and the base *R*36 (8-γ-aminopropylamino-6-methoxyquinoline) employed in the preparation of the antimalarial substance *R*63.

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Hypochlorite Sterilization of Metal Surfaces Infected with Bacteria Suspended in Milk

IT was first shown by Holwerda[1], and later confirmed by Levine and his co-workers[2,3], that *in solution* hypochlorite is germicidal by virtue of the undissociated hypochlorous acid.

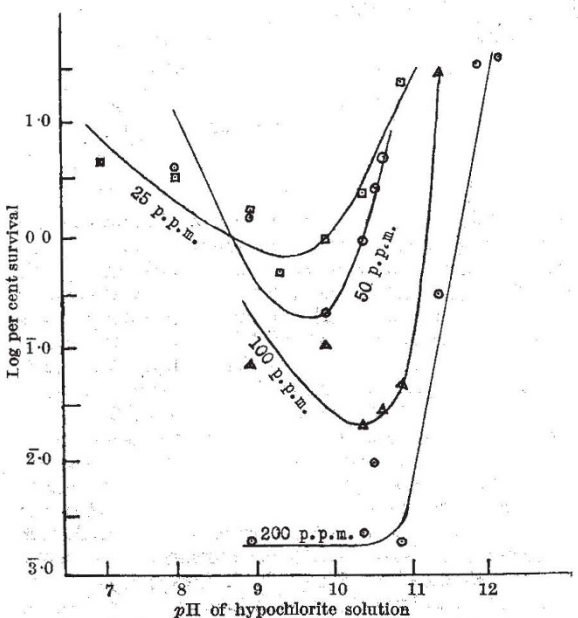
Neave and Hoy[4], working with metal surfaces artificially infected with a suspension of *Staph. aureus* in milk, found that the *p*H of hypochlorite solutions had little effect on the germicidal rate providing it did not exceed 11.

Using a technique essentially similar to that of Neave and Hoy and working with suspensions of *Staph. aureus*, thermoduric micrococci, and spores of *B. subtilis*, we found that the latter when dried in a milk film on a metal surface behaved identically as when suspended in solution, that is, solutions of low *p*H were more germicidal than at higher *p*H. Thus the percentage survivals of spores when in contact with a solution containing 50 p.p.m. available chlorine for 5 min. was 0·2, 2·5 and 80 at *p*H values of 7, 7·85 and 9 respectively.

The two vegetative organisms, on the other hand, behaved very differently, showing optimum 'kills' at *p*H values of 9·4, 9·8, 10·5 and 11 with concentrations of 25, 50, 100, 200 p.p.m. av. cl. respectively.

We suggest the following explanation, which is in keeping with the observed facts. The living protein-like cell wall of vegetative bacteria, as distinct from the refractile cell wall of spores, is able to adsorb a protein film derived from the milk and perhaps organic matter of the medium. The hypochlorite solution before it can reach the vegetative cell has to react with this protein film, forming a 'chloroamine'. The survival curves obtained with the various solutions used appear to agree with a 'chloroamine' theory rather than hypochlorite. Charlton and Levine[2] have observed that monochloramine is more germicidal than hypochlorite at *p*H values above 9·5. Thus keeping the time of contact constant at 1 minute, an increase in concentration results in a higher concentration of 'chloroamine', which produces a higher 'kill', as illustrated by the graph. The contact time with the solution containing 25 p.p.m. av. cl. was 2 min. At 1 minute it would not have cut the curve for 50 p.p.m. av. cl. It also satisfactorily accounts for the greater survival of bacteria below *p*H values of approximately 9·5.

Metcalf[5] has observed that at *p*H 14 monochloramine was completely hydrolysed. The increased survivals shown in the graph are probably due to hydrolysis of the 'chloroamine' due to increasing *p*H. It would thus appear that sterilization of surfaces by hypochlorites in the presence of milk and organic matter is largely due to the properties of a 'chloroamine' produced by the interaction of hypochlorite with some of the proteins. The importance of employing a detergent of not too alkaline a character in conjunction with hypochlorites, for example, in sterilization of dairy utensils and perhaps crockery, is obvious, and for efficient sterilization it would appear that the *p*H of the combined solution should not exceed 10–11.



SURVIVAL OF VEGETATIVE BACTERIA ON METAL SURFACES

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A Simple Method of Demonstrating the Pressure of Sound

SOUND, in common with other forms of radiation, exerts a pressure on the surface on which it impinges. Measurements of this pressure have been made by Altberg and others by means of sensitive torsion balances. While measurements necessarily involve a certain degree of elaboration, a simple demonstration of sound pressure can be given without difficulty. A small hole is made in the base (or even in the side wall near the base) of a cylindrical resonator which is filled with smoke. On presenting an appropriate tuning fork, smoke issues from the hole in a thin but definite stream, thus demonstrating the steady pressure that sound exerts. The experiment provides an attractive demonstration of an important property of radiation.

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