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Dynamics of Spore Germination and the Development
of *Clostridium botulinum* Type B in Canned Meat
and Meat-Vegetable Preserves

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There are many different factors affecting the endospore germination and growth of spore-forming bacilli in canned food. This problem is not yet properly elucidated by sanitary microbiology and therefore there is an urgent necessity of undertaking research works to examine canned products for their ability to stimulate the germination of spores and vegetation of toxinogenic anaerobes.

The purpose of these investigations was to determine the dynamics of germination of *Cl. botulinum* type B spores in water extracts of canned meat; to test the influence of incubation temperature of the extracts showing the most different effect on the germination and growth of *Cl. botulinum* type B; to examine the germination and multiplication of *Cl. botulinum* in infected canned meat basing on the time concaving appearance; and to determine the relationship between the pH of canned food and their water extracts and the germination of spores and growth of *Cl. botulinum*.

Material and methods

Experiments were performed with 4 kinds of canned meat /goulashes and minced meat/ and 9 kinds of meat-vegetable pre-

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sporulation was very different, independently of the incubation temperature used. The temperature of 30°C approached closely to that of termolabile storage of canned food in warm seasons of the year /20°C/ and to that of a cold storage plant /10°C/. It should be stressed that in canned meat extracts of strong inhibitory properties the growth of germinated spores and vegetative forms was scanty at both temperatures. The percentage values did not exceed 5% and were much lower than those obtained at examining canned fish /4/. This finding is of great practical importance because it shows that meat and meat-vegetable preserves, stored at ambient and cold storage temperatures, are more resistant to germination of spores and development of *Cl. botulinum* B than are canned fishes to *Cl. botulinum* E. These differences result from the known biological properties of *Cl. botulinum* E spores, which are able to multiply at low temperatures /2/.

Some relationship has been found between pH of canned food and its suppleness to germination and development of clostridial spores. In general, the low pH exerts inhibitory effect but this is not the only factor involved. For instance, although the preserve no. 3 had some inhibitory properties, its pH was less acid than that of preserve no. 12 which showed a stimulating action. The pH of extract prepared from preserve no. 3 was the least acid out of all the examined canned food extracts.

Although these investigations were performed with a small number of meat and meat-vegetable preserves the results obtained showed that they had very different suppleness to the processes of germination and development of *Cl. botulinum* type B. The per-

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serves. Spores of *Cl. botulinum* type B, strain 1162, which was kindly supplied by the Institute of Hygiene, were used in all the experiments. This strain had stable toxigenic properties and spore production. The strain was multiplied in Ellner's medium /1/ kept in cellophane bags /3/ for 6 days. The grown up cultures were digested with lysozyme /BDH-Chem./ and trypsin /Difco Lab./ by the method of Walker and Batty /5/.

It has been decided to use in the study mainly these kinds of canned food which contained much pickle or sauce and were semiliquid at the incubation temperature ranging from 10° to 30°. The semiliquid consistency of canned food facilitated greatly the spreading of spores on the whole surface of the meat product contained in a can.

Results

The results of investigations on the dynamics of germination and growth of *Cl. botulinum* B in all kinds of canned food showed that the conditions for the development of anaerobes were favourable. In all cases, germination and growth were found in more than 50 per cent of the observed spores, 12 to 24 hours after infection, rarely after 42 hours. The number of germinated spores was nearly 100 per cent after prolonged time. For comparison, it should be mentioned that nearly 20 per cent of canned fish extracts had so strong inhibitory properties that within 240-hour observation period less than 50 per cent of germinated spores or vegetative forms were found /4/.

In extracts of the greatest and smallest vegetation indices which were infected with the same dose of inoculum, dynamics of

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formed experiments demonstrate that canned minced meat, e.g. pork meat and pulpets in tomato juice are very favourable environments for the development of *Cl. botulinum* while other kinds of canned meats, e.g. cabbage soup with smoked bacon and ham and sausage stewed in sauerkraut have some inhibitory properties for the development of this microorganism.

It is very difficult to determine whether tomato juices have some stimulating action because no references were found in the available literature. It seems that this problem should be investigated separately.

References

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