

35.—FOUL FISH AND FILTH FEVERS.

BY J. LAWRENCE-HAMILTON,

Member Royal College of Surgeons, London; Licentiate Royal College of Physicians, Edinburgh.

DEFINITIONS.

(1) For practical purposes and for those of this paper "fish" includes aquatic and amphibian animals generally, as well as their products used or capable of being used for food.

(2) Except where specially stated or implied, I here use the term "fish" to represent food derived from dead aquatic and amphibian animals.

(3) Except where specially stated or implied, I here use the term "fisherfolk" to include fish catchers, curers, salters, preservers, and fish vendors generally.

BIBLICAL.

Accepting the accredited views of the ancient Egyptians, among whom as a quasi royal prince he spent his early life, Moses considered certain kinds of "fish" and other foods as the producers of "leprosy." The biblical leprosy evidently included almost every kind of skin disease and skin rashes generally. Hence Moses forbade the Jews to eat "fish" without fins and scales—oysters, shellfish, turtle, tortoise, etc.

Like the ancient Egyptians, Moses also believed that neither "fish"—aquatic and amphibian animals—nor insects and reptiles possessed any blood. Indeed these erroneous views seem to have not alone been indorsed by the rabbis who composed the Talmud, but even now by too many Jewish clergy at home and abroad, who are still alive.

Whilst Moses forbade the Jews eating hares, rabbits, pigs, and all creeping animals without wings, probably because these foods were then supposed to produce "leprosy" or other diseases in man, nevertheless he allowed his peculiar people to eat flying, creeping things, including such dirty insects as beetles, locusts, scorpions, grasshoppers, etc. Indeed the mere touching or carrying of the carcass of any animal considered unclean made the man and his clothes unclean until the evening, and until after he had thoroughly washed himself and his clothes. The Jews were also forbidden to eat the blood of beast or fowl. (See *Leviticus*, VII, XI, XIII, XIV.)

HISTORICAL.

The subject of fish inspection early engaged the attention of our forefathers. By a statute of Edward I, dated 1272, no fishmonger was allowed to water his fish more than once. No fresh fish was to be kept in London beyond the second day from its capture; nor was any bad fish to be sold.

In 1382 "Reynald atte Chambre brought in maliciously herrings and mackerel, corrupt and unwholesome for man," for which the mayor and alderman put him in the pillory for six days, and burnt his fish beneath him, as was then the custom of the city of London in like cases.

About the same time John Welburgham, who kept a fried-fish shop in Bread street, London, sold two pieces of cooked conger eel "rotten, stinking, and unwholesome for man," to four countrymen who went to dine at his house. They had the fish taken to Guildhall. There a jury of cooks, good men and true, were sworn to smell the fish, and by their verdict Welburgham was put into the pillory and his stock of fish burnt under him.

Compiled probably somewhere about 1419, or earlier, it was enacted by the Liber-Albus that "No fishmongers shall be so daring as falsely to *dub their baskets*, or to make a show of desirable fish at the top of the basket, and undesirable fish of little value beneath. On being attainted such a 'dubber' shall forfeit his fish to be burnt with fire in the Chepe—now Cheapside—in London. Such a dubber shall be held a cheat and imprisoned therefor."

In 1499, by 19 Henry VII, a trade search was made quarterly, or oftener as need should require, by the wardens of the Fishmongers' Company, who were to perambulate the whole city and suburbs for corrupt and unseasonable fish. The mayor for the time being was to punish and correct delinquents according to the laws and customs of the city. These laws were confirmed by the charter of James I in 1604 to the Fishmongers' Company.

Officially printed in 1620, "The laws and markets" of the city of London enacts that "no unwholesome or stale victual was to be sold; each offense to be punished by a penalty of 40 shillings and forfeiture of the victual.

The 1668 bylaws of the Fishmongers' Company—which the company professes to have religiously carried out from that date to this—in its trade duties include the prevention of the sale of "*overday*" fish, that is fish over a day or twenty-four hours old, by "*oasts*" hosts, innkeepers, or eating-house keepers within a radius of 12 miles of Billingsgate market. If the company were to enforce this law, the sale or distribution of bad fish in greater London and in its markets would be impossible.

It appears that on January 14, 1685, by 16 Charles II, the charters of the company were surrendered, but they were subsequently restored and confirmed.

FISH AND CHOLERA.

Unfortunately the present (September and October, 1893) outbreaks of cholera at Grimsby and at Hull (our largest fishing ports) further confirm the association of avoidable fishy filth and preventable diseases.

On September 4, 1893, at Bradford, a fish-hawker (John Walmsley) died, apparently from cholera. On September 2 he had obtained a consignment of mussels from the cholera-infected port of Grimsby (Cleethorpes).

At Rotherham, on September 6, Burnand died of cholera, having on September 5 visited Grimsby. He had been fishing the day previous to his death.

On September 8, at Doncaster, Hepworth, of Leeds, died of cholera, having recently eaten oysters from Cleethorpes in the port of Grimsby.

At Leicester, on September 10, a woman living at a fish and oyster shop died in a few hours, apparently of Asiatic cholera.

On September 14, at Mansfield, Notts, the wife of a fishmonger named Coleman died within twenty-four hours, of cholera.

In spite of the weather becoming suddenly much cooler, on September 22, 1893, at Newcastle, in its poor and crowded district of Byker, a fishhawker, Thurgate (or Stringate), died of Asiatic cholera, which he had previously fatally communicated to his friend and neighbor Platten.

The cockles and mussels in and about Grimsby and Cleethorpes are stated to be more or less sewage-fed, from the filth of the great fish-trade center.

Of all food trades the fishing populations are the most slovenly and dirty in their habits, overcrowded in their dwellings, and therefore more prone to endemic as well as epidemic affections; for, though apart from the manner in which inoculation occurs, cholera, jail fever, virulent smallpox, typhoid, typhus, diphtheria, leprosy, and the "plague," etc., have been always associated with poverty and avoidable filth, of course unwholesome food and dirty surroundings diminish our resistance to these infectious diseases, against which a healthier, stronger condition, obtainable by superior sanitary social surroundings and good food, becomes immune or free.

When light is thrown upon the present state of Grimsby and Hull, fishing ports of great importance, we find that their sanitation is very imperfect, that the fish trade has remained in its old-fashioned unhygienic ways, and that poverty has increased owing to the recent strikes. No wonder that these ports should form an apt *nidus* for disease. And, digressing for the moment, let me point out that in ports like Hull and Grimsby not only should we be exercised in preventing the entry of a *contagium vivum* from a foreign infected port, but by internal sanitation, dealing with our food-refuse, secreta, etc., we should prevent the origin of sporadic diseases.

Taking for granted that specific bacteria have been latent or dormant, "*sporadic*" disease suggests that local filth and other local causes are alone sufficient to produce and originate disease, apparently without any direct infection by infected persons or by infected imported clothing, rags, etc. Unless this view be accepted there appears to be no reasonable or rational explanation of sporadic disease, as of course in these Darwinian days of evolution no sensible person believes in "spontaneous" generation.

It is probable that the cholera bacteria may have been introduced last year or years ago into Grimsby or Hull, where the germs remained dormant till increasing filth and poverty, augmented by the recent local strikes, caused the cholera bacteria to infect some of the people at these seaports.

Whilst in strong, robust health, Pettenkoffer experimentally swallowed a lot of cholera bacteria, which practically caused him no inconvenience. Had he then been in ill-health this dose of cholera bacteria would probably have killed him.

No one can tell, therefore, that last year or years ago the inhabitants of these places and of other unsanitary fishing towns have not had mild attacks of cholera.

Tetanus, or "lock-jaw," essentially a dirt disease, is always with us, yet the tetanus microbe can only thrive in the absence of air, a circumstance which, one would think, would tend to have long since caused the extinction of tetanus.

Especially in the United Kingdom, practically all our leading fishing districts are more or less "health" resorts; thus, for all intents and purposes, Brighton is a railway suburb of London. It is therefore evident that the healthy condition of our seaports immediately concerns the inhabitants of our inland towns and districts.

