

Utilization of probiotic bacteria for development of raw fermented meat products

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KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

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Probiotic bacteria

- Producers of different foodstuffs are very much interested in probiotic bacteria on account of their importance in human organism functioning.
- Probiotic food inhabited by microbiota, mainly lactic acid bacteria, is expected to have prohealth activity.
- Probiotic bacteria include principally some species of the *Lactobacillus* genus: *L. acidophilus*, *L. casei* and *L. rhamnosus*

Probiotic bacteria role in the human organism

- maintaining a balance in natural bacterial intestinal microbiota,
- preventing and treating diarrhea,
- protecting against intestinal infections e.g. the irritable bowel syndrome, by stimulating the immunity system,
- antibacterial properties,
- suppression of survival of *Clostridium botulinum* endospores in the gastrointestinal system,
- prevention or fighting infections caused by *Helicobacter pylori* and *Salmonella Typhimurium*.
- Decreasing of cholesterol level
- Facilitation of absorption of calcium, iron, and zinc
- the ability to bind nitrosamines and other mutagenic substances.
- control the development of fecal and putrefactive bacteria whose toxins have carcinogenic activity.
- production of PP vitamin, folic acid, H and B6 vitamins;
- partially digestion of milk proteins, due to which they lose their allergenic activity;
- probiotic bacteria secrete an enzyme that participates in digesting lactose thanks to which products containing them may be consumed by people with lactose intolerance without any obstacles

Probiotic bacteria

- Probiotic bacteria strains are successfully used in production of processed milk products, and certain juices, however, their use has not been observed in production of raw ripening meat products.
- In the case of meat products, raw products are deemed to be and actually are a suitable medium for the development of probiotic microorganisms.

Fermented meat products

- Fermentation and drying belong to the oldest methods of preserving and storing foods. Raw cured and ripened meat products (different kinds of sausage and smoke-cured meat products) are manufactured with the use of fermentation process i.e. a guided decomposition process involving the meat's own enzymes and enzymes of microbiological origin from the growth of microbiota.
- Traditional production of raw cured meat products is based on fermentation of native or added carbohydrates by lactic acid bacteria found in meat or in its environment.
- During those transformations, in the products numerous substances come into being / existence such as lactic acid, pyruvic acid, alcohols, aldehydes, ketones, and carboxylic acids. Those compounds, in accordance with their amount, shape the quality and storage stability of a product.

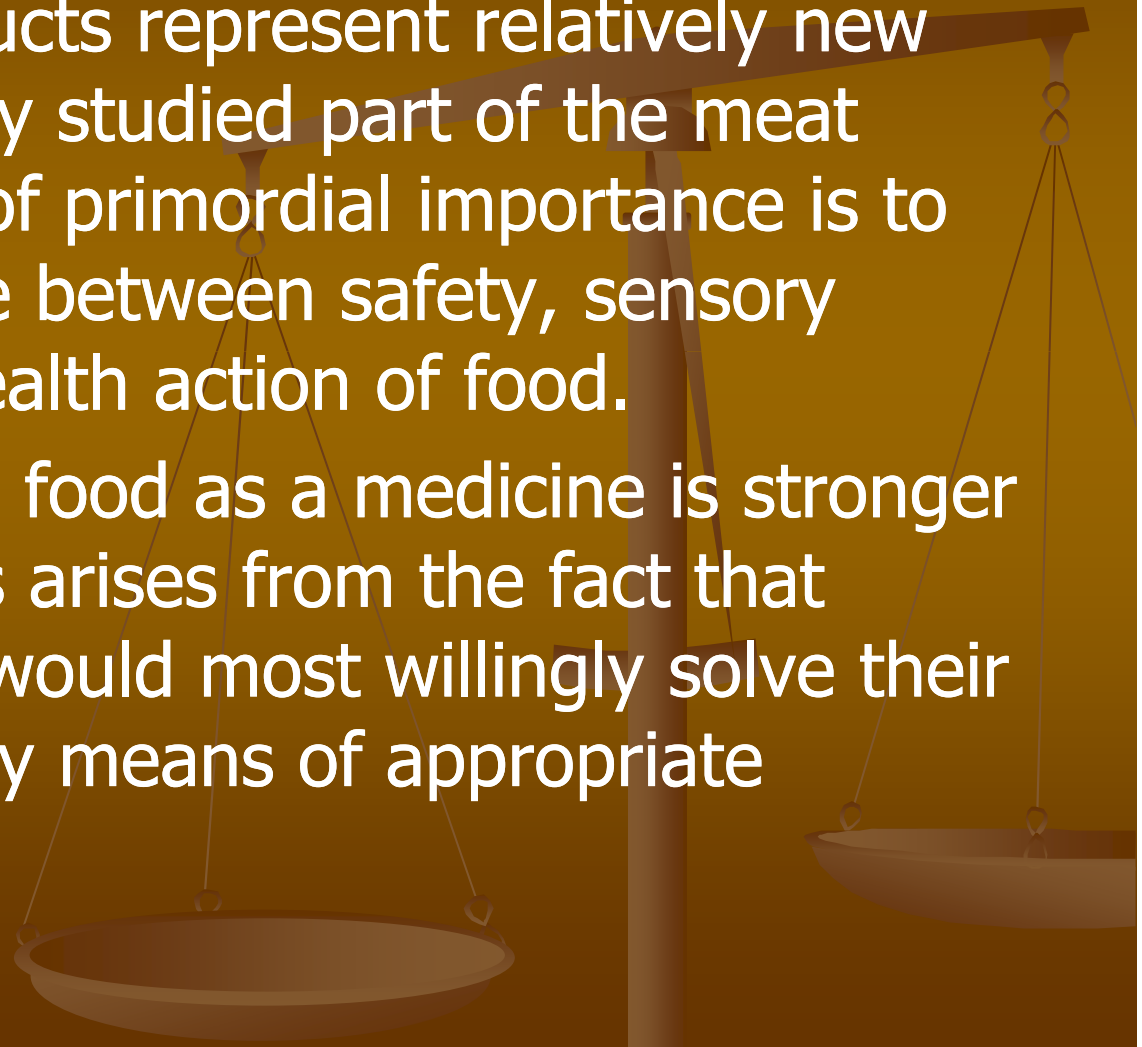
Fermented meat products

- It is quite a common practice in manufacturing raw cured ripened products to apply starter cultures whose composition is extremely varied and often – unknown.
- Those starter cultures include mostly lactic acid bacteria, principally *Lactobacillus sakei*, *Lactobacillus curvatus*, *Lactobacillus plantarum* oraz *Lactobacillus lactis*

