Electron microscopy and 3D nano-organization of virus-like and surface structure of Entamoeba, Candida and Escherichia species

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Keywords: Microscopy, virus, *Entamoeba*, *Candida, Escherichia*

Protozoa, yeast and bacteria can be considered as attractive models for different organisms to analyze cytoplasmic and surfaces structure as well as cellular processes of eukaryotes and prokaryotes [1-3].

For electron-microscopic (EM) study of virus-like symbiotic strains of *Entamoeba histolytica, E. moshkovskii, Candida guilliermondii* (Cg strains NP-4), *Escherichia coli* (serogroup O_{124}) and their nano-particles it has been using the methods of negative contrasting, cryo- and ultrathin sections of computer morphometric and stereometric analysis (Video-test program, structure-5, nanotechnology) both.

The virus nano-particles of *Entamoeba* are shown to have stick-type form: their length is 180- 200 nm, diameter - 60-70 nm, surface square - 11036 nm^2. They are in the cytoplasm of *Entamoeba* solely and with rosette type. Ultra structural pathological changes of viruses-symbionts were established under γ-ionizing radiation in cellular membrane structures with thickness size of 9-10 nm and in nucleoide both, and also in formation of electron density round particles with diameter of 5-35 nm in virions, eliminating from the individual virus-like particles: diameter of the big round particles “O1” of 35 nm, surface square - 885 nm2, diameter of the small “O2” – 8 nm, surface square - 45 nm2 (Fig. 1). The length of biomolecular ribonucleoproteid helical-like nano-particles and crystal body in the vegetative and cyst forms of *Entamoeba* is of 300 nm, diameter – 40 nm. Morphometric scanning EM analysis of the *C. guilliermondii* after x-ray radiation allow to consider the relation of square of destructive structures to the total square cell of Cg is equal to 26,2773 : 73,723 (Fig. 2).

The application of direct EM method allows visualization of the surface of entero-pathogenic *E. coli:* there is a large number of fimbria. Computer stereometric EM analysis of these fimbria points out that their diameter is 8-15 nm (Figs. 3a, 3b).

Thus, the results obtained with EM morphometric and stereometric analysis of nano-particles of virus-symbionts of protozoa, yeast and bacteria allow considering the effective ness of comparative EM approach during the investigation of radiation effects as well as of bio-nanoparticles.

1. D. Gerlich, J. Ellenberg. Nature Cell Biology. **5** (2003), p.14-19.
2. K.O. Hovnanyan. Reports of National Academy of Sciences of Armenia. **108** (2008), p.67-71.
3. K.O. Hovnanyan, A.H. Trchounian. Reports of National Academy of Sciences of Armenia. **109** (2009), p.75-81.

DOI: 10.3217/978-3-85125-062-6-172,

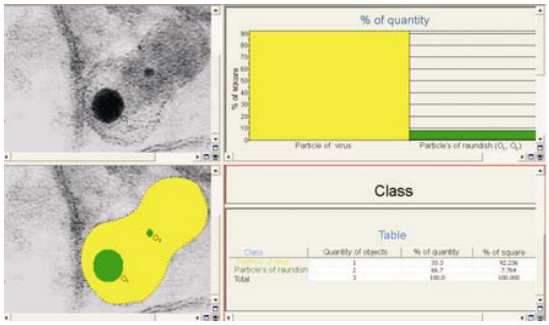

Figure 1. Transmission EM picture of virussymbionts of *Entamoeba*. Computer morphometrical analysis of the "Video-test, structure-5, nanotechnology" was used under the program.

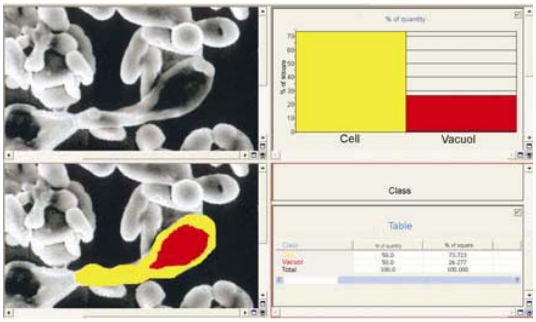

Figure 2. Scanning EM picture of *Candida guilliermondii* after x-ray radiation. Computer morphometrical analysis of the "Video-test, structure-5, nanotechnology" was used under the program.

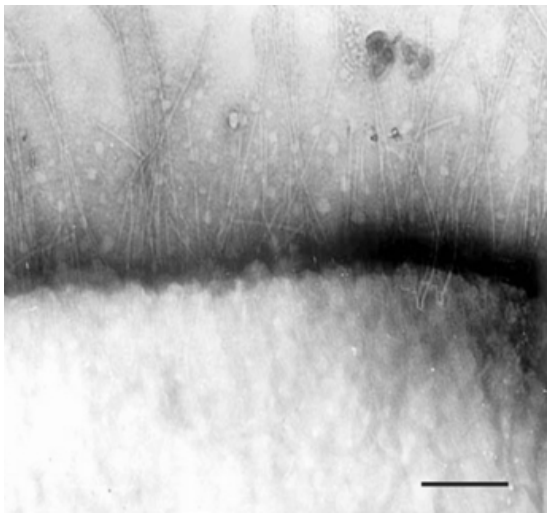

Figure 3a. Transmission EM picture of fimbri of *E. coli* (serogroup O124) (negative contrastin). Bars: 100nm.

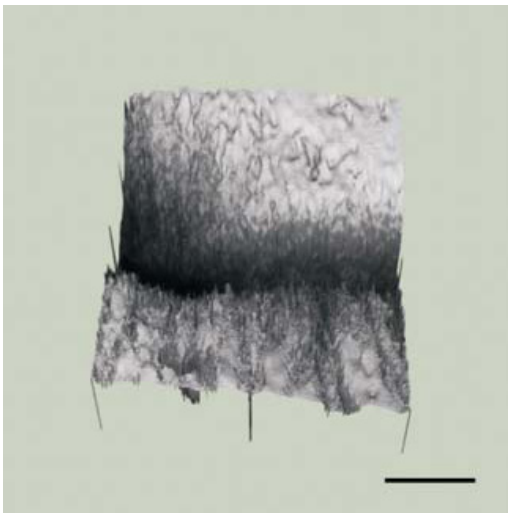

Figure 3b. Fimbri of *E. coli* (serogroup O124). 3D imaging analysis with program "Video-test, structure-5, nanotechnology" Bars: 100nm.

M.A. Pabst, G. Zellnig (Eds.): MC2009, Vol. 2: Life Sciences,
DOI: 10.3217/978-3-85125-062-6-172, © Verlag der TU Graz 2009