

# Inhibition of ochratoxigenic moulds by *Debaryomyces hansenii* strains for biopreservation of dry-cured meat products

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## Abstract

The ability of the osmotolerant yeast *Debaryomyces hansenii* to inhibit *Penicillium nordicum*, the most common ochratoxigenic mould encountered in dry-cured meat products, was evaluated. The antagonistic effect of ten *D. hansenii* strains isolated from dry-cured ham was screened in vitro using malt extract media and meat extract peptone media with the water activity ( $a_w$ ) adjusted to 0.97 and 0.90. A significant inhibition of the two tested *P. nordicum* strains by *D. hansenii* cells and cell-free supernatants was observed. At 0.97  $a_w$ , increasing *D. hansenii* inoculum concentrations significantly improved the inhibition of mould growth on solid medium, whereas at 0.90  $a_w$  this was not always the case. As observed by bright field microscopy, most *D. hansenii* strains were able to delay *P. nordicum* spore germination when co-cultured in malt extract broth. *D. hansenii* FHSCC 253H showed the highest overall in vitro inhibition of ochratoxigenic mould growth, and was therefore chosen for co-cultivation assays in dry-cured ham slices incubated at 0.94 and 0.84  $a_w$  simulating ham ripening. Regardless of the experimental conditions tested, lower levels of the inoculated *P. nordicum* strain were detected in cocultivation batches compared with batches without *D. hansenii*. The highest level of mould growth inhibition was observed in batches at 0.94  $a_w$ . Ochratoxin A (OTA) production in ham samples was detected by HPLCMS. Co-culturing of *P. nordicum* with *D. hansenii* FHSCC 253H resulted in lower OTA levels compared with control samples without *D. hansenii*. The decrease of the mycotoxin presence due to *D. hansenii* FHSCC 253H was more efficient at 0.94  $a_w$  (OTA was below the detection limit). In conclusion, *D. hansenii* is potentially suitable as a biopreservative agent for preventing ochratoxigenic mould growth and OTA accumulation in dry-cured meat products. The inoculation of *D. hansenii* should be made at the beginning of processing (at the end of post salting) when the  $a_w$  of the product is still high (near 0.94). This action in addition to application of appropriate hygienic actions and control of temperature and

relative humidity throughout ripening is required to reduce health risks due to OTA exposure.