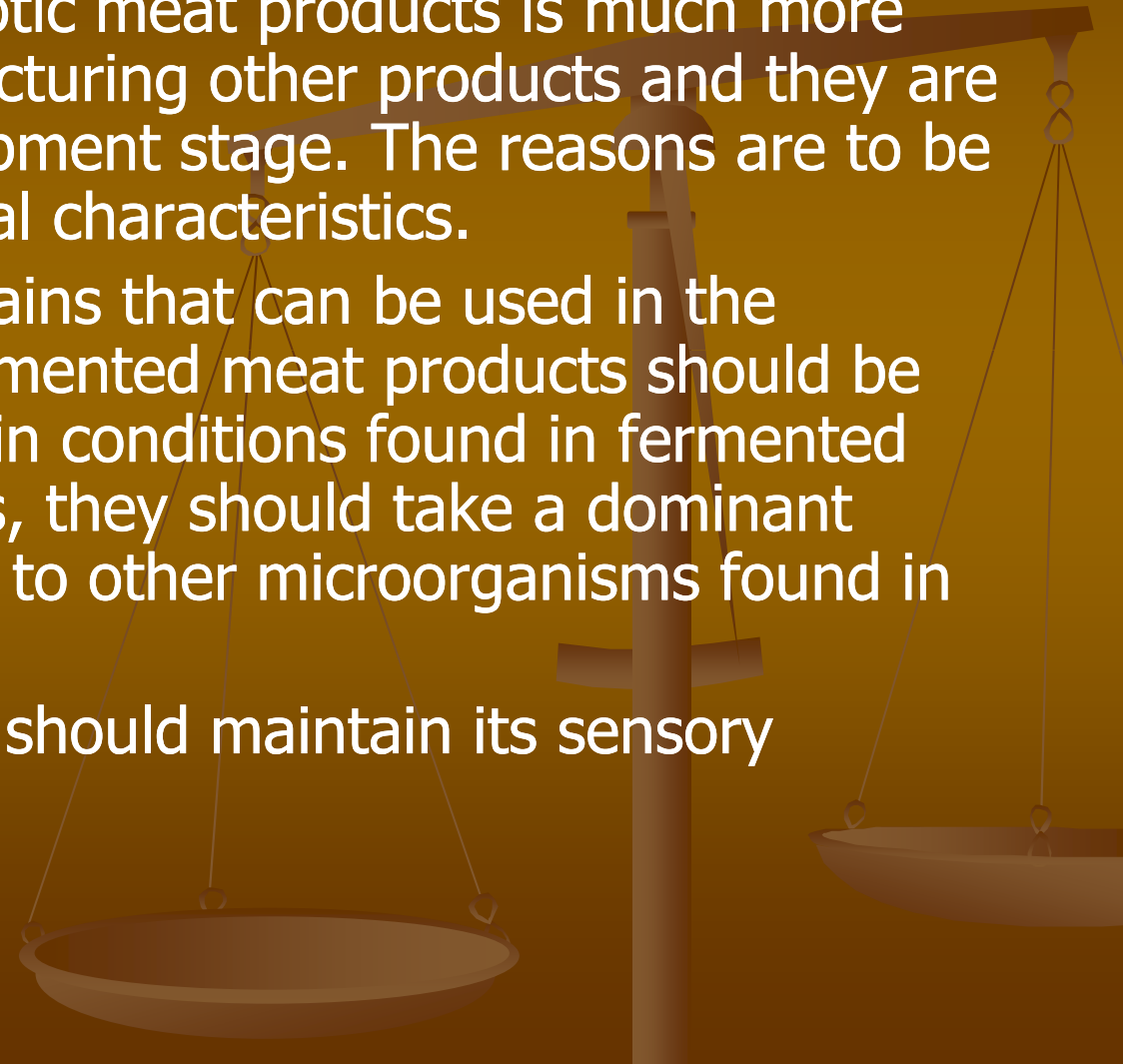
Fermented meat as a carrier for probiotic bacteria

Probiotic meat products represent relatively new and not completely studied part of the meat industry wherein of primordial importance is to find a compromise between safety, sensory quality and pro-health action of food.

The trend to classify food as a medicine is stronger and stronger. This arises from the fact that some consumers would most willingly solve their health problems by means of appropriate nutrition.

