

Figure 1. Calculation of lag time

may remain the same, even though the lag times of two cultures are quite different. Such a situation is shown diagrammatically in figure 2. In other words, if the angle α is likely to vary, there is no advantage in choosing a cosine function over a sine function to define the lag; neither repre-

sents a true picture of what is going on in the culture.

The conclusion is that one can either try to estimate the duration of the lag proper (see Monod), or else he can resort to some derived parameter and thereby gain precision at the expense of accuracy. The simple L of Hinshelwood is probably as good a measure of lag as any other.

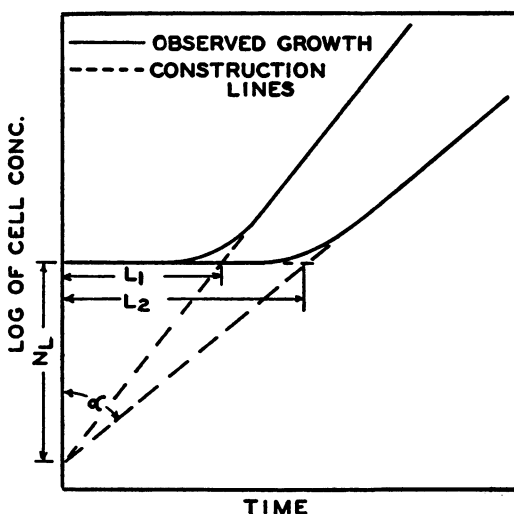


Figure 2. Illustration of the difference between growth lag and time lag.

THE INDUCTION OF CORDING IN AN AVIRULENT VARIANT OF *MYCOBACTERIUM TUBERCULOSIS*

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An avirulent variant of *Mycobacterium tuberculosis* strain H37Rv was isolated by Steenken (Proc. Soc. Exptl. Biol. Med., **33**, 253-255, 1935). This variant, designated H37Ra, is morphologically distinguishable from H37Rv. The cells of H37Rv grow parallel to each other, leading to cord-like formations and flat colonies. The cells of H37Ra, however, are randomly clumped, yielding colonies which are higher and denser than those of H37Rv. No "cord factor" can be extracted from cultures of H37Ra (Bloch, J. Exptl. Med., **91**, 197-218, 1950). Young cultures of H37Rv produce more "cord factor" than older

cultures of this organism, as assayed on mice (Noll and Bloch, Am. Rev. Tuberc., **67**, 16-40, 1953; Bloch, J. Exptl. Med., **92**, 507-526, 1950). Chick embryo extracts contain a heat labile, nondialyzable component which stimulates growth of both H37Rv and H37Ra. Furthermore, this extract enhances the cording of H37Rv and causes H37Ra to grow in cords (Bloch, J. Exptl. Med., **88**, 355-360, 1948).

Detailed investigations in this laboratory have shown that cells of H37Ra grown on solid medium are arranged in cords during the early stages of growth. The cells progressively lose their parallel

orientation and by the 10th to 15th day of incubation the cells are arranged in random clumps.¹

A petri dish (Difco's dubos-oleic-albumin medium) on which H37Ra had been streaked became contaminated with an organism subsequently identified as *Micrococcus epidermidis*.² The colonies of H37Ra growing in the vicinity of this contaminant had the appearance of typical Rv colonies. An acid fast stain of cells from these colonies showed them to be arranged in characteristic cords.

M. epidermidis acidifies the medium during

¹ The H37Ra used in these investigations were kindly supplied by Dr. G. P. Youmans of Northwestern University and Mr. W. Steenken of the Trudeau-Saranac Laboratory.

² The authors wish to thank Drs. W. B. Sarles and E. McCoy of the Department of Bacteriology, College of Agriculture, University of Wisconsin, for their identification of this organism.

growth. It was shown, however, that low pH is not responsible for the cording of H37Ra in the presence of *M. epidermidis*.

The factor produced by *M. epidermidis*, like that found in chick embryo extracts, is nondialyzable; however, it differs from the chick embryo extract in that it loses little or no activity on being autoclaved for 10 minutes at 121 C.

It is postulated that H37Ra, a mutant of H37Rv, has a genetic block of a reaction in the biosynthetic pathway leading to the production of cord factor. It is further postulated that *M. epidermidis* excretes a factor into the medium which enables H37Ra to compensate for its genetic block, at least insofar as to enable it to grow in cords like its parent strain, H37Rv. The cording of young cultures of H37Ra, grown on solid medium, may be a reflection of an incomplete genetic block.

A NEW SALMONELLA TYPE: *SALMONELLA BLOCKLEY*

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The new serotype to be described represented by one culture, number 9262 was sent to us February 15, 1955 by Dr. G. M. Eisenberg, Chief, Division of Bacteriology and Immunology, Philadelphia General Hospital (Blockley Division), Philadelphia, Pennsylvania. "Blockley" represents the name of this hospital at the time of its founding and has been carried along ever since. The culture was isolated from the stool of a 60-year-old white male who was suffering from nausea, vomiting and diarrhea.

This organism possessed the usual cultural and biochemical characteristics of the genus *Salmonella*. It produced H₂S and utilized citrate. Indole was not formed, urea was not hydrolyzed and gelatin was not liquefied within 60 days. The methyl red test was positive, and the Voges-Proskauer test was negative. Glucose, mannitol, dulcitol, sorbitol, xylose, trehalose, arabinose and rhamnose were promptly fer-

mented with gas production. Lactose, sucrose, salicin, inositol, adonitol, and *d*-tartrate were not fermented.

The culture was a member of the C2 group. Its O antigen (6,8) was identical with *Salmonella newport*. It was lysed only by a *Salmonella* C2 phage. The flagella antigens were found to be k-1.5. Phase I (k) completely exhausted a *Salmonella thompson* k serum with a titer of 1:3200, while *Salmonella thompson* antigen reduced the titer of number 9262 k serum from 1:3200 to 1:200. Phase 2 (1,5) of number 9262 was identical with that of *Salmonella cholerae suis* as demonstrated by reciprocal absorption.

SUMMARY

Salmonella blockley with the formula 6,8:k-1.5, a new type isolated from a diarrheic stool, is described.