In the 1893 cholera epidemic many visitors to Cleethorpes took cholera at this seaside health resort and carried the disease to various inland towns and places.

THE CHOLERA EPIDEMIC AT ST. PETERSBURG, FROM EATING BAD "FISH."

Doubtless, as the doctors declare, the long severe orthodox Russian church fast, which being in full force (December 16, 1893) and will remain so up to Christmas, 1893, has caused the poorer classes to eat bad "fish," producing intestinal disorders and increasing the winter abating cholera. It must be recollected that the exceptionally extreme mild winter weather has thawed the naturally frozen dead fish, making them dangerous food. The St. Petersburg, 1893, cholera epidemic had almost subsided till towards the middle of December, 1893, when a large number of soldiers and other people attended a colossal banquet at the winter palace on the occasion of the annual feast of the military order of St. George, which took place early in December, and subsequent to this several thousands of the guests who had eaten at the fête in the palace were attacked with cholera symptoms.

Early in January, 1894, at a St. Petersburg Orphan Institute, a rapidly spreading epidemic appeared, which within a week assailed 194 out of 200 inmates, or only spared 3 per cent of these residents. This attack was attributed to the consumption of fish contaminated with cholera bacilli from infected water.

Like the 1893 winter epidemic of cholera at Nietleben, in Saxony, and confirmed by Professor Uffelmann's laboratory experiments, these united facts show the resistance of cholera bacilli to cold.

THE PLAGUE IN ASTRAKHAN.

Astrakhan is the seat of the sturgeon and its caviare industries. The following remarks quoted from my papers in the "Practitioner" of 1880, show how foul fish may cause "filth" fevers.

During the winter of 1878 and 1879 the plague visited Astrakhan. Towards the latter half of November the real winter in Astrakhan begins, when its rivers are frozen over, whilst the temperature is often some 10° Réaumur below the freezing-point of water. In Astrakhan province most of the people seem well to do, but a fearful want of cleanliness is here as strikingly characteristic as in other parts of Russia. In the city of Astrakhan most of the streets are without pavement. There are no fresh-water springs, and the water supply is drawn from the fouled branches of the Volga.

The laborers employed in fish salting exist under very miserable conditions. In many places they dwell in cavities hollowed in the earth, or in caverns. The price of bread being beyond their means, they subsist chiefly on the leavings of the inferior parts of the prepared fish. Formerly Government rules enforced that the unused remains of the prepared fish should be thrown directly into the water, but now these, collected and accumulated in masses, are left to rot in and about the banks of the rivers under the heat of sometimes an almost tropical sun. Further, the vats used for salting fish are never properly and systematically cleaned. It is the custom merely to add more salt from time to time. The local atmosphere is further vitiated by many fat-boiling, fish-oils, blubber, isinglass, etc., works.

During the five years preceding the outbreak of plague in 1878, in Astrakhan, enteric fever, measles, and smallpox had been epidemic, whilst scarlet fever raged in

1876 and 1877. Previous to 1878 the town of Astrakhan during the last twenty-two years had suffered nine epidemic attacks of cholera and three of enteric fever.

Further statistics or observations of the twelve years ending 1878 recorded only one birth for every 36.5 persons, whilst one death took place for every 21 inhabitants of Astrakhan. Or, in other words, owing to preventable diseases due to avoidable filth, the population of Astrakhan would gradually become extinct were it not continually recruited and increased from external sources.

SUDDEN SPORADIC DISEASES ON SHIPS AT SEA.

On ships which have not touched land for months, when still at sea, if sporadic disease suddenly breaks out on board, this suggests overcrowding, dirt, putrefaction, infected drinking water, etc., with perhaps bad or scanty food *plus* privation, exhaustion, and the like, consequent upon continued foul weather, accidents at sea, etc. Below deck a ship is a floating house or hospital where the bacteria of disease may long remain dormant, till enabled to infect increasingly debilitated people.

Under favorable conditions and circumstances, where sufficient filth, heat, and moisture exist, there the latent, dormant, or passive germs of infectious disease are probably permanently present. These home-grown, indigenous, or endemic bacteria fortunately only occasionally assume the virulent and active pathogenic types, which produce epidemics.

In addition to the endemic form of contagion of course there is also the spread of infection by means of infected persons, clothing, etc. Passive or active germs, like plants, seeds, spores, etc., or animals and their eggs, etc., can also be imported and introduced as exotics or "foreigners" from abroad. Hence, in rare cases, there may be in the same place a series of contagious epidemics caused *conjointly, alternately, or successively* by the action of home-grown bacteria and by imported foreign bacteria.

FISH AND SPECIAL DISEASES.

Fish, filth, and poverty have also been suspected of producing such skin complaints as elephantiasis and ichthyosis (fish-skin disease), besides causing beri-beri, a tropical disease characterized by anæmia, paralysis, dropsies, dyspnoea, etc.

Decomposed animal or vegetable matter tends to propagate and circulate fever and disease. Fish putrefies quicker than meat, game, poultry, fruit or vegetables. Indeed fishermen themselves are so acutely alive to the early rapid putrefaction of fish that an ancient and still familiar name for a kind of rock or whiting pouter is the "stink-alive."

Of all our food industries, none is so constantly and belligerently offensive as the proverbial fish and fish-offal trades, as a visit to bacterial Billingsgate and its abominable colossal underground vaults will prove.

HEREDITARY SUSCEPTIBILITIES TO "FILTH" DISEASES.

Recent history confirms that disease and death from "filth" fevers may be increased by hereditary tendencies. H. R. H. the late prince consort, Prince Albert, is reported to have died from typhoid fever, probably produced by the filthy emanations from a dust bin, accidentally placed near his bedroom window. His son, H. R. H. the Prince of Wales, very nearly died of typhoid fever, caught whilst on a visit to a nobleman

where the drainage and sanitation were defective. His grandson, H. R. H. the Duke of Clarence, is reported to have died from eating oysters which had been contaminated by having lived in sewage-fed waters.

WOUNDS CAUSED BY HANDLING FISH.

These are often serious owing chiefly to an accidental dose of putrefactive matter getting into the sore, producing local whitlow or cellulitis, abscess, necrosis, loss of finger, or even fatal gangrene. The average fisherman has never any remedies at hand at sea, unless it be a quid of tobacco to put on the wound.

Surgeons attached to the Mission to the Deep Sea Fishermen have noticed that, in spite of the usual health of these fishermen, wounds heal but slowly at sea. Whilst cleaning fish slight abrasions, punctures, and cuts from knives soon inflame, causing deep suppuration and great suffering. The poisoned wounds of such fisherman are generally irritated by salt water, which soaks through their bandages.

Their putrefactive surroundings from decaying "fish" seem to suggest that the putrefactive bacteria and products connected with the decomposition of "fish" may account for the slowness with which fishermen recover from sea boils, salt-water cracks, and local injuries from the skin having been cut or torn.

These injuries resemble the course of "wound fevers" in armies during war, etc.

I have quoted these instances to suggest a more intimate relationship between the effects of the prick or wound and the resulting inflammation than has hitherto been supposed, and that these cases may point to a direct inoculation of putrefactive virus contained in foul "fishy" surroundings.

During October, 1892, at a coroner's inquest upon a fish porter, it was shown by Dr. Rolf, of the London Hospital, that death was due to the rapid cellulitis and gangrene which followed from the prick of a fish bone.

In the British Medical Journal of July 6, 1889, I called attention to the case of a woman, described by Dr. Buckell, where the patient pricked her tongue with a fish bone, and then was said to have inoculated the wound with vaccine virus, owing to her having kissed her baby's vaccine vesicle. Now, in this case the inflammation of the tongue might just as well have been due to the poison of the wound by the fish bone.

Again, rectal abscess in man is often due to a fish bone penetrating the local mucous membrane. Goodsall describes eighteen cases, and there are numerous others mentioned by writers at home and abroad.

In these examples, in like manner, inflammation may be due to wound-poisoning caused by the bone, and not to the mere mechanical irritation excited by the foreign body, and the necessary contamination of the wound with the local excreta.

