

Studies on vitamin contents upon the introduction of modern lines for the manufacture of sterilized meat and liver pastes

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The contents of vitamins B<sub>1</sub>, B<sub>2</sub>, A and E were studied in raw materials and the ready product. The per cent losses in the individual technological steps were calculated, upon the application of an accelerated technology for the production of liver and meat pastes.

Untersuchungen über den Vitamingehalt bei der Anwendung moderner Linien zur Herstellung von sterilisierten Fleischleberpasteten

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Es wurden Untersuchungen über den Gehalt an den Vitaminen B<sub>1</sub>, B<sub>2</sub>, A und E im Rohstoff und im Endprodukt durchgeführt. Dabei wurde der Verlustprozentsatz in den einzelnen technologischen Etappen bei Anwendung einer beschleunigten Technologie für die Herstellung von Fleischleberpasteten berechnet.

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### Etude sur la teneur en vitamines dans les pâtés stérilisés de viande et de foie, fabriqués sur des lignes modernes

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On a étudié la teneur en vitamines B<sub>1</sub>, B<sub>2</sub>, A et E dans les matières premières et dans le pâté fini. On a évalué en pourcentage la perte dans les différentes étapes technologiques en utilisant une technologie intensifiée de fabrication de pâtés de viande et de foie.

### Исследование содержания витаминов при внедрении современных линий для производства стерилизованных мясопеченочных паштетов

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Исследовано содержание витаминов B<sub>1</sub>, B<sub>2</sub>, A и E в сырье и готовом продукте. Вычислены процентные потери на отдельных технологических этапах, при использовании ускоренной технологии для производства мясопеченочных паштетов.

Studies on vitamin and trace element contents upon the introduction of modern lines for the manufacture of sterilized meat and liver pastes

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Pastes are an excellent ready food and, depending on the manner of preparation of the raw materials, determined by the standards and norms in force in this country, different kinds are manufactured and put on the market for realization.

Usually, paste is a finely homogenized mass with a spreadable consistency. For this reason, pastes are foods desired and demanded by the consumer, from childhood till advanced in years.

Depending on the technological processing and the packaging type, already in 1968, Bentler (1) classed pastes into three basic groups:

- /1/ Ready heat treated pastes (as meals), produced in public or home kitchens.
- /2/ Paste sausages, filled into natural or artificial casings, heat treated, and consumed cold.
- /3/ Canned pastes, filled into cans of tinsplate or aluminium foil, sealed and sterilized.

In this country, three types of paste are mainly produced with the addition of liver, paste 'Apetit' being the most demanded and preferred one among them.

A new technology was developed for it, servicing highly mechanized lines.

Experiments were carried out by the technology developed beforehand and suited to the equipment in question.

With the new lines, the production of meat and liver pastes is improved and increased further and further. In this way, meat raw materials are utilized more completely and efficiently. High quality brands are turned out. The most demanded and preferred one among them is the paste 'Apetit'.

The present work treats of the problem of the contents of vitamins B<sub>1</sub>, B<sub>2</sub>, A and E, and the trace elements, cobalt, molybdenum and zinc, and their preservation upon the heat treatment of the meat and liver paste 'Apetit' produced by the old technology and by the new one.

The following materials were used in the investigation: Pork liver, raw; pork head meat, raw and cooked; ready paste before sterilization; and ready sterilized cans of 'Apetit' paste.

Vitamin B<sub>1</sub> determination was performed by the fluorimetric (the thiochrome) method modified by Gasmann, 1960 (2), which is based on the process of thiochrome oxidation in alkaline solution to the intensively blue fluorescent thiochrome.

Vitamin B<sub>2</sub> was determined by Gasmann's (1960) lumiflavin method, recommended by the co-ordination committee on standardization at the COMECON.

Vitamin A was determined spectrophotometrically, the extinction being read at 325 nm. Calculation was performed by a standard curve plotted with ascending standard concentrations of vitamin A.

Vitamin E was determined by the method of Leland et al., 1966. Fluorescence was read off with a preliminary filter 813, and a second one, 818, on the instrument Turner 101.

The methods for trace element determination were as follows: for cobalt, Kovalskyi and Golo-



lobov's (1969); for zinc, Baron's (1954); for molybdenum, Tautzin's (1968).

