Influence of abiotic factors on ochratoxin A production by a *Penicillium nordicum* strain in dry-cured meat model systems

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**Abstract**

OTA production from an ochratoxigenic *Penicillium nordicum* strain was studied in artificial inoculation trials managed both in a dry-cured pork-based medium (DCM) and in dry-cured pork cores. The experimental region defined by 7–23 °C temperature, 0.83–0.97 aw and 7–21 days of incubation was considered for DCM in the applied Central Composite Design (CCD). aw > 0.92, temperature > 18 °C and incubation time protracted to 21 days strongly enhanced OTA production. The conditions of CCD central point (aw = 0.90, temperature = 15 °C and days of incubation = 14) and those predicted as the most suitable for OTA production in DCM, were tested in dry-cured pork samples incubated up to 190 days. A ten-fold increase in OTA (0.04–0.41 μg/g) was achieved when the temperature rose from 15 °C up to 20 °C, an over twenty-fold (0.02–0.43 μg/g) when switching from 0.90 to 0.93 aw. The results can be useful as guidelines for critical control points (CCPs) detection in dry-curing processing to prevent OTA contamination of the products.

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1. Introduction

Pork meat and pork derivatives are known for being a possible source for human exposure to ochratoxin A (OTA) (Govaris, Solomakos, & Pexara, 2007), reported as an immunosuppressive agent, a nephrotoxin and a renal and urinary tract carcinogen (Lock & Hard, 2004; Pfohl-Leszkowicz & Manderville, 2007). Ochratoxin A is controversially reported as involved in Balkan Endemic Nephropathy (BEN) (Schmidt-Heydt, Schunk, & Geisen, 2009) with less information on ecological conditions favorable to OTA production in model systems and in food products.

*P. nordicum* strain in dry-cured meat model systems

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*P. nordicum*, morphologically similar to *Penicillium verrucosum*, was recently identified as a separate species, according to its secondary metabolite profile (Larsen, Svendsen, & Smedsgaard, 2001) and genomic sequences (Bogs, Battilani, & Geisen, 2006). Studied strains of *P. nordicum* all originate from proteinaceous, dry-cured salt rich foods like cheese and meat products, while isolates of *P. verrucosum* derive from plants, suggesting a different ecology for the aforementioned species (Larsen et al., 2001). Studies on *P. nordicum* were mainly focused on molecular detection methods and the genes involved in OTA biosynthesis (Bogs et al., 2006; Schmidt-Heydt, Schunk, & Geisen, 2009) with less information on ecological conditions favorable to OTA production in model systems and in food products.

The aim of this research was to study the role of temperature and substrate water activity (aw) on OTA production from a *P. nordicum* strain previously tested as OTA producer, both in a dry-cured pork-based medium and in a dry-cured pork model system closely approaching real samples. Investigated temperature,