ROLE OF STAPHYLOCOCCI IN THE OXIDATION OF FREE FATTY ACIDS

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Background

Lipid oxidation can lead to off flavours in meat products but also contribute to the development of the desirable flavour of dry cured ham or fermented sausages (*Chizzolini et al., 1998*). During sausage processing, several factors influence the rate of lipid oxidation such as composition of raw meats components, grinding and adding exogenous components: salt, nitrite, spices, antioxidants (*Kanner, 1994*). The manufacturing of sausages includes starter cultures, which contribute to the development of dry sausage aroma by influencing the composition of volatile compounds in the products. In particular, they modulate the level and the nature of volatiles originating from lipid oxidation (*Berdagué et al., 1993; Montel et al., 1996; Stahnke 1995a, b, c*). We have already shown that staphylococci inhibited oxidation of unsaturated free fatty acids (*Talon et al, 2000*). Also we know that *S. carnosus* and *S. xylosus* synthesised antioxidant enzymes: catalase and superoxide dismutase (Sod).

Objective

The objective of this work was to study the effect of different factors on the antioxidant properties of *S. carnous* and *S. xylosus* grown in presence of linoleic acid.

Methods

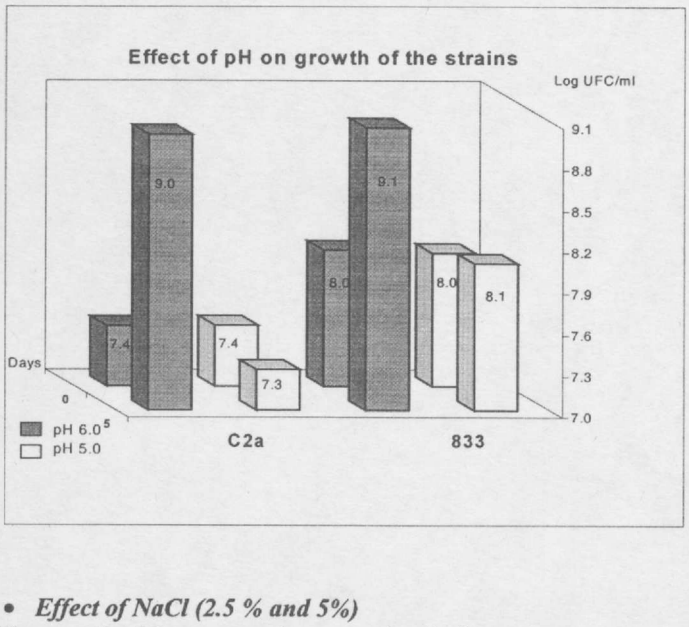
Staphylococcus carnosus (833) and *Staphylococcus xylosus* (C2a) were grown in MC media (*Talon et al., 2000*). After sterilisation, linoleic acid was added to a final concentration of 0.5 g/l. The effect of two NaCl concentrations (2.5 or 5.0 % W/V), two pH's (5.0-6.0) and two oxygen conditions: anaerobiosis or aerobiosis was studied. The strains were inoculated at approximately 10^6 cells/ml. Samples were incubated at 25°C and were analysed after 0 and 5 days. Viable counts of staphylococci (Log of CFU/ml) were enumerated with Chapman medium incubated at 25°C for 48h. Oxidation was evaluated by thiobarbituric acid reactive substances (TBARS) (*Lynch and Frei, 1993*). Results are expressed in µmoles of malonaldehyde/g of lipids.

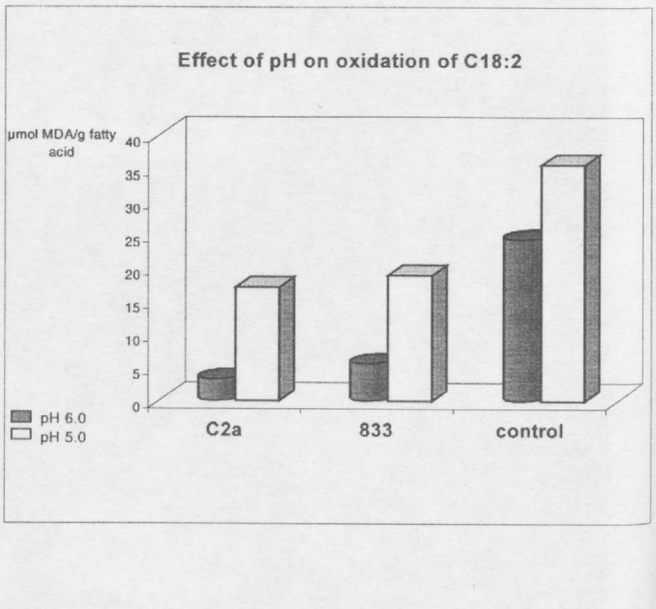
Results

- ***Effect of pH (pH 6.0, 5.0)***

Both strains grew very well at pH 6.0 and they reached 10^9 cells/ml. At pH 5.0, they stayed at the level of inoculation.

In the control samples, the substrate C18:2 was oxidised after 5 days of incubation in aerobiosis and at 25°C. The oxidation was higher at pH 6.0 than at pH 6.0. Both strains limited the oxidation of C18:2 at the two pH-values. However, the inhibition of the oxidation was higher at pH 6.0, certainly in relation with their higher number.

