Correction to: Industrial antifoam agents impair ethanol fermentation and induce stress responses in yeast cells - DTU Orbit (28/09/2019)

The Brazilian sugarcane industry constitutes one of the biggest and most efficient ethanol production processes in the world. Brazilian ethanol production utilizes a unique process, which includes cell recycling, acid wash, and non-aseptic conditions. Process characteristics, such as extensive CO2 generation, poor quality of raw materials, and frequent contaminations, all lead to excessive foam formation during fermentations, which is treated with antifoam agents (AFA). In this study, we have investigated the impact of industrial AFA treatments on the physiology and transcriptome of the industrial ethanol strain Saccharomyces cerevisiae CAT-1. The investigated AFA included industrially used AFA acquired from Brazilian ethanol plants and commercially available AFA commonly used in the fermentation literature. In batch fermentations, it was shown that industrial AFA compromised growth rates and glucose uptake rates, while commercial AFA had no effect in concentrations relevant for defoaming purposes. Industrial AFA were further tested in laboratory scale simulations of the Brazilian ethanol production process and proved to decrease cell viability compared to the control, and the effects were intensified with increasing AFA concentrations and exposure time. Transcriptome analysis showed that AFA treatments induced additional stress responses in yeast cells compared to the control, shown by an up-regulation of stress-specific genes and a down-regulation of lipid biosynthesis, especially ergosterol. By documenting the detrimental effects associated with chemical AFA, we highlight the importance of developing innocuous systems for foam control in industrial fermentation processes.

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