In some parts of the United States their oyster "fishermen" or dredgers, owing to being wounded by the shell of the oyster and the putrefactive poison derived from the decomposed "fish," get on their hands one or more large abscesses, usually situated beneath their nail or nails. This affection is described as a huge "felon," or a kind of general paronychia or whitlow of the hands. The bones and tendons are often exposed, with possible loss of one or more fingers. The usual American treatment is deep and free lancing and improvement of the general health and surroundings of the patient.

Old hands having long manufactured dry mother-of-pearl, tortoise-shell, horn, ivory, bone, etc., are liable to impeded breathing, shortness of breath, or cough, prob-

ably caused by breathing in the dry dust made in their business. In other instances the organic dust made by workers of mother-of-pearl, being absorbed into their lungs and thence into their blood, causes an affection at the end of their bones near the joints, simulating the symptoms of acute rheumatism. Sometimes mother-of-pearl workers have had various bones, especially those of the lower jaw, wrists, collar-bone, etc., attacked with severe *periostitis*, or inflammation of the bone's external lining membrane. It is supposed that the mother-of-pearl dust contains traces of phosphorus in the form of phosphate of lime.

In the United States "gurry" (or fish-offal) sores on the hands, wrists, and arms of its fishermen are common. These wounds are caused by the poisons, chiefly putrefactive, derived from fish-hooks, fish-pins, fish-scales, and from handling fish. These "gurry" sores are made worse by exposure to wet, extreme cold, or excessive heat, and often aggravated by dirt and poverty.

"PROFESSIONAL" PUTREFACTIVE POISONING.

In the Norwegian whale fisheries, after having driven the whales toward the shore, they are surrounded by a net, which prevents them through fear returning to the deeper sea. The whales are next struck with prepared putrefactive-poisoned harpoons. In about twenty-four hours some of the whales begin to exhibit sign of exhaustion, probably through septic or suppurative poisoning, and are hence readily captured. It is then found that the harpoons are imbedded in masses of inflammatory gangrenous tissue. These harpoons are removed and carefully preserved without being wiped or cleaned, to be employed for the next shoal of whales, when they are again used, producing and repeating their septic or poisonous properties.

The explanation of this rapid poisoning is due to the harpoons carrying with them the germs or bacteria of an infective inflammation and inoculating the whales by setting up infective or poisonous inflammation in the same way as spreading gangrene, fatal erysipelas, and child-bed fever.

Nero and Domitian used special putrid preparations made from the sea hare (*Aplysia punctata*), a kind of sea slug or snail, for secretly poisoning their enemies. Similarly, some savages use dried putrid fish poisons for their arrows to kill men and animals.

PUTREFACTION.

To satisfactorily study and intelligently understand the putrefactive processes of animal matter it is sometimes necessary to compare the decomposition of meat, of game, of poultry, and of fish, and even also the decompositions which occur in living and in dead vegetable matters, including flowers. Hence I have considered it occasionally advisable to enter into the *comparative chemistry and comparative bio-chemistry* of putrefactive processes which occur both in living and in dead men, animals and plants, without forgetting certain other facts bearing upon the question of natural food preservation.

As an illustration of the power of putrefaction, even in quantities which probably could not be weighed on even the most delicately contrived balance in the analytical chemist's laboratory, let us recollect what may take place in the "putrid" sting of a filth-feeding wasp. Thus, during the summer of 1893, in various parts of the United Kingdom there were several serious cases of poisoning, and sometimes fatal poisoning,

by stings of these apparently insignificant insects. Occasionally these stings produced a bright-red mottled rash, just like the rash which follows upon eating bad "fish," especially shellfish, above all periwinkles and mussels, more or less "on the go" or tainted, which bring many cases of suspected poisoning to the local medical man, who generally cures his patients with a prompt emetic and purge.

While bees are vegetarians, wasps are filth-feeders, greedily devouring dirt and decomposed animal matter. Hence it is probable that fatal cases resulting from wasp stings are caused, not by the acrid and the specific secretions of the wasp, but are due to the infuriated insect inoculating accidentally a very minute dose of putrid poison.

In Exodus XXIII, 27, 28, Deuteronomy VII, 20, and Joshua XXIV, 12, we read of hornets being sent to drive out and destroy enemies.

From time immemorial in Eastern countries the sting of the wasp or hornet was considered as venomous and deadly as oriental leprosy.

The Talmud declares that the lion fears the mosquito, the elephant the gnat, and the scorpion the ichneumon fly.

Without suffering from their stings, wasps are devoured by toads.

The importance of the question of putrid food will be readily appreciated when it is recollected that quite recently a well-known London modern medical writer has boldly stated that "though you may eat and drink cholera, you can not possibly catch it." Personally I believe that cholera is infectious, but that bad food and water may also communicate the disease.

In 1848 Prof. Virchow showed that the symptoms and anatomical changes caused by injecting putrefying fluids into the blood of animals most closely resembled cholera.

Ancient physicians wisely assumed that there were both a *status putridus* and a *febris putridus* in foul fevers, and that all these infectious diseases contained a common putrid element.

DOMESTIC ANIMALS POISONED BY BAD FISH.

Especially at the seaside, or near fish shops and fish markets, dogs are particularly liable to putrefactive poisoning and choleraic conditions, more frequently originating by their having eaten bad fish than from any other kinds of decomposed animal or vegetable matter. Because of their so readily vomiting unhealthy food, though proverbially fond of fish, cats suffer much less than dogs. From time immemorial, in some oriental countries, at certain seasons, when fish is suspected to be specially poisonous, the natives feed suitable domestic animals on the fish, when, if no bad symptoms occur in the animals experimented upon, the people eat the fish.

In man, but for the fact that "fresh and cured" fish (*i. e.*, aquatic and amphibian animals and their products used as food) produce in many cases immediate vomiting and diarrhoea, fish-poisoning would be practically universal. There are numerous diseases directly attributable to eating bad fish or neglecting to destroy its offal. I may mention, for instance, that domestic animals act as hosts to parasites, which attack some races of Northern Europe and Asia. The eggs of the parasites are propagated; these may dry and get distributed; or else dogs eat them and then pass them, thereby often contaminating local drinking-water supplies, etc. Tape-worms, and various other worms infecting man, hydatids, etc., are thus frequently introduced, especially when men and animals drink out of the same vessels.

TREATMENT OF BITES AND WOUNDS CAUSED BY HANDLING LIVING OR DEAD FISH, ETC.

(1) Ammonia, as sal-volatile, smelling-salts, etc., or other available alkali should be immediately placed on the bite, sting, or wound.

(2) Subsequently a little Condy's fluid (permanganate of potash) should be poured on the wound, so that in case of the animal inoculating any putrid matter into the patient, such poisonous material shall be at once disinfected and destroyed.

(3) The immediate pain and itching from bites of animals seem due to something more than the mere acidity of a secretion. The pain and itching depend, probably, rather upon the introduction of some specific irritant, possibly distinct and peculiar to almost every large class of insect and other animal.

(4) Where practicable, especially owing to possible putrefactive properties, the sting, etc., should be extracted as soon as possible.

(5) The same method of treatment is equally applicable to bites from domestic animals, the stings of serpents, and to various injuries caused by amphibian and aquatic animals, to which fishermen and sportsmen are liable.

FOULED FISH AND FISHY FILTH.

Offensive fish markets and fish shops, stationary or perambulating costermongers, evidently come under the section of offensive trades, exposing the delinquent to a first penalty of a sum not exceeding £2, and subsequent convictions may, even for a single offense, amount to £200.

The public health ships act (48 and 49 Victoria, 1885) confirms section 110 of the 1875 public health act, extending the powers so as to bring ships within the jurisdiction of the local authority in which the ship is lying. This would evidently include all fish-carrying vessels under the jurisdiction of the public-health acts of England.

By the 1890 public-health amendment act and the 1891 London public-health act any solid or liquid article or animal intended for the food of man, exposed for sale or deposited in any place for the purpose of sale, or in preparation for sale, may be seized and, if found diseased, unsound, unwholesome, or unfit for the food of man, the medical officer of health, the inspector of nuisances, or their representatives, may seize, condemn, and destroy the said article or animal. For every such improper article exposed or prepared for sale, etc., the would-be vender or food-preparer seems liable to a fine of £50, or else a term of imprisonment not exceeding six months with or without hard labor.

