

September 22, 1948.

Dr. Martin Kristensen,  
Statens Seruminstitut,  
Kobenhavn, Danmark.

Dear Dr. Kristensen,

Thank you for your letter of the 1st September, and the culture of *S. typhi* II which arrived in good condition. I am glad that you clarified the status of *typhi* II for me. If you should ever encounter any examples of "shift mutations" in the sense I used the term, I would be very grateful to hear from you about it.

As to the simultaneous acquisition of two or more fermentative capacities: My work on *E. coli* K-12, so far unpublished has led me to the conclusion that the genetic control of fermentative enzymes is highly complex, i.e., that there is no simple 1:1 relationship here between gene and enzyme. We have for example a *coli* mutant which is negative for lactose, maltase and gluconate, and as far as could be tested with any organisms, suffers a mutation of a single gene. As you might expect, such mutants occasionally "revert", and when they so do, could be spoken of as acquiring (rather re-acquiring) several fermentative capacities, in analogy to your cases. As I am studying lactose fermentation most intensively, I should be interested to hear if you ever encounter such complex "reversions" in which lactose is implicated.

Yours sincerely,

Joshua Lederberg  
Assistant Professor of Genetics.