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OF THE MEAT INDUSTRY

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EFFECT OF MEAT STORAGE CONDITIONS ON THE ANTIBIOTIC
ACTIVITY

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S U M M A R Y

Meat that is stored even at low plus temperatures (0° to 4°), spoils quickly. Meat industry has no methods available for prolonged storage of chilled meat yet.

Work, carried out in the Soviet Union and abroad, showed that chlortetracycline (aureomycin) was most effective in preventing bacterial spoilage of meat. To prevent bacterial spoilage, we sprayed internal and external surfaces of sides with solution of two antibiotics: chlortetracycline and nistatine.

Experiments carried out revealed a possibility of prolonging shelf-life of chilled meat, treated with the antibiotics, by 4-10 days; it depends on the temperature rate during storage of meat.

As for transportation of chilled meat at large distances in wagons-refrigerators during various seasons, it was found out that in spring the use of chlortetracycline and nistatine ensured 15-17 days' retention of meat quality; whereas in autumn resistance to spoilage was 17-20 days.

DAS ALLUNIONS-FORSCHUNGSINSTITUT DER FLEISCHWIRTSCHAFT
U d S S R

DER EINFLUSS VON LAGERUNGSBEDINGUNGEN AUF DIE
ANTIBIOTIKAAKTIVITÄT

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Z U S A M M E N F A S S U N G

Das sogar bei niedrigen Temperaturen ($0 - +4^{\circ}$) gelagerte Fleisch verdirbt schnell. Die Fleischwirtschaft verfügt bis jetzt über keine Methoden zur Dauerlagerung des gekühlten Fleisches.

Zur Vorbeugung des bakteriellen Verderbens sowie der Schimmelbildung wurden die inneren und äusseren Oberflächen des Halbkörpers mit der Lösung der zwei Antibiotika - (Chlortetracyclin + Nistatin) besprüht.

Die durchgeführten Versuche ergaben, dass die Möglichkeit besteht, die Haltbarkeit des mit Antibiotika behandelten gekühlten Fleisches von 4 bis auf 10 Tage je nach den Temperaturverhältnissen der Lagerung zu verlängern.

Der Versuchstransport des gekühlten Fleisches in Gefrierwagen auf grosse Strecken während verschiedener Jahreszeiten zeigte, dass die Lagerfähigkeit des mit Chlortetracyclin und Nistatin behandelten Fleisches im Frühling 15-17 Tage, im Herbst aber - 17-20 Tage beträgt.

L'INSTITUT D'ETAT DE RECHERCHES SCIENTIFIQUES DE LA VIANDE
L' U R S S

L'INFLUENCE DE LA CONSERVATION DE LA VIANDE
SUR L'ACTIVITÉ DE L'ANTIBIOTIQUE

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R É S U M É

La viande se gâte assez vite pendant la conservation à une température comprise entre 0 et $+4^{\circ}$. Jusqu'ici l'industrie alimentaire n'a pas de méthodes de la longue conservation des viandes refroidies.

Pour la prévention de la détérioration bactérienne de la viande nous arrosons les couches superficielles et internes de la demi-carcasse par la solution de deux antibiotiques: la chlortétracycline et la nystatine.

Les examens effectués montrent qu'on peut prolonger de 4 à 10 jours la conservation des viandes refroidies traitées par les antibiotiques en fonction de la température de conservation.

La transportation des viandes refroidies dans les wagons frigorifiques aux saisons différentes montre qu'au printemps l'emploi de la nystatine et de la chlortétracycline assurait la qualité de la viande de 15 à 17 jours. La transportation en automne montre que la qualité des viandes était stable pendant 17-20 jours.

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EFFECT OF MEAT STORAGE CONDITIONS ON THE
ANTIBIOTIC ACTIVITY

V.I.Krasikova,
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Meat industry has no methods available for long storage of chilled meat yet.

Meat deteriorates even when stored at low temperatures (0° to 4°): psychrophilic flora develops intensively on the surface of meat; it results in slime, colour change and unpleasant odour.

To preserve meat, they often freeze it and keep it frozen. But nutritive value of such meat decreases.

Consumers prefer chilled meat, but it is well known that chilled meat can be preserved only for a short period. Different attempts have been made to raise meat resistance, to prolong its storage life.

One of the most reliable ways is the use of antibiotics as preventing meat spoilage. During recent decade various studies have been made to find out possibilities of applying antibiotics in food industry.

It has been established, that the most effective of all tested antibiotics for meat and meat products treatment to prevent their spoilage were those of tetracyclines.

Work carried out in the Soviet Union and abroad, show that chlortetracycline (aureomycin) prevents bacterial spoilage of meat most effectively.

The workers of VNIIMP's laboratory of antibiotics possess extensive experimental data showing that of all existing methods of antibiotic injection the best preservation

of meat is achieved by intravenous infusion of chlortetracycline (before slaughtering an animal) and by spraying internal and external surfaces of sides.

Numerous tests failed to record advantages of neither of these methods when chilled meat was stored at 0° to 4° .

From the point of view of hygiene, the second method is more acceptable as after spraying meat retains some amounts of the antibiotic. This method is less expensive and more accessible commercially.

All investigations of 1958 on the use of antibiotics were carried out in our laboratory by the method of spraying the surface of sides with chlortetracycline solution (100 mg per litre of water). Expenses per each side were 1.5 - 2 litres. While spraying by hydrosprayer "ПМ-2", surfaces of the sides retained 600 ml out of the total 1.5 l solution.

The above mentioned method allows the antibiotic to penetrate up to 5 mm depth.

The data obtained indicate that chlortetracycline penetrates into the muscle tissue only at the moment of spraying; than within the first two hours after treatment; further storage of treated meat does not reveal deeper penetration (48 sides were experimented).

