A comprehensive method for simultaneous quantification of six boar taint compounds in meat products

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Objectives: The indolic metabolite of tryptophan skatole and the steroid androstenone (5α-androst-16-en-3-one) have been recognized as the two major boar taint compounds. Later on, indole and two pheromone metabolites of androstenone, 5α-androst-16-en- 3α/β-ol, are categorized to the boar taint group as well. Recently, the hepatic metabolite of skatole, 2'-aminoacetophenone, has been identified as a new contributor to the offodor in pigs[1]. More interestingly, sensory research found out that it influenced the perception of skatole and androstenone synergistically. Due to the ban of surgical castration of piglets without anesthesia in Germany, new food technologies are highly demanded to deal with boar tainted meat. Meanwhile, practical analytic methods are required both as assistance to new technology development and in routine market control. In the last years, many different methods have been published for the quantitation in meat, meat products, serum and plasma. The procedures vary from sample pre-treatments to instrumentation. However, no method has been reported to detect the six compounds simultaneously so far. This study aimed to develop a method, which enables a simultaneous quantification of the indolic and steroid boar taint compounds in pro- cessed meat products, such as emulsion type sausages. Materials and Methods: The traditional Lyoner was chosen as a model sau- sage type and was produced in the technical unit of the institute following standard recipes, with a final fat content of 30%. Both fat and meat were from sow. Standards of boar taint compounds were fortified in the sausages during production. For the sample preparation, regarding the lipophilic characteristics of the analytes, a fully liquid fat extraction step through hexane was applied firstly with the help of Accelerated Solvent Extraction (ASE). Subsequently, compounds of interests were separated from the fat through Size Exclusive Chromatography (SEC). At last, the cleaned aliquots were injected into the Gas Chromatograph (GC) and detected by Mass Spectrometry (MS) in selective-ion-mode (SIM). Lyoner samples without fortification of boar taint compounds were prepared in the same way and used as matrix for calibration curves. All data were statistically analyzed in JMP (Version 16.2.0).

Results and Discussion: The two spatial isomers, 5α-androst-16-en-3α/β-ol, were successfully separated in the GC, which ensured a further reliable quantification in the MS. High linearity of all six compounds was obtained in lyoner matrix ($R^2 \geq 0.99$). The limit of detections (LODs) of skatole and androstenone were not only lower than threshold values[2] set in pig but also below the perceptible levels[3] in different meat products. Comparable LODs were obtained of the other compounds according to previously published data1,4. A range between 7% - 13% of relative standard deviation and 60% - 80% of recovery were obtained, which indicated a high precision and acceptable accuracy. The fat extraction procedure from Lyoner was found to have a high impact on analyte recovery. By heating with salt[5], only 42% - 65% recovery were obtained. Thus, for emulsion type sausages the fat extraction was changed to ASE as an efficient and stable method. Conclusion: This new developed ASE-SEC-GC-MS method 1) is reliable for a simultaneous quantification of the six boar taint compounds; 2) can be applied to meat and meat products containing different lev- els of fat; 3) and thus can be applied to the development of new meat processing technologies.

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