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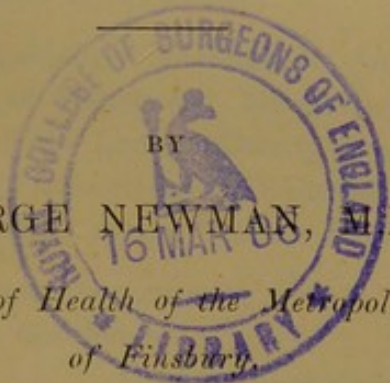
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THE
METROPOLITAN BOROUGH OF FINSBURY.
—
REPORT
ON THE
MILK SUPPLY OF FINSBURY
1903.

A Special Report ordered to be printed by the Public Health Committee.

BY
GEORGE NEWMAN, M.D.,

*Medical Officer of Health of the Metropolitan Borough
of Finsbury.*



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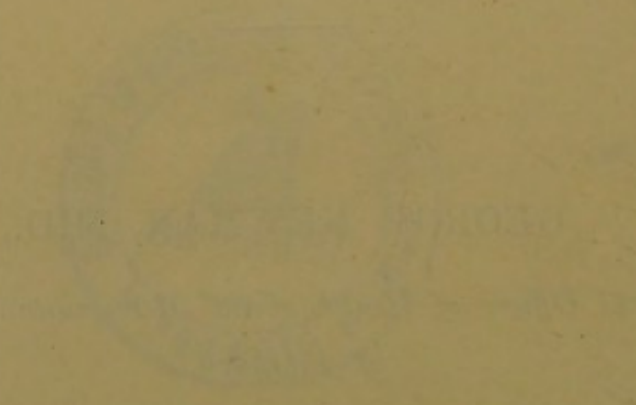
1903.

METROPOLITAN BOARD OF HEALTH

REPORT

MILK SUPPLY OF FISHERY

1908





*To the Public Health Committee of the Metropolitan Borough
of Finsbury.*

GENTLEMEN,

I beg to submit herewith a Special Report on the Milk Supply of Finsbury. The facts obtained, and set out in the Report, are the result of a minute enquiry into the whole subject as it affects the Borough.

The Report contains, of necessity, a good deal of criticism, but I do not assert that the milk trade is open to more unfavourable criticism in this district than in any other similar Metropolitan districts, and I believe that many of the milk dealers in the Borough have been, and are, fully desirous of conducting their business in a wholly satisfactory manner, and in compliance with the requirements of the law. I have to thank many members of the trade for their courtesy and assistance.

It will be apparent to the Committee that a considerable amount of exceptional work has been involved in the production of this Report, and I desire to express my thanks to Chief Inspector Green for his invaluable assistance in the enquiry.

I have also to acknowledge indebtedness for information or assistance to Dr. Niven, of Manchester, Mr. Shirley F. Murphy and Mr. Shaw, F.R.C.V.S., of the London County Council, the Medical Officers of Staffordshire, Leicestershire, Wiltshire and Derbyshire, and Mr. Harold Swithinbank, of the Denham Research Laboratory.

I have the honour to be,
Gentlemen,
Your obedient Servant,

George Newman, M.D.

Medical Officer of Health.

PUBLIC HEALTH DEPARTMENT,
TOWN HALL, ROSEBERY AVENUE, E.C.

November, 1903.

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CHAPTER I.

SOURCES OF FINSBURY MILK SUPPLY.

DURING the present year we have made enquiries respecting the source of the milk sold in Finsbury. In a general way, it may be said, that vendors have three modes of obtaining milk. First, some 185 milk-sellers in Finsbury obtain their supply through milk contractors, who deal with more than a thousand country farms. There are 14 such wholesale contractors trading in the Borough. Secondly, there are some 50 milk sellers who obtain their milk through other milk sellers in the Borough from country farms. Thirdly, there are, perhaps, a dozen milk shops which obtain part or all their milk from town cowsheds situated in the Borough. Speaking generally, therefore, it may be said that about 235 of the 261 milk sellers in Finsbury obtain their milk wholly or partly from country cowsheds, whereas about a score obtain their milk wholly or partly from town cowsheds.*

It is proposed to deal briefly with these two different sources.

I. Country Cowsheds Supplying Milk to Finsbury.

The fourteen contractors deal with some 1,111 farms situated at varying distances from London. The following table and map sets out the main facts with regard to the distribution of the towns and villages where the farms are situated which send milk:—

* We have a register in Finsbury of the source of the milk of every milk seller, whether it be town or country, so that it would be practicable at any moment to trace a milk supply with some degree of accuracy. A register is also kept of all the milkshops in the Borough, containing particulars of each in respect to general and particular sanitation, management of milk trade, &c.

Contractor.	No. of Farms.	Counties in which Farms are chiefly situated.	No. of Milk Sellers supplied in Finsbury.
A	13	Derby, Essex	9
B	43	Wilts, Derby, Berks, Somerset, Norfolk, Hants, Worcester, Dorset, Oxford, Gloucester, Cambridge.	6
C	3	Stafford, Derby	4
D	400	Berks, Wilts, Bucks	18
E	100	Leicester, Dorset, Warwick, Cheshire, Suffolk, Somerset.	21
F	30	Norfolk, Essex, Cambs., Derby, Leicester.	31
G	3	Derby, Stafford, Northampton... ..	7
H	58	Leicester, Warwick, Stafford, Derby, Herts.	16
I	70	Devon, Dorset, Wilts, Derby, Stafford	9
J	70	Stafford, Derby, Leicester	24
K	1	Middlesex	4
L	60	Derby, Leicester, Bucks	2
M	60	Leicester, Middlesex, Stafford, Derby, Bucks	2
N	200	Bedford, Gloucester, Derby, Cambridge, Essex, Norfolk, Bucks, Stafford, Hunts, Leicester, Warwick.	32
TOTALS	1111		185

In addition to the farms dealing with contractors some 70 farms, situated in a like manner in different parts of the country, deal direct with 21 of the larger milk sellers, and in this way about 60 shops are supplied. Hence, about 1,200 farms send milk into Finsbury more or less regularly.

MAP SHOWING SOURCES OF
MILK SUPPLY

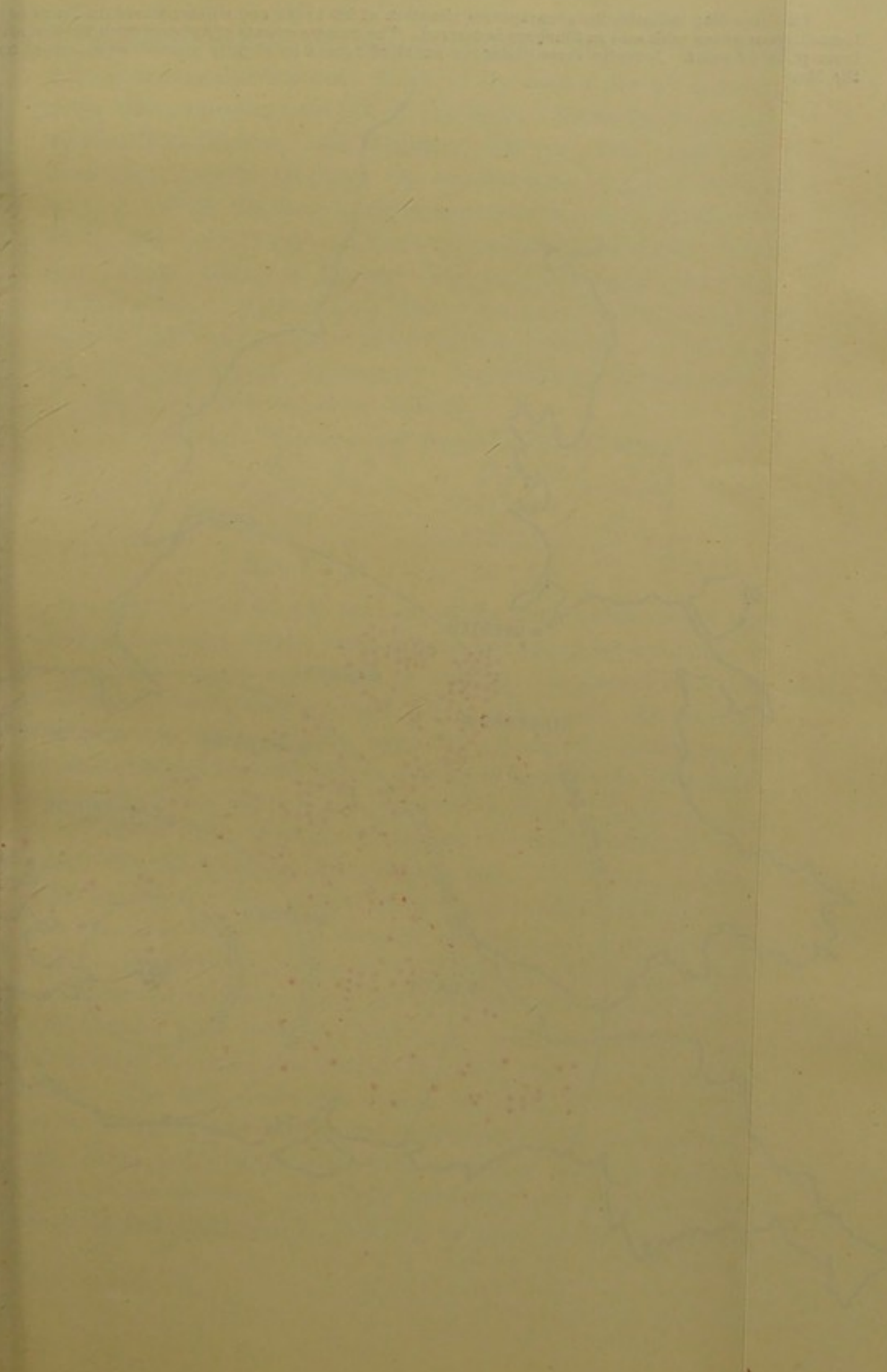


CHART SHOWING SOURCES OF FINSBURY MILK-SUPPLY.

This Spot Map indicates the geographical situation of 280 towns and villages where the farms are located, from which milk sold in Finsbury is derived. The measurements of distance from London are from point to point. Actually these distances would of course be slightly more than as stated on the Map.



The country sources, as will be seen from the attached map, show a characteristic distribution. Much of the milk is derived from the great milk-producing counties of Derbyshire, Staffordshire, Leicestershire, Warwickshire, and Wiltshire, and very little appears to come from the home counties. To furnish some idea of distance I have marked on the map straight measurements from London for 25, 50, 100, and 150 miles. Of course, actually the distances by rail from London are much greater. But even this rough and ready method gives an approximate idea of the great distances which Finsbury milk travels before it reaches the milkshop. On the map 280 towns and villages are marked. The distances of these places, in straight measurement, are as follows:—

Within the 25 mile radius equal	2	(	0·7	per cent.)
„ 50	„	„	13	(4·6 „)
„ 100	„	„	111	(39·5 „)
„ 150	„	„	145	(51·9 „)
„ 200	„	„	10	(3·5 „)

It is evident that 95 per cent. of all the milk which comes into Finsbury from the country must of necessity spend several hours on the railway. From one cause or another this period of transit from farm to milk-shop averages 10 to 12 hours. An example will illustrate what actually happens. A certain contractor in Finsbury obtains his milk from a number of farms in the Derbyshire and Staffordshire district. He possesses a more or less correct list of the farms with which he deals, and a correct list of his milk agents through whom he does his business. He receives between 1,000 and 1,500 gallons of milk daily, and it is delivered in ordinary milk churns at Euston or St. Pancras Stations early in the morning. At R., in Staffordshire, he has an agent who obtains milk from some half dozen farms within three or four miles of R. railway station. Milking takes place between 4 and 6 p.m., and the milk is strained, and some of it cooled, and placed in churns and sent to R. railway station. The milk undergoes various vicissitudes on the railway (whose company does not provide refrigerator cars for its ordinary milk traffic), and eventually it arrives at Euston about three or four o'clock in the morning. The milk contractor (with his vans) meets the milk and distributes it, selecting so many churns for this van

and so many for that, and by six in the morning the milk is at the milk-shops in various parts of London. Exactly which milk reaches each milk-shop is not known to the contractor or anybody else. What is known is that it is at least 12 hours old, and some of it 18 hours old. A certain quantity, sometimes the whole supply, is taken from the railway stations to the depôt of the contractor, from which it is distributed to various districts. But in any case it has not reached its destination. For much of it is retailed (sometimes twice over) in small quantities to small shops which, whilst selling lamp oil, soap, pickles, candles, bacon, boot blacking or toffee, also deal in a few quarts of milk. And so from hand to hand the milk passes, and under some circumstances does not reach the consumer until 24 hours after being drawn from the cow.

The milk trade is now a very complex one, largely owing to the growth of the towns. Instead of a man owning his own cows or obtaining his necessary milk from neighbours in small quantities as required, it is now necessary to transport milk long distances in large quantities. Thus there has arisen the opportunity, or necessity, for the milk contractor. He is the middle man between the farmer and the milk-vendor. The following chart makes his position clear:—

The blue squares represent the 37 towns or villages in various counties in which the contributory farms are situated. The purple block in the middle represents the contractor through whose hands the milk passes on its way to the 32 milk shops. These are represented by the round red spots, and are of two kinds. Some shops receive their milk supply direct from the contractor (*e.g.*, Nos. 1, 15, 16, 17, 18 and 24). These are small retailers. Other similar retailers (*e.g.*, Nos. 2, 4, 6, 8, 9, 11, 12, &c.) receive their supply from other milk shops in Finsbury which receive milk from the same contractor (*e.g.*, Nos. 3, 5, 7, 10, 13, 19, &c.) These last-named shops do a wholesale and retail trade in the Borough. So it comes about that this one contractor supplies directly 10 wholesale and retail milk-vendors, also directly six retail milk-vendors, and indirectly 16 retail milk-vendors. Thirty-two shops in all, therefore, in this Borough get their milk from this contractor. But the ten wholesale

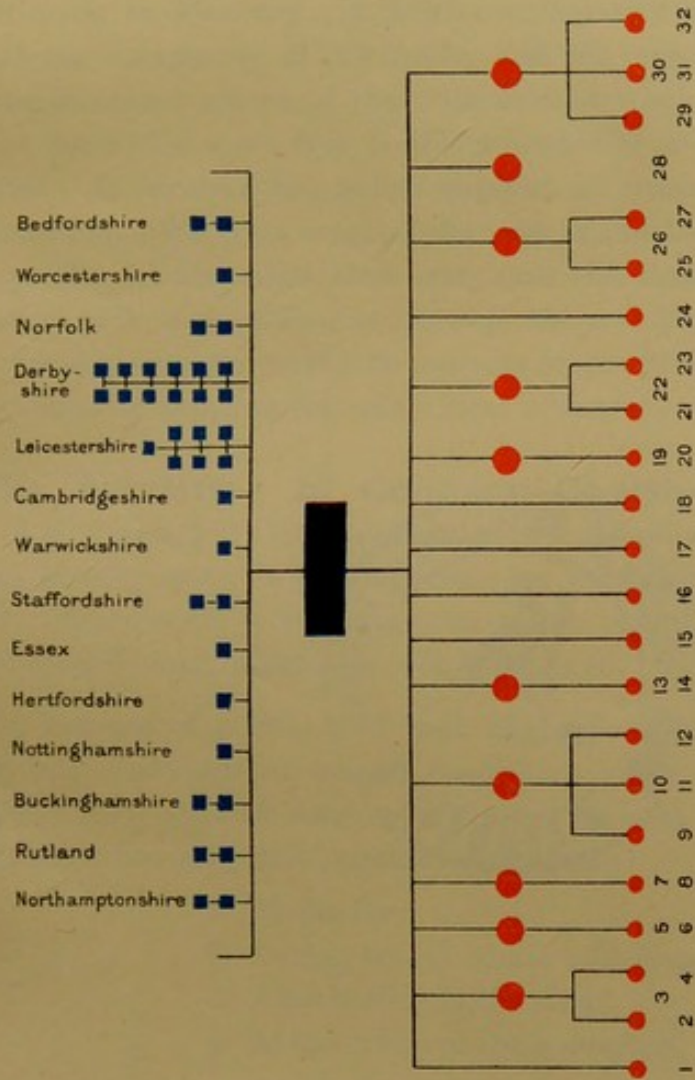


DIAGRAM TO ILLUSTRATE RELATIONSHIP OF MILK CONTRACTOR TO PRODUCERS AND VENDORS.



dealers carry on a retail trade inside and outside the Borough. For example: No. 28 is such a milk shop, doing no wholesale but only a retail trade in Finsbury. A brief consideration of this chart will reveal the complexity of the trade, and the extreme difficulty of tracing the exact source of the milk sold by wholesale or retail in any of these 32 shops. Nor is this a matter of merely theoretical interest. It involves the entire question of tracing infection and adulteration. We know much of the milk in Finsbury is adulterated (see p. 27); we also know that every now and then disease is conveyed by milk sold in Finsbury (see p. 46), and yet, under existing circumstances, we are unable to trace its origin, or say who it is that is to blame for bringing the whole local milk trade under suspicion.