In these experiments the greatest amount of the antibiotic on the sprayed surface of the side was naturally observed on the loin. It was due to the fact that loin surface contained more subcutaneous cellular tissue than other parts of the side.

Study of 862 samples, selected at different periods from various parts of the side (shoulder, loin, round, etc.) sprayed with the antibiotic resulted in establishing terms of inactivation of chlortetracycline on meat. In most cases chlortetracycline has not been revealed within three weeks after processing meat with the antibiotic; but there were samples in which it has been revealed within 7 days.

The analysis of the data obtained emphasizes the fact that positive results of meat treatment depend on the degree of total microbe content on the side surface.

Positive results were obtained on sides with insignificant total microbe content. These sides were treated after wet toilet, 1.5 - 2 hours later.

In our experiments the sides, treated with the antibiotic 1-2 days later after wet toilet (chilled meat) had less storage life as compared with the first group, treated just after wet toilet (total number of sides in the experiment was 494).

On the basis of experiments, one should bear in mind that in order to get an effect from chlortetracycline use, it is necessary to treat fresh meat with small microbe content. It is quite natural as a spoiled food product cannot become a product of good quality: spoiled products contain a lot of microorganisms, activity of which changes covering layers of the products. Thus, the use of antibiotics and other antibacterial preparations can be successful only under high sanitary conditions that ensure small microbe content on meat surface.

On the basis of the material obtained, the effect of various temperature conditions of sprayed meat storage on the activity of chlortetracycline was experimented on beef.

Slaughter and primary processing of cattle was performed in accordance with the standard technological scheme including electrostunning, vertical bleeding, mechanical hide take-off, sawing carcasses into sides and wet toilet.

There were experimented forty beef carcasses. One half of each side was sprayed with chlortetracycline solution, the other part was a control one, it was not treated with the antibiotic.

Both sprayed and control sides were cooled at 3° - 7° with relative humidity 90 per cent. The sides were stored after 8° - 12° was reached in the depth of round muscles.

The meat was stored in a hanging position for twenty days.

At the beginning of the experiment the meat was examined once each 2-3 days; with the first signs of spoiling the control sides were examined daily. During the whole test period samples were taken several times to determine the

residual antibiotic. The surfaces of the sides, both sprayed and control ones, were washed off to determine total microbe content of meat.

All the test carcasses were divided into two batches. The surfaces of twenty sides of each batch were sprayed with chlortetracycline; the other twenty sides were control samples.

The first batch was stored at the average of -1.19° (the temperature varied from -2.2° to -0.1°).

The control samples were taken off in this experiment due to the slime on their surface.

Bacterial spoilage of the sprayed meat was not observed, but there were noted colonies of yeasts and moulds in the field of articulation tarsi and shank.

The second batch was stored chilled for 20 days at the average of 0.1° (the temperature varied from -1.2° to 1.9°).

Observations of the sides showed that in the given temperature conditions the use of chlortetracycline made it possible to prolong storage life of chilled beef by 7-8 days as compared with beef not treated with the antibiotic.

Comparison of total microbe content on sides, sprayed and non-sprayed with chlortetracycline, showed that microbe content was less on the sprayed sides throughout the experiment. Residual chlortetracycline was not revealed in the treated meat within three-five days. The procedure described above was applied to the tests on meat treated with chlortetracycline and control meat, kept at 2° to 4° . In these experiments storage life of treated beef was prolonged by 6-7 days as compared with the control meat.

In 1957 the workers of our laboratory (Dyklop et al.) found out that resistance of meat processed with chlortetracycline increased when it was kept at 4° - 9° . Storage life of meat was then prolonged by 4-5 days.

Tests carried out with sides sprayed with the antibiotic and kept at 8° - 10° , showed that it was possible to prolong storage by 3 days as compared with the control meat.

Observations of meat cuts (500-600 g), sprayed with chlortetracycline solution and kept at 12° - 17° , showed that

the quality of chilled sprayed meat was retained by 24-36 hours longer than non-sprayed meat under similar conditions.

On the basis of the data obtained, the temperature of 0° to 4° may be considered the best for keeping chilled meat processed with chlortetracycline, as it ensures more prolonged retention of meat quality.

It should be noted that, as a rule, in all the experiments colonies of yeasts and moulds on the treated meat appear earlier and develop more intensively than on the control meat.

Thus, there arose the necessity of selecting antimould preparation.

There were made a number of experiments to select preparations inhibiting the growth of moulds that cause spoilage of meat and meat products. As a result of these studies, nistatine was found to have an effect on test cultures of moulds isolated from meat.

Nistatine is not an antibacterial preparation and it can be used to prevent meat deterioration only in combination with chlortetracycline.

To prevent bacterial spoilage and moulding of meat, a solution of two antibiotics - chlortetracycline and nistatine (100 mg and 250 mg per litre, respectively) was used.

Tests in the laboratory and at the plant (but on a small scale) showed that the antibiotics had positive effects on meat storage. The tests at the plant showed that meat treated with chlortetracycline and nistatine, can retain its quality 9-10 days more than meat that was not treated with the antibiotics. The meat was stored at 3° - 4° .

The chilled meat was transported in wagons-refrigerators at great distances during various seasons.

Summarizing the results of transportations, the following should be noted:

in spring, the use of chlortetracycline and nistatine ensured retention of meat quality for 15-17 days;

in autumn, the use of these two antibiotics gave the possibility of increasing meat resistance for 17-20 days;

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it is interesting that bacterial spoilage of meat was not observed within 21-22 days transportations; but there were colonies of yeasts and moulds in the field of articulation tarsi and shank.

The positive data obtained from transportation of chilled meat (22 wagons), sprayed with chlortetracycline and nistatine, at great distances at various seasons made it possible to long transport chilled, but not frozen, meat.