Laboratory Infection with a Lactose-Fermenting Strain of Salmonella typhi

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Unusual epidemiological and bacteriological aspects prompted this report of a case of typhoid fever acquired in a research laboratory through inadvertent labeling of a culture of *Salmonella typhi* and misunderstanding of the pathogenic capacity of the organism.

The patient, a glassware-washer in the laboratory, experienced a classical case of typhoid fever with chills, fever, bacteremia, rose spots, antibody response, and relapse. After the etiological agent had been isolated and characterized, it was determined that prior to the onset of the patient's illness a graduate student in the laboratory had performed experiments with cultures of an organism labeled simply "643 lac⁺," not realizing that the organism was a pathogen. The original culture, acquired by the student as part of a course in bacterial genetics, had been derived by treating a typical culture of *S. typhi* with an episome recovered from a lactose positive (lac⁺) strain of *S. typhi* isolated in nature (Falkow and Baron, J. Bacteriol. 84:581, 1962).

Recognition of the organisms isolated from blood and urine of the patient merely required procedures for accurate identification. The more complicated task of isolating lac⁺ *S. typhi* from feces which also contained other lac⁺ bacteria was simplified because of the routine use in the diagnostic laboratory of lysine-iron-agar medium (Edwards and Fife, Appl. Microbiol. 9:478, 1961) which was designed to facilitate differentiation of lac⁺ Arizona bacilli from other hydrogen sulfide-producing (H₂S⁺) bacteria selected from Bismuth Sulfite Agar plates.

For isolation of the lac⁺ *S. typhi* from feces, H₂S⁺ (blackened) colonies were subcultured from SS agar and Bismuth Sulfite Agar plates to lysine-iron-agar regardless of their ability to ferment lactose. Lac⁺ *S. typhi* was easily differentiated from other H₂S⁺ organisms on this medium and identified on the basis of further biochemical tests and agglutination with appropriate antisera.

Comparison of biochemical, antigenic, and phage-susceptibility properties of the strain isolated from the blood of the patient with those of a subculture of the laboratory strain ("643 lac⁺") revealed no differences. The bacteriophage type of both strains was D6, slightly degraded. Because of these facts and the rarity of lac⁺ *S. typhi* in nature, it was concluded that the infection was acquired in the laboratory.

In bacteriology laboratories it has always been standard procedure to sterilize or otherwise decontaminate all cultures and glassware after use, regardless of the pathogenicity or supposed nonpathogenicity of the cultures. Apparently, this precaution is not always followed in biochemical and genetics laboratories, possibly because the first microorganisms to be extensively employed in their research programs were relatively innocuous. With the extension of studies to salmonellae, shigellae, and other pathogens, a general reconsideration of policy and techniques in respect to hazards of infection would seem to be a matter of prudence.

Concern that the lac⁺ *S. typhi* strain may have spread into the community through secondary cases or through other, subclinical primary cases emphasized the desirability of complementing classical procedures for isolating enteric pathogens with methods employing selectivity on bases other than lactose fermentation.