

Morphology, physiology, biochemistry and functional design of the termite gut: an evolutionary wonderland

Abstract

The chapter reviews termite gut structure and associations with mutualists, now informed by a great increase of data on intestinal microbial diversity made possible in the last decade by molecular genomics, and in the light of contemporary theories on the origin, evolution and trophic diversification of the Isoptera. Detailed morphological descriptions are not given, but the more modern synoptic literature on anatomy, histology and in situ coiling is listed and discussed in relation to current concepts of the termite gut as a bioreactor system. Knowledge of intestinal microbiology, and of microbial physiology and metabolism, has outstripped progress in understanding secretory and absorptive processes by the gut wall and associated structures, such that the primary substrates fermented in the hindgut and the end products utilised by the termite host are still not precisely identified in many cases. Current perceptions of the specialised digestive processes of fungus-growing and soil-feeding termites are summarised, and an overarching evolutionary thesis is proposed, arguing that social organisation in termites has developed primarily to safeguard the fidelity of symbiont transmission between individuals and generations.