The data obtained on the vitamin status in the raw materials and the ready product enabled the calculation also of the per cent loss of the vitamins B<sub>1</sub>, B<sub>2</sub>, A and E upon the heat treatment of the raw materials for the manufacture of the sterilized 'Apetit' paste.

All results refer to fresh weight.

The results of the analyses carried out indicate that vitamin B<sub>1</sub> level is decreased slightly after sterilization: from 0,258 mg% in the raw material prior to sterilization, to an average of 0,248 mg% in the ready product manufactured by the new technology. Vitamin B<sub>1</sub> loss amounts to 3,9 %. Thiamin is stable in a neutral medium, but easily destroyed in an alkaline one. On cooking in a neutral medium, it is hardly destroyed, for which reason it endures more heat processings. The pH values of the ready paste prior to sterilization are in the range of 5,50 to 6,25. This is one of the causes for the minimum loss of vitamin B<sub>1</sub> on the sterilization of the machine-processed raw materials for the 'Apetit' paste.

Vitamin B<sub>2</sub> content in liver reaches up to 2,46 mg%, and in the raw or cooked pork heads it is appreciably lower, 0,18 to 0,22 mg%. The quantitative values of vitamin B<sub>2</sub> on the heat treatment of the raw material for meat and liver paste manufacture, are preserved to a high degree. Riboflavin is also stable to heating. Its loss amounts to 6,1 % with raw material processing by the old technology, and with the new one, to 3,4 %.

Vitamin A is contained in amounts of about 0,72 mg% in the pork liver, the basic component of the paste. The values found by us are lower than the ones in literature, 3,29 mg% by Tashev, 1975. Vitamin A is oil-soluble and insoluble in water. In the absence of oxygen and on heating to 120-130°C, it may not change its chemical structure, nor lose its biological activity.

The variations in vitamin E level in the raw material for paste 'Apetit' manufacture are in the range of 0,62 to 0,90 mg%. Its content is especially high in pork liver: 0,90 mg%. These values are higher than the ones found by Tashev (1975). Vitamin E is oil soluble and stable on heating to 170°C in the absence of oxygen. Heat processing has almost no effect on the destruction of vitamins A and E. In the old technology, the degree of vitamin A degradation is 2,4%, and of vitamin E, 2,6%. In the new technology, those values are lower: 1,4 % and 1,9 %, respectively.

The results obtained on the variations in the levels of the basic vitamins indicate, that the technological processing of the raw materials for the manufacture of the 'Apetit' meat and liver paste involves a minimum loss of vitamins B<sub>1</sub>, B<sub>2</sub>, A and E, necessary for the normal course of human metabolism.

The investigations into the contents of the basic trace elements, cobalt, molybdenum and zinc, and their possible loss following heat treatment, indicate that they change inconsiderably.

The trace element cobalt shows values of  $52,2 \pm 4,2 \mu\text{g\%}$  in the product ready for sterilization. The paste prepared by the old technology has cobalt values of  $42,7 \pm 5,4 \mu\text{g\%}$ , and the one obtained with the new technological line,  $55,3 \pm 4,5 \mu\text{g\%}$ .

Values of  $5,70 \pm 0,61 \text{ mg\%}$  were obtained for zinc in the raw product. In the paste sterilized by the old technology, the values are  $4,89 \pm 1,47 \text{ mg\%}$ , and by the new one,  $5,04 \pm 0,67 \text{ mg\%}$ .

As far as the trace element molybdenum is concerned, values of  $0,36 \pm 0,042 \text{ ppm.}$  were found in the product prior to sterilization; in the paste prepared by the old technology,  $0,27 \pm 0,05$ ; and in the new one,  $0,28 \pm 0,04 \text{ ppm.}$ , respectively.

The statistical processing of the results indicates a level of reliability of  $p > 0,05$ , i.e., the variations in the differences between raw and finished product are not affected by the changes of a technological nature. The trace elements studied have a high melting point and are not affected by the thermal conditions of treatment.

The preservation of vitamins B<sub>1</sub>, B<sub>2</sub>, A, and E, and the trace elements Co, Mo, and Zn, in the manufacture of the meat and liver paste 'Apetit' points out the advantages of the new technology in paste production.

Further advantages of the new technological line, decisive for vitamin preservation, are the lowered temperatures in the processing of the raw materials, the pH values of the paste prior to sterilization, and the high degree of mechanization of the technological line.

Proceeding from the results obtained, we could state, that the paste prepared by the new technology is a high quality food of a high biological value for the consumer.

#### References

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