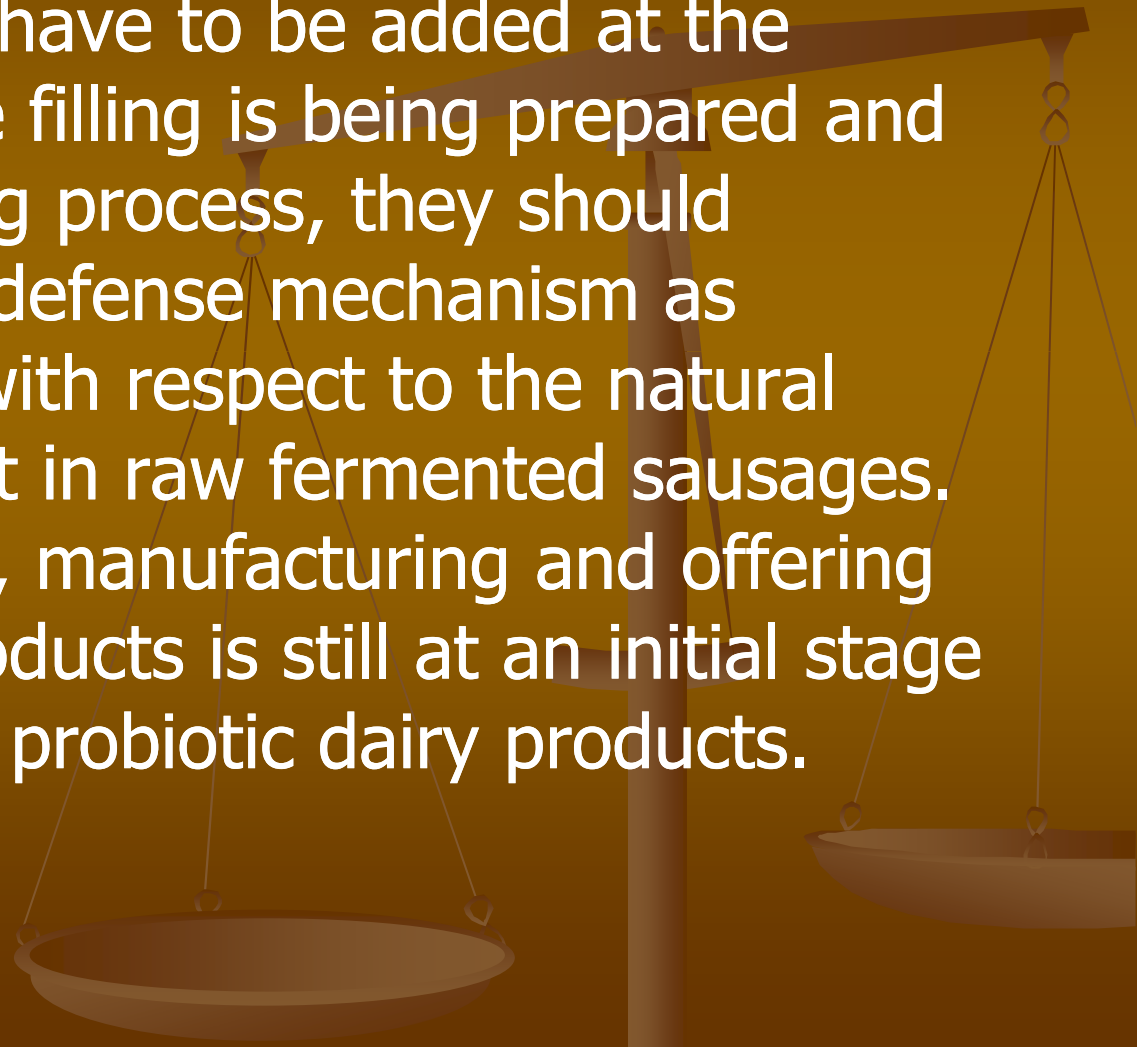


Fermented meat as a carrier for probiotic bacteria

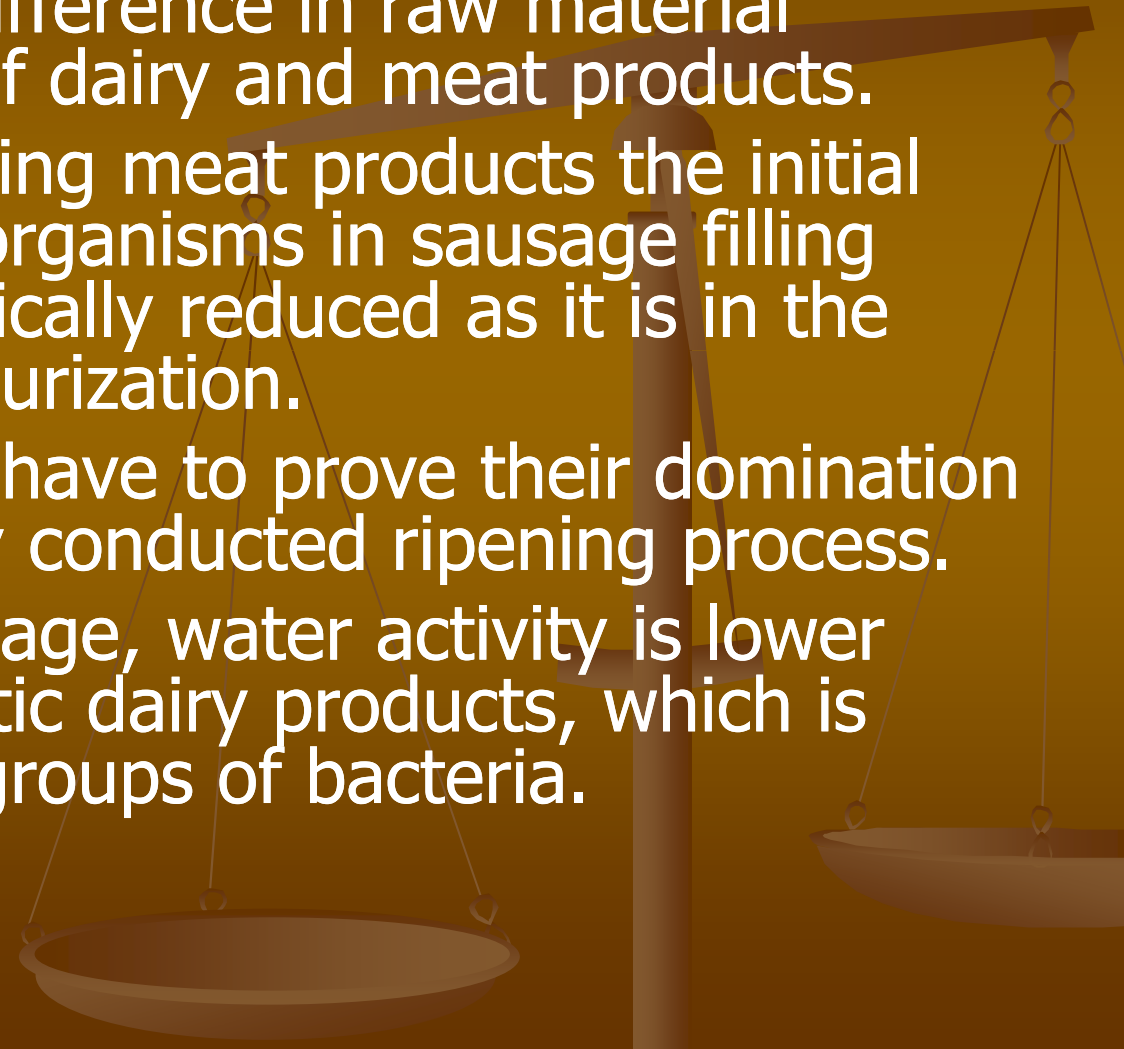
- Manufacturing probiotic meat products is much more difficult than manufacturing other products and they are in their initial development stage. The reasons are to be found on raw material characteristics.
 - Probiotic bacteria strains that can be used in the manufacturing of fermented meat products should be capable of surviving in conditions found in fermented products and besides, they should take a dominant position with respect to other microorganisms found in the finished product.
 - Besides, the product should maintain its sensory characteristics.
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Fermented meat as a carrier for probiotic bacteria

- Probiotic bacteria have to be added at the moment when the filling is being prepared and during the ripening process, they should produce a strong defense mechanism as bacteria atypical with respect to the natural microbiota present in raw fermented sausages. For these reasons, manufacturing and offering probiotic meat products is still at an initial stage as compared with probiotic dairy products.