The Condition of Country Cowsheds.—The long period of transit and the opportunities of contamination of the milk which thereby occur is not, however, the only fact to be borne in mind. There is the further question of the condition of the farms and cowsheds from which the milk is obtained.

The sources of pollution of milk are various, and depend upon many minor circumstances and conditions. But for all practical purposes there are four chief opportunities between the cow and the consumer when milk may become contaminated.

1. At the farm.
2. During transit to the milkshop.
3. After arrival in the shop.
4. At the home of the consumer.

Here it is only necessary to refer to the contamination arising at the farm. There are diseases of the cow (see p. 18), uncleanness of the cow, insanitary and ill-ventilated cowsheds, uncleanly milking, and diseased or dusty milkers, all of which agencies may add their quota of contamination to the milk. It is, therefore, evident that the community living in Finsbury has a direct interest in the condition of the farms from which is derived the milk they daily consume. The next step therefore to discovering the source of the milk supply of the Borough seemed to me to be to learn, if possible, something of the conditions obtaining in the contributory farms. For the fol-

lowing information which, for obvious reasons, can only be stated in general terms, I am indebted to the official reports of the county medical officers of health in Staffordshire, Derbyshire, Leicestershire, Wiltshire, &c., from which most of the Finsbury milk comes.

Staffordshire.—The Medical Officer of Health of Stoke-on-Trent, from which a large quantity of Finsbury milk is derived, writes, in his annual report for 1900, that he has made a special inspection of the cowsheds in his district, with the following results:—"In nearly every instance the cowsheds were overcrowded. In some instances as little as 350 cubic feet only being allowed for each cow. The ventilation of the sheds was, in most cases, not attended to in the slightest degree. In some it was necessary to open the doors for a few minutes before going in, on account of the oppressive smell and moisture-laden air; in some there was no means of ventilation. The fodder was frequently stored in the shed, or in a loft above in direct aerial communication with it. In most sheds the lighting was very deficient. In some there was no means of admitting light other than by the open door. In few was there any attempt at keeping the floors or walls clean, and in some cases they were filthy. The hind-quarters of the cows were in a similar condition. In one instance the Sanitary Inspector refused to recognise the erection as a cowshed, the conditions were so bad. In some instances drainage of the sheds was very defective, or absent altogether, and immense accumulations of manure were within a few feet of the doors. It is satisfactory to note that in a few cases some of the defects were remedied, but little or nothing was done in the worst instances, even after repeated efforts." In 1901 he again reports:—"There are in the borough 16 dairies and cowsheds, and 31 milkshops. The model regulations of the Local Government Board came into force in the Borough in November, 1901. In this district the cows are fed on grass most of the year, but for two or three months they are kept in the sheds all day, with the exception of a few minutes each day when they are out to water. In many instances the cubic space per cow is much below 800 feet, and some as low as 400 cubic feet. The ventilation of the sheds has in several instances been much improved. In some, however, it is still bad.

In all cases greater care in watching the condition of the air in the sheds is necessary. The fodder is frequently stored in the shed or in a loft above, in direct aërial communication with it. In many of the sheds the lighting has been much improved, but in others more lighting is necessary. The floors and walls have, on the whole, been kept somewhat cleaner than the previous year, but there is still much room for improvement. Drainage alterations have been carried out in some instances, but large accumulations of manure occur frequently within a few feet of the doors and openings for ventilation.

“In April I reported to your Committee on the grossly filthy condition of certain cowsheds in the borough. I have, during the year, pointed out the advisability of having a veterinary surgeon to inspect and report on the cows in the sheds. No one has yet been appointed.”*

Another illustration may be cited from a different district of Staffordshire from which milk is derived, and which is fairly representative of the condition of things prevailing in many other milk-producing districts of which I have reports. The Medical Officer of this district writes in 1900:—“There are no dairies in the proper sense of the word. Milk is brought in large churns from the country, but no provision is made for storing cans and cleansing them other than will be found at any ordinary working man’s house. The cowkeepers do not make any special provision, using their wash-houses, and in some cases the cellars, in which to keep and wash the cans. In one case in which the cellar was used I found a drain communicating with the sewer. I am satisfied that the class of cowkeepers in this district, with one or two exceptions, have a very hazy idea of the importance of making separate provision for storing the milk and pails. With regard to the cowsheds, from what I have seen, the regulations might as well have never been issued. There are two only that I can conscientiously report as being well kept and clean; but even those are open to improvement as to ventilation, drainage, and storing of manure. The system under which cowkeeping exists is not likely to ensure good sanitation.

* Report of Medical Officer, Staffordshire County Council, 1901, p. 97.

Any working man who can afford it thinks he knows how to keep cows—he goes on with his usual work and the wife looks after the cows; the consequence is they very rarely get groomed, and you find their hind quarters plastered all over with manure, and slop and filth lying all about the place. At some of the cowsheds I have found the place, at almost tropical heat, with slop and filth lying about, the cowkeeper protesting that the heat and the smell were both good for the cattle. Of course this means so much ignorance and laziness, which should be sharply looked after. A visit once a quarter evidently does no good, and some better and more strict supervision, new bye-laws, or more stringent regulations, is urgently needed.”†

I made other enquiries in this county, which resulted in similar information. In two cases, however, I received fairly satisfactory reports of farms sending milk into Finsbury. I am also indebted to Dr. Reid, the Medical Officer of Health for Staffordshire, for information kindly supplied, at one time or another during the last three years, concerning the milk supply. Writing on June 9, 1903, Dr. Reid summarized the condition of Staffordshire dairy-farms as follows:—“I may mention generally that I very rarely come across a dairy-farm which is satisfactory as regards the cowsheds; *most are ill-lit, overcrowded, badly ventilated, and badly drained.*”

Derbyshire.—I have been unable to obtain particulars beyond the fact that there are more than 1,400 dairies, cowsheds, and milkshops registered under the Dairies’ Order, and that there have been a number of inspections, also a number of infringements of the Order. The Medical Officer of the County Council writes to me to the effect that the Dairies’ Order is now “fairly well enforced in Derbyshire as compared with the dead letter which the Orders were before the County Council came into existence.” He is further of opinion that inspection and regulation of Derbyshire cowsheds is for the protection of other districts, and he adds:—“I am bound to confess I do not see why the ratepayers of a rural district, such as Sudbury or Repton, should pay for the inspection of dairies, the milk from which is consumed in London and other parts of the country. The cost of administrating these Orders should come from Imperial taxation.”*

† *Report on Health of Staffordshire, 1900.*

* *Report on Health of Derbyshire, 1901, p. 19.*

Leicestershire.—The County Medical Officer reports:—"Most of the dairies and cowsheds are inspected; but the registration of dairymen, cowkeepers, and purveyors of milk in some districts appears to be a dead letter. An important legal safeguard for the protection of the health of the people is thus allowed to remain in abeyance. In these districts where registration is not kept up to date, any man may, with impunity, commence to sell milk, no matter from what source obtained. In the event of an outbreak of infectious disease like typhoid fever, which may be due to milk supply, the difficulties of tracing the source of the infection in a district without registration, and possibly containing a number of small milk sellers, are almost insurmountable. In my opinion, it is greatly in favour of the large milk sellers, who have a big reputation to keep up, that registration should be enforced, by this means protecting themselves against any difficulties that might arise from the small, and often not over scrupulously clean, retail sellers."*

With a few exceptions the farms in Leicestershire sending milk to Finsbury appear to be neither regulated or registered.

Wiltshire.—The County Medical Officer informs me that "the farms in the Highworth rural district, of which Swindon forms a part, are very well looked after. They are frequently inspected and a perfect register is kept. In the Cricklade and Wootton Bassett district there is no supervision as far as I am aware. This authority was one of the first to adopt regulations (in 1890) but they are not enforced. Their attention has been called to the matter from time to time, apparently without effect. The provisions of the Dairies, Cowsheds, and Milk-shops Order are more or less enforced in every urban and rural district in Wiltshire, whether 'regulations' are adopted or not, except in the rural district of Cricklade."

In a general way it may be said that country cowsheds and country cows are maintained at a lower standard of sanitation than town cows and cowsheds. The Dairy Order is administered in many rural districts with considerable laxity, and the personal interests of the members of the Local Authorities leads to a certain degree of supineness. It is rather the exception than the rule for Regulations

* Annual Report, Medical Officer, Leicestershire County Council, 1901, p. 29.

under the Order to be adopted, or if adopted to be enforced. In towns, on the other hand, Regulations are usually enforced with more or less strictness.

But the facts recorded above do not exhaust the available evidence concerning the conditions prevailing amongst cows and cowsheds in Cheshire, Derbyshire and Staffordshire, the districts which send most milk into Finsbury. The Corporation of Manchester has made it part of its duty to enquire into the sources of the Manchester milk supply, with the result that a number of facts are forthcoming to which brief reference may be made in so far as they concern the areas from which Finsbury milk is obtained.

(1.) *As to cows.*—In 1901, 1839 cows were inspected in Manchester cowsheds and one was found suffering from tuberculosis of the udder; in 1902, no case of tuberculous udder was found.

But a very different result was obtained when country cows, the milk of which is sent into Manchester, were examined. The facts are set out in the following table:—

	Farmers sending milk to Manchester.		Farmers sending tuberculous milk to Manchester.		Percentage of tuberculous milk.	
	1901.	1902.	1901.	1902.	1901.	1902.
Cheshire ...	172	196	18	25	10·4	12·7
Derbyshire ...	65	104	6	9	9·2	8·6
Staffordshire ...	25	25	2	1	8·0	4·0
Totals ...	262	325	26	35	9·2	8·4

In this table only the three counties have been taken from which milk comes into Finsbury. It is evident that a certain percentage of milk from these districts has been proved to be tuberculous.

(See Chap. III., for the condition of the milk reaching London.) But this is not all. Fortunately the Manchester Corporation followed the matter up, and endeavoured to remove the tuberculous cows. In 1902 they found that there were 31 cows in these country farms suffering from tuberculosis of the udder. Sixteen of these were slaughtered on the instructions of the Corporation, *but the other 15 were disposed of on the open market.** In one instance where a search was being made to find the animal yielding the tuberculous milk, 75 farms were visited containing 181 cowsheds. The Veterinary Surgeon reports: "The great majority of the cows and cowsheds were in a very dirty condition, and a considerable number of cows examined, while not suffering from tuberculosis of the udder were certainly otherwise tuberculous. The farms in fact, with few exceptions, were totally unfit for dairy farms. only a comparatively small proportion of the milk was sent to Manchester, the remainder, a very large quantity, *being sent to London.* . . . The dairyman stopped sending to Manchester for some time."†

In another case, the farmer replied to the Manchester Corporation instruction to slaughter his tuberculous cow, "asking to be allowed to keep the cow, as he had discontinued sending milk to Manchester, *and was sending to London.* The Medical Officer of Health replied that the cow should be slaughtered." To this the Secretary of the local Milk Producers Association replied, asking that the farmer be allowed to sell the cow in the open market, as times were hard, etc. The Medical Officer again replied that the cow should be slaughtered. After much delay the cow was slaughtered at Market Drayton and the carcass was found to be "very extensively diseased and quite unfit for food."‡ It had therefore been unfit for milking for a long period.

Other examples might be given revealing the ways in which tuberculous cows are handed on from one farmer to another, or from one district to another, and their milk, when its sale is discontinued

* *Report on Health of City of Manchester, 1902, p. 141.*

† *Ibid.*, p. 148.

‡ *Ibid.*, p. 149.

in one district, being sent to another. It is, surely, a disgraceful traffic, and fortunately some of these dealers have been brought to justice in Manchester. *In London we exercise no direct control over any of the farms or cows sending milk from the country.*^{*}

(2) *As to Cowsheds.*—The Veterinary Surgeon for Manchester reports as follows:—

In *Cheshire*—“Greater attempts are made at cleanliness . . .

“The cowsheds are, for the most part, dark and ill-ventilated, and either badly drained or not drained at all.”†

In *Derbyshire and Staffordshire*—“The conditions show no improvement. The cowsheds are, on the whole, decidedly worse than those in Cheshire. In many cases the cubic space per cow is only about 200 cubic feet.”

[Local Government Board standard is 800 feet.] No suitable provision for storage of manure; yard surfaces uneven and dirty; manure kept adjacent to cowsheds; water supply very often of a questionable character; and unclean refrigeration are all more or less prevalent in these counties.‡

In 1901, report was made to the Manchester Corporation of 111 cowsheds in the districts where the farms are chiefly situated which supply Finsbury with milk.§ I have tabulated the results as follows:—

	Cowsheds examined.	Dirty.	Bad light.	Deficient ventilation.	Bad Drainage.
Totals - -	111	48	73	68	64
Percentages	--	43·2	66·2	61·2	57·6

These facts concerning the condition of country cowsheds, situated in the milk gathering-ground of Finsbury, will be sufficient

^{*} The Public Health (London) Act, 1891, sec. 71, only applies in the event of an outbreak of disease.

† Report on Health of City of Manchester 1902, p. 143.

‡ Ibid, p. 144.

§ Ibid, 1901, pp. 246-251.

to show that much remains to be done in the direction of supervision and control of the dairy farms furnishing London's milk supply.

II. Finsbury Cowsheds.

Milk sold in Finsbury is also derived from seven cowsheds situated in the Borough, containing at the present time 118 cows. There is licensed accommodation for about 150. The number both of cowsheds and cows has diminished in recent years. In 1856, for example, in Clerkenwell alone as many as 540 cows were stabled. Ten years ago there were 13 cowsheds in the district which now constitutes the Borough of Finsbury.

The seven existing cow-houses licensed by the London County Council are situated as follows: 39a, Baldwin Street; 1, Georg Street; 30, Great Sutton Street; 40, Rawstorne Street; 230, St. John Street; 4, Sermon Lane; 27, Whiskin Street. The main facts, which may be stated here, are set out in the following table:—

No. of Cowshed.	No. of Cows.	Cubic Capacity per cow, in cubic feet.	Paving, Drainage.	General Sanitation and Cleanliness.	Daily Milkings.	Cleanliness of Milking.	Treatment of Milk.	Destination of Milk.
1	49	560	good	fair	2	fair	strained and cooled	Finsbury, Stoke Newington, &c.
2	10	848	good	fair	2	fair	strained and cooled	Finsbury.
3	12	990	good	fair	2	fair	strained and cooled	Finsbury.
4	5	2154	good	bad	2	fair	strained and cooled	Finsbury, City of London.
5	22	1000	fair	bad	2	not clean	strained and cooled	Finsbury.
6	3	2000	very good	fair	2	fair	strained and cooled	Finsbury.
7	17	1100	good	fair	2	fair	strained only	Finsbury.

