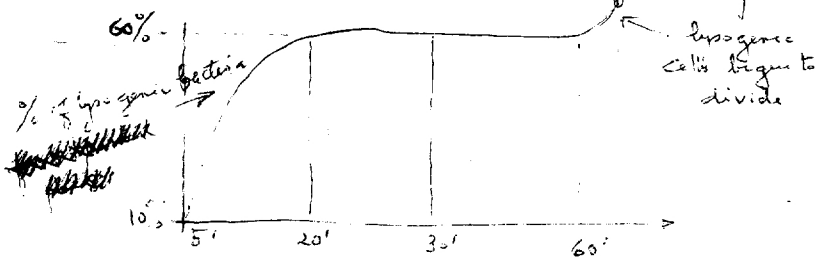
Weigle

P. O. # 26.
Puerto Vallarta, Jal.
Mexico.

Dear Dr. Lederberg

I live in a very primitive way and I have no means to type a letter and less yet to have copies made. So, if you think the enclosed information might be useful to Dr. Morse please do send it to him in Denver.

René Cohen who has spent a year in Lwoff's lab. in Paris and who now work with Delbrück on Phycomyces has done a few experiments on lysogenization by λ which might be useful in their results for us. He measured lysogenic cells by Luria's "Lac technique" and I think that he's measurements are correct. He grew his bacteria (strain 112 of Wollman) to about 5 to 8 10^8 centrifuged and resuspended them in buffer. The phage are adsorbed for a short time, anti λ-serum added to inactivate the non adsorbed phages and the mixture diluted in broth (Tryptone) at 37°. Then at different times afterwards he measured the number of lysogenic cells. He obtained the following result:



His multiplicity of infection was about 3 or 4 phages/bacterium (as his adsorption was not very good ~ 60% he had used about twice as much in the adsorption mixture and he had thus to use high titer anti λ serum to get rid of the unadsorbed phages).

He thought that this result could be due to the fact that before plating the bacteria they were introduced for a short time in melted top agar at 44°C thus giving them a temperature shock to which they would be sensitive for about 20 to 30 minutes after infection. He then proved the point by giving 3 to 4 minutes at 44°C (in broth) then putting back the bacteria at 37° and plating at different times as in the curve above, since the curve obtained was exactly the above one (temperature shocks at lower temperatures than 37°C had no effect at all). Cohen thinks also that the shock effect may be produced already in 30" or 1'. Hence apparently to obtain results which are reproducible (with the plating technique) one should leave the infected bacteria in broth at 37° for 20 to 30 minutes.

Having thus controllable conditions Cohen studied the effect of multiplicity on the efficiency of lysogenization. He does not find "refractory" bacteria as Peggy Lieb and as I find them always and I dont know why. His results are as follows (see verso)

multiplicity	.5	1	2	4	8	16	48
% lysogenics	8	24	42	63	39	40	17

I think he calculates his percentage of lysogenics by dividing the number of lysogenic colonies by the total number of bacteria minus the number of non infected bacteria.
but certainly do not prove the assumption,

This sort of result can be explained, says Cohen, if one assumes that a single phage per bacterium never lysogenizes, 2 ph/bact have a probability of lysogenization of 40%, 3 to 4 100%, 5 30% etc. The very low efficiency of lysogenization at small multiplicities could then be due to the fact that at these multiplicities only a small proportion of the bacteria are infected with 2 or more phages.

I have sent these results to Arber in Geneva as he seems to find that the number of defective prophages introduced with the Gal marker depend very much on the multiplicity of infection...

This is all for today. Maybe that this letter will reach you before the 1st of the new-year. So let me wish you that 1957 brings you a lot of success

Yours

J. Weigle.