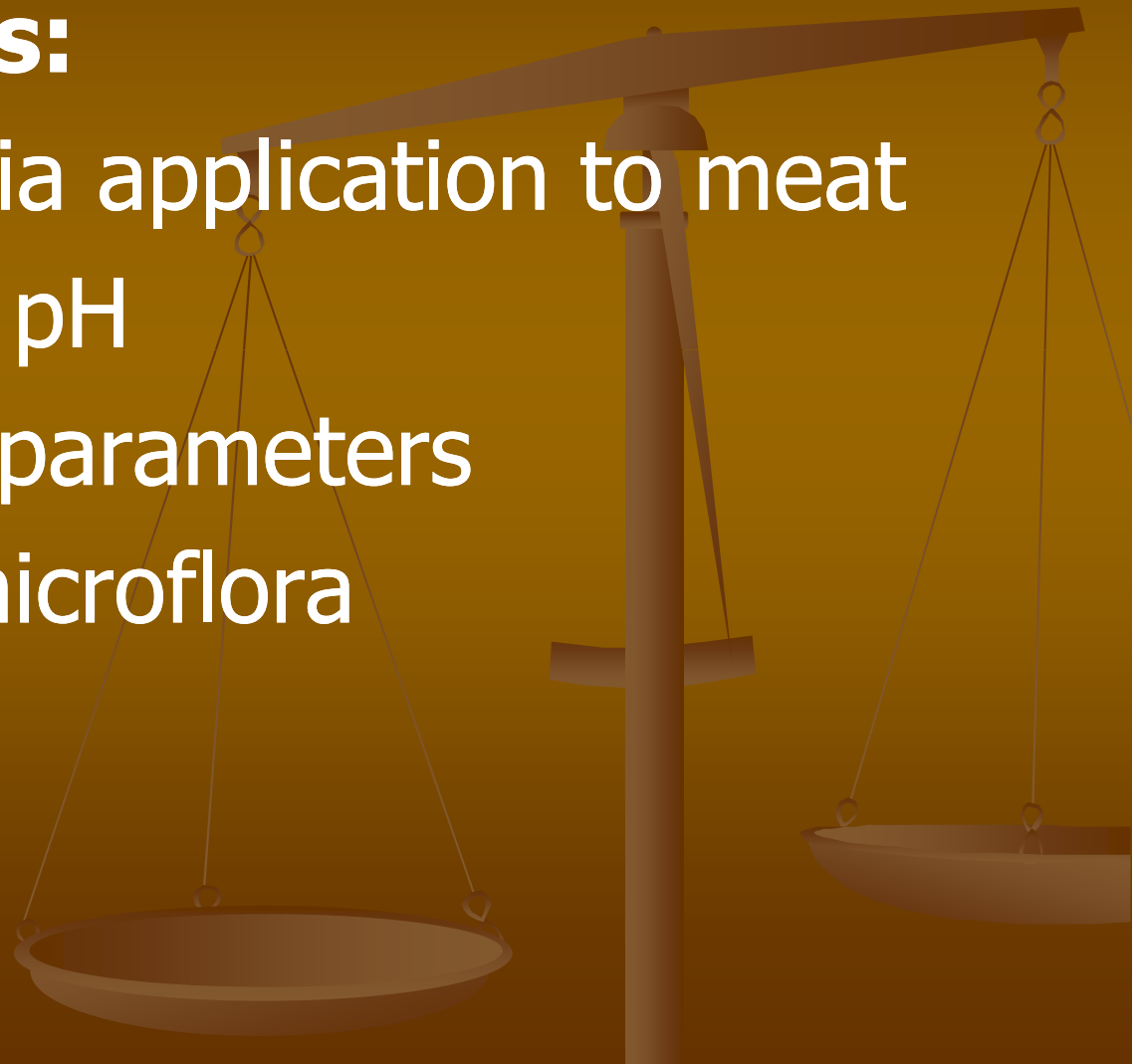
Fermented meat as a carrier for probiotic bacteria

- There is a basic difference in raw material between groups of dairy and meat products.
 - When manufacturing meat products the initial quantity of microorganisms in sausage filling cannot be dramatically reduced as it is in the case of milk pasteurization.
 - Probiotic bacteria have to prove their domination through a suitably conducted ripening process.
 - In raw cured sausage, water activity is lower than a_w in probiotic dairy products, which is tolerated by few groups of bacteria.
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Authors studies

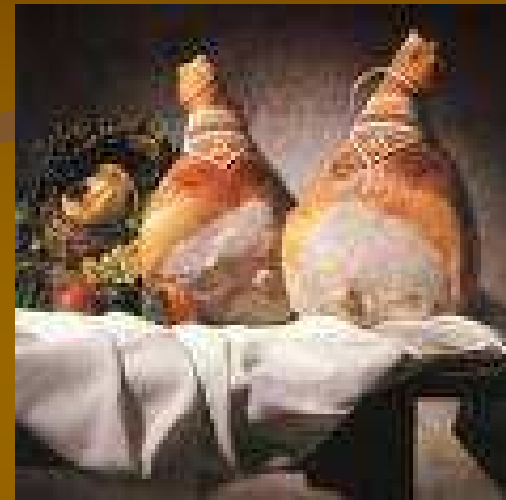
Main problems:

- Way of bacteria application to meat
- Decreasing of pH
- Fermentation parameters
- Competitive microflora