Fishing ports or districts and fish shops, stores, and markets are proverbial for their now avoidable abominable smells and worse sanitary arrangements.

Though from their earliest history the Norwegians, immediately on capture, have always bled their fish by incisions just under and behind the gills, yet British fishermen have never generally adopted this practice, which, combined with gutting on capture and improved methods of curing, secured to the Dutch the practical monopoly of the fish trade of the world, between the fourteenth and eighteenth centuries.

In the United Kingdom its fish venders consider it necessary to sell their fish looking full, fat, and round within, and wet without. Hence till the fish is bought it is usually unbled and ungutted, whilst to make its skin and surface look bright and

wet, it is kept artificially soaked and sodden with water or melting ice, or both. What butcher would so ill-treat his meat?

Only after the fish is sold, the trade then gut the fish, which is already too stale to bleed, as the blood is mostly clotted and usually more or less decomposed. Their so-called cleaning, if any, consists in placing the "fish" in a small tub or pail containing a super-saturated solution of fishy filth and offal, reeking with almost every obtainable form of putrid bacteria, and the putrid products of parasitic worms and their eggs, etc. Fish costermongers or itinerant fish-venders, frequently carry on this offensive trade at the very doors of their customers, a practice which ought to be illegal and punishable.

Meat, etc., can not be successfully dressed near a foul gully, cesspool, drain, dung-hill, dust-bin or other receptacle containing putrefactive bacteria and their products.

Fish decomposes with extraordinary rapidity, partly because its shorter, lighter, looser muscular fibers both contain more and absorb additional moisture more readily and abundantly than is the case in the denser, longer, stronger muscular fibers found in meat, game, poultry, etc.

FISHY ODORS.

An ancient Tuscan proverb accuses fish and guests of stinking from the third day.

The filthy but frequent habit of our costermongers and itinerant fishmongers of "dumping" or depositing their fish offal and fish refuse on the road is pregnant with danger, especially during warm wet weather: In 1890 I published the fact that around bacterial Billingsgate, if a street stone be removed a horrid overpowering stench arises from the local foul festering fishy filth having supersaturated the soil.

A Billingsgate fish salesman once said:

The smell of fish in a market would permeate every part and room of the neighborhood for a quarter of a mile round. You can have no idea of the tentativeness of the smell, and the people would be poisoned. A short time ago I went to the theater and sat behind several ladies. In about half an hour I heard, "Dear me! What a strong smell of sprats!"

It is evident that in the theater this man must have carried about with him the putrefactive bacteria of foul fish, which proved so offensive to the ladies in front of him. In other words, as soon as the heat and closeness of the theater made him warm and perspiring, then the fishy bacteria and their products gave out their putrefactive characteristic odor.

Shakespeare was familiar with the "very ancient and fish-like smell" of such putrefying matter.

In 1888 whilst traveling from the North Cape, in northern Norway, we visited for less than half an hour a local whale factory. On returning to our steamer, which was continually moving quickly southwards, nevertheless for about five days the offensive smells of the decomposing whale stuck to our boots, clothes, hands, etc.

Passing nausea, sometimes accompanied by vomiting may be caused by merely smelling putrid fish and "fish" offal.

The public-health (London) act 1891, by section 21, paragraph 1, provides that "Where any trade, etc., causing effluvia is certified to be a nuisance, etc., (1) by the local medical officer of health, or (2) by any two legally qualified medical practitioners, or (3) by any ten inhabitants of the district, and the complaint laid before the local sanitary authority, then such authority shall make a complaint to the local petty

sessional court, which, unless it is shown that such person or trader has used the best practical means to abate the nuisance, etc., prevent or counteract the effluvia, the person or his representative so offending is liable to a fine not exceeding £50.

Consult sections 35, 47, etc., of this 1891 act, and also the public-health acts amendments act, 1890, sections 25-31 inclusive. Of course these acts apply to fish shops or stores, public fish market, etc.

The public health (London) act 1891, by sections 134 and 135, state that where complaint is made to the local government board, that "the commissioners of sewers have made default in executing and enforcing any provisions of this said act," that then the local government board has the legal power to compel the said commissioners of sewers—*i. e.*, the corporation of the city of London—to carry out the sanitary and other provisions of the public health (London) act, 1891.

If we can not expect, then at least let us hope, that public opinion as well as the financial interests of the fisherfolk, fish-venders, and the local municipal authorities responsible for the cleanness of our public food-markets will themselves speedily put and keep their own trading-places in good order and healthy conditions. If not, there is ample legal power under the various acts which I have already quoted, especially under provisions contained in the 1890 and the 1891 public-health acts, to enforce the necessary remedies. By future legislation these remedies should be made strictly *compulsory* upon the local sanitary authorities and no longer left to the optional action of more or less private individuals.

LOCAL MEDICAL OFFICERS OF HEALTH TO BE APPOINTED FOR LIFE.

The weak and breaking point of the sanitary administration of the United Kingdom is the unfair, unfortunate, and uncertain position of the local medical officer of health, who is too often practically dependent and depending upon the mere majority of the unpaid members of the local municipal body.

The municipal body, though personally "well meaning," may be more or less ignorant, incompetent, prejudiced, or impractical faddists—or worse still, one or more of its members may be directly or indirectly interested in defiance of public law and public good, in upholding the very abuses and nuisances which the medical officer of health desires to extinguish. If, however, the whim of a bare majority of a municipal body can deprive its medical officer of his position and livelihood or make his official existence a continued misery and martyrdom, how can such a specialist and scientist carry out the official and moral duties of his station as public local trustee of the health of his community?

After election and appointment by the local municipal body, the medical officer of health should only be removable after being legally proved unfit at a bona-fide public inquiry, say, presided over by the local government board or other competent tribunal. Like judges, magistrates, coroners, etc., the tenure of office by the local medical officer of health should be for life, or else up to a certain age, with a pension to retire upon.

The public health (London) act, 1891, by its sections 82, 83, 110, and 113, demands that the local sanitary authority shall provide all such acts, matters, and things as may be necessary for mitigating any disease, these powers extending to trading vessels lying in their local ports, rivers, waters, etc. The removal or prohibition of avoidable filth is, of course, included.

STRIKES, POVERTY, FILTH, AND DISEASE.

By lowering the local general health and means to obtain sufficient suitable food and healthy lodgings, added to excessively exhausting excitement, increasing privation and augmenting poverty, caused by the recent protracted colossal Hull strike, may have indirectly contributed to the subsequent appearance of the cholera at the Humber ports. During the strike the sanitary state of the city, especially in its poorer quarters, would necessarily have been more or less neglected. This means that poverty favors the tendency to and opportunity for local filth accumulations.

The present frequent colossal British strikes are practically localized civil wars. Apart from the irreparable injuries which they inflict upon the capitalist, trade, strikers, and their dependents, these strikes also tend to start local, if not general, disease throughout the Kingdom. (In the Times of April 9, 1878, I showed the horrible diseases which follow war.)

It appears that when these strikers and their families are practically starving or semi-starving, the local authorities decline to give them relief, even though the trade unions on which these poor people depend are apparently bankrupt, and when the sources of private charity are also dried up. Though probably no nation would now dream of going to war unless it had arranged a satisfactory food supply under a commissariat, nevertheless strikers too often commence their civil war without funds and food.

Foul fish fostering filth fevers (which are alike avoidable by superior sanitation) is a lesson yet to be admitted, acknowledged, and appreciated by the general public, who probably has now to thank the hitherto impenetrable ignorance of its fisherfolk and fish-venders for the present (1893) invasion of cholera in the United Kingdom.

Apparently the 1893 cholera epidemic was *home-grown* or *home-made*, and chiefly caused by deficient sanitation, due to avoidable local filth accumulations of animal matter in which decomposed fish and fish offal have been the principal factors. In these circumstances there is no reason to suppose that the 1893 cholera epidemic was imported from abroad.

