WATER SUPPLY CONTROL AT EVANSTON, ILL.

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Whenever a village emerges as a city, it inherits three large sanitary problems, milk supply, water supply and sewage disposal. The difficulty encountered in the solution of these problems depends upon the size and location of the city. In general, it may be said that as a population thickens throughout a country, these problems became more difficult of solution. Their importance to the health of the community is no longer underestimated. It used to be accepted that sickness was more or less of a visitation, to be awaited and endured with patience and fortitude. With the germ theory of disease, and the modern science of Public Health, contagious diseases have been brought to the correct responsibility. This new attitude finds expression in such a statement that "whenever a death occurs from typhoid, someone ought to be hung." When you consider that typhoid bacilli can live no where save in the human intestinal tract for any considerable period of time, the criminal aspects of the spread of this disease are more apparent.

As a society, we have not yet solved our problem of milk supply, else why the annual toll of sickness and death in every city directly traceable to this source? The solution will probably never come so long as milk delivery is in the hands of competition. Too much altruism is called for. Evanston's milk supply is far above the average and an ordinance soon to come before the City Council will make the control still more rigid.

Our local sewage disposal problem is an interesting commentary on "how not to do it." A great drainage canal defaces our outlying districts designed to carry sewage of this and nearby communities down to someone else. State, governmental and international complications point to the inadequacy of this measure as a permanent solution. Complications have moved faster than construction, and the prospects are that this dilution method of sewage disposal for this community will have survived its period of usefulness before it is ever employed.

The City of Evanston believes she has solved her water supply problem, with the completion in June of the new $225,000 filtration plant. Meantime, the city water is rendered safe by chemical sterilization. The steps that have led to these results may not be without interest and a certain moral.

It has been obvious to many for a number of years that the local water supply carries sewage contamination. A mere physical survey of the situation makes this probable. From the south line of the City of Evanston to the north line of the City of Glencoe, thirteen main sewers pour the drainage of a population of 40,000 into Lake Michigan. The Evanston intake lies in 35 feet of water one and a sixteenth miles from the shore. Knowing that typhoid bacilli can live from one day to a week in lake water and with capricious currents at play, a vicious circle is most possible. Chemical and bacteriological tests repeatedly confirm this. Furthermore, before the chemical sterilization of the water, Evanston, with about the same sources of food and milk supply as Chicago, with superior sanitary advantages and a select population, maintained for a number of years a typhoid death rate from two to three times that of Chicago.

COMPARISON OF DEATH RATES FROM TYPHOID PER 100,000 IN EVANSTON AND CHICAGO

Year	Evanston	Chicago
1907	21	17.5
1908	32	15
1909	28	12.5
1910	24	13
1911	28	10.8
1912	13.8	10.5
1913	13.3	10.5

An investigation of a hundred Evanston cases in 1911 showed that 90 per cent of the victims were users of raw city water. The distribution of these cases by months showed a larger number of cases in the winter months. In sanitary science, this is a recognized index of water-borne typhoid. The situation became acute when in November and December, 1911, Evanston, with a population of 30,000, was averaging over a case a day.

At a cost of $750.00, and on short notice, a "Hypo" sterilization plant was installed, December 25th, 1911, at the Pumping Station, and within two weeks, the mild epidemic was checked. Since that time the rate has been maintained near the normal residual typhoid rate for this district. Moreover, our cases now occur mostly in the summer and autumn, the period when vacation typhoid, finger and fly typhoid, etc., are operative. This is borne out by the following chart:

TYPHOID CASES BY THE MONTH—EVANSTON

Year	Jan.	Feb.	Mch.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Cases	Total Deaths
1910	7	8	19	4	5	4	4	5	3	3	2	0	69	6
1911	4	1	1	0	3	0	4	2	4	9	22	49	99	7
1912	12	9	2	4	1	2	1	0	5	17	7	4	64	4
1913	0	1	1	1	3	4	2	1	6	8	3	0	30	4

Year	Cases per 100,000	Deaths per 100,000
1910	276	24
1911	396	28
1912	224	13.8
1913	100	13.3

Enteritis is recognized as a disease rather closely associated with a contaminated water supply. The following table summarizes the deaths from this cause for the past seven years.