The following facts may also be added.

Cows.—Most of the 118 cows at present stabled in Finsbury are Shorthorns or their cross. It is the practice to purchase good cows, and, on the whole, they are in good condition. Certainly the Finsbury cows are in a much better condition than the general average of cows in country cowsheds. This is due to three causes operating in the Metropolis. First, good class animals come to the London cowsheds, because the owners have to send them to the butcher when dry, and, therefore, inferior animals are a poor investment. Secondly, there is a very regular and thorough inspection by the veterinary inspector of the London County Council. Thirdly, there is no inbreeding. Consequently, general tuberculosis, which probably affects more than 30 per cent. of milch cows in the country (McFadyean, Delépine, etc.), only affects 20 per cent. in London, and whereas 2 per cent. of country cows have tuberculosis of the udder, only 0·20 per cent. of London cows have tuberculous disease of the udder.*

* These facts are of such importance that it is desirable to furnish the evidence upon which they are stated. The following table shows the results of 13 veterinary examinations of London cows by the London County Council, as reported by Mr. Shirley F. Murphy, the Medical Officer of Health (see *Annual Reports of Medical Officer*, 1899-1901, and since that date *Minutes of Council*, 1902-3).—

	First Examination. (1899.)	Second Examination. (1900.)	Third Examination. (1900.)	Fourth Examination. (1901.)	Fifth Examination. (1901.)	Sixth Examination. (1901.)	Seventh Examination. (1901.)	Eighth Examination. (1902.)	Ninth Examination. (1902.)	Tenth Examination. (1902.)	Eleventh Examination. (1902.)	Twelfth Examination. (1903.)	Thirteenth Examination. (1903.)
1. Number of cows examined ...	5144	4640	4510	4317	4352	4086	4164	4299	4035	3909	3987	4027	3983
2. Clinically affected with tubercular disease of the udder ...	7	6	8	6	4	6	4	2	4	5	3	3	3
3. Suspected cases of tubercular diseases of the udder ...	5	4	6	10	8	4	3	2	3	1	2	4	5
4. Subjects of acute mastitis ...	82	41	33	52	41	37	23	28	28	30	34	30	22
5. Affected with chronic induration of the udder ...	165	116	28	18	17	14	5	15	7	4	8	5	6
6. Atrophy of one or more quarters	214	125	128	137	99	139	154	138	105	76	103	140	98
7. Injuries, abscesses, simple eruptions, strictures and obliterations of milk ducts ...	38	30	31	50	26	57	42	20	51	23	31	26	34
8. Hypertrophied udders without indurations ...	20	8	7	1	2	2	1	3	0	0	6	0	2
9. Giving milk of poor quality, dried-off cows ...	112	46	21	35	59	9	14	20	12	5	7	31	20
10. Recovered or removed from premises ...	37	11	26	47	27	24	12	18	18	5	11	6	5
11. Cows affected with disease or defects of udder...	680	387	288	356	255	292	258	246	228	140	205	245	195
12. Percentages of diseased cows ...	13'2	8'3	6'3	8'2	5'8	7'1	6'1	5'7	5'6	3'8	5'1	6'0	4'8
13. Percentage of udders with tuberculosis or suspected of tuberculosis	0'23	0'21	0'31	0'37	0'27	0'24	0'17	0'09	0'17	0'15	0'13	0'17	0'20

The last 12 of these examinations were carried out by Mr. W. F. Shaw, F.R.C.V.S., the Veterinary Inspector of the Council.

Mr. Shaw has also made two separate investigations as to the degree of tuberculosis present in London cows. The first, in 1898, was an examination, by tuberculin, of 73 cows selected haphazard in six different metropolitan cowsheds. Sixteen or 20·5 per cent. of these cows reacted to the tuberculin, and were therefore judged to be suffering from tuberculosis. In only two of these sixteen cows was there any clinical sign of disease, the others appeared to be healthy. It should be added that in one shed 44 per cent. of the cows were tuberculous, in another 36 per cent. were tuberculous, and in two sheds (28 cows) there were no cases of tuberculosis.

The second investigation made by Mr. Shaw was at Colney Hatch Asylum in July, 1900, when he tested 53 cows with tuberculin. Ten, or 18·8 per cent. of them were found to be tuberculous. If these returns are compared with results obtained in connection with the milk supply of Manchester or Liverpool it will be found that London cows appear to suffer less from tuberculosis than cows in the country. (See *Transactions of the British Congress on Tuberculosis*, 1901, and *Reports of Medical Officers of Health for Manchester and Liverpool*, 1902.) It would appear that the reason for the better condition of London cows are three. First, as a rule only good class animals are sent to the London cowsheds, as their ultimate destination is the butcher. Secondly, there is no inbreeding. Thirdly, inspection is more regular and thorough than obtains in country districts.

The cows in Finsbury are not kept as clean as they might be, and in not a few cases, at the time of my last inspection, I found cows in a filthy condition and their flanks and hindquarters plastered with dirt.

Cubic Capacity. The standard laid down by the Dairies, Milkshops and Cowsheds Order is 800 cubic feet per cow (Regulation 8) It will be seen that in only one instance is the cubic capacity in Finsbury cowsheds below this figure.

The condition of Cowsheds in Finsbury is, on the whole, good. The paving and drainage is satisfactory, but general uncleanliness and untidiness is marked. Manure is left lying about, and the receptacles for this stuff are not cleared as often or so thoroughly as they should be. One or two of the sheds are deficient in light. But, in a general way, it may be said that the defects are not those of structure or accommodation so much as those due to careless management.

Periods of Milking. All the cows in Finsbury are milked twice daily, in the early morning and early afternoon. I saw no evidence of thoroughly clean milking, although I was informed in most cases that milkers washed before and during that operation, and also cleansed the udders of the cows about to be milked. After milking, the milk is in all cases strained ("screened"), generally through muslin, in order to get rid of particulate matter. In five out of the seven cowsheds the milk is cooled over a Lawrence cooler. In one it is cooled in a can under a tap of cold water, and in one it is not cooled at all. I consider the entire absence of cooling a great disadvantage, but I was told that the customers preferred it not cooled. Most of the milk is sold in Finsbury on "rounds" or in shops, but some of it finds its way to other metropolitan districts. The approximate amount yielded is 10 quarts per cow per day. On the whole, and judging the matter on broad lines, there would appear to be much room for improvement in the straining, manipulation, cooling and storage of milk in all these seven cowsheds. Rough and ready management, in a corner of the cowshed or yard, and entrusting the work to the cowman will not suffice. Dirty milkers and dirty utensils are unpardonable.

Summary.

In a general way it may be said that the facts recorded in this chapter indicate that the sources of Finsbury milk are open to more or less serious criticism. Especially does this conclusion apply to the country sources as distinct from the town sources.

CHAPTER II.

MILK SHOPS IN FINSBURY.

There are registered in the Borough 261 milk vendors, of whom 40 are confectioners or maintain coffee shops, leaving 221 milk vendors (or about one to every 450 of the population) who sell milk for consumption off the premises. For the purposes of this enquiry a thorough inspection has been made of these 221 milk shops. They are divisible into two groups, namely, (*a*) dairies and (*b*) general shops selling milk. There are 39 so-called dairies (or 18 per cent. of the total) and 182 general shops. At the dairies only milk, butter, cheese and mineral waters are sold as a rule. At the general shops every kind of provision and grocery is sold, and in many cases spices, soap, wood, paraffin oil, blacking, etc., are also sold. This, therefore, is the great dividing line between these milk shops, and, as a general rule, it may be said that the dairies sell most milk (about 60 per cent. of the total) and are managed in a more satisfactory and cleanly manner than the general shops. It is, of course, evident that it is impossible to manage a general provision shop, selling all sorts of miscellaneous materials, in a cleanly way. Hence it comes about, that most of these general shops are open to criticism from the point of view of a pure milk supply. Several matters of importance respecting the 221 milk shops may now be briefly considered:—

Milk Storage.—When the milk arrives from the farm, or from the contractor, which it generally does, as we have seen, in the early morning, it is necessary to store it on the milk shop premises. Such milk may be stored for two or three hours only, or for 24 hours or more. In 35 shops (or 16 per cent.) it is stored in the

churns in which it arrives, or in special vessels kept for the purpose, and protected in a greater or lesser measure from pollution. In 186 (or 84 per cent. of the total milk shops in the Borough) the milk is at once placed in the counter pan (metal or earthenware) in the shop. As every one knows, these counter pans are exposed in the shop and dipped into whenever a customer requires serving with milk. Commonly, such pans will contain from 2-4 gallons of milk, and this is the store which will last, more or less, throughout the day. As a rule, these pans and the other utensils used in the Finsbury milk shops are fairly clean; but as the day goes by it is found that dirt collects in the pan and on the milk owing to the fact that, as a rule, the pans are not covered. Two years ago instructions were given that everyone of these pans was to be covered, and many of the milk sellers provided themselves with muslin covers, paper frames or metal lids. Now we found by inspection that in 161 shops no cover at all was being used. That is to say, that 73 per cent. of the milk sellers do not take the most simple and elementary precaution to keep their milk from becoming polluted. It cannot be too strongly emphasised *that milk becomes contaminated in milk shops*, because it is not sufficiently protected. Such contamination arises from three sources:—

1. Constant dipping and manipulation.
2. Dust from the air.
3. Flies.

If a pan of milk is exposed to the dusty air of a small general provision shop, as it is in 180 shops in Finsbury, for from two to twelve hours, it gains an almost incredible amount of dust and dirt. A frequent use of the dipper must inevitably convey some small quantity of dust into the milk. But this is unavoidable, and a negligible quantity. Exposure to dusty atmosphere for a number of hours carries into the milk much more, and *flies* are responsible for a third dose of filth. I entered a milk shop in the Borough only recently and found nine flies in the milk pan. The pan was nearly empty and the vendor had occasion to empty it while I was in the shop, and it was easy to show the vendor a black scum of deposited dirt at the bottom of his pan. Flies are responsible for a great deal of

the pollution of milk. They pass from putrifying animal and vegetable matter in the street to the nearest milk pan and deposit in the milk the filth attaching to their bodies, mandibles, wings, and legs. It is thus that typhoid fever infection was spread in the Spanish-American War and in the South African War.* It is thus that every kind of objectionable filth finds its way into *unprotected vessels of milk*. There are only 60 (or 16 per cent. of the total) shops in Finsbury where the milk is protected from such pollution.

Cleanliness of Utensils.—I am glad to report that the matter of cleanliness of vessels receives increasing attention of milk-sellers in Finsbury. As a result of this enquiry it appears that in five shops only were the milk pans, milk cans, and other similar utensils absolutely dirty. In 204 shops the vessels used were fairly clean, and in 12 instances they were “thoroughly clean” and in every way beyond criticism. The importance of this matter cannot be overstated. At a moderate computation some 8,000 milk vessels are used daily in the Porough. Any dust or dirt which they contain will naturally pass into the milk supply. Fifty-two shops use *house-cans* in their trade. These vary in size from half-a-pint to one quart, and it appears that 7,579 of them are in daily use. Milk is conveyed in these vessels from the shops to the consumer’s home, where they may remain indefinitely before being returned to the shop.† It is satisfactory to learn that it is the custom of the 52 milk-vendors using these house-cans to have them thoroughly cleansed after each use in hot water and soda.

Sanitary Condition of Milk-shops.—Out of the total of 221 milk-shops inspected in this enquiry, 116 (or 52 per cent.) were found to have one or more sanitary defects. The chief defects may be tabulated as follows :—

**American War Department, Official Report, 1900; British Medical Journal, 1901, vol. i., pp. 642, 770; and 1902, vol. ii., 936.*

† In 1902 on visiting a fatal case of confluent small-pox in Valetta Street, I found eight of these milk house-cans on a small table by the patient’s bed. He had used them for drinking out of.

Sanitary Defects.	No. of Milk-shops.
Dust-box accommodation defective	20
Dust-box altogether absent	15
Yard paving absent or defective	10
Yard extremely dirty or refuse accumulated ...	23
Water-closet defective	32
Whole drainage defective	3
Water cistern defective	4
Foul water cistern	25
Dirty premises throughout	36

As a rule, the most defective premises were those used for general purposes and where a few pints or quarts of milk were sold. In some cases, however, sanitary defects were met with at dairies carrying on a large business.*

Milk Trade in Finsbury.—A little more than one half (about 60 per cent.) of the milk trade done in the Borough is in the hands of the 39 dairies, and the remainder (about 40 per cent.) is in the hands of the 182 general dealers. The trade appears to be distributed as follows:—

* It is, perhaps, hardly necessary to add that the condition of the Finsbury milkshops is not altogether unique in London. Where investigations have been made somewhat similar conditions have been met with. For instance, in Paddington, in 1902, Dr. Dudfield reports that 51 per cent. of the milkshops in that district are general shops, or selling other articles besides dairy produce, and a large number of defects were found. In Lambeth, in 1901, 47 per cent. of the milkshops showed sanitary defects, which included general dirtiness of premises, lack of ventilation, defective drainage, &c. In Bethnal Green, in 1901, half of the milkshops were found to be general shops selling "paraffin oil, Dutch herrings, and other odoriferous articles."

Daily sale.	No. of shops.	Total barn gallons of milk sold daily.
Shops dealing in gallons of milk ...	114	1381
Shops dealing in quarts of milk ...	94	48
Shops dealing in pints of milk ...	13	4
Totals	221	1433

Assuming these figures to be the daily average throughout the year it would appear that upwards of 500,000 barn gallons of milk (*i.e.*, a million imperial gallons), are sold in Finsbury during the year (an average of ten imperial gallons per head of the population per annum). Our returns show that 513 persons are actually engaged in the direct manipulation of this milk.

To this must be added the trade in condensed milk, respecting which we have also made enquiry. This trade, as is well known, is largely one of recent growth, and during the last ten years has shown enormous increase. We have reason to estimate that upwards of one and a-quarter million tins of condensed milk are sold in Finsbury every year. Such tins weigh about 1 lb., and contain about half a pint of fluid. Various brands are sold in the Borough, ranging from 2½d. to 5½d. in price. The most commonly used brands are Nestle's, "Tip-Top," "Head," "Cross," "Imperial," "Cup," "Goat," "Handy," "Rose," "Sunshine," &c.

Summary.

We must now add to the previous facts as to sources of milk sold in Finsbury, the further facts that in the Borough itself 52 per cent. of the milkshops have sanitary defects, and 73 per cent. of the milk sellers fail to protect their milk from dust.

CHAPTER III.

THE CONDITION OF MILK SOLD IN
FINSBURY.

The next matter requiring the consideration of the Borough Council is the condition and quality of the milk offered for sale within its boundaries. There are two sources of evidence respecting this portion of the subject, namely (a) the results of chemical and (b) bacteriological examination of the milk. This chapter will, therefore, be concerned with these matters.

(a) The Chemical Examination of Finsbury Milk.

The composition of milk varies according to a variety of external circumstances, and it is, therefore, necessary to adopt a standard. The Board of Agriculture have prescribed the minimum standard, as follows:—

Water	...	...	88.50	per cent.
Fat	...	...	3.00	,,
Solids, not fat	...	...	8.50	,,
			100.00	

The adulteration which occurs in Finsbury, in common with other places, is judged by this standard. Adulteration is generally one or all of three kinds. First, water may be added, to increase the volume of milk. Secondly, fat (as cream) may be abstracted. Thirdly, preservatives may be added with the object of increasing the keeping power of the milk. The object of The Sale of Food and Drugs Acts, 1875-1899 (with the consequent appointment of Public Analysts) is the detection, on behalf of the public, of these various illegal adulterations of milk. If the adulteration is above a certain degree the local authority may prosecute the offender under the Acts.