Instead of being disinfected by carbolic acid and other falsely reputed specifics for destroying putrid material, all bad fish and fish offal should be *burnt up* in suitably constructed *furnaces*. I shall again refer in detail to the importance of this subject, which hitherto has unfortunately been generally neglected by home and foreign sanitary authorities. Suffice it here to say, that usually in our fish centers and markets decomposed fish is stacked and sprinkled with a small quantity of disinfectant, often carbolic acid, absolutely insufficient to cancel all the injurious effects, yet quite sufficient to destroy it for manure or other agricultural purposes.

FOUL FISHING BOATS AND FISH BOXES.

In the United Kingdom the too usual plan is, so long as the vessel keeps at sea, that all its catch is kept together for sale. This fish is unbled, ungutted, and uncleaned. It is frequently bruised and damaged, and stacked in such large masses that the lower strata of fish suffer incredible injury. Arriving at the fish pier, beach, or station, it is again bruised and banged about in foul, filthy boxes, pregnant with every kind of putrefactive bacteria and their products. To make matters worse, it is usually packed in ice and melting ice, which rapidly rots and ruins fish, that, of all animal substances, most requires to be kept perfectly *dry*. As fishing vessels, as well as fishing

ports; piers, beaches, and other districts where fish is landed, are fully as offensive as most private slaughter-houses, it is only fair that on landing all such fish should be inspected previous to being sold or offered for sale as food in their special localities of arrival or else forwarded for sale as food to distant markets.

There appears to be considerable confusion as to the duties of the port sanitary authorities as to their on the spot seizing, condemning, and destroying fish unfit for the food of man. It is evident that no bad fish should be allowed to be sold locally, or offered for sale for the purpose of food, or forwarded by rail, etc.

As the delivering of bad fish on land is an offensive nuisance, dangerous to public health, all bad fish on landing, after inspection, should be destroyed in suitably constructed furnaces.

Abundant evidence that fish is already rotting when dispatched from the fishing ports is to be found in the corporation fish and Billingsgate inquiries of 1868 to 1870 and in the 1881 reports, as well as in the evidence before the House of Commons in 1882 on the Shadwell fish-market inquiry.

George Stevenson, a fish salesman and auctioneer and a member of the corporation markets committee, recorded the following evidence:

I have been in Billingsgate Market for sixty years, where I did the most mighty business in London. The corporation absolutely made the basement of Billingsgate 25 to 30 feet below the waterway. We spent something like £50,000 to £70,000 to clean out cart loads of human excrement from that basement. Billingsgate is an abortion above and a cesspool below. At Billingsgate the diseased fish is sold very cheap, where the *filth* fetches a very low price.

Other witnesses swore that the railway fish muck came in a half-stinking state to Billingsgate.

Another smack-owner declared that he loaded his fish in railway bullock trucks with the muck or manure not cleaned out.

Another witness swore that the railway fish barrels, when delivered from the trucks, were so filthy from adhering manure that he had to wash the fish before taking them on his back.

Again, another swore that the great bulk of fish condemned in Billingsgate ought never to have got there. Fish meters or inspectors of the Fishmongers' Company have also stated that the fish was bad before it started from the railway station at the fishing port.

Another fishmonger stated that he had sold stinking fish.

Further, another of the fish meters or inspectors of the Fishmongers' Company, with whom he had been for ten years, stated:

After we (the Fishmongers' Company) have condemned the fish, even if it stinks so badly that you can hardly go near it, nevertheless we have plenty of poor people who take away whole baskets full. They wash it, clean it, and eat it. I know this as a fact from my own personal experience.

A Billingsgate fish salesman said:

I know for a fact that the refuse of the fish all comes to Billingsgate. Hull and Grimsby furnish much inferior quality of fish. Hence on the coast I have heard the remark "anything will do for London."

A fish meter stated:

The jurisdiction of the Fishmongers' Company extends 12 miles round, but the farthest place I have ever been to is about a mile and a half from Billingsgate.

There are three distinct methods of effectually disinfecting empty porous, rough, sodden, supersaturated, saline, stinking, foul fish boxes, trunks, baskets, etc. In the fish trade these receptacles are technically termed "*empties.*"

(1) *Prolonged boiling* during several successive hours, which is quite impracticable in the circumstances under consideration.

(2) The action of *superheated steam* at about 300° F., or more.

(3) *Baking or prolonged exposure* during several successive hours to dry heat of about 300° F., which would be impracticable because of the resulting shrinking of the wood.

It must be recollected that porous, uneven, sodden supersaturated fish trunks, boxes, and baskets, pregnant with putrefactive bacteria and their products, are especially difficult to free from moisture, owing to the hygroscopic or water-absorbing qualities of the sea-salts, with which these receptacles are impregnated. This is another reason why sterilization by superheated steam would, by dissolving out the sea-salts, be a more effectual procedure than the application of dry heat, which would fail to extract the hygroscopic sea-salts. In other words, dry-heating or baking would lead to the concentration of the sea-salts in the wood.

If my long-advocated plans for making fish "*imperishable*" by bleeding before blood-clotting, immediate gutting, thorough cleaning with abundant flowing (sea) water, and dry-air refrigeration, were adopted, then the expense and inconvenience of these bulky fish-trade boxes, etc., would be no more required than in the meat trade, nor would the purchasing of ice and melting ice be necessary.

SANITARY FRESH-FOOD MARKETS.

Unfortunately most of the fish markets in the United Kingdom are as unsuited for receiving fish as a befouled sewer would be for a larder. The internal building materials, including their walls, pavements, and ceilings, suggest that accident and intention had conspired together to construct colossal sponges, or bacterial traps, adapted to suck up, in the shortest time, the maximum amount of putrid and putrefying filth. Most of these markets exhibit collections of fish offal and fish refuse on their premises, and are frequently as offensive as ill-kept slaughter-houses. It is important that the premises used for fresh-food storing should be made of glazed, level-faced, non-absorbent materials. The roofs of such markets should be only of glass and metal. The flooring or pavement must be even, non-porous, non-absorbent, hard, but not too slippery. For cleansing and disinfecting purposes, the flooring of public markets requires a good gradient or fall towards the gutters and outlets. To exclude the germs of putrefaction and contagion, cleanliness, dryness, and low temperature are essential.

Where possible every fish market should have on its premises a suitably constructed furnace, to at once destroy bad fish and fish offal, which above all should not be allowed to be carted through a crowded city with narrow streets.

In ordinary gas-burners, where the combustion is not very perfect, for each cubic foot of ordinary coal gas burnt, nearly three-fourths ounce of water is produced, furthering the early spoiling of fresh animal foods. In a closed room, the excessive burning of gas may saturate or supersaturate the contained air, as is frequently observed on glass window panes, and the dripping moisture staining and spoiling absorbent and porous wall-papers, etc. Besides heat and moisture, the burning of

gas evolves some carbonic and sulphuric acids. Generally, in fairly well-made coal gas, ammonia is absent, but, if present, it occurs only as a slight trace, when it burns off as nitrogen and water. For London the legal maximum is 22 grains of sulphur in winter and 17 grains in summer per 100 cubic feet of coal gas consumed, but the average amount in the metropolis is only 12 grains per 100 cubic feet of coal gas burnt.

Except perhaps the Siemens hot-blast burners, probably no gas-burner consumes the whole of the coal gas, but always lets some of the gas escape unburnt into the atmosphere. Therefore every room lighted by gas contains, besides carbonic acid, water-vapor, and sulphuric acid derived from the gas, also some carbureted hydrogen and carbonic oxide. Coal gas contains up to 20 per cent of carbonic oxide. Thus Erdmann found in the air of a room which had been lighted by gas 0.056 per thousand volumes of carbureted hydrogen (marsh gas). At the same time he discovered that candles burn as a rule still more imperfectly than gas; as much as 0.187 per 1,000 volumes of marsh gas resulting in such a case. He also found that candles produce fatty acids and acroleine in the air.

The following figures by Erdmann may be interesting in this connection. With electric arc light no water-vapor was evolved, and only traces of carbonic acid, and only from 57 to 158 calories of heat. With the Siemens hot-blast burners no carbonic acid or water came into the room. With Argand burners 0.86 kilo water and 0.46 carbonic acid, with evolution of 4,860 calories. (Siemens burner, 1,500 calories.) With a two-hole burner, 2.14 kilo water and 1.14 kilo carbonic acid, heat 12,150 calories.

