BACTERIA

OF

COOKED MEAT

by

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It has come to be known as a universal fact that bacteria are present and can live, thrive and grow in almost any climate in which man and animals can live except in the far north. When conditions become unfavorable for their growth they form spores which resist the action of heat and cold to a far greater extent than do bacteria.

Bacteria are not found in the blood of the normal healthy animal but how many of our domestic animals are found to be perfectly sound and healthy. Out of almost every herd of cattle there will be found some animals which are diseased. I mention cattle not because they are the only animals which are subject to the infection of pathogenic bacteria, for they are not, all animals are more or less subject to their action, but because cattle are such a universal source of meat for food.

It is on account of the fact that people are thrown so at the mercy of ignorant and sometimes even dishonest butchers that they (the people) should be extremely careful from whom they purchase meat and also in the preparation of the meat for the table. Most people think that by going through a process which is termed cooking bacteria will be killed. But in a majority of cases the meat is not thoroughly cooked and the organisms are not destroyed.

Animals may become infected either by inhalation of contaminated air or by ingestion of any fluid or solid containing pathogenic bacteria.

A great many people have the mistaken idea that anything which an animal will eat is good enough for them, and consequently all of the kitchen refuse is thrown into a common receptacle and often allowed to collect there for a day or two when it is taken and fed to the animals. This conglemeration of material is an ideal media in which germs may thrive. Milk is often a source of contamination. It has been proven that milk from tubercular cows fed to swine will cause tuberculosis among the latter.

On account of the expense or indolence stock raisers are prone to fence in running streams for a source of water supply for their stock. In most cases this is an ideal source but there are exceptions, such as river water which receives the contents of the sewerage system from a large city, where plagues and diseases which are common to both man and animal frequent the city.

Then again one herd of stock at the head of the stream may have an infectious disease and this will be carried to all the stock which drink water from the stream for hundreds of miles down the stream.

Carelessness on the part of stock raisers to disinfect the sheds and stables where diseased animals have been will often lead to these becoming a source of infection for years as in the case of anthrax which is spread in this way.

Disease is more readily detected by the butcher in the living animal than in the flesh after the animal is killed, but we cannot always depend on the honesty of the butcher. He may have purchased an animal which was apparently healthy but which showed symptoms of disease later and not wishing to lose so much, he will be tempted to slaughter the animal and put it on the market. The meat after it has had preservatives added to it and placed on ice will look very innocent to other than a practiced eye; and even the inspector will be misled a great many times.

All animals which are sent to the large packing factories are inspected by the government inspector but this does not always imply that diseased animals are not slaughtered and sold as canned meat under very fancy high sounding names.

The fact that preservatives are used in meat does not prove that the bacteria contained in the meat are killed for preservatives simply retard the growth for the time the meat is canned.

The early detection of disease in the living animal has been made the object of scientific study in late years and has been brought to a great deal of use by the Boards of Health in the different states and cities; as for example, the tuberculean test for tubercular animals

The final detection of disease germs in meat is by the use of the microscope and innoculation.

Among the different diseases which are communicated from animals to man perhaps the most important are tuberculosis and anthrax.

Tuberculosis is one of the commonest yet the most fatal diseases common to both animals and man. The germ of this disease taken from different species of animals amy be quite different in appearance under the microscope but when innoculated from one species of animals to another will produce the same symptoms of the disease common to the animal innoculated.

The prevalence of tuberculosis in man and ox in the same country and district is so frequent that it may be safely set down as a rule that tuberculosis of man and ox is co-existive.

Among the great fishing communities like the people of the Hebrides, Iceland, Newfoundland, Greenland and the coasts of Hudson Bay tuberculosis is rare. In these countries cattle are few or absent and when present they are kept unhoused and in the open air and are not subject to the disease. In Northern Sweeden, Norway, Lapland and Finland where cattle are scarce and reindeer plentiful, tuberculosis is said to be rare, though the inhabitants are said to live in the closest of dwellings during the winter. In most of the Pacific islands there are no cattle and the natives are comparatively free from consumption. In Hawaii since the introduction of cattle consumption has increased.