Unsweetened condensed milk is often added to cows' milk when a sudden call is made for an increased quantity. Some large dealers are said boldly to add water to fresh milk if their supply runs short. The Sanitary Authority, of course, only obtains indirect evidence of this. If it is done, and the retail or wholesale vendor detected, prosecuted and fined, the fine is almost invariably of so small amount that a large profit will still be the result of the transaction. On the whole there is evidence to show that the old and grosser form of milk adulteration, by the addition of water, is largely giving place to more refined methods of mixing "separated" with "whole" milk, or in other ways reducing the quality of good milk, so that it may just reach the admittedly low standard fixed by the Board of Agriculture in their sale of milk regulations.

The Finsbury Borough Council authorize a certain number of samples of milk to be taken under the Acts and these are examined by the Public Analyst (Mr. J. Kear Colwell, F.I.C.). The following table gives the results obtained during the last ten years in the area now incorporated as the Finsbury Borough:—

	No. of Samples Analysed.	No. of Samples Adulterated.	Percentage of Adulterated Samples.	Added Water.					Percentage of Watered Milks in Samples Analysed.	Removal of Fat.					Percentage of Milks with fat removed on Samples Analysed.
				Under 5%	5% or over.	10% or over.	15% or over.	20% or over.		Under 5%	5% or over.	10% or over.	15% or over.	20% or over.	
1893	71	29	40.8	2	8	7	2	5	33.8	—	—	1	—	4	7.0
1894	119	29	24.3	1	8	6	3	7	21.0	—	—	—	—	4	3.3
1895	121	36	29.7	3	10	4	6	2	20.7	1	1	2	—	7	9.0
1896	235	74	31.5	8	23	9	7	6	22.6	—	6	3	5	7	8.9
1897	187	46	24.6	4	14	11	5	2	19.3	—	2	2	4	2	5.3
1898	197	42	21.3	2	14	14	3	1	17.3	—	—	1	1	2	4.0
1899	205	55	26.8	9	16	9	4	6	21.5	—	2	2	6	1	5.3
1900	228	36	15.8	5	12	6	4	2	12.8	—	—	4	1	2	3.0
1901	251	56	22.3	17	13	2	3	2	14.7	2	7	4	3	3	7.6
1902	269	53	19.7	15	15	3	2	3	14.2	2	6	3	2	2	5.5

In a number of the cases in the above Table both forms of adulteration was detected, water had been added and fat removed. Such cases have been entered under "added water."

This table is based upon an examination of the milk of all milk-sellers in the Borough, without any exception. Occasionally, by arrangement or by accident, some vendors are sampled twice or thrice in the year, and others perhaps only once. But the methods adopted are such as work automatically and cover the whole trade, the large dealer and the small dealer, without partiality.*

Several points of interest will be noticed in this decennial table. In the first place the number of samples examined has increased, owing to the increased necessity of protecting the public against adulteration. Secondly, it will be observed that the percentages of adulterated samples do not vary widely. The average works out at 25·6 which is much higher than most metropolitan boroughs. The return for 1902 (of 21·2) stands *sixth* amongst the London Boroughs.‡

*During the existence of the Borough Council (1901-1903) there have been prosecutions for milk adulterations resulting in convictions and penalties as follows:—

MILK.

Year.	No. of Convictions.	Fines amounting to.	Costs amounting to.
1901	32	£44 17 6	£17 12 6
1902	23	£33 5 0	£33 7 0
1903 up to end of Oct.	26	£68 0 0	£22 8 0
Total for the 3 years	81	£146 2 6	£73 7 0

Total for Fines and Costs = £219 9s. 6d.

‡ The Annual Report of the Local Government Board for 1902-1903 gives the returns as follows:—

Metropolitan Borough.	No. of milks examined.	No. found to be adulterated.	Percentage of adulterations.
Hackney	310	103	32·2
St. Pancras	262	84	32·0
Stepney	550	167	30·3
Shoreditch	154	46	29·9
Poplar	151	34	22·5
Finsbury	274	58	21·2
Lewisham	231	46	19·9
Stoke Newington	44	8	18·2
Battersea	157	28	17·8
Greenwich	134	23	17·1
Bethnal Green	205	33	16·1
Southwark	1057	170	16·0
Holborn	177	28	15·8
<i>London as a whole</i>	8411	1314	15·6
Westminster, City	574	86	14·9
Fulham	148	21	14·2
London, City	605	80	13·2
Camberwell	318	39	12·2
Chelsea	94	11	11·7
Kensington	206	23	11·1
Paddington	320	35	10·9
Wandsworth	215	23	10·7
Deptford	157	16	10·2
Islington	587	55	9·4
Bermondsey	389	31	7·9
Lambeth	310	24	7·7
St. Marylebone	202	14	6·9
Hammersmith	139	7	5·0
Woolwich	374	18	4·8
Hampstead	67	3	4·5

There can be no question that more adulteration goes on in Finsbury than in many other London districts.* A high return, as

*Dr. Harris of Islington and others have furnished evidence to show that most of the adulteration is done not by the farmer but by the wholesale or retail vendor. Examinations of milk at railway stations in London have shown such milk to be superior to the milk obtained for examination from milkshops, as judged by chemical analysis. See *Reports on Health of Islington*, 1901, p. 226 1902, p. 214.

an exception, might bear another interpretation, but a continuously high return over 10 years is a fairly reliable indication. In 1902 this Borough had *six per cent.* more adulteration than the average for all London. The comparative figures for that year (the most recent obtainable) work out as follows :—

	Percentage of Milk Adulteration.
Borough of Finsbury	22·2
London	15·6
Twenty largest towns of England and Wales	10·3
The rest of England and Wales	10·0

The percentages of adulteration for every five years since 1877 for England and Wales may also be added for comparative purposes :—

	No. of Samples in 1902.		Percentage of Adulteration in							
	Examined	Found Adulterated	1902.	1901.	1900.	Quinquennium.				
						1897-01.	1892-95.	1887-91.	1882-86.	1877-81.
MILK	29 452	3,427	11·6	11·2	10·8	10·6	12·3	13·2	16·7	21·1

Thirdly, an examination of the table of results of analysis will show that much the most common adulteration is that of added water. It is, of course, the easiest to manage, and appears to the offender a less formidable undertaking than absolutely "tampering" with the milk. Nor is this feature of adulteration common to Finsbury. In London as a whole in 1901, out of 952 adulterated milks, 618 were cases of added water, 384 of abstraction of fat,

and 50 both watered and deprived of fat.* It is, therefore, evident that in London, and particularly in Finsbury, a not inconsiderable amount of watering of milk is going on. For it must be remembered that it is but a very small fraction of the actual adulteration taking place which is detected by the Local Authority.‡

The question of the addition of preservatives to milk has not claimed much attention in Finsbury up to the present, although it has been known for some time past that preservatives were being used in Finsbury milk. Recently I had occasion to suppose that a certain milk-vendor was periodically adding preservatives to his milk. Accordingly I asked the Public Analyst (Mr. Colwell) to examine a dozen samples from this person, half-a-dozen to be collected by him, and half-a-dozen by myself. This was done, and the following table reveals the results :—

* "The average percentage of the added water reported to have been found in the 668 watered samples was 10·1, while the average percentage of fat removed from the 434 creamed samples was 16·8. In a memorial recently addressed to us by the Dairy Trade and Can Protection Society it is stated that the quantity of milk received in the London area from outside is approximately 144,000 imperial gallons a day. If this is correct, and if we assume that the samples taken for analysis in the metropolis in 1901 correctly represent the quality of this outside milk supply, it seems that Londoners pay, at 4d. per quart, at least £30,000 per annum for water which has been added to the milk supplied to them."—Thirty-first Annual Report of Local Government Board, 1901-1902.

‡ This point becomes clear when it is seen that 500,000 barn gallons of milk (one year's sale in Finsbury) are equal to 8 million pints. But 269 samples (analysed in 1902) equal 134 pints. Hence only 134 pints out of 8 million pints have been analysed. It should be understood, moreover, that the 8 million pints is, if anything, an under estimate. In actual cost to the consumer, this amount of milk (500,000 barn gallons or 8 million pints), at the ordinary market price, works out at £67,000 per annum.

No.	Date of Purchase.	Specific Gravity.	Total Solids.	Fat.	Non-fatty Solids.	Preservatives.	Remarks.
1	1903 26 May	1021.5	12.46	3.32	9.14	Not found	Genuine.
2	27 "	1029.0	10.46	2.79	7.67	Not found	Added water 9.8 per cent.
3	29 "	1028.5	10.75	2.70	8.05	Not found	Added water 5.3 per cent; fat removed 5.0 per cent.
4	3 June	1032	11.28	2.60	8.68	Formalin	Fat removed 13.3 per cent.
5	4 "	1024.5	14.65	7.00	7.65	Formalin	Abnormally high fat. (?) Purchaser known.
6	4 "	1028	10.75	3.00	7.75	Not found	Added water 8.9 per cent.
7	5 "	1027	13.38	5.40	7.98	Formalin	Abnormal fat.
8	9 "	1029	11.60	3.50	8.10	Formalin	Added water 4.6 per cent.
9	9 "	1029.5	11.61	3.40	8.21	Formalin	Added water 3.5 per cent.
10	10 "	1031	12.00	3.20	8.80	Formalin	Genuine.
11	10 "	1029	11.98	3.60	8.38	Formalin	Genuine, poor quality.
12	11 "	1030.5	11.25	2.90	8.35	Formalin	Slightly below standard, probably fat removed and water added.

Preservative was found in considerable amount (approximately to 1 in 10,000 parts) in eight samples out of the 12, and nine samples out of the 12 showed other forms of adulteration. In only three samples was the milk normal and genuine.

Probably it would be correct to say that at least 30 per cent. of all the milk sold in Finsbury contains preservatives of some kind and in some degree. It varies with the season, and is as a rule

greater on Sundays than week-days. About 50 per cent. of the London dairymen are said to use preservatives.*

It may also be desirable to add here that as a result of a Special Report by a Departmental Committee, the Board of Agriculture, in exercise of the powers conferred on them by Section 4 of the Sale of Food and Drugs Act, 1899, have made the following Regulations:—

1. Where a sample of milk (not being milk sold as skimmed, or separated, or condensed, milk) contains less than 3 per cent. of milk-fat, it shall be presumed for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine, by reason of the abstraction therefrom of milk-fat, or the addition thereto of water. [Although the Departmental Committee recommended a higher standard.]
2. Where a sample of milk (not being sold as skimmed, or separated, or condensed, milk) contains less than 8½ per cent. of milk-solids other than milk-fat, it shall be presumed for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine, by reason of the abstraction therefrom of milk-solids other than milk-fat, or the addition thereto of water.
3. Where a sample of skimmed or separated milk (not being condensed milk) contains less than 9 per cent. of milk-solids, it shall be presumed for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine, by reason of of the abstraction therefrom of milk-solids other than milk-fat, or the addition thereto of water.
4. These regulations shall extend to great Britain.
5. These regulations shall come into operation on the First day of September, One thousand nine hundred and one.
6. These regulations may be cited as the Sale of Milk Regulations, 1901.

These regulations lay down standards similar to those which have been adopted for some years by most Public Analysts.

The Departmental Committee appointed in 1899, to consider the questions of Preservatives and Colouring Matters in Food, and quoted above, reported, as follows:—

1. That the use of Formaldehyde in food and drink be absolutely prohibited, and that Salicylic Acid be not used in greater proportion than one grain per pint or pound respectively for liquid or solid food, its presence in all cases to be declared.

**Report of Departmental Committee on Preservatives and Colouring Matters in Food.* Board of Agriculture, 1901, pp. xii-xvii.

2. That the use of any preservatives or colouring matter in milk be made an offence under the Sale of Food and Drugs Acts.
3. That Boric Acid preservatives only be allowed in Cream, the amount not to exceed 0·25 per cent., and be notified on a label.
4. That Boric Acid preservatives only be allowed in Butter, the amount not to exceed 0·5 per cent.
5. That chemical preservatives be prohibited in all dietetic preparations for the use of children or invalids.
6. That the use of Copper Salts for "greening" be prohibited.
7. That a Court of Reference be established to supervise the use of preservatives and colouring matters in foods

Condensed Milks.—Condensed milk may be defined as cows' milk from which a large proportion of water has been removed by evaporation under reduced pressure and with the aid of heat. The cream has often been removed from the milk previous to treatment, and in consequence the product is really condensed skimmed milk. Cane sugar is added, it is alleged, with the object of preservation. Such addition, however, renders subsequent dilution necessary, and eventually some brands of condensed milk are little more than a solution of cane sugar. There are many scores of different brands of condensed milk, most of which are imported.* Some are condensed whole milks.

As we have seen (p. 26), the trade in condensed milk now carried on in Finsbury is extensive and rapidly increasing. Dr. Hope, Medical Officer of Health of Liverpool, drew attention in 1898 to the inferiority of many of these condensed milks, pointing out that the chief variation is in the amount of cream (or fat), which is generally very low, and that almost all brands show a large addition of sugar. Twenty-one out of 22 brands contained bacteria, and were not sterile. Twenty-eight per cent. of the brands contained less fat than one per cent. (as compared with three in ordinary milk), and 73 per cent. contained less fat than two per cent. Added sugar was in almost all cases about 40 per cent.†

* *Food and Dietetics.* By R. Hutchison, M.D., F.R.C.P., 1902, pp. 442-445.

† *Report on Health of City of Liverpool*, 1898, pp. 131-136.

In 1902, Mr. Colwell (the Public Analyst) examined five samples of condensed milks being sold in Finsbury with the following results :—

(Results of analysis of condensed whole milk are also added for comparative purposes.)

Description of Sample.	Water.	Fat.	Proteids.	Lactose.	Mineral Matter.	Cane Sugar.	Deficient in Fat.
A	26.25	1.80	12.05	14.80	2.35	42.75	per cent. 82
B	24.30	1.60	11.46	15.50	2.40	44.74	84
C	23.20	2.00	11.72	14.88	2.80	45.40	80
D	25.45	1.00	12.26	14.71	2.45	44.07	90
E	24.40	2.00	9.60	15.50	3.00	45.50	80
Sweetened whole milk	22.55	12.00	9.23	13.36	2.20	40.66	—
Unsweetened whole milk	62.39	10.80	11.09	13.67	2.05	—	—

Four of these samples were sold in cans on which were labels notifying the fact that they contained condensed machine-skimmed milk mixed with cane sugar, but on the other can no mention was made of the addition of cane sugar. Proceedings were therefore instituted as recorded above, and a conviction was obtained for the Borough Council.*

The use of such a milk for the feeding of infants frequently results in the production of "rickets," which is apparently due to excess of carbohydrate and poverty of proteid and fat in the milk. All medical men who see much of children's diseases recognise that much harm is done in this way by the continued and increasing use of such milks as that under consideration. There is also reason to believe that the presence of an excess of cane sugar in the diet

* See *Report on Public Health of Finsbury, 1902*, pp. 102-108.

of infants is apt, from fermentation in the stomach, to result in the production of acidity, colic and diarrhoea. Particularly is this so in summer; and if in cooler weather it is possible for some time to avoid these troubles, the child wastes from want of fat in its diet, and such children die from exhaustion and stomachic diseases. The use of condensed milk is, in the opinion of many medical men best able to judge, responsible for a number of deaths of infants under one year.*

(b) **The Bacteriological Examination of Finsbury Milk.**—As already pointed out, the sources of pollution of milk by bacteria are fourfold, namely—(1) at the farm; (2) during transit to the milkshop; (3) after arrival at the milkshop; and (4) in the home of the consumer. It was Tyndall who first pointed out, in 1878, that dust particles acted as “rafts” for carrying micro-organisms, and since that date abundant and indisputable evidence has been obtained in support of his view. *Wherever and whenever dust and dirt obtain access to milk, bacteria also obtain access.* Therefore, a large number of bacteria in milk will indicate, other things being equal, a large degree of dust pollution; a small number of bacteria, under similar circumstances, will indicate a small degree of contamination. But we may go a step further and learn, if possible, the *kind* of micro-organisms present in milk, where they have come from, and what action they are having upon the milk. Some of these bacteria may be harmless; indeed, we know that some are advantageous and beneficial, assisting in the ripening of cream and flavouring of butter. But others may be of putrefactive species, bringing about decomposition in the milk to which they gain access. And a third group may be actually disease-producing species, conveying disease to the persons drinking

* In reference to this class of milks Dr. Robert Hutchison, in his work on *Food and Dietetics* (1902, p. 444), says:—“There can be no doubt that an immense amount of harm is done to infants by the indiscriminate use of such milks. Babies fed on them may look fat enough, but they are pale and flabby, and often suffer from rickets, for fatness produced by abundance of sugar in the milk is by no means a sure indication of health, and the pictures of such fat but flabby infants so freely spread abroad by the makers of condensed milks are very deceptive.”

the milk. Hence it is clear that, by a bacteriological examination, we may obtain facts of great value as to the condition of a milk, and in any case form some opinion as to the degree of pollution by dust and dirt which milk receives.

