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FOOD QUALITY AND FOOD SAFETY OF ANIMAL ORIGIN

KEYNOTE LECTURE

MEAT AS A SOURCE OF ANTIOXIDANTS

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ABSTRACT

Muscle food is considered to be one of the main cause of the incidence of many cardiovascular diseases and even some types of cancers. That is why the recent WHO recommendation is to lower the amount of meat and especially processed meat products in our diet. However, fresh, unprocessed meat is a rich source of many valuable, beneficial and bioactive substances including vitamins, minerals and natural antioxidants. The latest one are substances present in food at relatively low concentration, comparing to easily oxidized molecules, which are able to decrease the dynamic of lipids, proteins, DNA and carbohydrates oxidation processes. The presence of active antioxidants determines both the quality and durability of food products, including meat. Antioxidants are generally divided, according their way of action, to protective inhibitors and proper antioxidants. Protective inhibitors are able to remove the primary active reduction products of oxygen or a transition metal converting an inactive form and inhibitors acting on secondary catalysts for the oxidation of lipids. Proper antioxidants intervening the chain reactions of lipid oxidation by reacting with the lipid radicals. Maintaining the balance between antioxidants and prooxidants is necessary for the proper functioning of a living organism and prevent negative effects of oxidative stress. Mechanisms of defense against reactive oxygen species can be divided into three groups consisting of: antioxidant enzymes (glutathione peroxidase, catalase and superoxide dismutase), the hydrophilic and hydrophobic low molecular weight antioxidants that disrupt free radical chain reactions, and as well proteins able to bind prooxidative transition metal ions. In meat the first line of defense i.e. enzymes, are not active, as a result of processing operations, in particular heat treatment and high concentrations of sodium chloride. So, the primary antioxidative defense system of meat is based on low molecular weight endogenous antioxidants, both hydrophilic and lipophilic. Naturally occurring in meat antioxidants capable to scavenge free radicals are lipid-soluble tocopherols, tocotrienols, ubiquinones and carotenoids, as well as water-soluble amines, amino acids, peptides i.e. carnosine and anserine, histidine related compounds, and protein thiols, glutathione, uric acid and polyphenols. Currently, in the technology of food of animal origin a strong trend to increase antioxidants compounds concentration is observed. It can be done directly by adding antioxidants during meat processing, as well as on the indirect way by the animals diet modification. However, due to dualistic properties of some antioxidants and potential reactions with other meat components during processing leading to the acceleration of oxidation processes and formation of toxic/harmful compounds, special attention should be put to this aspect of meat science and technology.

ORAL PRESENTATION

FUNGAL COMMUNITY IN AUSTRIAN VORARLBERGER HARD CHEESE DURING RIPENING

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ABSTRACT

Vorarlberger Bergkäse (VB) is an artisanal raw milk washed-rind hard cheese (manufactured in Western Austria) without adding external ripening cultures and has a protected designation of origin (PDO). In previous studies, the bacterial and fungal composition of the rind microbiota of VB was assessed by using 16S and 18S rRNA cloning and Sanger sequencing, revealing a high diversity on the VB cheese rind (Schornteiner et al., 2014).

The aim of this study was to identify cheese-associated eukaryotes (yeast and filamentous fungi) present in the VB cheese rinds during ripening process.

Cheese rind samples (n=200) were taken from ripening cellars of two cheese producing facilities in Austria at the day of production and after 14, 30, 90 and 160 days of ripening. i) Illumina MiSeq sequencing, ii) TaqMan quantitative real-time PCR (qPCR) and iii) cultivation approaches were used.

Results: i) The culture-independent results, obtained using high-throughput Illumina ITS2 (ITS3/ITS4) sequencing summarized the current knowledge on yeast and filamentous fungi in VB rinds. ii) The quantitative analysis (part 2) using 18S rRNA qPCR provided information about the quantitative level of fungi during ripening and revealed differences between the two ripening cellars. iii) Fungi culture collection (part 3) provided isolates to understand the importance of interactions between fungi and bacteria in cheese rinds. These new findings enable us to understand the VB cheese-making process better and might allow the processing- and ripening conditions to be improved to enhance the quality of the product.

