P-04-33

Detection of protein hydrolysate additions to turkey meat By determination of the free amino acid contents with high-performance liquid chromatography (#651)

Bertolt Kranz, Sabine Andrée, Dagmar A. Brüggemann

Max Rubner-Institute (MRI), Federal Research Institute of Nutrition and Food, Department of Safety and Quality of Meat, Kulmbach, Germany

Introduction

Basic foods, a daily need for all people, should be inexpensive and of high quality. These conditions lead into temptation to replace high quality food ingredients with cheaper ones. One quality parameter of meat is the content of meat protein. This is normally determined by the analysis of nitrogen in relation to the water content. However, sometimes poultry is surrogated by protein hydrolysates which consist of amino acids and peptides from other – cheaper – sources. The usage of protein hydrolysates is advantageous compared to proteins in fresh meat products as they have a higher solubility. This is problematic from a consumer safety point of view as peptides from some sources (e. g. wheat) can have allergenic effects[1].

An unambiguous proof is necessary for an effective control of foods. This can be performed by the determination of the content of free amino acids (FAA) with high performance liquid chromatography with ultraviolet and visible detection (HPLC-UV/VIS). In this study, turkey meat was used as a model system because of its high water capacity[2] and low profit margin. Natural fluctuations (e. g. female-male variations[3]) must be taken into account. The protein hydrolysate can be gained from different sources like plant (e. g. wheat), animal (e. g. casein) or meat (e. g. mechanically deboned).

Methods

All experiments were performed with turkey breast muscles (*Musculus pectoralis superficialis*, BUT Big 6, *Meleagris gallopavo*). The trade samples were fetched from a slaughterhouse or local and nationwide acting food retailer in Germany. All meat samples were frozen in liquid nitrogen and stored at -20 °C until further use. Protein hydrolysate or water was added via injection (1 $ml_{solution}/g_{meat}$) to the meat.

The meat samples were homogenized in 0.025 M EDTA / 0.100 M Tris buffer (pH 8.0) in a sodium cloride / ice bath (-20 °C). Internal amino acid standards were added. Proteins and longer peptides were precipitated with acid (pH about 2.2). The samples were centrifuged and filtrated and the filtrates were used for the analysis.

The free amino acid content was determined with cation exchange chromatography within a pH-rage of about 3 to 10. A post-column derivatisation with ninhydrin was done. All sample supernatants were analysed diluted and undiluted in duplicates. The quantification was performed with an external amino acid standard solution.

The statistical analyses were done by JMP or Excel. A p-value of < 0.01 indicates a significant difference.

Results

The selected free amino acid (FAA) contents of the slaughterhouse turkey meat samples increased as time went by. This is shown exemplary for 0 h and 99 h *postmortem* in figure 1. However, the contents of FAA were generally lower in the slaughterhouse samples than in the trade samples. Poultry meat is normally available on the market two to five days after slaughter. Different conditions (e. g. storage temperature) can influence the FAA contents. The high variation is also illustrated by the unusual high content of the free L-aspartic acid of the sample from the nationwide acting food retailer. But also the other FAA contents showed significant differences between the slaughterhouse and trade samples. For example, the FAA contents of L-histidine for both time dependent samples showed significant differences referred to both trade samples. Only the FAA contents of L-histidine at 0 h and 99 h *post mortem* were not significant different towards each other.

The addition of water or protein hydrolysates can only be proven by clearly significant differences of the FAA contents. The addition of water significantly reduces the content of selected FAA (see figure 2). Otherwise, the additions of protein hydrolysates lead to a significant increase of most of the FAA contents.

For free L-aspartic acid, the maximal natural content was significant different to the content after addition of casein hydrolysate, but not in the case of the added wheat hydrolysate. However, the maximal natural content of free L-valine was significant different compared to both hydrolysate additions. The different protein hydrolysates from wheat and casein proteins caused the increase of different FAA contents. This is due the fact that these proteins have different amino acid compositions.

Conclusion

The natural content of FAA in meat is changing *postmortem* because of the metabolic depletion and hydrolysis of meat proteins. Also the conditions like feeding, age or storage time influence the natural FAA contents. Further on, the used protein hydrolysate is also crucial for the FAA contents in the meat. Therefore several FAA contents must be compared in order to prove an addition of protein hydrolysates or water. A quantitative method with small variations is important for that. It is also necessary to measure a sufficient amount of control samples in order to compensate extreme single FAA contents.

Notes

Literature

1. Schaafsma, G. (2009) European Journal of Clinical Nutrition, 64, 1161-1168.
2. Carciofi, B. A. M.; Lurindo J. B. (2007) Chemical Engineering and Processing, 46, 444-450.
3. Tatara, M. R.; Brodzki, A.; Pyz-Lukasik, R.; Pasternak, K.; Szpetnar, M. (2012). Journal of Poultry Science, 49, 219-223.

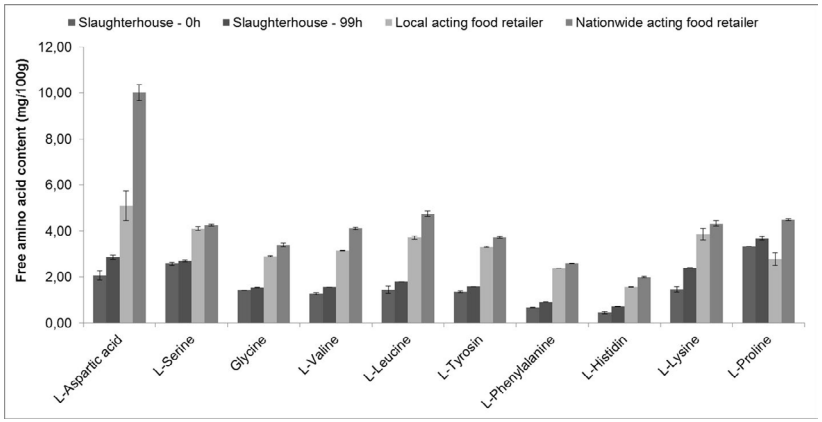

Figure 1:
Natural contents (± standard deviation) of the FAA of slaughterhouse and trade samples.

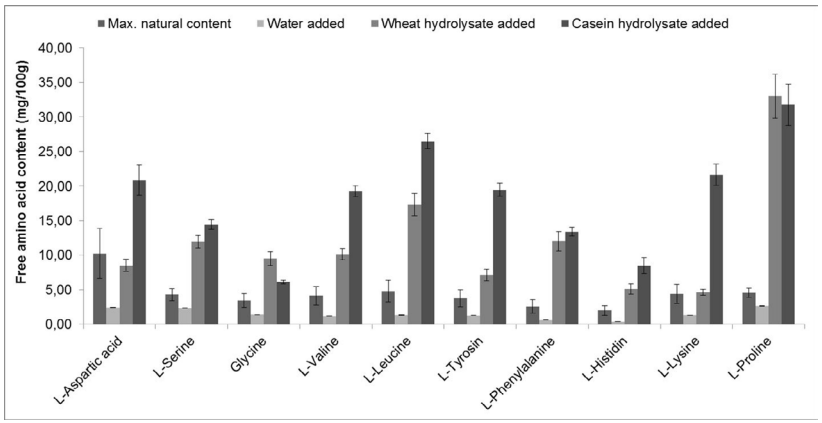

Figure 2:
FAA contents (± standard deviation) with and without the addition of water or protein hydrolysate.

Notes