Types of pork products

- hams
- loins
- sausages



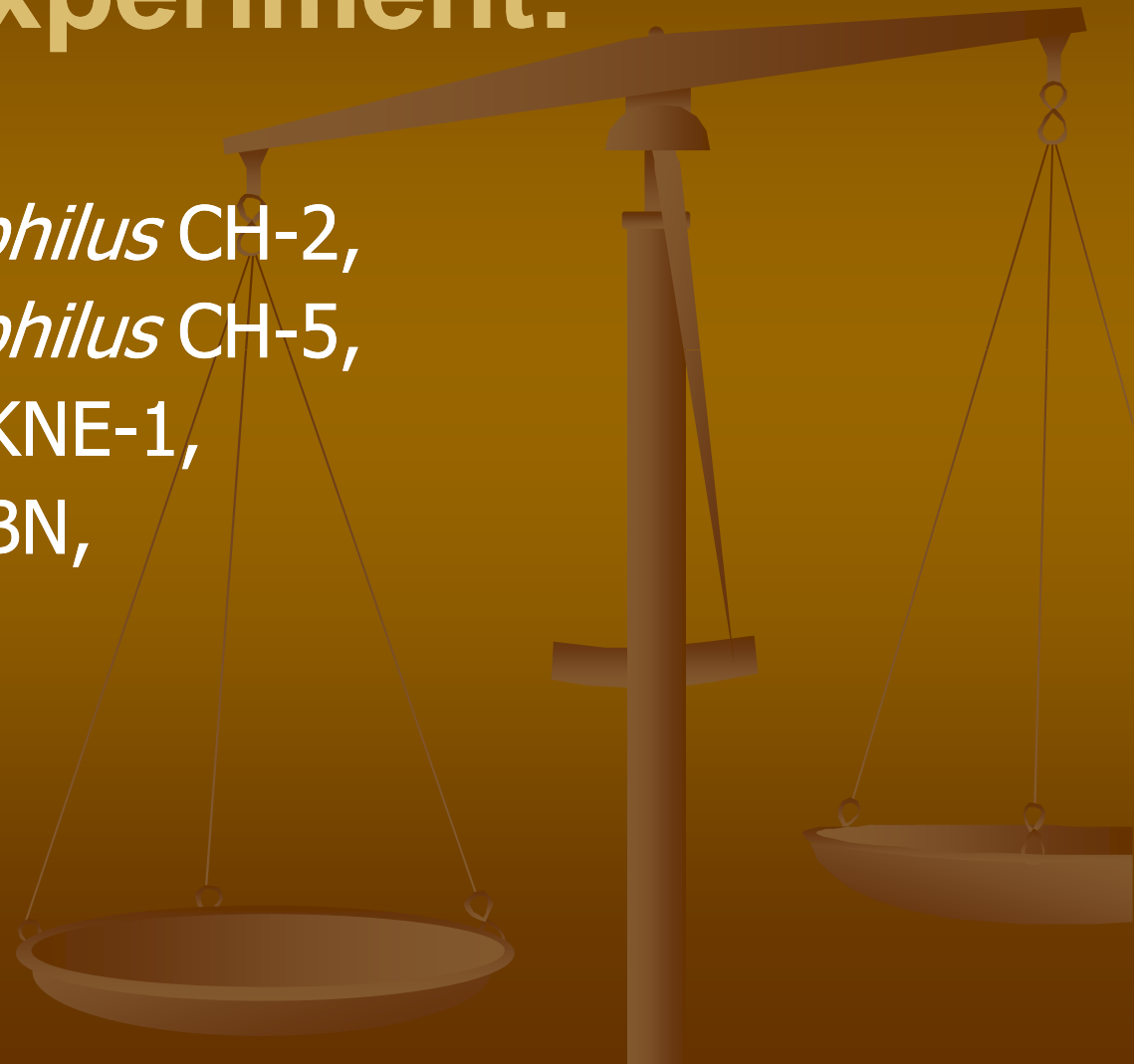
Preliminary microbiological evaluations

Goal: selection of probiotic bacteria for meat fermentation (species, strains, initial number of bacteria)

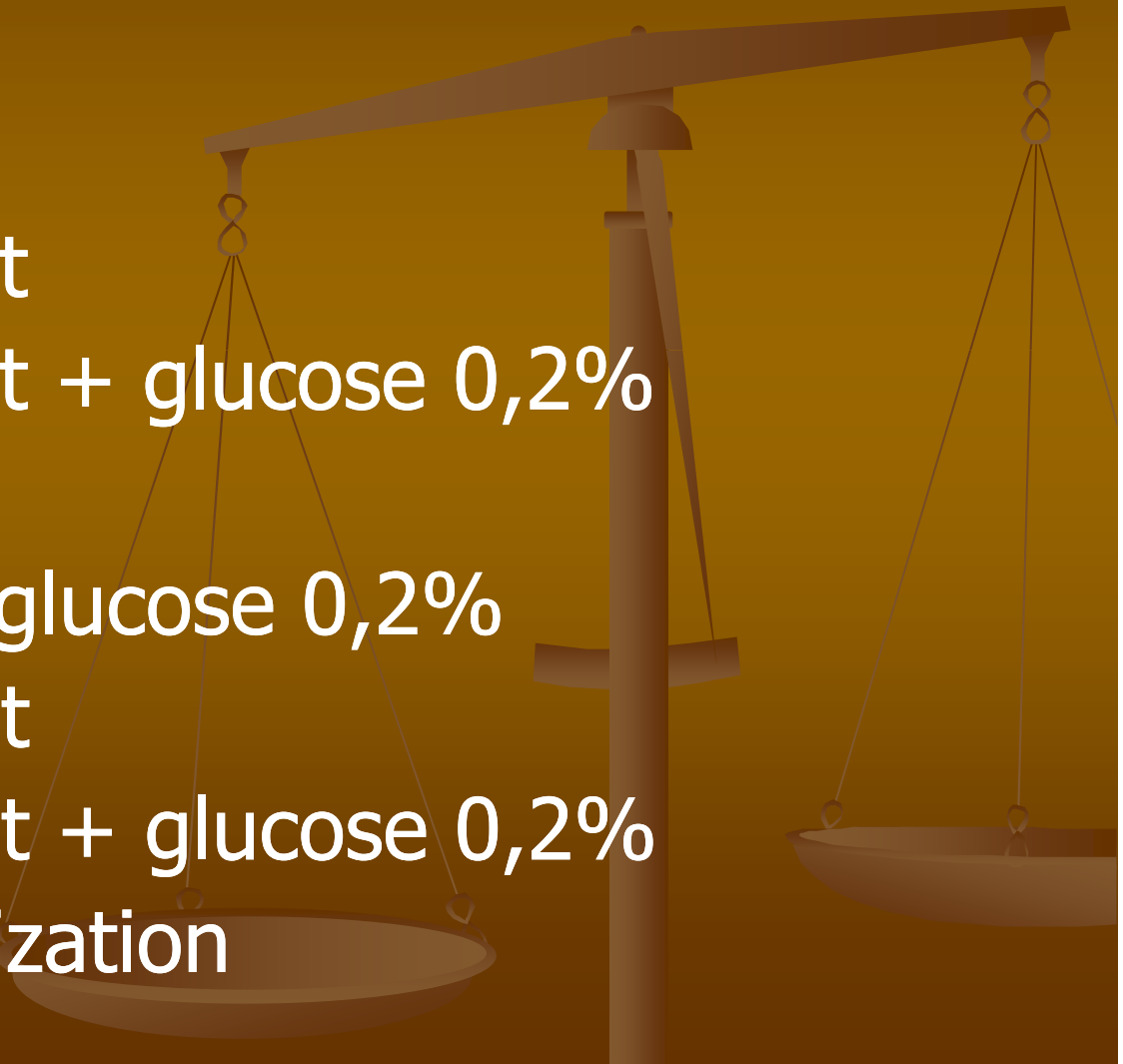
- Total number of probiotic bacteria was examined (cfu/g)
- Samples of pork meats with different strains of probiotic bacteria, different additives and different technological treatment were evaluated.

