyte is left somewhat bemused by the multitude of factors involved and theories invoked to explain them, heart can perhaps be taken from the words of the English philosopher, Emerson Pugh: "If the human brain were so simple that

we could understand it, we would be so simple that we couldn't." The chapters in this section clearly demonstrate that despite the tremendous progress in our knowledge of the neurobiologic foundations of appetite in the last decade, we are just emerging from medieval times, hopefully to enter the Renaissance Period of insights into appetite regulation. Despite our present limitations, I believe that the future development of viable *treatment modalities for eating disorders will be based in the knowledge gained from the neurobiologic foundations of appetite and eating.*