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Microbiology**MUTUAL RELATIONSHIPS BETWEEN CANDIDA CELLS AND BDELLOVIBRIO LIKE ORGANISMS****S.A.Muradova, Corresponding Member of NAS of Azerbaijan Z.O.Garayev, A.I.Gurbanov,  
E.K.Gasimov, S.S.Javadov, F.H.Rzayev**

*The electrone microscopic appearance of bdellovibrio like organisms parasitizing fungi from the genus Candida and structural changes caused by their reproduction in cells of Candida species have shown.*

**Keywords:** *bdellovibrio like microorganisms, Candida cell ultrastructure*

First in 1963 german researcher H.Stolp reported about *Bdellovibrio*(*Bdellovibrio bacteriovorus*) parasitizing in gram-negative bacteria. Their main feature is reproduction inside another bacteria. These wild bacterias hydrolize outer membrane of prey-cells using hydrolytic ferments, enter the periplasmic space and utilize organic substances resulting with lysis of these cells [1]. *Bdellovibrio* and like organisms parasitize in bacterias of genus *Acinetobacter*, *Aeromonas*, *Bordetella*, *Burkholderia*, *Citrobacter*, *Enterobacter*, *Escherichia*, *Klebsiella*, *Morganella*, *Proteus*, *Pseudomonas*, *Salmonella*, *Serratia*, *Shigella*, *Vibrio*, *Yersinia* etc., which play great role in human pathology. *Bdellovibrio* and like organisms significantly reduce number of microorganisms both in culture and biofilms [2,3,4]. These bacterias inhibit formation of biofilms by *Staphylococcus aureus* and at the same time reduce its' virulence [5]. Due to their lytic effect appliing of *Bdellovibrio* and like organisms in medical practice is discussed [6]. At the time due to morfological features number of wild bacterias is known.

In previous studies [7,8] we reported about recognition of these organisms in opportunistic representatives of human normal flora – fungi of the genus *Candida*. Unlike the *Bdellovibrio* multipling in periplasma described organisms reproduce in vacuoles of *Candida* cells. Under adverse conditions they form vacuoles in *Candida* cells, morphological changes occur and fungi cells are lysed eventually. Existence of lytic effect of *Bdellovibrio* like organisms to *Candida* cells makes stydying of mutual relationship between them

necessary. The main objective of the proposed research is studying of mutual relationship between *bdellovibrio* like organisms (BLO) and *Candida* cells using electrone microscopy.

**Material and methods**

10-day culture of *Candida albicans* obtained from patient was used. The research was performed in Electrone Microscopy Laboratory of Azerbaijan Medical University. Preparations were prepared in accordance with known protocols. Sediment obtained from *Candida albicans* culture fixed in 2,5%-glutaraldehyde and 1%-osmium tetroxide (OsO<sub>4</sub>). Dehydration was performed in different concentrations of ethanole. Araldite-Epon was used in preparation of blocks. Ultra-thin sections were made from blocks using EM UC 7 -LEICA microtome. Sections were painted by uranile-acetate lead citrate. Preparation were studied under the JEM 1400 transmission electrone microscope(Japan).

**Results**

Motile and nonmotile (bdelloplasts) forms of BLO revealed outside the fungi cell during ultra-thin sections microscopic examination are represented in figure 1. Like the *Bdellovibrio* they have two-stage development consisting of motile and nonmotile forms. But unlike the *Bdellovibrio* both two forms live inside and outside the cell. Motile forms exist in vacuols, nonmotile – are fixed in vacuols and cell membranes. Released from the cell motile forms (Fig.1A,B) of *bdellovibrio* like organisms turns to nonmotile (Fig.1C,D) – outside form of organism.

Infected fungi cell undergo significant structural changes. Primarily it accompanied with contour loss between organelles, violation of integrity and stability of cell membrane. Reproduction of parasites and leaving of mature forms lead to reduction of homogeneous mass and damage of cell membrane. As the result of the parasites impact to cell membrane bulges occur which consequent thinning. Parasites leave cell through these convexities. It is due to high sensitivity of these areas to parasite desintegration from cell. (Fig.2A). Parasites leaving the cell take some components of membrane. During this process no bulges occur but damages of cell membrane are observed. (Fig.2B). Increase of parasites lead to reduction and lysis of intracellular structures and membrane damages

take place after parasites desintegration from the fungi cell. Such cells are filled by developing parasites (Fig.2C).

Thus, infected cell undergo morfological and structural changes. It manifested with gradual decrease of homogeneous mass formed from organelles caused by parasites reproduction (Fig.3A). Reproduction of parasites results with lysis (Fig.3 B,C) of homogeneous mass and a "blank" cell (Fig.3 E,F) appears. Parasites trying to leave cell damage some sites of cell membrane. As the result, membrane contours disappear, turn to fragile structures and eventually, fungi cell takes vague forms (Fig.3D,E). Remains forms after cell decomposition are lysed. It shows that parasites use them as a food source.

