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HUSLANKA AND YOGURT AND THE COMPARISON  
OF THE ACIDIFIERS IN TWO TYPES OF FERMENTED MILK [1912]\*\*

No. 4 of the *Oesterreichische Molkerei-Zeitung* [Austrian Dairy Journal] (Volume XVIII, 1911) contains a brief note on the long-lasting fermented milk *huslanka*, which is a popular food among the Ruthenian\*\*\* clans of the Hutsuls in the Eastern Carpathian Mountains in Galicia and in Bukovyna.

It is distinguished by its long shelf life: commonly it can be stored for 1 to 2 years without going bad.

This long shelf life is due to the significant quantity of lactic acid, on average 2 to 2.5%, produced by the bacteria.

It was interesting to study the acidifiers which are active in the milk in question and to determine which one of them was capable of producing so much lactic acid.

Since I was staying in the aforesaid regions, I had an opportunity to obtain some samples of *huslanka* and, thanks to the kindness of Prof. Winkler, to study them in his bacteriological laboratory.

My study related primarily to the lactobacteria; random contaminants and the usual inhabitants of fermented milk (yeasts and mould fungi) were not taken into account.

Plate cultures grown in the normal manner showed that two kinds of lactobacteria were present: specifically 1. – double-short bacilli on lactose-enriched gelatine and on buffered lactose-enriched gelatine, which proved to be identical to the *Streptococcus güntheri*, and 2. – colonies of long bacilli on dextrose, wort, and date-extract agar. The latter were the focus of the study undertaken.

In order to study the impact of this bacillus on milk, sterilized milk was inoculated with a pure culture of it and placed in an incubator at 38°C. Coagulation did not produce any gas and the quantity of lactic acid produced was 97.3 in accordance with Soxhlet-Henkel scale of acidity.

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\*\* Dr. Wladimir Kindraczuk, *Huslanka und Yoghurt und die Vergleichung der Säuerungserreger der beiden Sauermilchsorten* in: *Oesterreichische Molkerei-Zeitung*, Editor Dr. Willibald Winkler, Nummer 17, Wien, 1 September 1912, Jahrgang XIX, S. 257–259.

\*\*\* Ruthenians is the name that was used for Ukrainians during the Austro-Hungarian Empire.

More detailed testing showed that the bacillus found was a lactobacillus very closely related to the *Bacillus bulgaricus*. I named it *Bacillus carpathicus*.

Its optimal growth was determined in accordance with its capacity to acidify at different temperatures. 2 cm<sup>3</sup> of pure, fresh milk culture was added to 48 cm<sup>3</sup> of sterilized milk and the quantity of acid determined after 3 hours and right after coagulation in degrees of acidity using n/4 NaOH in accordance with the Soxhlet–Henkel method.

As is evident from the table below, the ideal temperature lies between 42 °C and 44 °C as is the case with *Bacillus bulgaricus*.

Temperature	Degree of acidity after 8 hours	Duration of coagulation	Degree of acidity after coagulation
30 °C	8.8	14 hrs 30 min	32.4
35 °C	12.8	5 hrs 30 min	21.6
38 °C	14.0	4 hrs 50 min	20.2
40 °C	16.6	4 hrs 15 min	19.7
42 °C	19.4	3 hrs 20 min	19.4
44 °C	20.2	2 hrs 50 min	19.0
46 °C	15.6	3 hrs 10 min	18.2
48 °C	12.2	4 hrs 35 min	17.1
50 °C	7.6	22 hrs 00 min	16.0

The bacillus produces 0.5 to 0.7 μ wide and 4 to 8 μ long straight rods, which usually appear in pairs (Fig. 1). Curved and chain-like threads are only observed rarely in milk and whey cultures but very often on solid nutrient media. It is not movable, does not produce spores, is facultatively anaerobic and can be dyed in accordance with Gram.

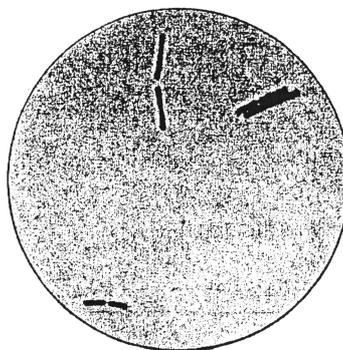


Fig. 1. *Bacillus carpathicus* at 1,200 enlargement

The rods are significantly weaker than those of *Bacillus bulgaricus*, and there seem to be differences with the latter, also in the event of propagation, in that coccoid sub-forms are produced even at the beginning (Fig. 2).

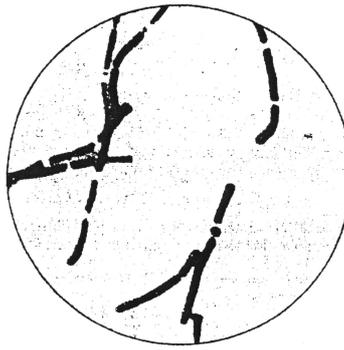


Fig. 2. *Bacillus bulgaricus* at 1,200 enlargement.  
A singular factor is the coccoid constriction of new individuals.