Strains of probiotic bacteria used for experiment:

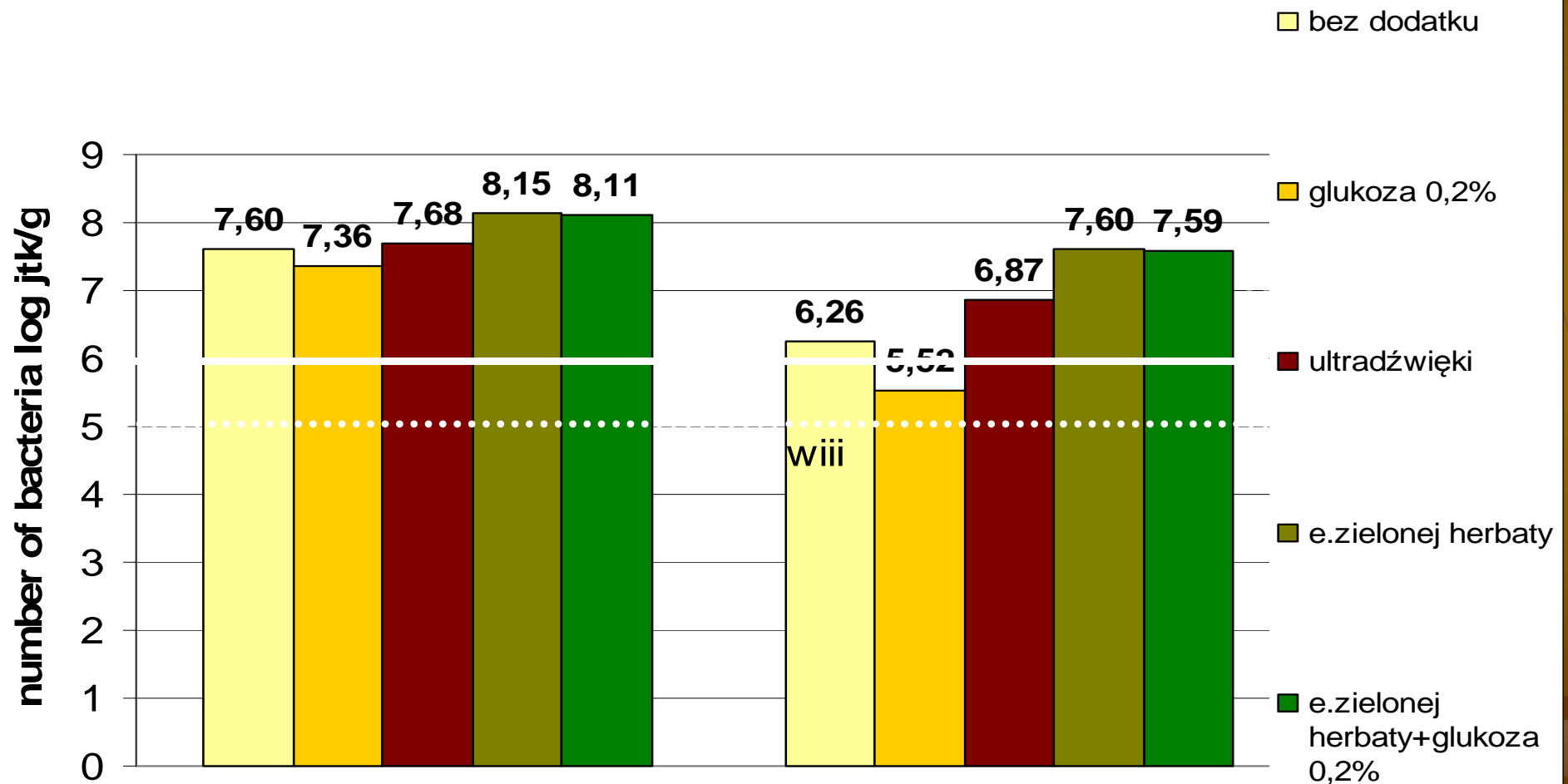
- *Lactobacillus acidophilus* CH-2,
- *Lactobacillus acidophilus* CH-5,
- *Lactobacillus casei* KNE-1,
- *Lactobacillus casei* BN,



Different additives and technological treatment used for products preparation

- Glucose 0,1%
 - Glucose 0,2%
 - Green tea extract
 - Green tea extract + glucose 0,2%
 - Salvia extract
 - Salvia extract + glucose 0,2%
 - Rosemary extract
 - Rosemary extract + glucose 0,2%
 - Ultrasound sterilization
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Lactobacillus casei BN (pork loins)



K1 - pr.kontrolna

K2 - pr.kontrolna + glukoza 0,2%

Number of probiotic strains in pork loins after 4 weeks ripening

LA CH-2:

- Green tea extract addition – 7,98 log jtk/ml
- Ultrasound sterilization – 7,51 log jtk/ml

LA CH-5:

