supplied to us by Larkum,[2] who has reported the efficacious use of this lytic principle in clinical cases.

We have attempted to adapt the bacteriophage which is lytic for a non-hemolytic variety of *Staphylococcus aureus* to 7 strains of hemolytic staphylococci which have been isolated in Porto Rico. Repeated attempts to bring about this adaptation have been made during the past year without success. This is in agreement with the work of Epstein and Fejgin,[3] who have reported the resistance of hemolytic staphylococci to bacteriophage and it may be, as these authors suggest, that such resistance may have some bearing upon the high virulence of hemolytic staphylococci.

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Bacteria as "Carriers" of Bacteriophage.

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There has been a great deal of discussion in the literature regarding the production of bacteriophage from bacterial cultures. A classical example of this phenomenon is the *B. coli* of Lisbonne and Carrére[1] which is able to elaborate lytic principle for *B. dysentery Shiga.* This subject has been treated extensively by one of us (McKinley[2]) in another publication. More recently Muckenfuss[3] has studied these cultures supplied to him by us and he concludes that such organisms as *B. coli* Lisbonne may be made lysogenic by exposing the organisms to a bacteriophage and that the organisms so exposed then "carry" the lytic principle and antibodies are produced against the bacteriophage when the "phage infected" bacteria are used for immunization. However, this author states that failure of such antibodies to appear on immunization with bacteria does not necessarily indicate that bacteriophage is not present.

We have attempted to "contaminate" or "infect" a strain of *B. coli* with a bacteriophage lytic for *Staphylococcus aureus.* The organ-

[2] Larkum, N. W., *J. Infect. Dis.*, 1929, xlv, 34.

[3] Epstein, T., and Fejgin, B., *Compt. Rend. Soc. Biol.*, 1926, xcv, 908.

[1] Lisbonne and Carrére, *Compt. rend. Soc. de biol.*, 1922, lxxxvi, 569.

[2] McKinley, Earl B., *Philippine J. Science*, 1929, xxxix.

[3] Muckenfuss, Ralph, *J. Exp. Med.*, 1928, xlviii, 723.

ism and lytic principle employed are at wide enough variance to preclude the possibility of any intimate relation existing between them. The lytic principle was active in 1:10,000,000,000 dilution against its sensitive strain of staphylococcus. *B. coli* was sown in bouillon and after 12 hours' incubation 1 cc. of the bacteriophage was added to the culture. Incubation was then prolonged to 24 hours. There was no evidence whatever of lysis, as might be expected. After 24 hours' incubation dilution plates were made from the *B. coli-Staphylococcus* bacteriophage broth culture in order to obtain isolated colonies of the *B. coli*. Typical colonies were picked and sown in broth and incubated over night. This culture was then heated at 58.5°C. for 30 minutes to destroy the microbes and 2 cc. of this heated culture were added to a tube of broth along with an inoculum of the sensitive *Staphylococcus aureus*. This "feeding-up" process was continued through 7 passages and tests for the presence of the bacteriophage against the *Staphylococcus aureus* were made after each passage. After repeated efforts to "contaminate" a strain of *B. coli* in this manner with a lytic principle active against a strain of *Staphylococcus aureus* we have only to report failure to recover the bacteriophage from isolated colonies. The technique described is that which is commonly employed to demonstrate the ability of *B. coli Lisbonne* to elaborate lytic principle for *B. dysentery Shiga*. In the latter case isolated colonies of *B. coli Lisbonne* may be picked and utilized in broth culture to demonstrate that *always* the lytic principle for *B. Shiga dysentery* may be elaborated. We believe that these experiments throw much doubt on the so-called bacteriophage "carrier state" of bacteria though it is perfectly reasonable to suppose that some microorganisms may become *lysogenic* as a result of the influence of a lytic principle upon them. This would not mean a contamination of the organisms with the bacteriophage but rather a process in which the bacteria themselves play a rôle other than a purely mechanical one. This would presuppose some degree of susceptibility (not sensitivity to lysis) on the part of the microbe to the lytic principle and this may be in the nature of a metabolic effect.