Now much of the market milk contains very large numbers of bacteria. Dr. Park, of New York, has made extensive researches into the quality of milk sold in that city, and he finds that the number of bacteria present varies according to season and according to the standard of milk shop. In a poor district the average number of bacteria present out of 13 samples was 1,977,692 per cubic centimetre (=15 drops) and in a well-to-do district the average of 10 samples was 327,500 bacteria per c.c.* Similar investigations have been made in Berlin, Paris, Edinburgh, Boston, Melbourne† and other cities. As a result it has come to be recognized that even good milk may contain from 50,000 to 500,000 micro-organisms per c.c., if such are not injurious species. Several of the American Milk Commissions have laid down that 30,000 bacteria per c.c. is a suitable standard by which to judge the quality of milk provided none of these are disease producing. Such figures apply to freshly drawn milk and not to milk which has travelled a long distance to market. Certainly such a standard is, at present, too high for London milks.

For the purposes of this report I have made a careful bacteriological examination of nine London milks. Purchases were made in five shops situated in Finsbury, and four shops located in the neighbouring districts of the City of London, the City of Westminster, and the Boroughs of Holborn and Islington. Three out of the nine samples were purchased in small poor shops, the other six in good class shops. The sample was bought in the ordinary way, and it was not known that it was being obtained for purposes of examination. It was collected in sterilized

* *Journal of Hygiene*, 1901 (July) p. 395.

† A report has just come to hand from Melbourne containing a record of the bacteria found in fifty samples of milk examined in 1902. The lowest number of bacteria present was 4,800 per c.c., the highest was 8,892,000 per c.c.

bottles and examined at the Town Hall within a few minutes of being purchased.|| The results obtained are set out in the following table :—

District of London.	Standard of Shop.	Average No. of Bacteria per c.c.	No. of Liquefying Colonies per c.c.*
City of London	Good class	4,800,000	120,000
City of Westminster	Good class	1,600,000	125,000
Borough of Holborn	Good class	4,800,000	145,000
Borough of Islington	Good class	1,600,000	10,000
Borough of Finsbury A	Good class	2,300,000	46,000
Borough of Finsbury B	Good class	1,280,000	30,000
Borough of Finsbury C	Poor class	3,200,000	45,000
Borough of Finsbury D	Poor class	2,700,000	†
Borough of Finsbury E	Poor class	340,000‡	0

The samples above recorded were obtained in a haphazard manner, and do not necessarily represent the usual quality of the milk in these several districts. It would be absurd to conclude from these

|| It should be stated that the examination was made on ordinary Petri plates, and the culture medium used was best French gelatine. The milk was diluted immediately after receipt with sterilized water to a dilution of $\frac{1}{500}$; 1 c.c. of milk was added to 9 c.c. of sterilized water in small flasks, and thoroughly mixed; 1 c.c. of this $\frac{1}{50}$ dilution was then added to 49 c.c. of sterilized water and again thoroughly mixed. This gave a dilution of $\frac{1}{500}$, which was found necessary in order to examine the milk. Two plates of each sample were made, and the resulting colonies of bacteria were counted on the second and third days after incubation at 22 c. The figures were checked by three counters.

* These numbers are included in the total average number of bacteria per c.c.

† These plates liquefied too rapidly for correct enumeration to be made of liquefying colonies.

‡ This milk probably contained a considerable quantity of preservative.

figures that the milk sold in the City of London or Holborn is inferior to milk sold in Finsbury. Obviously a very large number of examinations would be necessary to form any opinion upon the comparative condition of the milk of different districts, and other conditions would also have to be considered. The table, about the correctness of which there can be no doubt, must be taken for what it represents, namely, the bacterial content of nine milks, purchased by chance and examined at the same time, from nine London milk shops.

Without laying undue emphasis upon these results there are three simple deductions which may, I think, be safely drawn from them. First, Finsbury milk, as sold, contains a very large number of bacteria, and certainly a number much above any standard of suitability. Secondly, a considerable number of the contained bacteria are of the liquefying or putrefactive species (varying from one to three per cent.) Thirdly, in certain poor shops, of which we possess particulars, the numbers of bacteria are extremely low or the liquefying species are absent. The last figures recorded in the table (milkshop E) afford an excellent illustration of such shops. The cause of this apparently healthy state of the milk is the liberal addition of preservatives. The table appearing on page 34 of the present report deals with the condition of milk purchased at this same milkshop E. In such cases the findings of bacteriology must be taken in conjunction with the results of chemical examination. There can be little doubt that much of the inferior milk sold in Finsbury is bolstered up by the addition of preservatives, which are added to disguise its true character.

The milks were not tested for the presence of disease-producing bacteria. The organisms present in the numbers recorded above were chiefly of two kinds: (1) the ordinary *lactic acid bacteria* of milk, which bring about the souring of milk; (2) common, *putrefactive bacteria*, many of which liquefy gelatine, and all of which probably gain entrance to the milk from dust and dirt.* The milk from milkshop E was exceptionally bad, and contained a number of gas-producing and milk-coagulating organisms. In

* The species isolated included *Bacillus liquefaciens*, *B. fluorescens liquefaciens*, *Staphylococcus pyogenes albus*, *Bacillus coli communis*, several *Streptococci*, *Sarcinæ*, etc.

a milk derived from an inflamed udder in one of the Finsbury cowsheds, the micrococcus of mastitis was found, and was practically the only organism present. These facts in respect of Finsbury milk are not exceptional. London milks have been frequently examined, with the result that marked bacterial pollution has been demonstrated. One illustration will suffice. In 1899, 50 samples of milk were examined in St. Pancras. Sixteen (or 32 per cent.) were normal healthy milks; and 34 (or 68 per cent.) were unhealthy milks. Of the latter, 12 samples contained pus in smaller or greater amounts, and 5 (or 10 per cent.) contained the tubercle bacillus.*

A qualitative bacteriological examination of 25 samples of milk obtained in Finsbury has just been made by Mr. Foulerton, Bacteriologist to the Middlesex Hospital, and his report is as follows:—

BACTERIOLOGICAL DEPARTMENT,
THE MIDDLESEX HOSPITAL,
LONDON, W.

23rd November, 1903.

REPORT ON SAMPLES OF MILK.

The samples of milk referred to in this Report were received from Dr. Newman on the following dates: Monday, 26th October, samples 1-4; Wednesday, 28th October, samples 5-12; Friday, 30th October, samples 13-20; Wednesday, 4th November, samples 21-23; Friday, 16th November, samples 24-25.

All twenty-five samples were received in clean glass bottles, with new corks, and were examined immediately after they were received in the Laboratory. Each bottle contained a little more than 100 cubic centimetres of milk, and the method of examination carried out was the same in each case.†

The results of these tests were as follows:—

* Report on Health of St. Pancras, 1899, pp. 61-66 (Dr. Sykes).

† One hundred centimetres of the sample were measured out into a large glass tube, and were therein centrifugated by means of a Runne Centrifugal Machine for 15 minutes. The lowest ten cubic centimetres in the tube, containing all sediment, were then carefully pipetted off into a glass tube, and again centrifugated for 15 minutes.

The upper portion of the milk in the smaller test tube was then decanted, six coverglass specimens for microscopic examination were then prepared, and the remainder of the contents of the tube were employed for the inoculation test.

The six coverglass specimens were then stained in warm carbol-fuchsin for 15 minutes, decolourised in a 33 per cent. dilution of nitric acid in water, washed in water, counterstained and mounted in the usual way.

Three samples of the milk contained "acid-fast" bacilli, which morphologically resembled *Bacillus tuberculosis*, but which were proved by the inoculation test to be free from the latter micro-organism.

As regards *B. tuberculosis*, none of the twenty-five samples produced tubercular infection in the guinea-pig; all must therefore be pronounced as free from *B. tuberculosis*. With regard to the other types of organisms found, there are only two which require special mention. *Yeasts* are commonly found in samples of milk taken for analysis in the ordinary routine, and their presence in large excess may be taken as a general indication of staleness of the milk.

Micro-organisms belonging to the group of *Streptococci* are also frequently found in milk, and their exact significance, when thus found in large quantities, is not definitely ascertained. But in a number of cases milk in which *Streptococci*, of one species or another, have been found in predominating numbers, has been suspected of being a cause of disease in man.

Taken on the whole, the result of the examination of these twenty-five samples of milk may be said to be satisfactory from the Public Health point of view, and so far as the question of tubercular infection is concerned. At the same time, some of the samples contained an unnecessary amount of foreign dirt.

(Signed) ALEX. G. R. FOULERTON,
F.R.C.S., D.P.H. CAMB.

*Bacteriologist to the Middlesex Hospital; Lecturer on Public Health
and Bacteriology to the Middlesex Hospital Medical School.*

Mr. Foulerton furnished a Table of details showing the results of examination of each of the 25 milks sent to him. The following Table is an abstract of his findings:—

A careful microscopic examination was then made of each coverglass, with a view to the detection of "acid-fast" bacilli, if present, and at the same time a note was made of the predominating types of other micro-organisms which were present in the sediment, and notice was taken of any abnormal quantity of foreign matter present. Inasmuch as it is impossible to distinguish by microscopic examination, only between certain harmless "acid-fast" bacilli, which may be found in milk and *Bacillus tuberculosis*, and, moreover, since the latter may be present in milk in such small quantity as to be overlooked in such an examination, it was necessary to test each sample by inoculation. The remainder of the sediment left after the microscopic preparations were made was injected into the ham of a guinea-pig. The several guinea-pigs were killed by a dose of chloroform on the twenty-first day after inoculation, and the site of inoculation, and the neighbouring lymphatic glands and abdominal organs were carefully searched for evidence of tubercular infection.—A.G.R.F.

Bacteria, Pus, Dirt, etc., found in Milk.	No. of Milks in which found.	Percentage of Total No. of Milks Examined.
Pus... ..	8	32
Staphylococci	7	28
Streptococci	8	32
Diplococci... ..	12	48
Bacillary Forms	20	80
Yeasts	9	36
Sarcinæ	3	12
Epithelium	2	8
Acid-Fast Organisms	3	12
Dirt	10	40

The results of this examination reveal no tuberculosis in this series of samples, but considerable bacterial pollution of various kinds. It should be noted that none of the milks examined had been sold, and therefore whatever pollution they contained was derived from contamination at the farm, in transit, or at the milk-shop, and not at the home of the consumer.

A word may be added as to tuberculosis. We cannot tell what percentage of the milk coming into Finsbury actually contains the germs of this disease, but there is little doubt that some of it does. In Liverpool about 2 per cent. of the *town-produced* milk has been proved to be tuberculous, and 9 per cent. of the *country* milk. In Hackney on one occasion 22 per cent. of the milks examined bacteriologically were found to be tuberculous; in Woolwich in 1902, Dr. Davis reported 10 per cent. of the milk examined bacteriologically to be tuberculous; in Camberwell in 1902, 36 milks were examined for the tubercle bacillus, and in 4 (or 11.1 per cent.) the organism was found; in the City of London in 1902, 24 milks were similarly examined, and tubercle was not found in any of them; and in Islington about 14 per cent. of the milks examined bacteriologically contained the tubercle bacillus. In 1901 in Croydon 6 per cent., and in London as a whole 7 per cent. of the milks examined were found to contain the tubercle bacillus. These figures are sufficient to show that not only does London milk contain large numbers of bacteria (which is evidence of pollution), but a certain percentage of it contains the germs of tuberculosis.

Finally, it may be pointed out that the chief explanation of the large number of bacteria found in London milks is two fold. In the first place, as already pointed out in the present report, London

milk has generally travelled a considerable distance from the country, and as much as 12-24 hours have elapsed since the milk left the udder. Delépine and others have shown that the effect of *time* and *temperature* upon the multiplication of bacteria in milk is an intimate one. Given warm weather, and little or no refrigeration of the milk, and the organisms present will increase with almost incredible rapidity. Naturally, time will favour such multiplication. Consequently, a milk which when it left the farm contained some thousands of bacteria, will contain millions of bacteria some hours after when it reaches the milkshop in London. In the second place, in addition to the pollution milk undergoes at the farm (*see p. 9*) there are many opportunities for its contamination in transit and at the milkshop. In winter very much the same degree of pollution will be found as in summer *but at a later stage* in the life history of the milk. What occurs in, say, six hours in summer may occur in winter in twelve hours. These facts emphasise the extreme importance of *protection* and *refrigeration* of all milk sent to the Metropolis. The matter is fully discussed elsewhere*

Summary.

Here then are a large body of facts, strictly checked and abundantly confirmed, as to the condition of Finsbury milk as now being sold. The conclusions may be expressed briefly as follows:—

1. *Twenty-five per cent., or one quarter, of the milks examined have been found to be adulterated (ten years' average).* The latest figures obtainable (namely for 1902) show that Finsbury milk is adulterated six per cent. more than the average London milk, and twelve per cent. more than the average milk sold in the large towns of England and Wales.
2. *The sale of condensed milk of inferior quality appears to be enormously on the increase in Finsbury.*
3. *Milk, as sold in Finsbury, shows evidence of great bacterial contamination.* The average number of microorganisms present in four ordinary milks was upwards of two millions in every cubic centimetre, which affords absolutely indisputable evidence of pollution. Further, of samples examined 32 per cent. contain *pus*, and 40 per cent. contain dirt.

**The Bacteriology of Milk* (Swithinbank and Newman); see also *Report on the Public Health of Finsbury, 1902*, pp. 73-79.

CHAPTER IV.

THE RELATION OF MILK TO DISEASE.

Since the middle of last century it has been known that, on occasions, the milk supply is the means or vehicle by which disease is spread. In 1875, Dr. Michael Taylor, of Penrith, traced an outbreak of scarlet fever to the contamination of the milk supply with the infection of that disease. Since that date some 300 epidemics of scarlet fever, typhoid fever, and diphtheria, involving many thousands of persons, have been traced to infection conveyed by milk.* Nineteen of these epidemics have occurred in London, not including those in outlying suburbs. There have also been a number of outbreaks of sore throat illness (such as occurred at Hackney in 1900)† traced to an infected milk supply. Epidemic diarrhœa, which in the summer months carries off so many infants, is, without doubt, in part due to the milk supplied to young children. Indeed, the whole question of high infant mortality is probably intimately related to the consumption of milk. Lastly, there are the numerous records of illness due to the consumption of ice cream, made, as in Finsbury, from skim milk. It is now necessary to make brief reference to these subjects as they concern this district.

1. Outbreak of Infectious Disease in Finsbury traced to Milk (since 1900).—It will be remembered that in 1901 there was an outbreak of scarlet fever in Finsbury, involving 17 persons who had drunk infected milk obtained from a milk contractor retailing milk to several small shops. He obtained his

* For a discussion of this subject, see *The Bacteriology of Milk*, by Swithinbank and Newman, 1903, pp. 259-391.