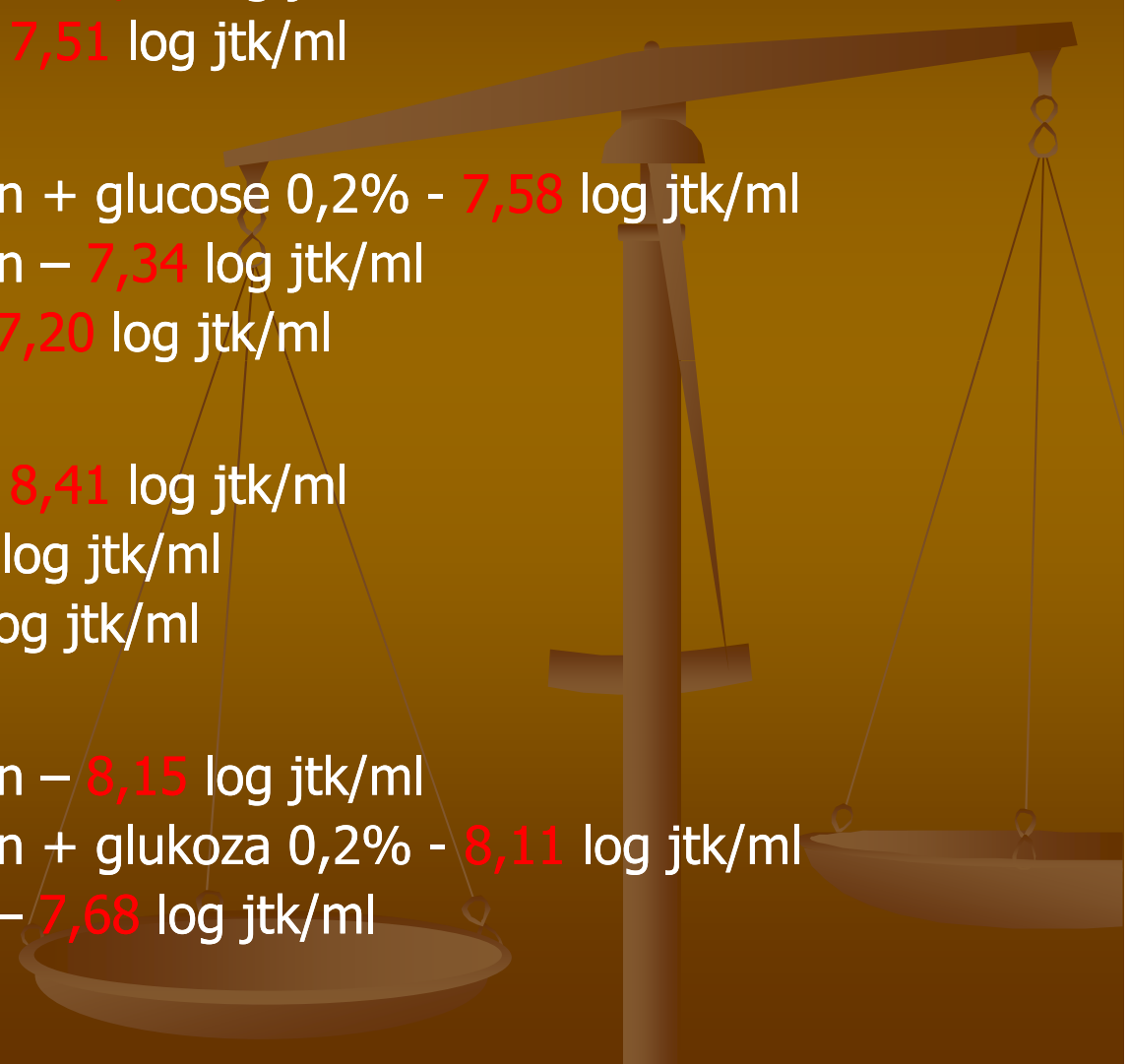
- Green tea extract addition + glucose 0,2% - 7,58 log jtk/ml
- Green tea extract addition – 7,34 log jtk/ml
- Glucose addition 0,2% - 7,20 log jtk/ml

LC KNE-1:

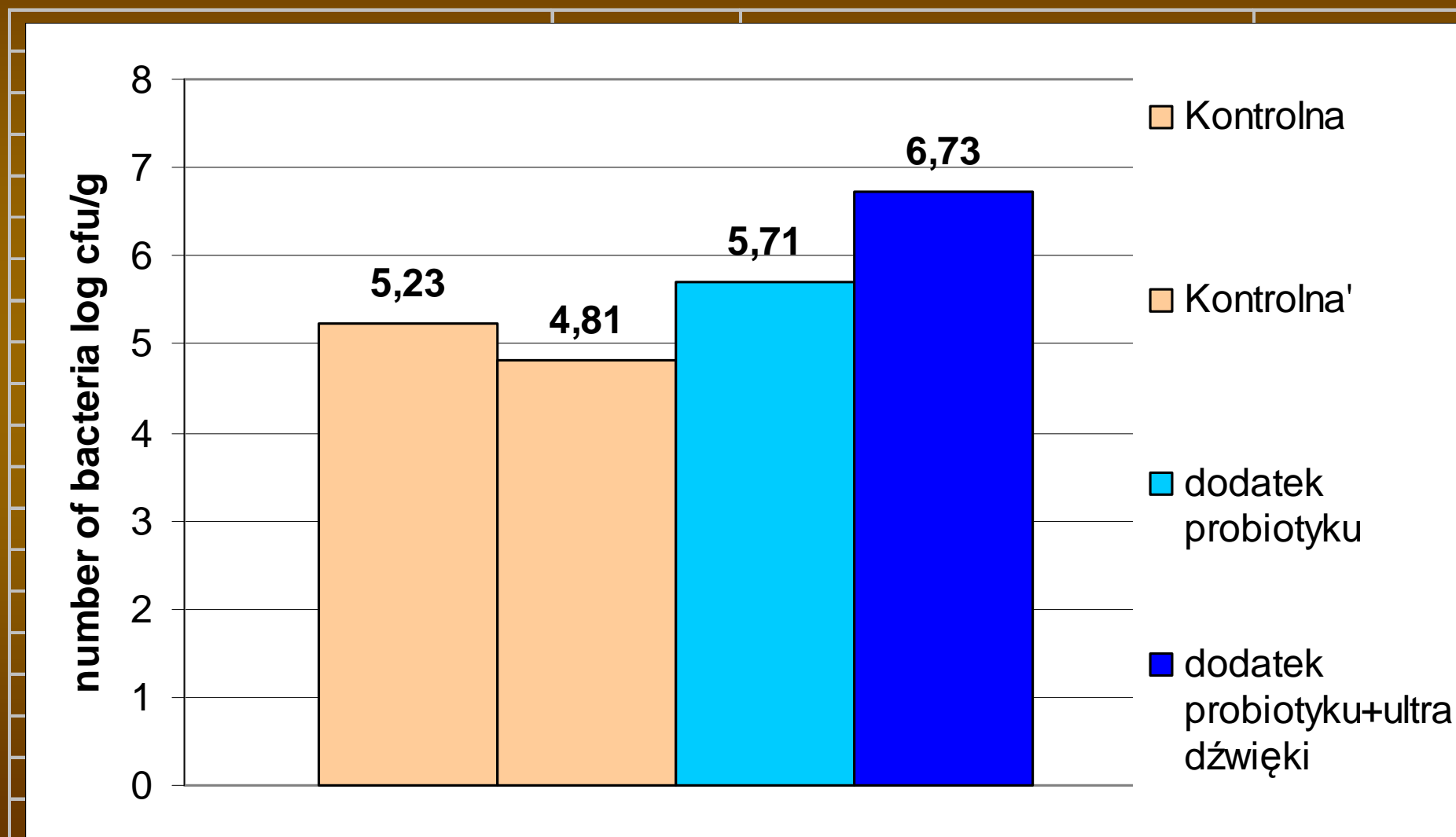
- Ultrasound sterilization – 8,41 log jtk/ml
- Without additives – 8,08 log jtk/ml
- Glucose addition – 7,97 log jtk/ml