Its growth is solely restricted to the following solid nutrient media: dextrose, wort, and date extract agar of which the first proves itself to be good and the latter two excellent.

The appearance of its colonies is very similar to that of *Bacillus bulgaricus*.

*Bacillus bulgaricus* forms punctiform colonies up to 1 mm in width with thick, yellowish–white centres and transparent, cloudily turbid edges which spread into numerous very fine, thickly branched threads and tendrils (Fig. 3).

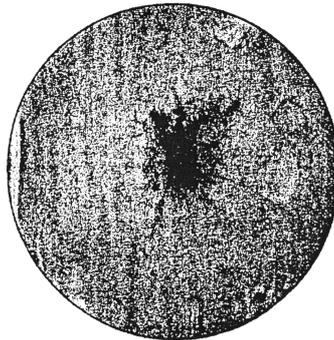


Fig. 3 *Bacillus bulgaricus* colony (enlarged 20 times).

The colonies of *Bacillus carpathicus* are similar, only larger and stronger, 1 to 2 mm wide, yellowish–white with thick centres surrounded by a dense network of coarse threads, transparent only on the edges and spreading further onto the agar (than with *Bacillus bulgaricus*) (Fig. 4).

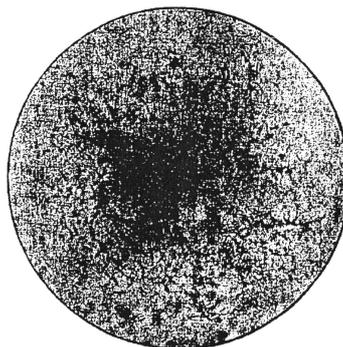


Fig. 4 *Bacillus carpathicus* (enlarged 20 times).

It produces 2 to 2.5% acid, and this is pure, laevorotatory lactic acid.

According to the studies by Stryzowski, *Bacillus bulgaricus* produces 1 to 1.5% lactic acid in yogurt<sup>1</sup>.

In order to compare the acidity of *Bacillus carpathicus* with that of *Bacillus bulgaricus*, two 1 litre flasks of sterilized milk were inoculated with the relevant fresh, pure cultures, placed in an incubator at 42 °C and the quantity of acid in the weighed samples determined using n/4 NaOH:

Date	<i>Bacillus bulgaricus</i>		<i>Bacillus carpathicus</i>	
	Degree of acidity	Quantity of acid (%)	Degree of acidity	Quantity of acid (%)
20 Febr.	40.5	0.911	91.6	2.061
21 Febr.	56.6	1.273	106.2	2.389
22 Febr.	56.6	1.273	107.2	2.412
23 Febr.	56.6	1.273	107.6	2.421
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Therefore, *Bacillus carpathicus* is, as the table illustrates, capable of producing 2.421% lactic acid and *Bacillus bulgaricus* only 1.273% under the same conditions<sup>2</sup>.

Grown together with the known intestinal bacterium *Bacillus coli* and the putrefactive bacterium *Proteus vulgaris*, it suppresses their growth to a higher degree than *Bacillus bulgaricus*, and this can be attributed solely to its stronger development and the production of larger quantities of acid.

In the same manner, *Bacillus carpathicus*, in symbiosis with the lactic acid *Streptococcus* in *huslanka*, suppresses the latter more and more so that in

<sup>1</sup> *Therapeutische Monatshefte* [Therapeutic Monthly] 21, 1907, pp. 529–531.

<sup>2</sup> The pure culture of *Bacillus bulgaricus* used in these tests was isolated from a fresh yogurt sample mailed from Sadova, Bulgaria.

older *huslanka* solely *Bacillus carpathicus* is found in a pure culture.

The effect of *Bacillus carpathicus* on intestinal flora, as is known from yogurt, was not studied in more detail, but because of its great ability to produce acid *Bacillus carpathicus* should not take a second place to *Bacillus bulgaricus* and may even surpass it in many cases.

Consequently, *huslanka* is a yogurt which is peculiar to certain regions of the Carpathian Mountains and is not a transplantation of Balkan yogurt. A glance at the photographs also shows the differences between *Bacillus bulgaricus* and *Bacillus carpathicus*, so that the latter cannot be regarded as a mere variety of the former.

*Huslanka* is prepared by boiling and then cooling skimmed milk – which is usually produced by allowing milk to sit – and then adding some *huslanka* to this skimmed milk and placing it in a warm oven in pots covered with thick cloth or in wooden containers. After coagulation it is stored in a cool location.

In the alpine regions it is usually prepared as a milk preserve during periods when there is a surplus of milk and then consumed and sold in winter and spring. For that purpose large quantities of milk are boiled, collected in high wooden barrels and old *huslanka* or sour cream is added to it. The filled barrels are placed near a hearth and stored in a cool location after coagulation. In the fall they are sealed air-tight and transported to the valleys.

This milk preserve can be stored for 1 to 2 years and is eaten by the Hutsuls directly or diluted with water and eaten with polenta or used in soups.

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*transl. from the German*

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