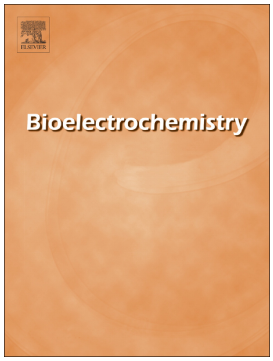

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Mechanisms of inactivation of *Candida humilis* and *Saccharomyces cerevisiae* by pulsed electric fields

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Inactivation of yeasts by pulsed electric fields

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Abstract

Aims: This study aimed to determine how electric field strength, pulse width and shape, and specific energy input relate to the effect of pulsed electric fields (PEF) on viability and membrane permeabilization in *Candida humilis* and *Saccharomyces cerevisiae* suspended in potassium phosphate buffer.

Methods and Results: Cells were treated with a micro-scale system with parallel plate electrodes. Propidium iodide was added before or after treatments to differentiate between reversible and irreversible membrane permeabilization. Treatments of *C. humilis* with 71 kV/cm and 48 kJ/kg reduced cell counts by 3.9 ± 0.6 log (cfu/mL). Pulse shape or width had only a small influence on the treatment lethality. Variation of electric field strength (17 - 71 kV/cm), pulse width (0.086 - 4 µs), and specific energy input (8 – 46 kJ/kg) demonstrated that specific energy input correlated to the membrane permeabilization (r^2 = 0.84), while other parameters were uncorrelated. A minimum energy input of 3 and 12 kJ/kg was required to achieve reversible membrane permeabilization and a reduction of cell counts, respectively, of *C. humilis*.

Conclusions: Energy input was the parameter that best described the inactivation efficiency of PEF.

Significance and Impact of Study: This study is an important step to identify key process parameters and to facilitate process design for improved cost-effectiveness of commercial PEF treatment.

Key words: pulsed electric fields, *Candida humilis*, *Saccharomyces cerevisiae*, propidium iodide, bleomycin, electric field strength, specific energy input.