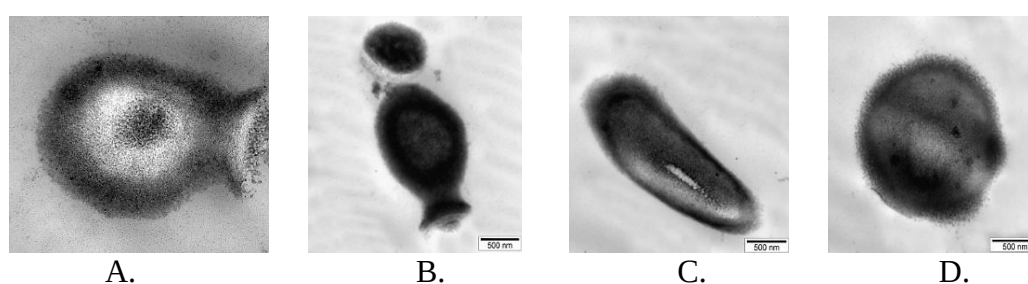


**Fig. 1.** Extracellular motile(A,B) and nonmotile (C,D) forms of BLO organism

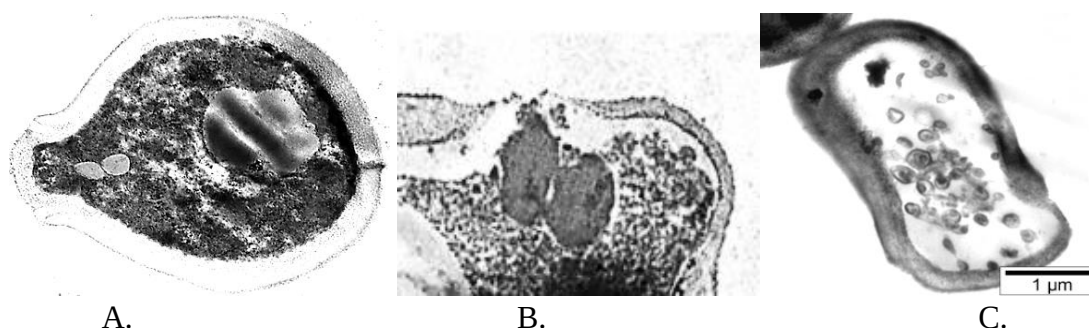


**Fig. 2.** Intracellular forms of BLO

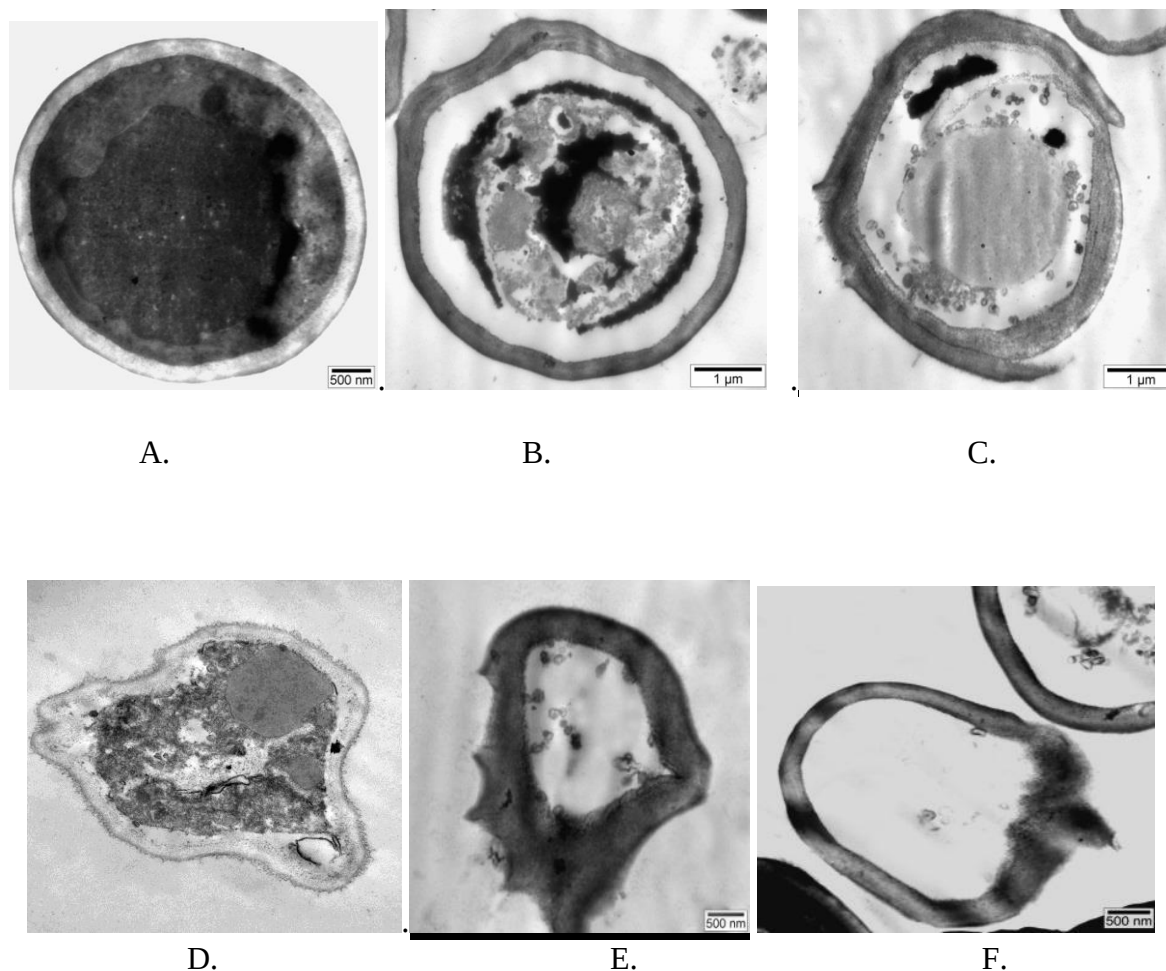


**Fig. 3.** Structural changes in *Candida* cells due to infection by BLO

Thus, forming of big vacuole from small ones, structural changes of organelles, damages of cell membrane and morphological changes are due to BLO's impact. Information represented above is a reliable evidence of BLO's reproduction in fungi. Parasites cause decay of *Candida* cells by producing structural changes in them.

As noted above, there is no report in scientific literature about BLO parasitizing in *Candida* cells. But similar structural changes in yeast and yeastlike organisms have been described and their causes are discussed at the time [9,10]. Unlike us, another researchers relate such structural changes to another factors. For example, degradation taking place after formation of vacuole is associated with autophagy, but the mechanism of the process is not described [11,12]. Some groups of researchers associate formation of autophagosome with

Golgi complex. At the same time, accumulation of antidepressants in cell membrane is shown to be the cause of autophagy. On the other hand, formation of vacuole in *C.albicans* cell has a great role in stress tolerance, mycelium development and virulency of the cell [13,14]. Although it is known to be a correlation between development of mycelial form and vacuols formation, there is no described mechanism of pathogenesis.

