those of Anai, Hirahashi & Takagi (1970) with the corresponding enzyme from *Micrococcus lyso-deikticus*.

This work was supported by grants from the Medical Research Council of Ireland and the Irish Cancer Society. M.L. received a maintenance grant from the Department of Education, Irish Republic.

- Anai, M., Hirahashi, T. & Takagi, Y. (1970). *J. biol. Chem.* **245**, 767.
 Furlong, N. B. (1965). *Analyt. Biochem.* **12**, 349.
 Marmur, J. (1967). In *Methods in Enzymology*, vol. 12A, p. 726. Ed. by Grossman, L. & Moldave, K. New York: Academic Press Inc.
 Satoh, K. & Inoue, Y. (1969). *Biochem. J.* **114**, 271.
 Stanley, W. M. (1967). In *Methods in Enzymology*, vol. 12A, p. 404. Ed. by Grossman, L. & Moldave, K. New York: Academic Press Inc.
 Sulkowski, E. & Laskowski, M., sen. (1962). *J. biol. Chem.* **237**, 2620.
 Winder, F. G. & Coughlan, M. P. (1967). *Biochim. biophys. Acta*, **134**, 215.
 Winder, F. G. & Coughlan, M. P. (1969). *Biochem. J.* **111**, 679.
 Winder, F. G. & Lavin, M. (1969). *Biochem. J.* **115**, 6P.

Role of Converting Bacteriophage in Antibiotic Resistance of Strains of *Staphylococcus aureus*

By F. A. CLYNES and L. K. DUNICAN. (*Department of Microbiology, University College, Galway, Irish Republic*)

Bacteriophage has been found to be a significant vector of antibiotic-resistance among strains of *Staphylococcus aureus* (Ritz & Baldwin, 1958; Mitsuhashi, Hasimoto, Kono & Morimura, 1965; Mitsuhashi, Oshima, Kawaharada & Hasimoto, 1965). However, its role in antibiotic-resistance within the recipient organism has not been clarified.

The phenomenon of bacteriophage conversion has been established in *Corynebacterium diphtheriae* (Freeman, 1951), where toxin production by the organism is dependent on the lysogenic state. The present study indicates that a somewhat similar relationship exists between probacteriophage and antibiotic-resistance in some strains of *S. aureus*.

S. aureus strain B was used as donor organism with drug-sensitive strains 8325 (containing P11, P12, P13), 8325-4, 8325-4 (P11), 8325-4 (P12) and 8325-4 (P13, P11 de) as recipients. Mitomycin C induction of *S. aureus* strain B yielded probacteriophage GU capable of transferring resistance to penicillin, tetracycline, cadmium, arsenate, lead and mercury in different combinations; loss of a β -haemolysin sometimes accompanied the acquisition of antibiotic-resistance. In addition, the transductants had required immunity to pro-

bacteriophage GU and to induced lysates of itself and of the other transductants prepared. Transductants were now capable of acting as donors, their induced lysates transferring their acquired resistances to new recipients.

Growth of transductants at 43°C, treatment known to eliminate some extrachromosomal DNA, yielded a low percentage of sensitive variants; these variants had simultaneously lost their antibiotic resistances and their immunity to bacteriophage GU.

Transduction of drug-sensitive hospital strains of *S. aureus* also gave cultures showing immunity to bacteriophage GU. Although probacteriophage pattern of these strains is not defined, as in Novick's strains, these results indicate that the lysogenic state and antibiotic-resistance are interdependent here also.

It was concluded that transducing bacteriophage and resistance markers are inseparable in these strains of *S. aureus* and either borne as a plasmid-bacteriophage association or within the bacteriophage genome itself.

F.C. holds a post-graduate research grant from the Department of Education.

- Freeman, V. J. (1951). *J. Bact.* **61**, 675.
 Mitsuhashi, S., Hasimoto, H., Kono, M. & Morimura, M. (1965). *J. Bact.* **89**, 988.
 Mitsuhashi, S., Oshima, H., Kawaharada, U. & Hasimoto, H. (1965). *J. Bact.* **89**, 967.
 Ritz, H. L. & Baldwin, J. N. (1958). *Bact. Proc.* p. 40.

The Isolation of Rat Liver Phenol Sulphotransferase

By F. A. McEVOY and J. CARROLL. (*Department of Biochemistry, Trinity College, Dublin 2, Irish Republic*.)

The sulphotransferases catalyse the transfer of the sulphuryl group of adenosine 3'-phosphate 5'-sulphatophosphate to an acceptor to form the sulphate ester and adenosine 3',5'-diphosphate. The acceptors include hydroxyl-containing compounds, and the sulphurylation of simple phenols, steroids and tyrosine esters is of particular interest. Using ion-exchange chromatography Banerjee & Roy (1966) separated the steroid from the phenol-sulphurylating activity of guinea-pig liver, and this latter fraction was also active towards tyrosyl esters (Banerjee & Roy, 1968). Mattock & Jones (1970) purified the L-tyrosine methyl ester-sulphurylating activity of female rat liver 70-fold, but this preparation was contaminated with phenol sulphotransferase (adenosine 3'-phosphate 5'-sulphatophosphate-phenol sulphotransferase, EC 2.8.2.1). Studies carried out in this laboratory on the susceptibility to denaturation, together with the effects of