Statistics show that Minnesota and Dakota in the early days were held to be incompatible with tuberculosis but since the coming of the white man and his stabled herds they have largely lost their sanitary reputation. The highest known mortality from tuberculosis today, says Law, is that of the reservation Indians of these states who feed on raw diseased beef.

In Japan Dr. Ashmead tells us that the common people escape tuberculosis while the aristocracy suffer severely. He attributes this mainly to the debauchery of the ruling class, but it must not be overlooked that they eat freely of beef and dairy products while the poorer people live principally upon rice.

Among the civilized people of the temperate zones a general average mortality of seven or eight per cent is from tuberculosis.

The contrast with the reservation Indians is still more striking. Holden and Treon testify that the meat furnished to the Indians is always poor and often diseased and that when the stock arrives the hungry Indians devour the internal organs raw, or later the flesh is pounded preserved meat and still uncooked. The deaths of these Indians from consumption is fifty per cent of the total mortality.

Dr. Washington Mathews, who spent twenty one years among the Indians gives their food as the main cause of disease and states that when the supply of fresh meat is liberal the death rate from tuberculosis is highest.

Anthrax is another disease which may be contracted by man, but which is more commonly a disease of cattle and sheep. Swine are also subject to its attacks. The cause of this disease is a rod shaped germ called bacillus Anthracis. It is found singly or connected in pairs or very short filaments. They form spores even in the body of the infected animal. "As in animals man suffers from ingestion and inhalation of bacillus; and sometimes wide spread mortality comes in this way."

Meat just killed may be thoroughly disinfected by secretions of a healthy stomach, yet the bacillus may pass through in an envelope of fat in an undigested mass or during an attack of dyspepsia and infect the intestines. The spores are proof against the gastric juice and as they are produced in a few hours after death the meat of an anthrax animal must always be considered as extremely dangerous even if it has been cooked at ordinary temperature of the cooking of meat.

Meats even when salted and smoked may contain living pathogenic bacteria which were present prior to the death of the animal and when not properly preserved are of course liable to be invaded by putrefactive bacteria. The typhoid bacillus, the pus cocci, the tubercle bacillus and the bacillus of swine plague resist the action of a saturated solution of salt for weeks and even for months; the ordinary process of salting and smoking does not destroy the tubercle bacillus in the flesh of a cow which had succumbed to tuberculosis. Smoking does not insure the destruction of these micro-organisms. Many, in fact most people, eat dried beef without previously cooking it; this should never be done as disease is liable to follow if the meat happened to contain any pathogenic bacteria.

Ordinary cooking does not always sterilize, as Martin and Woodhead found living bacteria in the center of a cooked six pound roast.

All bacteria will be killed by being subjected to high enough temperature while cooking. The spores however are not so easily destroyed, they will withstand a much higher temperature than the bacteria. We see therefore that we must consider the destruction of spores in cooking meat. Some spores of bacteria are said to have been obtained which resisted 100° C for sixteen hours, and others are not destroyed by several hours of steaming.

In a large roast the temperature of the interior is never as high as the outside and bacteria may not be harmed in the center of the roast. In this case the meat should be divided and cooked in smaller portions or else be cooked slowly for a longer period of time. In preparing meat for invalids raw meat is scraped and formed into balls which are seared over on the outside in order to make an appetizing appearance, while the interior is often not warmed through; the writer found living bacteria in meat balls prepared in this way.

Many persons prefer their meat underdone or rare but this is a dangerous practice as we cannot always tell whether the meat is free from micro-organisms.

Meats which are canned are supposed to be ready to eat upon opening the can. This meat is not free from bacteria and is therefore not fit for consumption until heated again.

In the research work on bacteria of cooked meats most of the bacteria isolated were found to be those whose habitat is water. They grew very slowly when first innoculated into bouillon.

Three different germs were isolated and identified from a can of meat labeled "Delicate Frankfurters."

No.1. B. flavus. (Adamety.)

Morphology-Bacilli 0.5:1.5 grow slowly at room temperature.

Gelatin stab - Slight growth in depth of yellowish color bead like.

Potato - Convex colonies. Chrome yellow color.

