

Chapter 5

GENETIC AND ECOLOGICAL ADAPTATION MECHANISMS OF TARDIGRADES

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The most durable extraordinary animals of the world that have managed to survive the lethal effect of the outer space are tardigrades also named small aquatic invertebrates or water bears. They were discovered in 1773 by the German Zoologist Johann August Ephraim Goeze. It was named Tardigrada by the Italian biologist Lazzaro Spallanzani in 1776, which means from Latin two word: *tardus* = slow, *gradi* = to walk ^(1,2). This microscopic invertebrates body size ranges from 50 µm marine terrestrial or freshwater to 1200 µm ^(3,4). Tardigrade's body is divided into body segments covered with chitinous cuticle and bilaterally symmetrical, usually has four pairs of legs, ending with different shapes or numbers of claws ⁽⁵⁾. They don't have any special respiratory and circulatory systems. Respiration is carried out by the cuticle and also have a body cavity which contains storage cells that play a role in circulation and respiration. They have a complete functional digestive system. Excretion can be removed from the body in different ways ⁽³⁾. Muscular structure consists of dorsal-ventral radial fibers, transverse muscles for movement, stylet and pharyngeal muscles, and intestinal muscles, that provide ovulation ⁽³⁾. Nervous structure consists of a trilobe dorsal brain linked to the lower pharyngeal ganglion with three joints ⁽⁶⁾. Many species feed on with plant material, mosses and algae, bacteria, plant cell, while some species can be predators. They can feed on nematod, rotifers ^(3,4,7).

This phylum is divided into two classes: Eutardigrada (limno-terrestrial tardigrades ^(Fig. 1.), Heterotardigrada (limno-terrestrial and marine tardigrades) ^(8, Fig. 2.). Heterotardigrades have a cuticular dorsal plate which is mean "armoured animals" but, this plates are absent in eutardigrades ⁽⁹⁾. Heterotardigrada has been named "other" and Eutardigrada has been named "true" tardigrades ^(9,10). The only one species (*Thermozodium esakii*, Rahm 1937) ⁽¹¹⁾ belonging to the third classes Mesotardigrada was found in the termal lake in Japan, but this species disappeared after the earthquake ⁽¹²⁾.

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