† In this outbreak not less than 150 persons were affected with a septic sore throat traced to infected milk. See *Report on Sanitary Condition of Hackney, 1900* (Dr. King Warry), p. 60.

supply from a farm in Staffordshire, where several members of the family were suffering from scarlet fever. The milk thus became infected, and being sold in Bethnal Green, Shoreditch and Finsbury, set up the disease in many persons consuming the milk.*

2. **Ice-Cream Poisoning.**—In 1901, 1902 and 1903, there were several cases of ice-cream poisoning, which were investigated in due course.

An outbreak of such poisoning occurred in the City of London in July, 1902, which was traced by Dr. Collingridge, the Medical Officer of Health of the City, in part, to some ice-cream made in Finsbury. Some eighteen persons, mostly telegraph boys, were affected. The symptoms were colic, headache, vomiting, diarrhœa and nervous depression. Dr. Collingridge took, altogether, 24 samples from suspected shops, and these were examined by Dr. Klein, who found that 13 of these (or 54 per cent.) were poisonous. Two of these samples were made in Finsbury, by M.A., a registered maker in the Borough. One of these was found to be satisfactory, and one poisonous. A sample of milk, used in the manufacture of Finsbury ice-cream, was also found to be poisonous. It should be added that one of the shops mostly implicated in the City outbreak was also supplied by an ice-cream maker of this Borough. It appears that 81 per cent. of the shops in the City, where ice-cream is sold, are supplied by makers outside the City, some being in Finsbury. We found, on investigation, that the poisonous samples of ice-cream, which had been sold in the City, were made in this Borough, in insanitary premises. In accordance with this finding, we took action for remedying the state of affairs. But, in point of fact, arrangements had already been made for dealing with the insanitary property in question.**

In June of the same year 12 boys contracted typhoid fever in Finsbury, and the only cause which could be at all traced was the

* *Report on the Public Health of Finsbury, 1901, pp. 63-72.*

** *Ibid, 1902, p. 114.*

consumption of ice-cream from a certain hawker, the skimmed milk and other ingredients of whose ice-cream had in some indirect way become infected.*

3. **Epidemic Diarrhœa.**—The conditions favourable to the occurrence of Epidemic Diarrhœa have been dwelt upon in various reports which I have made to the Borough Council,† and it is unnecessary that the general subject should be discussed here.

Most of our knowledge respecting the part played by milk in the production of Epidemic Diarrhœa is derived (*a*) from cases of the disease traceable to milk infection, and (*b*) from the conditions as to milk feeding in children who have died from the disease. In 1892 Gaffky recorded an instance in which three men were attacked at Giessen with chills, fever, diarrhœa and general illness. The only article of diet of which they had all partaken was milk, which was traced to a cow suffering from enteritis. In 1894 an outbreak occurred at Manchester, characterized by diarrhœa, sickness and abdominal pains. The cases numbered 160 in 47 houses, half of which were supplied by a milkman whose milk was proved to be polluted with excremental contamination. In 1895 and 1898 three outbreaks of this disease occurred at St. Bartholomew's Hospital, traceable, in the first two instances, to milk, and in the third to rice pudding made with milk. In all 291 persons were affected. These outbreaks may be taken as types.

But in addition to outbreaks of this disease, there are a large number of deaths caused by it every year. It is chiefly a disease of urban life, most common amongst the artisan and lower labouring classes, and in localities where there is most dust, dirt and surface pollution of the soil. In London, in 1902, there were 2,504 deaths due to this disease, 83 of which occurred in Finsbury, which was one of the lowest returns on record. In 1901, 127 deaths were due to it, and in 1900, 165. In 1902 and 1903, we have made enquiries respecting the milk supply of infants (under 12 months of age), dying from this disease. The results will be seen in the following table:—

* Ibid, 1902, p. 67.

† *Report on the Public Health of Finsbury, 1902*, pp. 73-79.

Age in months.	Human Milk.	Condensed Milk.	Human and Condensed.	Cows' Milk (Bottle).	Human and Cows' Milk	Total.
0-3	6	8	5	8	13	40
3-6	8	12	10	8	11	49
6-9	7	3	6	6	9	31
9-12	9	4	1	6	6	26
Totals	30	27	22	28	39	146

From these figures it will be seen that 30 (or 20 per cent.) were fed with human milk only (breast fed); 49 (or 33 per cent.) were fed largely or wholly on condensed milk; and 67 (or 45 per cent.) were fed largely or wholly on cows' milk.

In Brighton in 1900-1902 there were 226 fatal cases of diarrhœa, in 191 of which it was possible to trace the milk supply. Of these 18 (or 9·4 per cent.) were breast fed; 84 (or 44 per cent.) were fed on condensed milk; and 89 (or 47 per cent.) were fed on cows' milk (Newsholme).* In Croydon, Dr. Richards has shown that of 253 deaths of infants, about 12 per cent. were breast fed; 31 per cent. were fed on condensed milk; and 51 per cent. were fed on cows' milk.† These percentages may be tabulated thus:—

	Breast Fed.	Condensed Milk.	Cows' Milk.
Finsbury	20	33	46
Brighton	9	44	47
Croydon	12	31	51

* *Report on Health of Brighton, 1902, p. 50.*

† *Journal of Hygiene, 1903, p. 329.*

Dr. Orme Dudfield, Medical Officer for Kensington, reports that of 255 infants which had died under 12 months of age, 167 (or 65.4 per cent.), had been artificially fed and only 88 had been nursed by their mothers.*

From these facts, which must be viewed broadly owing to differences in different districts, there is one evident deduction, namely, that most of the deaths of infants from diarrhoea occur in children who have been hand-fed (according to Still, ninety per cent.). Further, there is no substantial evidence that condensed milk, which may be presumed to be, though not germ free, at least free from the chances of the active pollution of cows' milk, contains infective matter before it is opened. Therefore, any infectivity it possesses is obtained by contamination in the home. In the homes of the poor, such contamination from flies and dirt is inevitable. Probably, in large measure, the same applies to cows' milk. Hence it appears that most, if not all, of the eighty per cent. of the milks used in these fatal cases of diarrhoea obtained their injurious properties at the home of the consumer.

Delepine has urged that milk is infected at the farm or in transit, as many of the milks which he examined and proved to be virulent, had not been exposed to any influence attributable to a consumer's home, but was in fact infective before it reached the consumer. He considers the injurious properties of such milk is due to faecal pollution and the action of *Bacillus coli*. Newsholme considers such contamination may be responsible for setting up epidemics of diarrhoea occurring in connection with a particular milk supply, as in the analagous case of epidemics of infectious diseases, such as typhoid. But he holds that the ordinary sporadic cases of diarrhoea, which carry off single children in large numbers in urban districts, are due "chiefly to domestic infection of milk or other foods, or to direct swallowing of infective dust." With this view we agree. Further, a study of bacterial contents of milk, from town and country, within twelve hours of its production, will lend support

* Report of Medical Officer of Kensington, 1902, p. 66.

to this view. We have a double pollution of milk in actual practice, one originating at the farm, one brought about subsequently. The latter might be produced by flies, or from manure heaps (Waldo), or from dust in roads and yards of towns (Richards), or from the generally filthy manipulation of the milk from the time when it becomes the property of the milk seller to the moment of consumption. It should not be forgotten in this relation that stale milk contains toxic properties altogether apart from, and in addition to, actual bacteria. It is possible that the products of organismal action have a much greater effect in the causation of diarrhœa than is generally supposed.

Rickets and Scurvy are other diseases which have been attributed to the use of sterilized milk, condensed milk and proprietary foods. Most authorities appear to consider that when such conditions are due to milk it is because the milk has been treated at a very high temperature, at which certain changes occur in the milk, reducing its digestive and antiscorbutic properties. Infantile scurvy occurs more among children of the rich, and rickets among children of the poor. Possibly allied to these conditions is that indefinite cause of death termed "marasmus," and which was the certified cause of death in 90 children in Finsbury in 1902. It must not be forgotten that between 500 and 600 infants under 12 months of age die in Finsbury every year, and there is not a little reason to suppose that many of these deaths are due directly or indirectly to bad feeding, and chiefly in respect of milk.

Infectious Disease at Milk Shops.—It remains to be added that cases of infectious disease have occurred at milk shops during the last three years as follows:—

	1901.	1902.	1903.
Scarlet Fever	3	1	3
Diphtheria	5	4	2
Small-pox	—	4	—
Enteric Fever	—	—	1
Totals	8	9	6

In each case very strict measures have been taken to prevent the spread of infection, and until the house was free from infection no milk has been sold. In no case did infection spread.

Summary.

The facts to which reference has been made in this chapter furnish indisputable evidence of the intimate relationship existing between the milk supply and disease. Further, it will be evident that milk obtains its injurious properties on account of the lack of effective control, and therefore whatever evils follow in the train of a polluted or inferior milk supply should be considered to be preventable.

CHAPTER V.

THE CONTROL OF THE MILK SUPPLY.

THE control of the milk trade in Finsbury is in the hands of (a) the Local Authority and (b) the trade itself. The Local Authority in the metropolis exercises control of the milk supply by three statutes:—

- (a) The Dairies, Cowsheds, and Milk-shops Orders, 1885–1899.
- (b) The Public Health (London) Act, 1891.
- (c) The Sale of Food and Drugs Acts, 1875–1899.

There are other ways, as for example, by Certified Milk and Infant Milk Depôts, by which a Local Authority may exert an indirect influence upon the milk supply of its district, and to these subsequent reference will be made.

(a) The Dairies, Cowsheds, and Milk-shops Orders.

Under the Contagious Diseases (Animals) Act of 1878, the Privy Council drew up an Order for these purposes. It was called the Dairies, Cowsheds, and Milk-shops Orders, 1885, and it is the only legislative measure wholly dealing with the protection of the milk supply. It revoked the first Order of 1879, and applies to England, Wales, and Scotland. The chief matters dealt with are—(a) the registration of all milk dealers; (b) the construction and water supply of new dairies and cowsheds, with special reference to lighting, ventilation, etc.; (c) the health and good condition of the cattle therein, the cleanliness of milk utensils, and the protection of milk against infection derived from persons suffering from infectious diseases; (d) the position of water-closets or privies in relation to the dairy or milk shop; (e) regulations for a variety of sanitary matters to be made and enforced by the Local Authority; and (f) disease among

cattle. Some question was raised after this Order came into force in 1886, and after the power had been transferred from the Privy Council to the Local Government Board, and to the Local Authorities under the Public Health Act, 1875, as to whether or not there was any power to recover penalties for a breach of the Order. In consequence another Order was made by the Board in 1886, with the object of making it clear that such penalties could be recovered.¹ In 1899 a further amendment became law² as the outcome of the findings of the Second Royal Commission on Tuberculosis.³ This Order of 1899 altered Article 15 of the 1885 Order so that in addition to the diseases scheduled under the Contagious Diseases Acts, it should include, in the case of a cow, such disease of the udder as shall be certified by a veterinary surgeon to be tubercular. For the first time this brought tuberculosis under the control of the Order.

Further, just as we have the Dairies and Cowsheds Orders made under Section 34 of the Contagious Diseases (Animals) Acts, so we have Regulations for the control of cattle and dairies made under Article 13 of the Dairies and Cowsheds Order, 1885. These Regulations are adoptive by each Local Authority. They deal with the inspection of dairy cattle, and with the lighting, ventilation, and general sanitary requirements of Cowsheds (Parts i. and ii.), and of Dairies (Part iii.). They also secure the cleanliness of milk stores, milk-shops, and milk vessels, and prescribe precautions to be taken by purveyors of milk against infection or contamination. The penalty for offending against any of the Regulations is £5, and in the case of a continuing offence, a further penalty of £2 for each day after written notice of the offence has been given by the Local Authority.

As we have said, Regulations under the Dairies Order differ according to local circumstances, requirements, and standard. For the guidance of District Councils the Local Government Board

¹ The Dairies, Cowsheds, and Milk-shops Amending Order, 1886.

² The Dairies, Cowsheds, and Milk-shops Order, 1899.

³ *Report of the Royal Commission appointed to inquire into the administrative procedures for controlling danger to man through the use as food of the meat and milk of tuberculous animals*, 1898, part i., p. 22.

caused some Model Regulations to be prepared. The Board's confirmation of such regulations adopted by District Councils is not required, but if at any time the Board are satisfied on inquiry with respect to any regulation that the same is of too restrictive a character or otherwise objectionable, they may direct its revocation. On account of this power possessed by the Local Government Board it has become the practice of Local Authorities to send up drafts of their prepared regulations to the Board before finally adopting them.

Some of the chief clauses of the Order, after providing for registration, deal with the health and good condition of dairy cattle, the cleanliness of milk vessels, and the protection of milk from infection or contamination, as follows:—

CONTAMINATION OF MILK.

- 2.—It shall not be lawful for any person following the trade of Cow-keeper or Dairyman or Purveyor of Milk, or being the occupier of a Milk-store or Milk-shop—(a) To allow any person suffering from a dangerous infectious disorder, or having recently been in contact with a person so suffering, to milk cows, or to handle vessels used for containing milk for sale, or in any way to take part or assist in the conduct of the trade or business of the Cowkeeper, or Dairyman, Purveyor of milk, or occupier of the Milk-store or Milk-shop, so far as regards the production distribution or storage of milk; or—(b) If himself so suffering, or having recently been in contact as aforesaid, to milk cows or handle vessels used for containing milk for sale, or in any way to take part in the conduct of his trade or business, so far as regards the production, distribution or storage of milk—until in each case all danger therefrom of the communication of infection to the milk or of its contamination has ceased.
- 3.—It shall not be lawful for any person following the trade of Cowkeeper or Dairyman or Purveyor of milk, or being the occupier of a Milk-store or Milk-shop, after the receipt of notice of not less than one month from the Local Authority, calling attention to the provisions of this Article, to permit any water closet, earth-closet, privy, cesspool, or urinal to be within, communicate directly with, or ventilate into, any Dairy or any room used as a Milk-store or Milk-shop.

- 4.—It shall not be lawful for any person following the trade of Cow-keeper or Dairyman or Purveyor of milk, or being the occupier of a Milk-store or Milk-shop to use a Milk-store or Milk-shop in his occupation, or permit the same to be used as a sleeping apartment, or for any purpose incompatible with the proper preservation of the cleanliness of the Milk-store or the Milk-shop, and of the milk-vessels and milk therein, or in any manner likely to cause contamination of the milk therein.
- 5.—It shall not be lawful for any person following the trade of Cow-keeper or Dairyman or Purveyor of milk, to keep any swine in any Cowshed or other building used by him for keeping cows, or in any Milk-store or other place used by him for keeping milk for sale.

MILK OF DISEASED COWS.

- 6.—If at any time disease exists among cattle, the milk of a diseased cow—
- (a) Shall not be mixed with other milk ; and
 - (b) Shall not be sold or used for human food ; and
 - (c) Shall not be sold or used for food of swine, or other animals, unless and until it has been boiled.

The Regulations under Section 13 of the Order now in force in the Metropolis deal with Cowsheds and Milk-shops. In respect to Cowsheds they prescribe for lighting, ventilation, drainage, water supply, and manure receptacles ; also for periodical limewashing of the Cowshed twice every year, and for the regular and proper cleansing of Cowsheds and utensils or vessels used in the trade. On the whole, it may be said that these requirements have been fairly well carried out in the seven Cowsheds now existing in the Borough. Greater strictness and a closer supervision by the Local Authority is, however, desirable.*

In respect to Milk-shops the Regulations lay down the following important requirements :—

*How much behind we are in London in these matters is not only illustrated by the progress made in the provinces but by the advance in dairy control in America. In a special report just issued by the U.S. Department of Agriculture on *The Milk Supply of Two Hundred Cities and Towns*, there is abundant evidence in favour of much stricter supervision. It may also be mentioned that in the new Regulations (1903), under the Order adopted in the City of London, a special clause has been added requiring all vessels used for milk storage to be at all times covered.

