Time-related changes of Zn-chelatase and Zn-protoporphyrin IX in dry-cured hams

T. Toscani¹, R. Benedini², and G. Parolari²

¹ Consorzio del Prosciutto di Parma, v. M. Dell’Arpa 8/b, 43100 Parma, Italy.
² Stazione Sperimentale per l’Industria delle Conserve Alimentari, vle Tanara 31/A, 43100 Parma, Italy.

Objectives

The aim of this study was:

A. to classify green legs for their Zn-chelatase activity;
B. to elucidate the formation of zinc-protoporphyrin IX (ZPP) as affected by Zn-chelatase activity in individual muscles at various stages of Parma ham processing;
C. to test several substances, amongst those typically used in the meat industry, for their effects on ZPP formation.

Introduction

Parma hams develop their characteristic bright red stable colour without addition of curing agents such as nitrates and nitrites. Major red pigment has been identified as zinc-protoporphyrin IX, that would form via zinc replacement of iron in the heme ring during manufacturing time that is at least of one year. ZPP formation has been supposed to be supported by an endogenous enzyme such as Zn-chelatase, but the mechanism yielding ZPP in leg’s muscles is still to be clarified.

Methods

A. Different levels of Zn-chelatase activity in green meat samples suggest a specific attitude of legs to develop ZPP.
B. During manufacturing the enzyme is partly inactivated according to a muscle-dependent pattern. Residual activity accounts for final pigment content.
C. Sodium ascorbate enhances ZPP formation whereas sodium nitrate lowers pigment synthesis especially in the most advanced ageing steps.

Results

A. Fig. 1
Zn-chelatase activity in green legs (outer Semimembranosus muscle).

B. Fig. 2
Zinc-chelatase activity (left) and ZPP fluorescence intensity (right) in hams at several processing stages. BF = Biceps femoris, SM = Semimembranosus, RF = Rectus femoris, ST = Semitendinosus (light/inside and dark/inside portion).

C. Fig. 3
Time-related changes of ZPP in hams added with salt, or salt+ascorbate, or salt+nitrate.

References