Habitat - water, surface of body in eczema.

No.2. B.theta. (Dyer.)

Morphology - Bacilli 0.5-0.7:1.0-1.3 in pairs, motility doubtful.

Agar - Translucent, ocherous.

Gelatin - Liquified slowly after 24 days.

Lactose litmus - Blue.

Bouillon - A membrane.

Potato - Growth thick, spreading, glistening, ocherous, brown

Habitat - Air.

No.3. B.Rubefaciens (Zimmerman)

Morphology - Bacilli 0.3:0.7-1.6

Gelatin colonies - Deep, round, small yellowish, brown, surface flat, white, reddish.

Gelatin stab - In depth a uniform growth; on surface growth grayish.

Agar slant - Growth thick grayish blue.

Potato - Growth yellow brown with flesh colored edge.

Habitat - water.

Two organisms were isolated from Rex Potted Ham, Cudahy Canning Co.

No.1 B. ginglymus (Ravenel)

Morphology - Bacilli straight, 3-7 times their breadth, occur singly and in chains of 2-3 elements, ends rounded.

Gelatin colonies - Deep colonies, yellowish, granular, 0.5mm Surface colonies; in 24 hrs. minute white punctiform, gray granular edges, irregular; in 36 hrs. 0.25mm white center orange brown.

Agar slant - A grayish white line, moist, glistening, 1mmwide

Gelatin stab - In depth 10 da. indistinct globular outgrowths on surface a grayish yellow button 2-3 mm.

Potato - Growth thin, spreading, yellowish moist, glistening becoming brownish.

Bouillon - Turbid.

Litmus milk -Alkaline, not coagulated becoming translucent and in 2 weeks violet.

Glucose bouillon - no gas.

Habitat - soil.

No.2. B.Accidentalis (Kruse)

Morphology - Bacilli, small, short with polar stain.

Gelatin stab - In depth growth beaded; surface growth thin iridescent.

Potato - Growth glistening yellowish.

Pathogenesis - Pathogenic to mice, guinea pigs and rabbits. Death in a few days; bacilli in the blood, spleen swollen; often paralysis with convulsions.

Habitat - Isolated from the wound pus of a person dead of tetanus.

One organism was isolated and identified from Armour's Chicken Tram.

No.1. Planosarcina Mobilis.

Morphology - cocci 1:4 in typical packets each cell with 1-2 flagella generally 3 times length of cell.

Gelatine - Liquified slowly, formation of brick red pigment.

Agar slant - Growht, orange brick red.

Milk not coagulated.

Potato - no growth.

Armour's Lunch Ham contained one colony of growth.

No.1 B.Tremelloides (Tils)

Morphology - Bacilli 0.2-1.0

Gelatin- Colonies - Raised, spreading.

Potato - Growth coarsely granular, crumpled, yellowish.

Habitat - Water.

Three different organisms were found and identified in Armour's Potted Ham.

No.1 Bacterium Mycoides (Flugge)

Morphology - Bacilli 0.8:1.6-3.6 ; rods square ended or scarcely rounded; in chains. Stained by Grams method and was aerobic.

Gelatin Colonies - In depth an aborescent growth, liquifaction cateriform, becoming saccate, a membrane on surface of liquified gelatin.

Agar colonies - Gray white, moist with characteristic root-like branchings.

Agar slant - Growth shows rhizoid or root-like branchings.

Potato - Growth like B. Subtilis.

Milk - peptonized.

Glucose bouillon - no gas produced.

Habitat - Soil, water.

No.2. Bact. Zeta (Dyar)

Morphology 0.5:0.7-1.0

Gelatin - A slight development of liquifaction does not begin before 10 days.

Milk - On surface red cream.

Nitrates not reduced to nitrites.

Habitat - air.

No.3. (Not identified).

Morphology - Bacilli - short rods, in chains, spores present stained by Grams method.

Agar slant - Cream colored growth.

Bouillon - Clouded.

Potato - Slimy upraised tan colored growth.

Gelatin - Liquified

One germ was obtained from the center of a piece of beef which had been cooked at 85° C for ten hours.

