

NANOMECHANICAL MOTION OF YEAST CELL MEMBRANE AS POSSIBLE SOURCE OF ELECTRIC FIELD

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Introduction

Local nanomechanical motion of yeast cell (*Saccharomyces Cerevisiae*) wall has been measured by Pelling et al. with atomic force microscope (AFM). By means of the Fourier transform of the measured signal they have found oscillations with amplitude of a few tenths of nm to a few nm's lying around the frequency of 1 kHz. Frequency of these oscillations was temperature dependent. Background noise of the AFM was of the order of magnitude of 10^{-2} nm. Oscillations at a single frequency have been detected on the normal yeast cell wall and those at multiple frequencies different from the frequency on the normal cell wall have been detected on the bud scar. Oscillations of the yeast cell wall and of the bud scar ceased after addition of metabolic inhibitor, which suggests cellular metabolism is involved in the generation of motion.

Materials and Methods

This paper reports on the measurements of acoustic vibrations of the yeast cells in the region around kHz. Measurements were made with a Multimode IV, Veeco Digital Instruments AFM.

AFM has to be screened from the vibrational noise from the floor as well as from the noise generated by controlling electronic system. Background noise was below the level of 0.1 nm at frequencies above 0.5 kHz.

Results and discussion

The peaks of acoustic oscillations of yeast cell membrane were detected on the multiple frequencies around 1 kHz with amplitudes of about of 1 nm. Spectra of detected oscillations are presented.

The findings correspond to the Fröhlich's postulate of coherent electrically polar longitudinal vibrations in biological systems. Vibrations of the electrically polar structures in the cell membrane imply generation of electromagnetic field. Therefore we suggest that electrical oscillations of similar frequencies should be detectable in the vicinity of yeast cells.