Carried out research proves that BLO parasitizing in *C.albicans* cells are microorganisms which have not been investigated and described up to now. This microorganisms do not try to destroy yeast cell. Using yeast cells as a food source, they cause its gradual lysis. Obtained data shows necessity of definitive identification of them by molecular-genetic methods, studying of cell-parasite relations and another

features of parasites. We believe that, investigation of this problem will have significant role as in profilaction and treatment of yeast-associated infections as in explanation of phenomena associated with yeasts.

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*Azerbaijan Medical University  
sevdamuradova 3 @gmail.com*

## BDELLOVIBRIONABƏNZƏR BAKTERİYALARIN CANDIDA CİNSLİ GÖBƏLƏKLƏRLƏ QARŞILIQLI MÜNASİBƏTİ

S.A.Muradova, Z.Ö.Qarayev, A.İ.Qurbanov, E.K.Qasımov, S.S.Cavadov, F.H.Rzayev

Candida cinsli göbələklərdə parazitlik edən bdellovibrionabənzər mikroorqanizmlərin, eləcə də bdellovibrionabənzər mikroorqanizmlərin Candida hüceyrəsində çoxalan zaman baş verən struktur dəyişkənliklərinin elektron-mikroskopik təsvirləri təqdim olunmuşdur.

**Açar sözlər:** bdellovibrionabənzər mikroorqanizmlər, Candida hüceyrələrinin ultrastruktur

## ВЗАИМООТНОШЕНИЕ БДЕЛЛОВИБРИОПОДОБНЫХ БАКТЕРИЙ С ГРИБАМИ РОДА CANDIDA

С.А.Мурадова, З.О.Караев, А.И.Курбанов, Э.К.Касымов, С.С.Джавадов, Ф.Г.Рзаев

Представлены электронно-микроскопические изображения бделловибрионоподобных микроорганизмов, паразитирующих у грибов рода Candida, а также структурные изменения, происходившие в клетках Candida при размножении бделловибрионоподобных микроорганизмов.

**Ключевые слова:** бделловибрионоподобные микроорганизмы, ультраструктура клетки грибов рода Candida