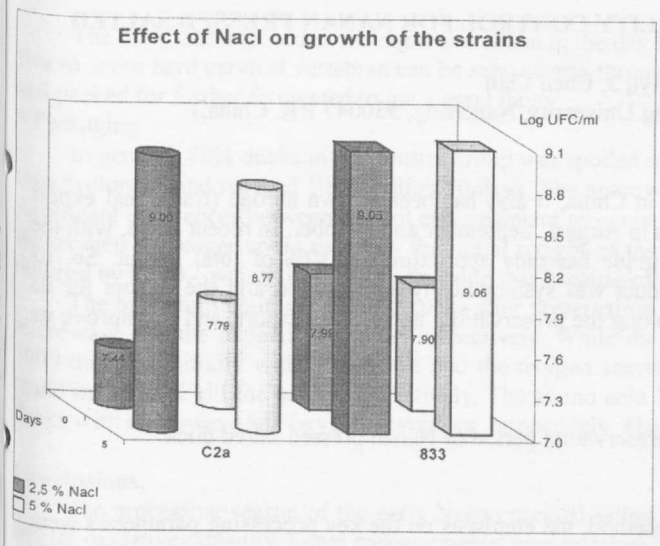


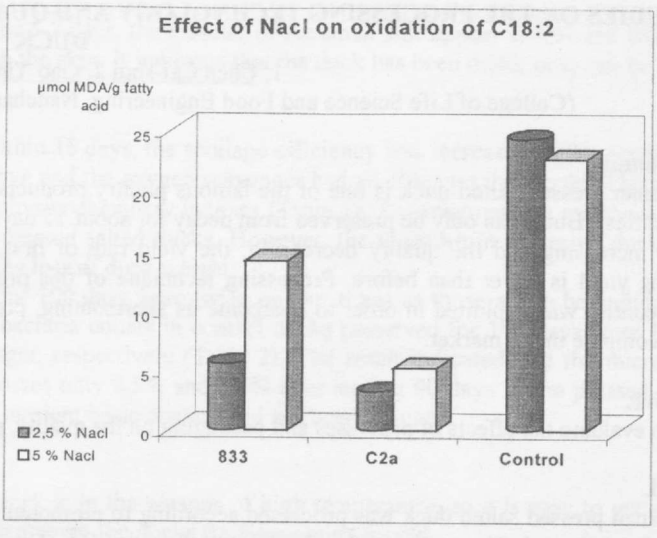


- ***Effect of NaCl (2.5 % and 5%)***

The growth of the two species was quite similar at the two concentrations of salt (2.5% and 5%). However a small effect was noticed for *S. xylosus* at 5% NaCl.

In the control samples, the substrate C18:2 reached the same level of oxidation at the two levels of NaCl after 5 days of incubation in aerobiosis and at 25°C (from 8 µmol to 25 µmol MDA/g lipid). In presence of the strains, the oxidation of C18:2 was inhibited. The inhibition was less important for *S. carnosus* grown with 5% of salt.





- ***Effect of oxygen (aerobiosis, anaerobiosis)***

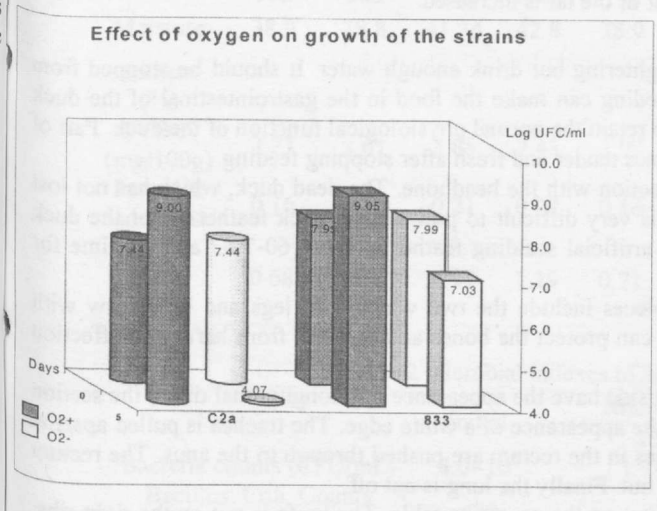
In presence of oxygen, both strains grew very well and reach 10^9 cells/ml. In anerobiosis, lysis occurred for both strains but it was higher for *S. xylosus* (7.4 log to 4.1 log).

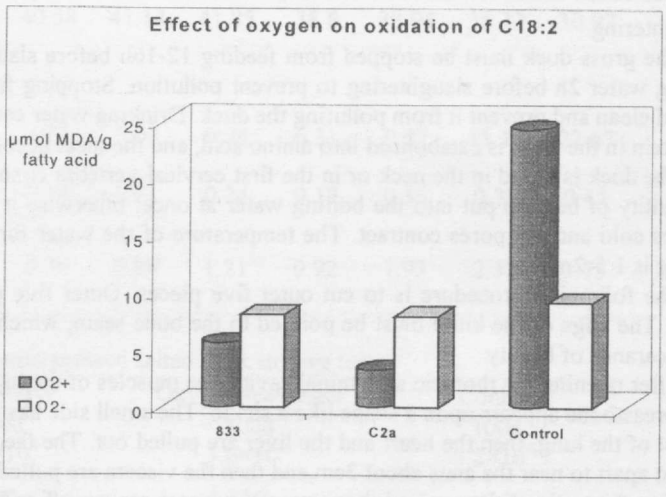
Again oxidation was noticed for the substrate in aerobiosis and the strains fight against oxidation. In anaerobic condition, the substrate did not oxidise and the strains had no effect.

Conclusion

In aerobiosis, the control steril substrate C18:2 was oxidised after 5 days of incubation at pH 5.0 and 6.0, with NaCl 2.5% and 5%. Both strains limited the oxidation of C18:2 in these different conditions.

In anaerobiosis, the substrate did not oxidise and the strains had no effect.





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