THE ACTION OF RUBBER ON MERCURIAL ANTISEPTIC SOLUTIONS.

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Unexpected contamination of several jars of a culture-medium was traced to some red rubber stoppers which had been washed and boiled and then kept for some days in 1 : 1000 potassium mercuric iodide solution, which was exposed to aerial contamination. An examination of this solution showed that it had very greatly diminished antiseptic properties. Not only did a mixture of equal volumes of the solution and broth support the growth of *Staphylococcus* but living organisms were actually present in it. These observations were repeated with a second solution of pure mercuric iodide and potassium iodide and other samples of red rubber, and their confirmation led to the investigation of the action of several kinds of rubber upon potassium mercuric iodide solutions.

The absorption of mercury from 1 : 1000 biniodide solution was examined quantitatively in the case of the following four samples. For their description we are indebted to the manufacturer.

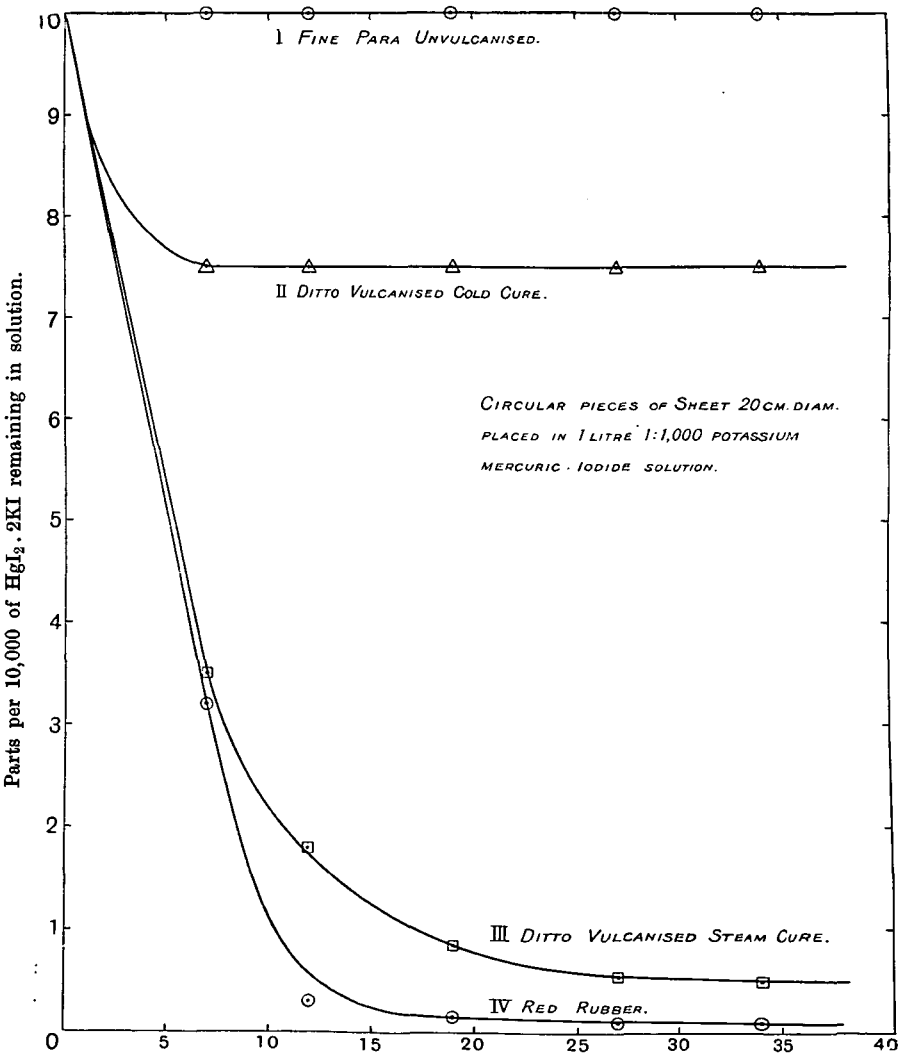
Sample 1. Fine hard Para rubber unvulcanised. In order to get it into sheet form it was necessary to soften it by coal-tar naphtha. It is pure rubber and contains no filling of any kind, and as it is not vulcanised it retains its solubility in chloroform, benzene, etc. It is met with as a manufactured article when rubber is required with its adhesive properties unimpaired.

Sample 2. This is exactly the same as the above, except that it has been vulcanised by the "cold-cure process," *i.e.* it has been treated with carbon disulphide and sulphur chloride. The best quality black rubber surgical goods, surgical gloves, catheters, etc., are made of this material.

Sample 3. This is the same as 1, except that it has been vulcanised by "steam-cure," *i.e.* sulphur has been incorporated and the whole heated to 280° F.

Sample 4. This is the ordinary red rubber from which rubber stoppers and tubing are made. It resembles 3 but contains antimony sulphide and sulphur. Some good quality red rubber surgical goods contain vermilion and are cold-cured.

Experimental. The samples were circular pieces of sheeting 20 cms. in diameter. Each piece was superficially cleansed by scrubbing with sand and soap, rinsed in distilled water and transferred to a stoppered bottle containing 0·55 grm. mercuric iodide and 0·45 grm. potassium iodide dissolved in 1 litre of water. From time to time samples of 25 c.cs. of the contained liquid were removed from each of the four bottles and at the end of 34 days the mercury content of each of the samples was determined. The results are expressed in the following diagram.



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The method employed for the estimation of the small quantities of mercury in these solutions was analogous to that used by Harcourt[1] for the estimation of small quantities of lead. 10 c.cs., and, in the case of great dilution, 20 or even 40 c.cs. of the solution to be examined were diluted to 50 c.cs. in Nessler tubes and two drops of a 10 % caustic potash solution saturated with sulphuretted hydrogen solution added. The brown tint of the colloidal mercuric sulphide was found to become permanent after ten minutes, and under these conditions there was no tendency to precipitation. Comparison was made with tubes similarly prepared containing known volumes of 1:1000 biniodide solution. Accurate results are obtained, and much time is saved in manipulation, if the standard tubes and the experimental tubes are prepared, and then the sulphide added to all as nearly simultaneously as possible.

It would seem from the results obtained that samples of rubber containing a considerable quantity of sulphur and sulphides take up more mercury than those containing little, while pure rubber takes up no mercury at all. In cases 3 and 4 the rubber surface showed signs of "perishing.' It had been observed previously that the walls of a piece of rubber tubing through which 1:1000 potassium mercuric iodide solution had been passed from time to time for some weeks showed a corrosion to a depth of 1—2 mm.

A single experiment performed with 1:1000 mercuric chloride solution and red rubber showed that the mercury was taken up just as it was from a biniodide solution.

Conclusions.

The practical bearing of these results on the sterilisation and sterile storing of rubber catheters, tubing, stoppers, sheeting, etc., by means of solutions of mercuric salts, is important. Not only do the solutions in which manufactured rubber articles are placed for some time lose mercuric salt but the rubber surface is attacked.

Sterilisation of clean rubber articles may be effected by soaking in mercurial solutions, but prolonged immersion leads to exhaustion of the mercury and it becomes imperative to guard against subsequent contamination.

[1] Harcourt (1910), *Journ. of Chem. Soc.*, p. 840.