

Introduction

Ticks belonging to the Superfamily Ixodoidea represent a group of highly specialized bloodsucking arthropods that are obligate temporary parasites of mammals, birds, or reptiles. This group unites the representatives of 2 families. About 700 species of Ixodidae belong to the subfamilies Ixodinae (genera *Ixodes* and *Ceratiixodes*) and Amblyomminae (genera *Haemaphysalis*, *Boophilus*, *Rhipicentor*, *Dermacentor*, *Amblyomma*, *Aponomma*, *Rhipicephalus*, and *Hyalomma*) of which about 70 species are found in USSR. Argasid ticks (Argasidae) comprise approximately 100 species belonging to the subfamilies Ornithodorinae (genera *Ornithodoros*, *Otobius*, *Alveonanus*, *Antricola*), and Argasinae (genus *Argas*). Seventeen species of Argasidae are found in USSR. The exceptional importance of Ixodoidea as ectoparasites of domestic animals, and particularly as vectors of agents of many zoonoses and zoonothroponoses, has made the study of this group an independent parasitological field in which zoological specialists take an active part in the domains of medicine, veterinary medicine, and microbiology.

Most research works have been devoted to elucidating the epidemiological and epizootological role of ticks in natural foci of infections, and much in this direction has been contributed by Academician E. N. Pavlovsky and his school. Owing to the practical necessity for health care and veterinary protection, the ecological characteristics of the most important Ixodoidea vectors have been studied in detail, chiefly their life cycle and its regulation by external environmental factors, their activity in natural biotopes, and their association with various vertebrate hosts. Many recent investigations have been devoted to studies of anatomical, physiological, and biochemical properties of ticks to elucidate their morphological adaptations to parasitism or in relation to their survival in unfavorable environmental conditions. Morphological and physiological properties of ticks are exceptionally interesting for understanding how different groups of microorganisms circulate within their bodies and the means by which they are transmitted to vertebrates.

Ticks of the Superfamily Ixodoidea, together with bloodsucking Diptera, are specific vectors of the chief groups of agents of transmissible infections of man and animals, including viruses, rickettsiae, bacteria, spirochetes, anaplasmas, piroplasms, theilerias, and filariae. Their participation in transmission of some species of fungi, toxoplasma, and flagellates is not excluded. These relationships with diverse microorganisms living in close association with bloodsucking ticks are due to their ancient parasitism and diversified biocenotic associations with terrestrial vertebrate hosts (Beklemishev 1948, 1955).

Important factors in explaining the exceptional ability of Ixodoidea to transmit agents of many infections are the specific anatomical, physiological, and biochemical properties of this arthropod group, which

differ considerably from those of bloodsucking insects.

This monograph represents many years of morphological and physiological investigation of the adaptation of bloodsucking ticks to parasitism of terrestrial vertebrates and of the associations between tick structures and their ability to ingest and subsequently to transmit pathogens (for example, rickettsiae). Particular attention has been given to feeding processes, metamorphosis, and reproduction. These processes determine the characteristic properties of the tick life cycle and the type of host interrelationships, and also to a certain degree provide the possibility for the agent to circulate in natural foci.

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MORPHOLOGICAL—ANATOMICAL OUTLINE

EXTERNAL STRUCTURE

Ixodoidea are the largest forms among Acarina. The body length of engorged individuals of some species [genera *Amblyomma*, *Hyalomma*, and *Ornithodoros savignyi* (Audouin)] may reach 20–30 mm. The body form of unfed ticks varies from oval to almost circular and is greatly flattened, while in engorged ticks it is lenticular, eggshaped, or droplike (Fig. 1–7).

From study of the segmental structure of the body in different tick groups, Zakhvatkin (1952) believes that within the framework of the Ixodoidea tick organization, as in other representatives of the Order Parasitiformes, there is an arachnoid type of cleavage into prosoma (cephalothorax) and opisthosoma (abdomen). The prosoma includes an acron (primary cephalic lobe) and 6 segments (cheliceral, palpal, and 4 limb segments). The opisthosoma lacks appendages and includes 9 segments and an anal lobe. Of these, the pregenital segment is considerably reduced and extends as far back as the prosoma, while the latter 3 segments remain rudimentary and fuse into 1 anal macrosomite. The tick abdomen thus in fact consists only of 6 segments.

The Ixodoidea prosoma and body have coalesced and margins between them have disappeared. Traces