Neural Control of Feeding Behavior Based on Taste Preference and Aversion

Yasunobu Yasoshima, Tadashi Inui, and Tsuyoshi Shimura
Division of Behavioral Physiology, Department of Behavioral Sciences, Graduate School of Human Sciences, Osaka University
1-2 Yamadaoka, Suita, Osaka 565-0871, Japan

Summary
Feeding behavior of humans and animals is controlled by innate and learned taste preference/aversion. Gustatory information elicited by a variety of tastants is processed in the gustatory neuraxis: the nucleus of the tractus solitari (NTS), parabrachial nucleus (PBN), gustatory thalamic area, cortical gustatory area, amygdala and lateral hypothalamus. Recent studies have indicated that thalamo-cortical and limbic connections for taste processing play distinct roles in feeding control. Changes of gustatory coding activity and neurotransmitter release responsible for conditioned taste aversion (CTA) have been shown in various brain sites such as the PBN, amygdala, cortical gustatory area, and ventral pallidum. Application of a novel neuroimaging technique in our laboratory showed clear memory-based activation of these brain sites on CTA retrieval, consistent with neuroanatomical data using c-fos expression as a maker of neuronal activity. Hedonic evaluation (palatability shift) of the taste conditioned stimuli is modified from positive (ingestive) to negative (aversive) through CTA learning; our data suggest that hedonic shifts are partly mediated by altered function of the brain reward system, including the ventral pallidum. Recent findings reviewed here suggest that reinforced/motivated feeding behavior such as conditioned taste preference and binge-like overconsumption are dependent on visceral processing of post-ingestive consequences to integrate neural substrates, including the brain reward and taste-nutrient associative learning systems in the ventral midbrain, PBN and amygdala. Present knowledge on neural control of feeding behavior based on taste preference/aversion learning is discussed.