In all gas combustion also some nitrous acid is formed which is very irritating and prejudicial.

With an incandescent electric-light burner, nothing ought to come into the room and the heat produced is small.

The worst illuminants as to water and carbonic acid are candles and fluid oils.

Slaughter-houses, meat stores and shops, fish shops, and fresh-food markets are best illuminated by incandescent electric light, which yields no combustion products. (In the electric arc lights, their carbons burn bodily away, producing carbonic acid.)

In crowded market-places additional impurities and moisture are given off by the processes of respiration and perspiration, which further contaminate and vitiate a limited supply of repeatedly overbreathed air, especially damp, warm, still air as occurring during fogs, mist, rain, etc.

During sunlight and activity it appears that an average adult will, through his perspiration and respiration, give off roughly about, more or less, 3 ounces of water per hour, besides considerable organic impurities and some carbonic acid. (During sleep these exhalations are considerably diminished.)

In densely frequented markets much dirt is unavoidably brought in from the streets, stables, etc., sticking to the boots of the visitors. This wet mud and filth necessarily adhere to the too porous, uneven, damp, dirty pavements of many of our market-places.

As to the impurities produced by respiration, besides carbonic acid and water, there are always formed ammonia, volatile organic fatty acids, sulphureted hydrogen.

Seegen and Nowack have also alleged that respired air always contains organic hydrocarbons, but this is doubtful, and any that may be found comes more likely from the intestines.

INFECTION OF FISH BY IMPURE PRESERVATIVES.

Fish must be kept perfectly dry, and of course melting ice or other added moisture scrupulously avoided.

When ice or melting ice is used for preserving food, as in the fish trade, or for drinking purposes, it should be made only from *distilled water*, where the receivers are kept perfectly clean and the water or ice properly stored.

The temperature at which artificial ice is made is probably much lower than that in the case of natural ice; therefore in artificial ice the chances of killing by cold traces of living organisms (bacteria, etc.) would be greater than in natural ice, especially that from small, shallow, dirty ponds at the freezing-point of water. Hence the Paris police prefecture has recently (1893) forbidden the use of ice taken from certain lakes and ponds in and about Paris, as it was found that such ice contained large quantities of unhealthy organic materials and bacteria, rendering its use for table purposes dangerous.

In the United States several outbreaks of typhoid fever have been traced to the use of infected ice taken from natural sources.

As it seems almost impossible to satisfactorily test the purity of natural ice and its freedom from organic tainted matter, one is driven to protest against the use of natural ice. As our present law stands, any filthy water frozen into ice may be sold for food and drinking purposes. In England there seems to be no supervision over the ice used for food, and it does not appear to be provided for by any of our acts of Parliament. I am not aware that there have been any legal prosecutions in reference to the sale of infected ice in the United Kingdom. It is a curious superstition and a common error which induces most people to imagine that ice made from dirty water is pure.

St. Luke said: "Salt is good; but if the salt have lost his savor, wherewith shall it be seasoned? It is neither fit for the land, nor yet for the dunghill; but men cast it out. He that has ears to hear, let him hear."

In fish-curing so old was the grievance against the use of dirty and impure salt by the fish-curers that already, by 12th Anne, cap. 2 (1713), it was enacted that all foul salt should be thrown overboard and destroyed to prevent its employment in curing fish.

From 1866 to 1884 French soldiers and sailors in Algiers suffered from poisoning after eating red-salted cod, due to bacteria, attributed to the foul salt derived from marshes near Copenhagen. At other times to minute low-typed water or algous plants frequenting shallow seashores, and often included in the crystallized sea-salt made by solar evaporation. The bacteria appear to have been the *Clathrocystis rosea persicana* of Cohn, *Sarcina morrhua*, or *Sarcina littoralis*, according to different observers.

In 1878, after eating red-salted codfish, a fatal case occurred at St. Petersburg. Some consider red-salted codfish harmless unless associated with the putrefaction of the fish. Salted sturgeon has also proved fatal in Russia. A circular dated December 31, 1885, by the French minister of commerce, forbade the sale of red-salted codfish, exposing the vendors to the penalties of imprisonment, seizure of their goods, the publication of the judgment by means of placards, and making the dealers responsible for sickness arising from eating red-salted cod.

In spite of these facts, some chemists, apparently in error, have doubted that salt can ever become red from bacteria, or fungi, any more than the usual redness of carbolic acid can be attributed to such causes.

Insufficiently or soft-salted codfish absorbs from the atmosphere more moisture in their flesh than well-salted codfish, and consequently weighs heavier, yielding more profit to the unscrupulous fish-vendor. Such red-salted cod is accused of infecting curing-houses, fishing vessels, warehouses, and wharves.

Salt is sometimes red from containing the red hydrated oxide of iron, which has nothing to do with this red-salted codfish. This red-salted codfish must not, of course, be confused with the so-called red codfish, especially good eating, whose color is attributed to its excessive feeding on shellfish and starfish, nor yet for codfish slices ingeniously dyed red and sold by a fraudulent trader.

Norwegian "sardines" are sometimes red, as alleged from inferior salt. A foreign Government has recently offered a premium in money for the best means to prevent salt from absorbing moisture.

BACTERIAL INFECTION OF FISH, MEAT, ETC.

Cooked and salted meats, as ham, beef, mutton, veal, pork, etc., frequently show iridescence, similar to that produced by light falling upon the scales of freshly-caught fish. This iridescence usually affects only a part of a cooked or salted joint; but it may possibly be associated with decomposition in another portion of the same joint. This iridescence seems due to conditions probably preceding decomposition, rather than necessarily accompanying putrefaction. Where the meat has been otherwise sound, sweet, and healthy, often have I eaten, and seen others eat, iridescent cooked and salted meats without my having been able to trace any subsequent disturbance or illness therefrom.

However, I consider iridescent meat as suspiciously doubtful, and especially inadvisable where any lesions may exist along any portion of the alimentary tract, and above all to be avoided where there may be ulcerations about the intestines. Whilst myself further investigating this matter, I shall be grateful to learn of any clinical, pathological, or bacterial work or research on this branch of meat inspection—a subject which has received too scanty attention from medical men. Though I have never yet noticed any iridescence on cooked fish, there appears to be no reason why it might not occur. Some writers and observers have actually mistaken phosphorescence for iridescence.

Bacillus phosphorescens produces phosphorescence in herrings and other aquatic animals. This bacillus or germ, when artificially grown in very large quantities on nutrient media, may in the dark emit sufficient light to enable one to see the time on a watch, etc.

In November, 1893, Prof. Klein showed that red or pink patches which had been observed on cooked meat and cooked fish were due to the *Bacillus prodigiosus* (a non-sporing bacillus), killed in a few seconds by a temperature of from 70° to 75° C.

In investigating the matter Dr. Klein came to the conclusion that the bacillus was due to the fact that a neighboring churchyard (which had been unused for generations) had been recently dug up, its human remains removed, and the old walls pulled down. During this process a strong southwesterly wind chanced probably to blow the disturbed microbes into the larder where these foods were kept.

In other words, the pink patches of the *Bacillus prodigiosus* observed on cooked meats, etc., seem due to conditions favored by moisture probably preceding decomposition rather than necessarily accompanying active putrefaction.

The hygroscopic action of common salt, especially if accidentally adulterated with chloride of magnesium, as in salted and cooked meats, suggests that moisture favors both the development of the "pink" patches of bacteria and the reddening of fowl salt.

Those who had partaken of the "pink" meat and "pink" fish or salted meat did not suffer from any subsequent disturbance or illness. Nevertheless I believe that "pink" cooked food stuffs caused by the invasion of the *Bacillus prodigiosus* should be avoided where there are any lesions in any portion of the alimentary canal, and especially where there are ulcerations about the intestines.

The *Bacillus prodigiosus* has been long been known to spontaneously infect food. It probably caused the so-called "bleeding bread" and "bleeding host" so superstitiously dreaded during mediæval history. When this bacillus occurred upon the sacramental bread, the clergy stated that it was Christ's blood. In 1843 it came almost as an epidemic in Paris, where it grew more especially on the bread made and obtained in military bakeries.

