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6, Halliwick Road,
London, N.10.

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Dear Professor Weizmann,

L. Farkas wrote me from Cambridge that you are interested in the sterilizing of drinking water. I have not seen him as yet, but hope to meet him soon, and hear something about your requirements. The position is as follows:-

Friends of mine, Dr. Lange and Dr. Brasch have developed methods for the production of electrons of 2 to 3 million volts, and are at present carrying out, at my request, experiments on the sterilizing action of these electrons. Our chief object is to see if it is possible to preserve fresh fruit and fresh meat in tins (up till now only cooked food was available in tins).

As far as the sterilization of drinking water is concerned, we shall have to investigate three main points before we can come to a definite conclusion.

$L\ 10^{11}$ 1. Power Consumption. If we assume that $10^{11}$ primary electrons per sq. cm are needed to kill the microbes suspended in the water, and if we use three million volt electrons which penetrate about 1 cm of water then $4.10^{-2}$ Watt sec / $cm^3$ of water ~~energy~~ is dissipated.

Assuming a water consumption of 200 liter per person and day i.e. 72 cubic m. per person and year, the energy dissipated in the water per person and year would amount to 0.75 kWh

As only part of the power consumption of the electric plant is transformed into the energy of the cathode rays the power consumption of the plant will be 1.2 - 5 times larger.

$\Gamma\ 10^{11}$ It is necessary to make further experiments in order to check our assumption that $10^{11}$ primary electrons per square c.m. are sufficient to kill reliably all bacteria. Such experiments are being carried out at present. The figure which we assumed, i.e. $10^{11}$ primary electrons per sq. cm. represents about 100 to 1000 primary electrons being shot through each individual microbe. Even if we have to use much larger intensities one can hope that the power consumption will in no case be prohibitive.

2. Cost of Apparatus. The water may be led in front of the discharge tube in a flat tube of 1 cm x 100 cm, (1 cm. is the depth of penetration of our electrons). If we assume a velocity of 10 m. per second in this flat tube we get 100 liter per second sterilized with one discharge tube. Assuming a water consumption of 200 liter per person and day one discharge tube would take care of 45,000 persons.

I am uncertain if I am allowed to assume, as I did, that some sort of storage of the water already sterilized is possible, Otherwise it is not sufficient to deal with the daily average but one must be able to take care of the peaks.

If we assume that we can charge 2/- a year per person for 10 years in order to cover the capital investment, there would be £45,000 available for investment per discharge tube. This is such a large sum that we may be confident that there will be no difficulty to cover the cost of the electric plant which, up to 3 million volts is not very expensive.

3. Reliability of operation under ordinary working conditions.

If the Berlin experiments continue to be favourable it may be advisable to build a small plant either in co-operation with Metropolitan Vickers in Manchester or in co-operation with the G.E.C. in London. I should think it would take at least one year to develop a discharge tube which is as reliable outside the laboratory as the present tube is in the laboratory.

As you will realise this method of ours has a very disagreeable limitation, i.e. it must be used centrally, and is therefore limited to towns which are provided with a water supply. I shall, therefore, mention to you soon two other potential possibilities for sterilizing water by physical methods, and perhaps one of your assistants will have time to go into the matter.

It would give me great pleasure if I could be of any assistance to you on this subjects.

Yours sincerely,

Leo Szilard

Anderson