EVANSTON DEATH RATE PER 100,000

Disease	1907	1908	1909	1910	1911	1912	1913
Enteritis	45	20	52	48	32	12	37

While there is a notable falling off in 1912, there is a return to near former rate from this disease in 1913. This is possibly explained by the fact of a higher mortality rate, especially among infants during the unusually hot summer of 1913. A higher rate with a greater percentage of cases among young children would in itself rather point to food supply as a source of the infection.

It is fully recognized that too much reliance cannot be placed upon statistics gathered from a population of 30,000 people, yet a fair examination of all the data seems to confirm the experience of many large cities in respect to water borne diseases before and after improvement in the water supply.

If Hazen's theorem is correct, namely, that for every death from water borne typhoid, there are three or four deaths from other diseases attributable also to contaminated water, the above improvement in the typhoid rate has still greater significance to the community.

Recognizing the conclusive evidence of sewage contamination of the city water, a bond issue for $200,000 was voted by a large poll in the fall of 1912.

This plant, now near completion, is of the mechanical gravity type equipped with mixing tank, settling basins, six independent two million gallon filter units and two 1¼ million gallon storage reservoirs. It is located just north of the University campus on land given by Northwestern University. The plant is built so as to use the present pumping station, and with the exception of the operating building, will be sodded over and covered with shrubbery.

The "Hypo" Treatment Plant being used in the meantime has been maintained without additional labor and with a cost for chemicals of about 25c per day. The plant consists of a mixing machine for making the "Hypo" into a thin paste with water. The mixer is set so that the overflow drains into two wooden tanks, eight feet in diameter and three and one half feet deep. The mixing and dilution tanks, arranged in pairs and used alternately, drain into a two-inch wrought iron pipe. Power for mixing and stirring the dilution tanks is furnished by a Pelton wheel. The dilution tanks are set about three feet above the floor and are tapped on the sides about two inches in the clear above the bottom, with ¾ inch galvanized iron pipe. The piping leads to an orifice box and is so arranged that the solution can be drawn from either tank or both tanks at once. The orifice box sets on the floor of the well house and feeds into ¾ inch galvanized iron pipes leading to the grids. Below the orifice box, a valve is set and below this valve a T through which a pressure pipe is connected. The grids consist of ¾ inch galvanized iron pipes, Ts and plugs, each lateral pipe having two ¼ inch holes drilled in and placed on the down stream side of the pipe. One grid is placed over the top of the shaft, the other in the 36 inch T at the side of the well. By placing the grids at these points, the water is treated when it enters the well, and has about twenty minutes contact before reaching the suction of the pumps. At present 50 pounds of the chemical are being used with 1,420 gallons of water. After this mixture has been thoroughly stirred in the dilution tanks, it is allowed to stand for at least one hour before being drawn off. Considerable insoluble matter is always present which would otherwise cause stoppage in the orifice box and valves.

Each gallon of the above solution contains .0352 pound of hypochlorite, analyzing 37 per cent available chlorine. From the following formula, the engineer operates his orifice box:

N=No. of gallons pumped per minute.

$$\frac{1{,}000{,}000}{N} = M$$ or number of minutes to pump 1,000,000 gallons.

Q=No. of pounds of "hypo" to be added to each 1,000,000 gallons.

$$\frac{Q}{M} = P.$$ or pounds of Hypo to be added each minute.

$$\frac{P}{.0352} =$$ No. of gallons of liquid to be added per minute.

When any considerable variation in the speed of the pumps is noticed by the engineer, he counts the revolutions and determines the pumpage. The number of gallons of solution to be added is then calculated and from a chart furnished by the manufacturers, the orifice box is set.

The amount of chemical used during the past two years has varied from three to ten pounds per million gallons. There has been some complaint of the odor and taste, but the city accepts the situation as a desirable temporary measure.