Research and development in the field of food science and technology
(Oral presentation)

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Our research activities focused on three major areas as follows. In the first phase of our studies, efforts were made to improve the quality of fatty goose liver, which is both a popular commercial food product, and an important raw material for the canning industry. This product is regarded as a Hungarian specialty in many countries. Some of our results include:

- Soft grits based force feeding proved to be superior to the conventional method both in terms of efficiency and environmental impact.
- *Chlamydia psittaci* infections had a negative effect on goose liver quality by lowering the rate of exsanguination during slaughter.
- The presence of engorged blood vessels in goose livers was reduced by optimization of transport and lairage conditions, stunning parameters, and duration of exsanguination. The following optimum values have been determined: transportation distance not exceeding 60 km, 60 min of lairage, stunning at 350 Hz, 90 V, and 80 to 85 mA, and exsanguination for 310 sec.

Another major objective was to determine heating parameters that result in optimum sensory properties in semi-preserved and fully preserved goose liver products made from domestic raw goose livers containing elevated levels of anaerobic spores compared to similar French raw materials. To this end, the most heat resistant anaerobic sporeformers in livers were identified down to species level and the degree of their heat resistance was subsequently determined.

- *Clostridium sordellii*, *C. perfringens*, and *Enterococcus faecalis* were found to be the major spoilage organisms in goose liver. It may be worth mentioning that *E. faecalis* is a non-spore-forming bacterium species.
- Heating at 95°C for 7 min and 18 min caused total destruction of *C. perfringens* and *C. sordellii*, respectively. This thermal treatment was considerably milder than the previously used method, i.e., 105°C for 30 min.

The results of our trials aimed at producing novel functional fermented milks can be summarized as follows.

- The use of 3g/L of powdered *Spirulina platensis* biomass for the manufacture of yogurts and ABT-type fermented milks proved to be optimal in regards to effectiveness (i.e., stimulating growth and acid production of starter organisms), sensory properties, and cost.
- The beneficial physiological properties of the *Spirulina* biomass were further improved by enrichment with iodine, zinc, and selenium. The levels of trace elements in the growth medium needed to produce an effect were determined in laboratory simulations. After cultivation in a photobioreactor for a period of 8 days in artificial media containing proper concentrations of the specific trace elements, 370-, 58-, and 47-fold increases were measured for I, Se, and Zn, respectively.
- As a result of *Spirulina* enrichment, the specific growth rate of the rod-shaped lactic acid bacteria (*Lactobacillus delbrueckii* subsp. *bulgaricus* CH-2 and *L. acidophilus* La-5) and bifidobacteria (*Bifidobacterium animalis* subsp. *lactis* Bb-12) strains tested doubled, and their fermentation activity increased by approximately 150%.

Finally, in a semi-hard cheese-making trial, whey protein retention (i.e., utilization) rates were improved by an enzymatic treatment. For this, transglutaminase was used, which catalyzed reactions resulting in creation of intermolecular bonds between protein molecules. Under appropriate reaction conditions, transglutaminase formed complexes between whey proteins and casein and, as a result, whey proteins were incorporated into the cheese curd at a highly improved rate.

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