

Application of the scanning ion-conductance microscopy (SICM) in study of voriconazole impact on *Candida parapsilosis* surface structure.

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The studying of antifungal drugs effect on the surface structure by traditional microbiological methods is unobtainable. SICM method allows to obtain the topography of the surface structure and its mechanical properties of biological samples in non-contact mode (Clarke et al., 2016). Achievable to obtain a data of cells stiffness by applying pressure between of the nanopipette tip a sample surface. Azole drugs inhibit the synthesis of ergosterol (a component of the yeast membrane) (Ghannoum & Rice, 1999), which lead to destruction and softening of candida cell membrane. There are reports of the antifungal effect of caspofungin on elasticity of cell wall (Quilès et al., 2017); impact of azole drugs on *Candida* surface structure (Madhavan et al., 2018; Behbehani et al., 2019). However, the dynamic effect of azole drugs on the surface structure and mechanical properties of *Candida* yeast in physiological conditions has not been studied. In this work, an impact of fluconazole on *Candida parapsilosis*. To perform an experiment, yeast immobilized on a glutaraldehyde layer was treated with voriconazole at 40 µg/ml for 6 hours. Cell morphology alteration of the *Candida* cell have been observed by SICM (figure 1). In addition, displacement map indicates increase at 2.5 times (figure 2 (A, B)). The average value of the displacement of the control cell was 17 nm, the value after cell treatment was 41 nm, which is indicated that the cell has softened after voriconazole treatment. Figure 2 (C) presents a graph of the linear dependence of displacement value along the cell surface from the time of exposure with the drug. The curve of the graph does not reach a plateau due to the short exposure time of cells with drug (less than 24 hours). An increase in displacement value indicates a decrease in stiffness at the cell surface and, consequently, destruction of the *Candida* membrane. The data are consistent with theoretical concepts of the antifungal effect of the azole drugs on *Candida* yeast. However, this characteristic is indirect in determining the mechanical properties. Due to the relatively low pressure exerted on rigid yeast cells. Therefore, further refinement of the method for determining cell elasticity is relevant.

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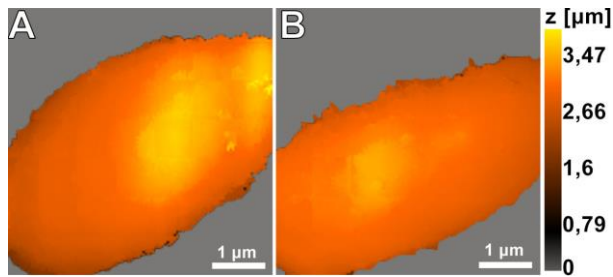


Figure 1. SICM images of *Candida parapsilosis* (A) control, (B) after 6 hours voriconazole treatment at 40 µg/ml.

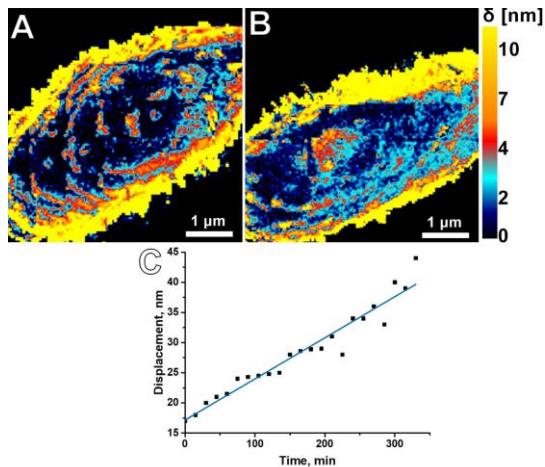


Figure 2. Surface displacement of *Candida* (A) control, (B) after 6 hours voriconazole treatment at 40 µg/ml. (C) Time dependence of *Candida* surface displacement treated with voriconazole at 40 µg/ml.

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