No. 1. B. Beta (Dyar)

Morphology - Bacilli short, rounded 0.6:1.5 - 2.0

Gelatin - Liquified slowly; surface growth thin feathery.

Agar slant - Growth translucent, glistening, white.

Litmus milk - Not coagulated; not reddened. Reduction of nitrates negative or slight.

Habitat - Air.

One germ was found in a meat ball which had been prepared for an invalid. (Not identified.)

Morphology - non-motile, rods, slightly bent, occur singly or in short chains.

Agar slant - wrinkled or upraised growth.

Gelatin - Gelatin liquified, had wrinkled pellicle on surface.

Litmus milk - Peptonized with a heavy wrinkled pellicle on surface.

Bouillon - Pellicle on surface.

Potato - Slimy upraised growth on surface.

Rex Brand Lunch Tongue contained two growth of bacteria which proved to be identical.

Bact. Mansfieldii.

Morphology - Bacilli 1.4 - 2.0 in twos and threes.

Gelatin colonies - Round, white, punciform, i mm, spreading only slightly.

Gelatin stab - Surface growth white, spreading, rather dry.

Agar slant - Growth white, rather limited to spreading.

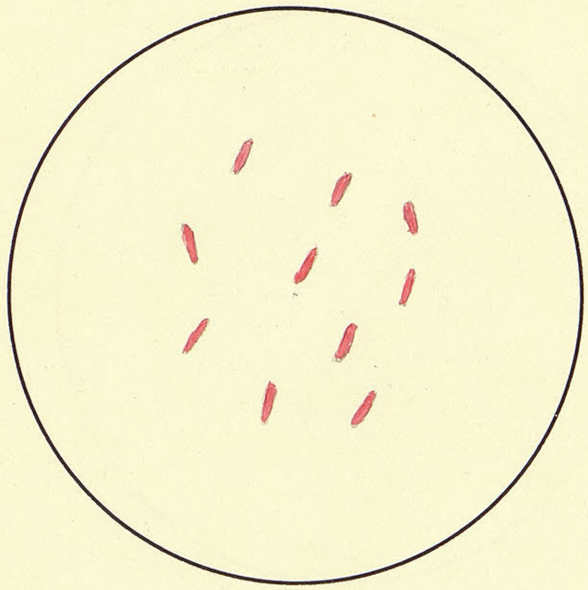
Potato - Growth thick, spreading, mottled.

Bouillon - Turbid, with a sediment and slight pellicle.

Habitat - Milk from Mansfield, Conn.

We see then that the subject of the bacteria of meat is one which deserves a great deal of study as the health of the individual depends so largely upon the meat consumed.

In cooking meat special attention should be given always to see that all parts of it are thoroughly cooked; and under no consideration should one eat underdone meat.

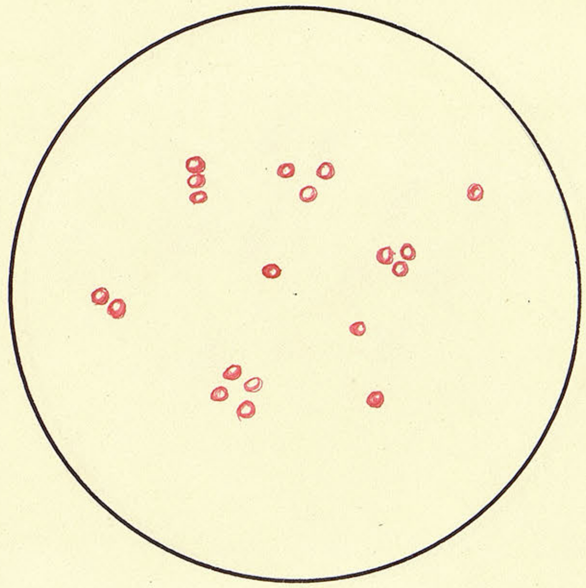


B. Rubefaciens.

B. Ginglymus.

B. Accidentalis.

Bact. Zeta.



Planosarcina.

B. Tremelloids.

B. Beta.

Bact. Mycoides.

Not identified Meat Balls.

Nos. 1 and 3 Not identified.