

THE BACTERIAL FLORA OF "BLOWN" TINS OF PRESERVED FOOD.

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So far as I am aware the literature on the nature of the causes to which gaseous decomposition of tinned food is due is extremely scanty. Pfuhl and his collaborators have, it is true, published one or two papers on this subject, but their attention has in the main been devoted to the practical side of the preparation of tinned food. In one paper¹ Pfuhl mentions that out of 106 tins of preserved food, 29 contained organisms but does not state their nature. In a still more recent publication² Pfuhl and Wintgen refer to a non-bacterial cause of gaseous decomposition in tinned foods, viz. the formation of hydrogen from chemical reactions going on between the food and the metal of the box. The following short note on the bacterial flora accordingly may be of some interest.

Through the kindness of Dr Alexander, Medical Officer of Health for Poplar, I was enabled to obtain a variety of "blown" tins which had been condemned as unfit for food by his inspectors.

In the present note I intend dealing most fully with the organisms obtained from the decomposed contents of several boxes of sardines. These boxes had all the typical signs of "blown" tins, bulging sides, etc. On opening them the gas which escaped was extremely foetid in odour. The flesh of the sardines however looked quite normal and healthy.

Cultures from the contents of the tins were in each case made in two different fashions, (1) a small portion of the sardine was removed by means of a sterile platinum loop and then emulsified with sterile normal saline. Lactose neutral red agar plates were inoculated direct by means of a bent glass rod from this emulsion, and grown both aerobically and anaerobically. (2) A tube of broth, inoculated with a small portion of the sardine, was cultivated at 37° for some 20 hours and then plates similar to the above prepared and grown in like manner. Anaerobic cultivation was carried out in the Bulloch apparatus, in an

¹ *Zeitschr. f. Hygiene*, 1904, Bd. 48.

² *Ibid.* 1905, Bd. 52.

atmosphere of hydrogen. The tins were, it may be here remarked, opened carefully with a sterilised instrument so as to avoid as far as possible any contamination from outside.

At the end of the first 24 hours there was some growth in both sets of plates, both aerobic and anaerobic; and by the end of 48 hours growth was good in all. Subcultures on the various sugar media, dextrose, lactose, cane-sugar, dulcitate, mannite, and on milk were made from the different colonies on the various plates. These were all grown aerobically, as the organisms from the anaerobic plates were found after examination to be the same as the aerobic growths. The results obtained after three days' growth showed that four different kinds of organisms had been isolated from the tin whose contents were being tested.

	I	III	VI	VIII
Dextrose	acid and gas	acid and gas	acid	acid
Lactose	-	acid and gas	-	-
Cane-sugar	-	-	-	-
Dulcitate	-	acid and gas	-	-
Mannite	acid	acid and gas	acid	acid and gas
Milk	-	acid	acid	very acid
Milk clot	-	+	-	partial +
Indol (6 days)	+	+	++	++

On further examination of these four cultures it was found that that numbered III was a colon bacillus, thus leaving three other unknown but apparently allied cultures.

To settle the question as to whether these cultures were pathogenic or not, injections were made intraperitoneally into guinea-pigs, with the result that after doses of 1 c.c. of 20 hours' broth cultures the animal which had been inoculated with culture I died the following day, that with culture VIII ten days after, whilst that with culture VI was quite well and healthy forty days later. In both of the fatal cases the organisms which had been injected were recovered from the peritoneal fluid.

It was further of some interest to see whether inoculation of boxes of fresh uncontaminated sardines with these various cultures would give rise to gaseous decomposition. On July 10 four tins of sardines were therefore inoculated with cultures I, VI, VIII, and *B. coli*, another tin obtained at the same time as the others being kept untouched as a control. On Sept. 25 the tins, which had been kept during the intervening period at room temperature, were examined. It was noted that the tins which had been inoculated with culture I and *B. coli* both felt blown and had the typical appearance associated with that condition

and further on opening the tins, from the two just mentioned there was a slight escape of gas, but no foetid odour. Cultures were made from all the tins; and abundant growth, except in the case of the control, which was sterile, of the organisms with which they were injected was obtained. Culture I now gave a small quantity of gas when grown on mannite broth.

From other experiments, using material obtained from beef, salmon, and sardine tins, the results were practically always the same, *i.e.* one obtained cultures of organisms which all conformed more or less to the intestinal type. For instance, as is seen from the following short table, two varieties of organisms were obtained from a "blown" beef tin and two from a "blown" salmon tin.

	Beef		Salmon	
	1	2	1	2
Dextrose	acid and gas	no effect on	acid and gas	acid and gas
Lactose	acid and gas	any sugar	-	-
Cane-sugar	acid and gas		acid and gas	-
Dulcitate	-		-	
Mannite	acid and gas		acid and gas	-
Milk	acid (no clot)		acid (no clot)	slight acid then alkaline

I may add that no ill result occurred either on feeding animals with the decomposed beef or salmon or on injecting a watery extract of the same material (2 c.c.) intraperitoneally into guinea-pigs.

From still another "blown" box of sardines some varieties of organisms were isolated:

	a	b	c	d	e	f	g
Dextrose	acid and gas	acid	acid	acid and gas	acid and gas	acid	acid
Lactose	acid and gas	acid	acid	acid	acid	-	acid
Cane-sugar	acid	acid	-	acid	acid	acid	acid
Dulcitate	-	-	-	-	-	-	-
Mannite	acid and gas	acid	-	acid and gas	acid and gas	acid	acid
Milk	acid	acid	acid	acid	alkaline	acid	acid
Milk clot	+	+	+	+	-	+	-
Indol (6 days)	trace	trace	trace	slight	distinct	slight	distinct

SUMMARY.

In the samples of "blown" preserve tins examined by me, organisms of an intestinal type were present, which on reinoculation into sound tins gave rise to a gaseous decomposition.

No toxic symptoms were produced on feeding guinea-pigs with the contents of the "blown" tins.