The *Bacillus prodigiosus*, even when injected in large quantities into the blood of warm-blooded animals, fails to set up any symptoms.

There is a special bacillus which gives a *red* color to milk, whilst another peculiar bacillus communicates a *blue* coloration to milk.

THE USES AND EFFECTS OF SALT IN PRESERVING FISH.

The success and value of all fish-curing, whether by salting, drying, or smoking, consists chiefly in driving off the maximum possible advisable amount of water or moisture contained in the muscles or flesh and the skin of the fish operated upon.

As an antiseptic, salt acts in two ways. A saturated salt solution coagulates albumen, and hence bacteria (whose protoplasm is, of course, albuminous) cannot live. Most antiseptics have this power. Besides its antiseptic properties, sufficient salt prevents the continuation of life, which only occurs under more or less favorable chemical conditions. Thus sugar is a good food for bacteria. But an excess of sugar, as in concentrated sirup, makes bacterial life impossible.

Albuminous bodies are perhaps the best food for bacteria, yet, if concentrated by drying, those albuminous bodies keep indefinitely.

Small amounts of salt are food for bacterial life, partly because, perhaps like most vegetables, probably every animal requires chloride of sodium (common salt); and also partly because small quantities of salt tend to keep perishable articles damp. Moisture is favorable to fungoid life, especially if the salt contains magnesium chloride, which is almost always the case.

Concentrated chloroform is also an antiseptic, while small quantities of chloroform are alleged to favor bacterial development.

Experimental bacterial cultivations on salted and pickled meats show that the proportions of salt used in these food preparations have but very little destructive action on the putrefactive bacilli found in diseased meat.

Prof. Panum, in 1856, from artificial solutions of pickled salmon and salted herrings, subjected the liquids to prolonged boiling so as to destroy all living organisms and bacteria. Injected into animals, these boiled solutions produced poisonous effects, though in a less severe form than from similar liquid preparations which had not been boiled previously. Further, after filtering the fluid, then boiling it for an hour, evaporating to dryness the residue, which was next digested in absolute alcohol, he finally heated the resulting residue with boiling water. Nevertheless this watery extract was also poisonous.

Dr. Lauder Brunton, one of the grandest of our great scientists, has shown that the poison of putrid meat boiled for eleven hours and then completely dried at boiling heat, nevertheless retained its poisonous properties. Further he declares that the poisonous venom of serpents, though weakened, is not destroyed by boiling.

All this demonstrates and proves the vitality of poisons derived from putrid and other animal matter.

Brine-pickled herrings are alleged to have sometimes an ammoniacal smell due to the presence of trimethylamine. This compound is an ammonia where each equivalent of hydrogen has been replaced by one of methyl, common ammonia (NH_3) being converted into trimethylamine [$\text{N}(\text{CH}_3)_3$]. However made, trimethylamine has a strong fishy smell.

Especially if left for over twenty-four hours in a copper vessel, or in a copper vessel inefficiently tinned or enameled, salt fish has caused serious poisonous symptoms. On examination, the side of the vessel has been found green, and sometimes even a green jelly covering the cooked fish, which has become green by the infiltration into the fish's structure of a subchloride of copper. This must not be confused with the natural green bones of the kelp fish (*Coridodax pullus*), of the gar-pike (*Belone*) and its allies, nor with the red-boned mackerel used as a rat poison in Guadaloupe, a West Indian Island.

Some American packers of boneless fish are reputed to use a mixture of borax and common salt, in about the proportion of one thirty-fifth of the fish's weight, to prevent the preserved fish turning red.

COARSE CAVIARE.

In some parts of Russia the sturgeon roes are simply put in a more or less foul bag, with a strong brine. The mass is pressed by rapid wringing. It is next dried to let the superfluous brine drain off, placed in casks or cisterns whose bottom is perforated, where the mass is again squeezed or pressed with weights, which are not heavy enough to break the eggs. Sometimes the poorest description of caviare is trodden with the naked feet of the operators, whose squalid poverty and miserable filth are too frequently associated with disease.

During the awful plague in Astrakhan the worst and most fatal cases were usually among its fisherfolk.

Often rancid or decomposed caviare, with avoidable filth, is added to fresher eggs.

The cleanliness in the United States caviare factories is unknown in southern Russia, the home of astounding dirt and disease, augmented by the most hideous poverty and ignorance.

OBSERVATIONS.

Upwards of thirty years experience and observation at the chief fishing stations at home and abroad have convinced me that at too many of these food centers there is an increasing indifference to putrefactive filth. The avoidable but scandalously dirty condition of our British fish trade may again at any moment form a suitable "home" for the propagation and distribution of the bacteria of infectious fevers and diseases generally. Thus this preventable survival of the "fittest" filth, gives the bacteria of cholera, the plague, typhoid, etc., chances of infecting the public. Of course avoidable filth tends to preserve the specific agents—special bacteria and their products—which produce and propagate these hideous but preventable diseases.

The veteran scientist, Prof. Virchow, when sent as a young man to investigate an epidemic outbreak, then suggested as a cure municipal reform, with free action.

Prof. Koch, when recently reporting on the German cholera epidemic, considered it caused by contagion carried in a foul-water supply, which we know also introduced epidemic typhoid at Worthing, Arundel, etc., in 1893.

Cleanliness versus cholera and other filth diseases becomes more imperatively necessary as population and consequent overcrowding increases in all our large towns. Dirt, debility, disease, and death too often form a connected chain, in many cases alike avoidable and preventable by superior and scrupulous sanitation.

CONDEMNED MEAT, FISH, ETC., TENDERS.

The corporation of London again seeks tenders from "persons desirous of utilizing for manurial purposes the meat, poultry, game, offal, refuse, etc. (besides separate contracts for condemned 'fish,' its offal and refuse), condemned in the city of London as unfit for human food."

Now, presuming that at the hands of the corporation the condemned meat, etc., is first subjected to a thorough treatment with disinfectants, what use can such disinfected material be for manurial purposes?

The disinfectant is as injurious to the seeds and roots as it is to the bacteria of putrefaction and disease, including parasites and their eggs.

But it is unwise and unsafe to assume that the disinfection is complete. It is therefore a grave responsibility for the corporation to allow putrefactive animal matter and infected carcasses to be transported for miles in carts, especially through the narrow streets of its densely crowded colossal city.

Further, there is the danger of allowing partially disinfected material to be utilized as manure. Such a process only tends to spread infection widecast over fields, and possibly to infect, by parasitic and other diseases, the green food destined for man and for animals supplying his special food.

I have proved that the 1893 outbreak of epidemic cholera in the United Kingdom was due chiefly to the avoidable filth of the "fish" and its offal trades as carried on at Hull, Grimsby, etc. (By "fish" I mean aquatic and amphibian animals and their products used as man's food.) Bad "fish" caused epidemic cholera in St. Petersburg during December, 1893.

Again, the corporation sanctions the use of condemned food for manufacturing purposes. Of course it would be monstrous to imagine that diseased meat would be worked up into articles of diet, sausages, etc., or retailed for food to the poor. But

that similar scandalous frauds have been practiced is well known to medical officers of health. For instance, in Paris, it is stated that till recently dead and diseased animals from their zoological gardens were regularly fetched away in carts, etc., without the knowledge of the zoological and other authorities in Paris. These miscellaneous mixed meats, under varied fraudulent names, were sold and eaten as food.

The working up of diseased products is a serious source of danger to those employed. It would be cruel, if not criminal, to allow diseased intestines to be made up into sausage-skins, and perhaps even eaten at civic banquets. But what supervision does the corporation exercise when once the putrid filth has left its carts? Does it see how the manufacturers use up these nauseous abominations and how and where this dangerous refuse is disposed of?

Surely public attention and action should force their "sanitary" servants, the municipal authorities of the United Kingdom, to avoid these peculiar and possibly poisonous proceedings. Such paid professional bodies should forthwith build and employ properly constructed local *furnaces* as the most efficient and economical hygienic means to destroy condemned animal matter, including "fish," its offal and refuse.