CLEANSING

- 1.—Every Milk-store and Milk-shop, as well as all fixtures and tables therein, used in connection with the keeping or sale of milk, shall at all times be kept in a cleanly condition.

MILK UTENSILS AND VESSELS.

- 2.—All utensils and vessels used for the reception, storage, or delivery of milk shall be thoroughly cleansed with steam or scalding water as frequently as may be necessary for keeping such utensils and vessels perfectly clean and sweet, and only clean water shall be used for the purpose.

PURITY OF THE MILK.

- 3.—Every person following the trade of Cowkeeper or Dairyman shall, at all times, employ such means and adopt such precautions as may be necessary for keeping the utensils and vessels used by him for containing milk in a clean and wholesome condition, so as to preserve the purity of such milk.

NOTICE OF OUTBREAK OF DISEASE.

- 4.—Every Purveyor of milk, or person selling milk by retail, shall immediately on any outbreak of infectious or contagious disease within the building or upon the premises in which he keeps milk, or amongst the persons employed in his business, give notice of such outbreak to the Council of the Metropolitan Borough of Finsbury.

MILK IN INFECTED BUILDING.

- 5.—Every Purveyor of milk, or person selling milk by retail, shall immediately on such outbreak coming to his knowledge, remove all milk for sale, and all utensils for containing milk for sale, from such building; and shall cease to keep milk for sale or to sell milk in such building until the same has been disinfected and declared by the Medical Officer of Health for the district to be free from infection.

OFFENSIVE EFFLUVIA AND IMPURE AIR.

- 6.—Every Purveyor of milk, or person selling milk by retail, shall not keep milk for sale in any place where it would be liable to become infected or contaminated by gases or effluvia arising from any sewers, drains, gullies, cesspools, or closets, or by any offensive effluvia from putrid or offensive substances, or by impure air, or by any offensive or deleterious gases or substances.

MILK UTENSILS.

- 7.—Every Purveyor of milk, or person selling milk by retail, shall only keep milk for sale in clean receptacles ; and all utensils used in connection with the keeping or sale of such milk shall be at all times kept clean.

GENERAL.

- 8.—Every Purveyor of milk, or person selling milk by retail, shall at all times employ such means, and adopt such precautions, as may be necessary for preserving the purity of milk, and for protecting it against infection or contamination.

(b) **The Public Health (London) Act, 1891.**

In this Act Metropolitan districts have further legislative powers conferred on them (Sections 28, 47 and 71). The first named section authorises registration, inspection, etc., of all persons carrying on the trade of dairyman, and thus practically re-enacts the registration clauses of the Dairies Order for London. Section 47 gives the well known power of inspection, examination, and seizure of any article of food, whether solid or liquid, intended for the food of man, and sold or exposed for sale, or deposited in any place for the purpose of sale or of preparation for sale. This, of course, includes milk, but it is only under rare circumstances that it is directly applicable to milk.

Section 71, however, is a definite milk section, and deals with the powers of the Local Authority to stop a milk supply when it can be proved that such supply is the cause of "a dangerous infectious disease." How cumbersome and useless this section is will be partly understood by reading it, and fully realised when the Local Authority finds itself in the midst of a milk borne epidemic. The section is as follows:—

Section 71.—1.—If the Medical Officer of Health of any district has evidence that any person in the district is suffering from a dangerous infectious disease, attributable to milk supplied within the district from any dairy situate within or without the district, or that the consumption of milk from such dairy is likely to cause any such infectious disease to any person residing in the district, such Medical Officer shall, if authorised by an order of a justice

having jurisdiction in the place where the dairy is situate, have power to inspect the dairy, and if accompanied by a veterinary inspector or some other properly qualified veterinary surgeon, to inspect the animals therein, and if on such inspection the Medical Officer of Health is of opinion that any such infectious disease is caused from consumption of the milk supplied therefrom, he shall report thereon to the Sanitary Authority, and his report shall be accompanied by any report furnished to him by the said veterinary inspector or veterinary surgeon, and the Sanitary Authority may thereupon serve on the dairyman notice to appear before them within such time, not less than twenty-four hours, as may be specified in the notice, to show cause why an order should not be made requiring him not to supply any milk therefrom within the district until the order has been withdrawn by the Sanitary Authority.

- 2.—The Sanitary Authority, if, in their opinion, he fails to show such cause, may make the said order, and shall forthwith serve notice of the facts on the County Council of the County in which the dairy is situate, and on the Local Government Board, and, if the dairy is situate within the district of another Sanitary Authority, on such Authority.
- 3.—The said order shall be forthwith withdrawn on the Sanitary Authority, or their Medical Officer of Health on their behalf, being satisfied that the milk supply has been changed, or that the cause of the infection has been removed.
- 4.—If any person refuses to permit the Medical Officer of Health, on the production of a justice's order under this section, to inspect any dairy, or if so accompanied as aforesaid to inspect the animals kept there, or, after any such order has been made, supplies any milk within the district in contravention of the order, or sells it for consumption therein, he shall, on the information of the Sanitary Authority, be liable to a fine not exceeding five pounds, and, if the offence continues, to a fine not exceeding forty shillings for every day during which the offence continues.
- 5.—Provided that—
 - (a) proceedings in respect of the offence shall be taken before a court having jurisdiction in the place where the dairy is situate ; and
 - (b) a dairyman shall not be liable to an action for breach of contract if the breach be due to an order under this section.

- 6.— Proceedings may be taken under this section in respect of a dairy situate in the district of a Local Authority under the Public Health Acts, and the notice of the facts shall be served on the Local Authority as if they were a Sanitary Authority within the meaning of this Act.
- 7.— Nothing in or done under this section shall interfere with the operation or effect of the Contagious Diseases (Animals) Acts, 1878 to 1886, or this Act, or of any order, license, or Act of the Board of Agriculture or the Local Government Board thereunder, or of any order, bye-laws, regulation, licence, or act of a Local Authority made, granted, or done under any such order of the Board of Agriculture or the Local Government Board, or exempt any dairy, building, or thing, or any person, from the provisions of any general Act relating to dairies, milk, or animals.

It will be observed that when the Medical Officer of Health finds himself face to face with a milk-borne outbreak, the following means have to be taken :—

- First, he must obtain an Order of a Justice having jurisdiction in the district where the dairy is situated (for example, Staffordshire) to inspect the same ;
- Secondly, he must be accompanied by a Veterinary Inspector ;
- Thirdly, he must report what he finds to his Sanitary Authority ;
- Fourthly, after due consideration the Authority may serve on the dairyman notice to appear before them within a specified time, not being less than twenty-four hours, to show cause why an Order should not be made for the discontinuance of his milk supply ;
- Fifthly, if the Authority deem the case to be made out against the dairyman, they may issue an Order forbidding the sale of his milk in their district until it is again evidently free from infection.

This power could not therefore be put into operation *until from three to four days had elapsed*, during which time the infected milk would be consumed by hundreds of persons. But this is not all. For if the dairyman declines to allow inspection of his dairy under the above circumstances, the proceedings are at a deadlock until the

dairyman is summoned at the police court in his district (Sec. 71 (5)), where, if he be found guilty of such obstruction, he is liable to a fine not exceeding £5. But for obvious reasons it might be quite worth while for an incriminated dairyman to risk such a fine, if it would give him a few days grace during which to get rid of, say, a diseased cow. Persons cognisant of the ways and means which have, on occasion, been adopted by dairymen in respect to getting rid of diseased cows, know by experience that the tracing of such a diseased cow is a difficult matter. But supposing that everything went smoothly, and the dairyman was an honest person really desirous of assisting the Local Authority in its investigations, and such, of course, is often the case, even then the powers given under this section are too cumbersome and too slow to be of service. It is well known that in recent Metropolitan epidemics the section has been found to be practically worthless.*

Some amendment of this legislation would therefore appear to be desirable. But a far more important and more immediate necessity is *such a regular and normal control of the milk supply that outbreaks of disease are prevented from occurring.*

(c.) **The Sale of Food and Drugs Acts, 1875-1899.**

The chief Act is that of 1875 and the others are amendments. The object of this legislation was to prevent (a) the mixing of injurious ingredients with any article of solid or liquid food or drug, and (b) the selling of any such article if of inferior quality; and (c) the selling of any such article from which abstractions have been made to affect its quality injuriously. In the first class of cases it is of course necessary to prove that the added ingredient is injurious. In the second class of cases that point is immaterial, it being necessary only to prove that the article in question is not of the nature, substance and quality of the article demanded.

It is under these Acts that Sanitary Inspectors act as Food Inspectors and take samples of milk, butter, &c., which are duly

* Report by Medical Officer to the London County Council on Milk-borne Scarlet Fever in London, 1901, p. 4.

analysed and reported upon. In the event of the milk falling below a certain standard, and from which it is to be inferred that water has been added or cream abstracted, the Local Authority issues prosecutions and the cases are tried before a stipendiary magistrate at a police court. About 20-25 per cent. of the milk samples collected in Finsbury during the past ten years have been proved to be adulterated, and proceedings have been taken (see pp. 29-33). As these Acts are in regular operation, and proceedings are being reported by the Public Analyst and myself, quarterly, and from week to week, it is unnecessary to burden the present report with details respecting an Act, the provisions of which are well-known. It is, of course, of the greatest importance that these Acts should be strictly enforced. We have made it a practice in Finsbury to sample wholesale vendors as well as retail, large dealers as well as small, and also to sample at irregular hours of day and night, and on Sundays. It is important that this should continue and that the Acts should not be restricted to retail vendors only. Thus, not only do vendors who indulge in infringements of the law meet with punishment, but a salutary effect is exerted upon the whole trade. The object of the law is, of course, *protective*, and not vindictive.*

Summary as to Legislative Powers of the Borough Council.

Under the Dairies Order and these two Acts the Borough Council has considerable powers to deal with milk as sold in the Borough. It is my duty to advise the Council that these various powers should be strictly enforced, and a higher standard of *cleanliness* insisted upon in the future than has been the case in the past. Without entering into details, I am also of opinion that certain amendments in the law, as regards the control of the milk supply in the Metropolis, are

* The case of *McNair v. Cave*, heard in the High Court of the King's Bench, is of importance from having definitely decided that it is not legal for an Inspector to take samples for analysis under the Sale of Food and Drugs Acts outside his own district, and that the words "places of delivery" in section 3 of the Sale of Food and Drugs Act, 1879, must be construed as meaning "places of delivery *within* the district of a Sanitary Authority in connection with which the Inspector taking the samples has been appointed."

urgently required. It is a remarkable fact that many provincial cities and towns have more extensive and adequate powers for controlling their milk supply than exist in London, which is, in fact, much behind in this matter.* The chief legislative requirements in London would appear to be the following:—

(1.) The Regulations under the Dairies Order, now in force in London, require revision and amendment. They were drawn up, I understand, under the Metropolitan Board of Works and have not since been revised. They are not now abreast of present knowledge of the conditions of a pure milk supply, nor are they even as satisfactory as the Model Regulations. No. 17 (5) (requiring clean udders and clean milkers) is altogether omitted in the London Regulations.

2. Section 71 of the Public Health (London) Act, 1891, requires modification in order to facilitate more expeditious action when it is necessary to stop the milk supply of a particular farm, dairy or milkshop. The Public Health (Scotland) Act, 1897, secs. 60 and 61, give much wider powers and duties in this connection than anything existing in London. Taken as a whole, the Scotland Act is the most advanced and satisfactory milk legislation now in force in the United Kingdom.

3. Under the Sale of the Food and Drugs Acts, a somewhat urgent requirement is the right to take samples of milk *outside* the boundary of a Local Authority, if it is believed the milk is to be sold within the boundary. For example, the Sanitary Inspectors of Finsbury should be allowed to go to Euston and St. Pancras, or, indeed, any wholesale depôt, and sample milk about to be delivered in Finsbury, and thus a check would be placed on farmers and wholesale dealers. It is also necessary that the recommendation of the Departmental Committee, that the use of preservatives and colouring matter in milk should constitute an offence under this Act, should be included in any amended legislation.

* Manchester, Liverpool, Leeds, Bradford, Oldham, Sheffield, Stockport and many other towns have powers for the protection of their milk supply under Local Acts containing milk clauses.

4. Various additional powers are also required, which have at present no counterpart in existing legislation in London, though some of the powers exist in provincial Local Acts, and Milk clauses or in the Public Health (Scotland) Act, 1897. Without being exhaustive, it may be said that the following powers are certainly required in one form or another:—

(i) Power to require a dairyman to supply to the Medical Officer of the District a list of his customers, on payment of a small sum for the service. Provision to be made for this requirement to apply (a) to the supply of retail vendors by wholesale vendors: (b) to the supply to consumers by retail vendors.

(ii) Power to require a dairyman to furnish to the Medical Officer of the District a list of the sources of his supply. In cases in which the retail vendor receives milk through a middleman it would suffice for the middleman to keep a register of the sources from which he supplies the retail vendor.

(iii) Powers to ensure that one vendor selling to another shall be required to keep a record of such transactions and, if possible, the source from which the supply is derived.

(iv) Powers to the Sanitary Authority to compensate a milk vendor whose milk supply is stopped at the request of the Authority on account of suspicion that it is infective, and whose milk is, as the result of further inquiry, subsequently determined not to have been infective.

(v) Powers to the County Council to exclude infected milk from the Administrative County of London, and necessary powers of inspection of dairies and cattle outside London supplying milk to London. And further that the same powers should be exercisable by Local Authorities when the exigencies of the case appear to require prompt action.

(vi) Powers to the London County Council respecting the exclusion, after necessary inspection of any farm, of

tuberculous milk from its district, and the seizure of such cows as are suffering from tuberculous disease of the udder.

(vii) Powers of legal control over the milk contractor or middleman, similar to those now exercised over the milk vendor.

Other than statutory powers are possessed by a Local Authority in respect of the milk supply. They may be referred to under three headings, viz.:—certified milk, municipal milk supplies, and the education of the trade and the public.

Certified Milk.

Some municipalities, amongst which is that of Sunderland, have adopted a semi-official control of the milk supply by laying down certain conditions upon which they would encourage the sale of milk. Certificates are issued stating that such and such milk is produced under special regulations drawn up and approved by the Health Committee of the Corporation. The certificate has to be renewed every year, and is cancelled immediately any breach of the regulations takes place. Dr. Scurfield, the Medical Officer of Health of Sunderland, informs me that five farmers doing a large business in the town are so certified, and have found the regulations to be most helpful to their business and beneficial to their herds. Certificates are granted by the Health Committee to dairy farmers, respecting the milk supplied from their farms, if, in addition to complying with the regulations made by the Council, under the Dairies, Cowsheds and Milk Shops Order of 1885, they also carry out the following regulations as to the construction and management of their farms and dairies.

Construction.—1. The byre must be well lighted, ventilated, paved, and drained.

(In a well-lighted byre, every part of the byre should be easily visible in the day time with the doors closed.)

(In a well-ventilated byre the air will not feel oppressively close, or smell disagreeably when the cows are all housed and the doors shut.)

2. The dairy must not communicate directly with the house, and must be well ventilated.

3. The place for washing and boiling the milk utensils must not communicate directly with the house, and must have a proper water supply.

4. An efficient refrigerator or cooler for the milk must be provided.

Management.—1. Only cows which pass a veterinary surgeon's examination, the examination to include the application of the tuberculin test, must be kept. The veterinary surgeon's certificate for each cow, together with the temperature chart after the application of the tuberculin test, must be sent to the Medical Officer of Health. Newly bought cows must be kept apart from the others till they have been examined and tested.

2. The milk must be of first-rate quality.

(Samples of the milk will be taken from time to time to ascertain that the quality is really first-rate.)