THE MECHANICAL EFFECT OF DIFFERENT COMPONENTS IN THE AUTOMATIC MILKING SYSTEMS ON THE FREE FATTY ACIDS FFA IN MILK

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ABSTRACT

There is an increasing trend in the number of automatic milking systems (AMS) installed worldwide. Various quality milk problems have been linked with AMS. New technologies use complex sensor technology than ever before.

The robots use sensor technology to find the teats, clean them, and attach the milking clusters. Milking with an AMS is a fully automated process, in which visual control of the milk is not possible as with conventional milking systems. The content of milk FFA is affected when milked with AMS leading to an accumulation of free fatty acids (FFA). The main reasons of too high FFA-levels are quite complex and not yet fully covered in AMS.

Therefore, the aim of this study was to determine potential factors inside the AMS, which significantly influence the FFA content, such as the teat cups design, pulsation ratio, air inlet, and tubes layout. In this case, the comparison is between AMS themselves; two AMS of different manufacturers were compared. The investigations were carried out in the milking laboratory of the International Committee for Animal Recording (ICAR) in Groß Kreutz, Brandenburg, Germany. The laboratory was equipped with different components of the chosen AMS. The bulk milk from the AMS was taken for testing the influence of different AMS components on FFA. The milk samples were regularly obtained (four to five times per month from February 2008 to February 2019) from the dairy herds for the milk quality determination in State Control Associations (LKV).

FFA levels increasing were noticed likely to milking machine components of AMS, some components imply more importance than technical parameters of the AMS. The results of the regression analysis showed that the FFA values differed significantly between teatcups with different designs and the different setting of AMS's.

THE EFFECT OF POLYPHENOLS AND VITAMIN E ON THE PERFORMANCE, MEAT QUALITY AND ANTIOXIDANT STATUS OF MONOGASTRIC ANIMALS UNDER NORMAL AND STRESS CONDITION

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ABSTRACT

The aim of the studies was to verify the hypothesis that the use of natural polyphenols (onion and grape seed extracts, Proviox®) and increase in the content of vitamin E in the diets influence the performance, meat quality, and antioxidant status of monogastric animals. First experiment was conducted on 52 sows (4 treatments) to determine the effect of vitamin E and natural polyphenols on performance, vitamin E and antioxidant status in sows. Considering the results it can be concluded that the sows received diets with the vitamin E and polyphenol (50:50) supplements were characterised by similar fertility, mating effectiveness and litter performance compared to the group sows fed diets with vitamin E addition. Results from the study demonstrate that compared with sows fed 100/150 mg vitamin E/kg diets (gestation, lactation) the sows fed the with vitamin E and natural polyphenols and their piglets were characterised by similar or better vitamin E status and better antioxidant status (GPx, SOD, TAS) and vitamin E status (α-tocopherol concentrations). It can be concluded that the replacement of 50% of dietary vitamin E with polyphenols did not compromise the growth performance of sows or piglets and improved their antioxidant status. The studies with boiler chickens (four) involved 480-day-old broiler chickens Ross 308 (120 birds in each experiment), randomized into 4-6 experimental groups. The birds received basal diets without added vitamin E or diets supplemented with vitamin E, vitamin E and polyphenols or only with polyphenols. Broiler chickens were exposed to the following stress factors: elevated ambient temperature, the presence of ochratoxin or oxidized fat in diets or were without stress condition. Partial replacement of vitamin E with polyphenols in broiler chicken diets can improve the antioxidant status of birds as well as some carcass and meat quality parameters. The obtained results are comparable with those reported for dietary supplementation with high levels of vitamin E in preventing the adverse effects of stress in commercial poultry production.