LC BN:

- Green tea extract addition – 8,15 log jtk/ml
- Green tea extract addition + glukoza 0,2% - 8,11 log jtk/ml
- Ultrasound sterilization i – 7,68 log jtk/ml



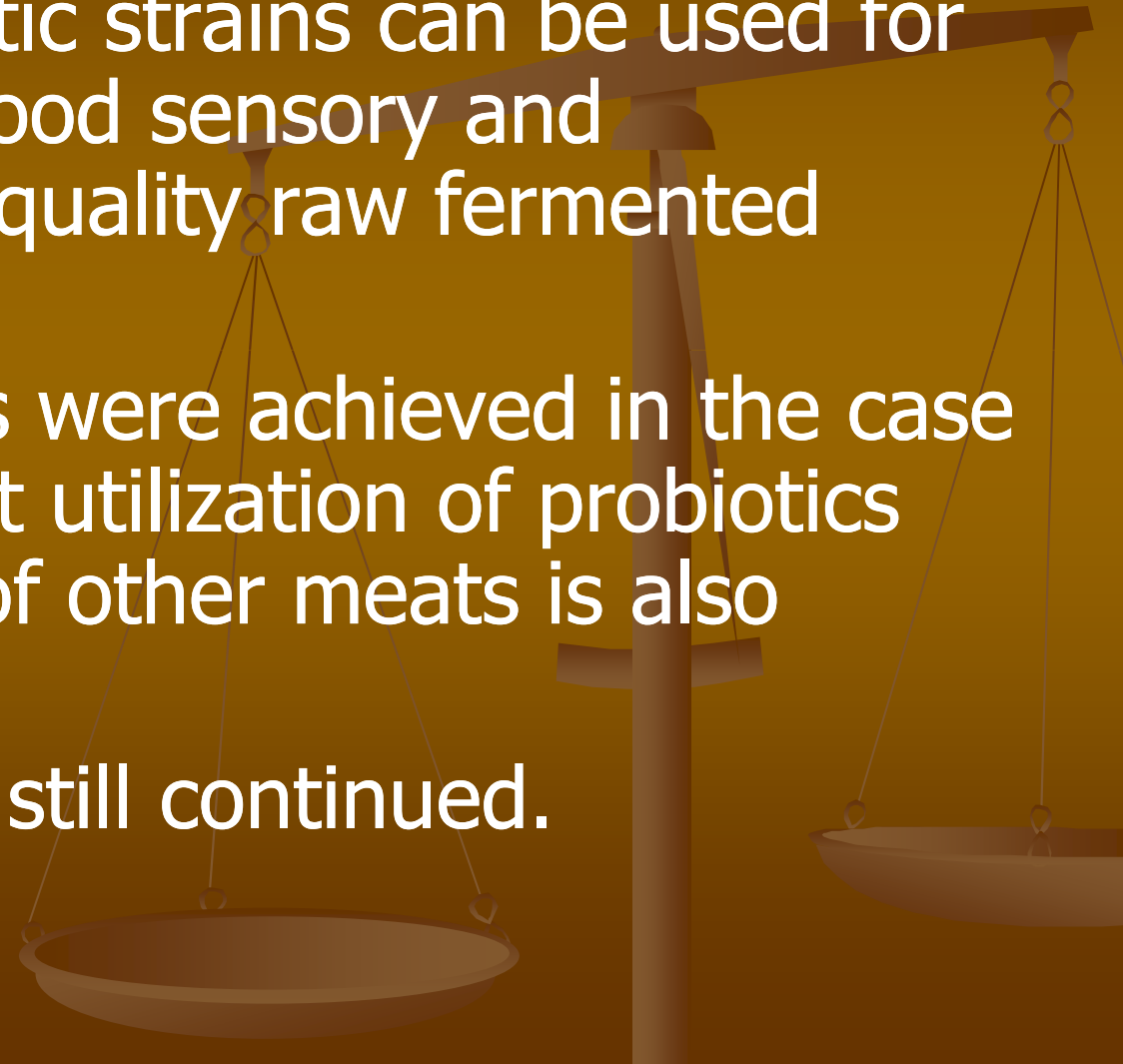
Number of probiotic strains in pork hams



Pork hams

- Number of probiotic bacteria in the control samples was 4,81 - 5,23 log cfu/g
- Number of bacteria in the sample with probiotic strain addition was 5,71 log cfu/g
- The highest number of probiotic bacteria was evaluated in the sample **sterilized with ultrasound before probiotic addition** (6,73 log cfu/g)

Conclusions

- Selected probiotic strains can be used for production of good sensory and microbiological quality raw fermented meat products.
 - The best results were achieved in the case of pork loins but utilization of probiotics for production of other meats is also possible.
 - Experiment are still continued.
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Thank you for your attention



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