3. The cows must be kept as clean as possible.

4. The byre must be kept as clean as possible. The ceiling should be cleared of dust and cobwebs at least every three months, and the walls and ceilings whitewashed every six months. The manure should be taken out twice a day, and the walks and gutters flushed with water.

5. The farmer must at once notify any case of infectious disease, including consumption, measles, and whooping-cough, occurring on the farm, or in the families of his employés, and take measures, satisfactory to the Medical Officer of Health, for preventing the possibility of the infection of the milk by such case.

6. Hay or food must not be stored in the byre, but kept in an adjoining building.

7. The dairy must only be used as a dairy, and the place for washing the milk utensils for that purpose only.

Milking.—1. The air of the byre must be kept as free from dust as possible, and at milking time especially so.

2. The udders and teats must be cleaned before milking.

(It is also recommended that the tail and hind quarters of the cows should be clipped)

3. The milker must wash his or her hands thoroughly before milking, and also rinse the hands in water after milking each cow

4. The milk must not remain a moment longer in the byre than is absolutely necessary, and must be at once strained and cooled.
5. The milk of any cow showing signs of disease of the udder, or of other disease, must not be used for sale.

It will be seen that such regulations deal with dairy farmers, and are not, in the same form at all events, equally applicable to milk vendors. The idea of municipally certified milk is, however, suggestive, and possibly something of this nature may become desirable in the effort to raise the standard of the milk supply, even above the minimum requirements of the law. The method has been widely adopted in America.*

Municipal Milk Depôts.

Several towns have established municipal milk depôts for the supply of milk to infants. The idea seems to have originated in Dr. Leon Dufour's establishment at Fécamp, in Normandy, and has now been adopted at Liverpool, St. Helens, Bradford, Battersea, and other places in this country. In principle it consists in

* The system is worked in America by means of "Milk-Commissions." Such exist in New York, Philadelphia, New Jersey and other places. A voluntary society of medical men and others form a Commission, which issues certificates to certain dairy farmers who comply with the conditions laid down. These conditions include a high sanitary standard as to cow and cowshed, and a minimum quality of the milk. For example, the barn-yard and stables must be kept clean and in absolutely good condition; the water supply must be pure; the cows must be healthy and clean; the milkers must wash before milking; the utensils and vessels used must be kept clean; and the milk itself must be of a certain standard. This standard consists chiefly in three conditions, viz.—the milk must contain not more than 30,000 bacteria per cubic centimetre, the acidity must not be over 2 per cent., and at least 3·5 per cent. of fat must be present. These are the broad facts. The details differ in the different Commissions. But all agree in requiring a high standard of dairy-farming, a good quality of milk, and constant supervision and inspection. At first, considerable difficulty was encountered in reaching the quality required, but eventually it was attained. Refrigeration of milk at 50-55° F., within two hours after milking, was found to be necessary to reduce the number of bacteria to the necessary standard. The system in America has resulted in demonstrating the practicability of obtaining a clean and pure milk supply, *when it is made necessary.*

supplying "humanized" sterilized milk in stoppered bottles, each bottle containing sufficient food for one meal only. In England, it is most largely carried out at Liverpool, where there are now four branches, with sterilizing apparatus at two of them. The process is as follows :--

When the milk is received from the farm it is tested and passed through a fine sieve. It is then "modified" (by addition of sugar and water to make it more suitable for infants) and bottled by means of a special apparatus. The bottles are placed on trays in the sterilizer, which is then closed and the steam admitted. When the temperature reaches 200°F. no further heat is applied, and this temperature is maintained for half-an-hour. The milk is then ready for sale.

In addition to the Corporation Depôts, arrangements have been made with over 30 dairies, situated in various parts of Liverpool, to keep a stock of the municipal sterilized milk,* so that customers may obtain a supply conveniently. As many as 3,000 bottles per day have been prepared and sold in Liverpool.

In 1902, the Metropolitan Borough of Battersea commenced to adopt this method, and now some 400 children are being fed with the milk. The milk is humanized and sterilized, as at Liverpool. The process of humanization adapts the milk to the weakly infant's digestive organs, the sterilization kills the germs, and as the bottle is not opened—or should not be opened from the time it enters the sterilizer until the infant is ready to take milk from it direct (no feeding bottle should be used)—home contamination, unless it is wilful or due to extreme carelessness, is prevented.

Upon the recommendation of the Health Committee, the Battersea Borough Council decided, on the 10th July, 1901, to adopt this method, and voted a sum of £400 to start the scheme. Premises were taken at 28, York Road, and adapted for the work at a cost of £250. The remaining £150 was devoted to the purchase of appliances, and the Depôt was opened on June 5th, 1902. The

* *Reports on Health of City of Liverpool, 1901 and 1902.*

appliances in use when the Depôt was opened were as follows:— 1 sterilizing chamber with two trolleys; 1 bottle-filling machine; 1 mechanical bottle-washing brush, with rinser and draining racks; 250 wire baskets; 25 gross graduated 7 oz. bottles; 1 baby weighing machine; 2 milk churns, cans, strainers, measures, &c. Additional appliances have since been purchased as the work has increased, and additional alterations have been made to the premises.

When the Depôt was first opened, a uniform charge of 1s. 6d. per week was made, but it was found that this amount barely covered the cost of the milk in the case of the older children, and in December the charge for infants between six and eight months old was raised to 1s. 9d. per week, and for children over eight months to 2s. per week. An extra 6d. per week is now charged for children living outside Battersea. An arrangement has been made with the Board of Guardians, whereby the Relieving Officer is empowered to issue weekly orders for milk in lieu of giving money in outdoor relief. The milk is given out from the central station, 28 York Road, and at the Municipal Buildings, the Public Baths and the Branch Libraries. As worked at present the Depôt results in financial loss, and according to the official Auditor it is not a statutory expense.

Dr. McCleary is of opinion that evidence obtainable affords justification for the establishment of the depôt. Medical men are satisfied that the introduction of such milk has been of service, and statistical evidence would appear to show that it may have had beneficial effects upon infant sickness and death rate in Battersea.†

At York, a voluntary Society, the York Health and Housing Association, has started a Milk Depôt of this kind, and has five branches. The regulations and arrangements are similar to those being carried out in Liverpool and Battersea, except that the *source* of the milk is controlled, the farm and cows being placed under strict regulations.

There can be little doubt that this kind of milk supply may be of great service to the children of the poor, in the reduction of

† Special Report by Medical Officer of Health of Battersea (Dr. McCleary) on the Infants' Milk Depôt, March, 1903; and Report on Health of Battersea, 1902, pp. 119-130. See also *Journal of State Medicine*, 1903.

infantile mortality, due to the use of contaminated or infected milk. It is not, however, of the nature of control of the milk supply, but rather, of a specialized supply, to meet special needs. There is evidence to show that at Liverpool, Battersea and other places, it has had beneficial results in meeting the special need.

It has, however, several limitations unless properly managed. Its object being the saving of life and prevention of infant diseases, it is necessary that the system should be *individualized*, i.e., each mother must be separately advised, each infant inspected and weighed periodically, each home inspected, the condition of the milk regularly tested, and the source of the milk kept under control, the cows and cowsheds, from which the milk is derived, being supervised by a veterinary surgeon and the Medical Officer of Health. And here, in any event, the quality of the milk used must reach a high standard, chemically and bacteriologically. If these conditions are not fulfilled, it seems to the writer that a municipal sterilized milk supply can only be a palliative measure of transient usefulness.*

Education of the Trade and the Public.

The Local Authority should, as far as practicable, act as a bureau of information and education respecting the milk supply. Many of the smaller milk vendors require educating as to the importance of cleanliness in milk dealing, and not a few of the public are in need of much the same knowledge. *The trade will supply what the public demand.* If the public demand a clean, pure milk supply, they will eventually get it; and a great deal remains to be done in the direction of an enlightened public opinion on this question. If a farmer or a milk purveyor knew that if he neglected sanitary precautions and absolute cleanliness his milk would not find a market,

* The common desideratum, surely, is a naturally pure milk supply, rather than an artificially purified and humanized supply. The latter question appears to the writer to be one requiring careful consideration, but of a different nature to the former. If undertaken by a Local Authority, it would appear desirable to do it *very thoroughly*, after the manner of Budin's work in Paris. Humanized milk should be given only on medical advice, and not indiscriminately.

he would very quickly accustom himself to comply with the necessary requirements. Legislation is able to do a great deal, but private enterprise in the trade and an enlightened public opinion will do very much more in the direction of purifying the milk supply.* The Local Authority may assist in obtaining these beneficial results (i) by distributing information in the form of leaflets; (ii) by encouraging the teaching of older girls in elementary schools in the technique of infant feeding and management; (iii) by teaching personal health and domestic economy in the homes of the people; (iv) by obtaining the services of one or more lady visitor, or a lady sanitary inspector, who would give practical advice and instruction in the home. An impure milk-supply is potential of much injury to a community, and it is the dissemination of information that seems to be required. To obtain a naturally pure milk supply is of more consequence than to furnish a sterilized milk supply. Possibly, in a district like Finsbury at the present time, both may be needed, and it is quite certain that vastly more care must be taken over the milk-supply if preventable disease is to be prevented.

A word may be said on the domestic sterilisation of milk by boiling. There can be no doubt that this is the safe course. There is no substantial evidence to prove that the nutritive value is diminished below that of human milk, or that such boiled milk is less digestible. The changed palatability of boiled milk is perhaps its chief disadvantage, but this may be reduced to a minimum by adopting certain precautions in boiling it, or by using one of the better forms of domestic sterilisers (Aymard's steriliser is now widely recommended). England is almost unique in its custom of drinking milk raw, and there can be little doubt that the simple practice of using boiled milk would at once remove many of the evils which arise from the consumption of raw milk.

In other portions of the present report many facts will be found dealing with the practice of milk purveyors which are full of suggestion as to the particular points requiring the attention of the

* Several of the large dairy companies, such as the Aylesbury, Welford, etc., have proved how much can be done in this direction.

trade. The prevalent idea among milk purveyors appears to be that if they do not actually adulterate their milk they are within the law and are doing what is necessary to protect their trade. But this is not sufficient. Of course, adulteration is wrong, and testing for it is essential, but the health of the cows producing the milk, the health of persons handling it, and the conditions to which it is exposed, are in reality much more important if judged by the results arising when these three matters are neglected. It is a commercial fraud to adulterate milk, but surely it is even more serious to endanger people's health and lives by allowing milk to become dangerously polluted. In brief, therefore, it may be said that what is needed is (a) milk from healthy cows and (b) clean handling at the farm and in milkshops. As already pointed out *time* and *temperature* are the two things which mostly influence the growth of bacteria in milk and therefore (c) cool and rapid treatment must be added. The time elapsing between the milking of the cow and the consumption of the milk is also affected by the period occupied in railway transit.

This raises two points of importance concerning the trade. First, it appears that a certain amount of mixing of milks is practised during transit on the railway. The *modus operandi* seems to be to take a measure of milk (about half-a-gallon) from each of a number of churns and to pour it into a churn, and then to replace the quantity removed from these churns with separated milk taken from another churn, consigned to the milk sellers. The reason, according to Dr. Harris, of Islington, who has enquired into this matter, that the milk is mixed at the station is that all the milk churns consigned to a dealer are not necessarily delivered at a central store, but are distributed to several branches situated in various districts. Clearly the only remedy for this practice is for the railway companies to prohibit the mixing of milks at their stations.

In the second place there is the question of sealing the churns previous to transit, which is desirable as a preventive of mixing milks and as a protection of the farmer against the accusation that if certain milk be adulterated it must have been tampered with by him or on the railway. The defence, which has been not infrequently set up by vendors and consignors has been that the

railway companies do not permit the churns to be sealed. This is absolutely incorrect. For in a letter dated 29th May, 1899, the Assistant Secretary of the Board of Agriculture inquired of the Railway Companies' Association through the Board of Trade if it was their practice to require milk churns to be unlocked, and if in consequence the consignor is unable to take any precautions to prevent persons tampering with their contents. In reply, he was informed by the Railway Companies' Association, in a communication dated 12th October, and signed by Sir Henry Oakley, that "senders have been for a long time allowed to send milk in sealed cans, the Companies accept the declaration of the senders as to the quantity conveyed, no extra charge being made; the only condition the Companies require to be fulfilled is that the tare weight of the cans shall be stamped on the outside of the can, so that in case of doubt the quantity of milk within the churn can be approximately ascertained by allowing $10\frac{1}{4}$ lbs. for each gallon of milk declared. It does not appear to the Companies that there is any difficulty in the senders protecting themselves against alleged loss of milk in transit by sealing, padlocking, or otherwise fastening the cans." The railway companies should insist, not only in the interests of their servants, who are practically looked upon as the delinquents, but particularly in that of the public, that all cans sent to them for delivery shall in future be locked, sealed or fastened. There cannot be the least doubt that, if the railway Companies refused to carry milk in unfastened cans, the adulteration of milk would be much checked, and the unfortunate farmer would cease to be so frequently, and often undeservedly, made the scapegoat for the large wholesale milk vendors in London and elsewhere.

Lastly, there can be no doubt that in addition to the contamination of milk at the farm, in transit, and at the milk-shops, serious pollution may occur at *the home of the consumer*. To obviate this, education of the public is greatly needed.

CONCLUSIONS.

The requirement is a pure milk supply ; that is, a clean, whole milk, unadulterated, unsophisticated, and without preservation, derived from healthy cows living under clean and sanitary conditions, and protected from contamination (dust and dirt) and infection (disease).

The enquiry, which has now been carried out, reveals a condition of affairs in respect to the milk supply of Finsbury which cannot be correctly described in these terms. The chief findings are as follow :—

- (1.) That the extent of the milk trade in Finsbury may be gauged by the fact that not less than a million imperial gallons of cows' milk, and not less than one and a quarter million tins of condensed milk are consumed in the Borough every year ;
- (2.) That 90 per cent. of the cows' milk consumed is obtained from country farms ;
- (3.) That 95 per cent. of the contributory farms are situated at a greater distance than 100 miles from London, which means that most of the Finsbury milk is 12 hours old before it reaches the milk shop.
- (4.) That there is evidence to prove that, as a general rule, the country cowsheds from which this milk is derived, are ill-lit, overcrowded, badly-ventilated, and badly drained. There is also little or no guarantee that the milk is derived from healthy cows, free from tuberculosis.
- (5.) That when the milk reaches Finsbury it is not infrequently sold under conditions open to criticism ; 52 per cent. of all the milk shops in the Borough were found to have one or more sanitary defects, and 73 per cent. of the milk vendors

fail to keep their milk covered or protected from dust. Further, 48 per cent. of the shops where milk is sold are small general dealers, doing a daily milk trade of only a few quarts or pints.

- (6.) That on the average returns of the last ten years, it appears that 25 per cent. of all the milk tested was found to be adulterated; in 1901, the adulteration was 22 per cent., but even then it was 7 per cent. higher than the average for all London.
- (7.) That there is reason to believe that Finsbury milk, and milk generally in London, contains great bacterial contamination. Four unpreserved samples of milk, selected from two good class and two poor class milkshops, gave an average of 2,370,000 bacteria per cubic centimetre, which is about 2,000,000 bacteria in excess of what should be present in good fresh milk. Of 25 milks examined in Finsbury in 1903, 32 per cent. contained *pus*, and 40 per cent. contained dirt.
- (8.) That there is evidence to show an intimate relationship existing between a dirty or infected milk supply and disease.

Recommendations.—It would, therefore, appear that much remains to be done by the Borough Council in the direction of the control of the milk supply in Finsbury.

- (a) By a more vigorous enforcement of the existing law, particularly in respect of cleanliness in milk shops (see pp. 53-62).
- (b) By pressing for certain amendments of the law (see pp. 62-65).
- (c) By general measures, as far as found practicable (see pp. 65-73).

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