EFFECTS OF PENICILLIN ON BACTERIAL CELL WALL SYNTHESIS IN E. COLI AND IN S. AUREUS. S. Mathenson* and J. L. Strominger. Dept. of Pharmacology, Washington Univ. School of Medicine, St. Louis.

Several lines of evidence indicating that penicillin interfere specifically with the synthesis of the cell wall of S. aureus are substantiated by the following experiments: Incorporation of C^{14}-lysine into cell wall was inhibited 91% by penicillin under conditions where incorporation into cell protein was diminished by only 2%. Similarly, incorporation of P^{32}-inorganic phosphate into the cell wall of S. aureus was inhibited 68% under conditions where no inhibition of incorporation was observed into the cold TCA precipitate of the cell contents. In E. coli, where the cell wall structure is more complex, incorporation of H^3-diaminopimelic acid into cell wall was inhibited 72% where C^{14}-glucose incorporation into cell wall was inhibited only 14% (double labeling experiment). An E. coli mutant requiring both DAP and lysine, kindly given by J. Lederberg, was used in these experiments. These observations provide direct evidence that penicillin inhibits the synthesis of the "basal structure" of the cell wall in both S. aureus and E. coli. In E. coli, the main fraction of the complex cell wall is a "superstructure" containing protein and lipid, the synthesis of which from C^{14}-glucose is not inhibited by penicillin (cf. Trucco and Pardee, J. Biol. Chem. 230:435, 1958, whose conflicting conclusions are resolved by these experiments). (Supported by NIAID Grant)