RINGS AND ROTTEN FISH.

The Billingsgate ring not alone chains the crushed and indebted fishermen of the United Kingdom in cruel, chronic poverty; it not alone makes the consumer often pay from 600 to 800 per cent or more for the fish than is given to the fishermen, but it provides the public with fish generally more or less stale or decomposed, and sometimes even putrid and poisonous.

To diminish the market supplies of "fish," so as to artificially keep up the high price of fish, this ring gets fish destroyed at various places along our coast. This Billingsgate ring is the ruin of our national coast and inland fisheries and fishing industries. Already in 1749 it extinguished the Westminster fish market. It caused the failure of the old Hungerford fish market. It strangled the Columbia market even when subsequently taken over conditionally from Lady Burdett-Coutts by the corporation of the city of London. Her ladyship is reported to have lost a large fraction of £1,000,000 sterling, partly because of the unscrupulous opposition to her benevolent schemes by the Billingsgate ring, and also because her public fish market was placed inland without any approach by water. It snuffed out Mr. Plimsoll's fish market at the "Elephant and Castle." It has turned the corporation fish markets in Farringdon street into trading fiascoes. By its clever combination it boycotts and starves Shadwell fish market.

Save a few favored fortunate virtual monopolists, the fish-traders of the United Kingdom are working hard to gain little or nothing, as the legitimate profits of their toil and trouble tend to tumble into the tills of the Billingsgate ring, who are assuredly remarkably shrewd "business men."

In 1880, before Mr. Spencer Walpole, by direction of Sir William Harcourt, the home secretary, holding an inquiry on alleged Billingsgate abuses, the late George Stevenson, a Billingsgate fish salesman, and, a popular member of the markets committee of the corporation, thus expressed himself in his evidence:

It would be better that all London should sink than that Billingsgate market should sink. Billingsgate is one of the grandest institutions of the country.

The Billingsgate ring, by a shrewd system of cruel, crushing mortgages on the *uncaught* and the caught "fish," enslave and impoverish the indebted fishermen. According to Cahill's evidence before the corporation 1881 fish inquiry:

The practice in Billingsgate market is that its ring realizes the highest price it can, and returns the sender *what is expedient*, or what may be agreed on among its members. This ring very often, after agreeing on the price to be sent to the senders, so distrust each other that they exchange account sales inclosed in open envelopes, so that A reads, seals, and posts B's sales, and *vice versa*.

The charters for our fresh-food markets were granted to directly bring the producer and public together, but are now usurped by a handful of capitalists, who have cleverly cornered the public markets and their entire fresh-food supplies, so as to sweat the producers, semistarve the masses, and overcharge the classes.

Cobden's free-trade principles have been so engineered that the producer gets no profit because the middlemen, monopolists, or cuckoos of commerce, gain all.

The Billingsgate ring excludes the public, the fishmongers, and the costermongers from purchasing "fish" except from the ring, who cling to perpetuating bacterial Billingsgate with all its avoidable abominations and augmenting abuses. Hence, stale fish continues at famine prices instead of cheap, fresh, healthy, or imperishable fish.

Every day of the year 2 pounds of bled, gutted, cleaned, dry-air-frozen (imperishable) fresh herrings (about six fish) could be profitably retailed by costermongers for 1 penny, or 2 pounds of sprats for 1 halfpenny.

CHEAP FOOD OR WANT.

Want or semistarvation for the masses, the impoverishment of many capitalists and manufacturers, and agitations leading possibly to riots, appear to threaten, unless cheap, healthy, abundant food is speedily secured for our poor and comparatively poor. Man, by labor or inherited labor called wealth, must get fed regularly and fed cheaply. His digestion requires a wide and varied diet. In our cold, damp climate, where sunshine is comparatively rare, every man should obtain at least one daily meal of fish or meat.

Owing to faulty distribution and preservation, much of the fish and meat consumed by the poor is often wretchedly inferior and exorbitantly dear. Hence, perhaps, their excessive tendencies to alcoholic drinks and tobacco, which at least please the palate.

The producer provides cheap, excellent frozen meat, poultry, and game which too rarely reach the consumer except when sold as and at the high prices of home bred, fed, and killed animals. Legislative interference should prohibit such fraudulent trading. Our manufacturers will soon be unable to compete with foreigners, who obtain cheaper labor because of cheaper food. Hence the land, buildings, and plant of the British manufactories will suffer increasing depreciation; their laborers and those dependent upon the earnings of the laborers will find their occupation gone.

Without the intervention of middlemen, by means of retail stores and costermongers for the poor, the producer should sell fresh food direct to the consumer.

Inferior and bad feeding injures a nation's growth, health, strength, and digestion, producing passing or permanent derangement and disease. Being thus enfeebled, the laboring classes do diminished and inferior work, thereby inflicting direct but an avoidable loss upon their employers. Hence the question of cheap, healthy, abundant food should be carefully considered by Parliament and the municipal bodies.

The laborer's chief daily item of expenditure is for food for himself and his family. Regular, cheap, healthy, fresh, imperishable food, and other foods unadulterated and undiluted, would *virtually increase the laborer's wages*. The present unnecessarily exorbitant price of food and its inferior quality are the chief factors which often lead to disputes between labor and capital, too frequently terminating in strikes.

GLUTTED MARKETS.

Glutted markets, as applied to fresh food, especially "fish," is a misleading trade term. Thus, because of its diminutive area, together with its inefficient road, river, and railway approaches, and owing to its restricted market hours, Billingsgate is too easily and frequently glutted with fish. No one has ever yet heard of London and the country generally being glutted with fish. On the contrary, whilst Billingsgate partly supplies upwards of 10,000,000 people at home and abroad with fish, many British fishermen, unable to get their fish to market, either have practically to throw it away to manure the land or, in other cases, abstain, while semi-starving, from fishing, because of their having no market for their produce.

The supply of imperishable fresh fish is independent of fogs, calms, and storms, which now too often cut off fish supplies.

The introduction of imperishable fresh fish would lead to a colossal lucrative export trade.

SALINE SODDENING OR MEAT "KOSHERING" BY JEWS.

This consists in three processes:

(1) *Soaking meat in fresh water*.—With the aim to absorb all available contained blood prior to cooking, orthodox or conforming Jews keep a special cookery pan, in which for about half an hour they soak their meat (killed after their own ritualistic practices) with a view to drain off all available blood. After half an hour this fresh water becomes a pink red color, which under the microscope reveals blood cells and hæmoglobin (red coloring matter). Chemical tests discover considerable traces of albumen and some alkaline salts. The varying conditions and circumstances make a quantitative analysis impossible as a practical average.

(2) *Slight salt-sprinkling*.—Next, the meat is slightly sprinkled with salt all over its surface and then placed on a perforated board, where it remains for an hour. The salt becomes of a pink color. On being dissolved in distilled water blood-cells are discovered in the salt mass by the microscope. The Jews throw this red and used salt away. They keep the soaking pan and perforated board scrupulously clean.

(3) *Salt washed off*.—Finally the salt is washed off the meat in a stream of running fresh water, as from a tap. Collecting this water, it is pink-red in color, showing under the microscope numerous red and white blood corpuscles, some sarcous elements (portion of muscle fibers or flesh) and some fat cells. Chemically it contains more albumen than the fresh water in which the meat had been previously soaked for half an hour.

These three processes constitute the koshering of food according to the practice of orthodox conforming Jews. By removing some of the albumen and alkaline salts, in every case it must tend to make the meat of poorer quality. Where the meat is

stale or decomposed, adding the moisture by soaking, damp salt and washing would promote putrefaction. Hence chemically, clinically, and economically it is a practice which is diametrically opposed to modern science and household thrift.

In the Jewish or kosher meat trade its authorities are said to insist that after meat has been killed for three days, or at the expiration of the 72d hour, it shall be sprinkled with a saline solution to make the meat again "kosher" or ritualistic. This has to be done with meat prior to its being refrigerated for export as "kosher." It has been falsely alleged that this saline soddening has made such refrigerated meat decompose and be unfit for food. Of course this is only a trade trick to exclude foreign and colonial meat.