since there are occasional trivalent carbon atoms and quadrivalent nitrogens.

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DRUGS AND CELL CATALYSTS

The Interaction of Drugs and Cell Catalysts. By FREDERICK BERNHEIM. 85 pp. Minneapolis: Burgess Publishing Company. 1942. $2.25.

THE author of this limited review has summarized the principal literature concerning the *in vitro* interaction of certain selected drugs and cell catalysts in order to attempt a correlation of pharmacological action, and the fate of drugs in the body, with enzyme action. No claim is made for a complete survey of the field. Certain chemical compounds ordinarily termed "drugs," such as the indifferent narcotics, the vitamins and the hormones, are purposely excluded from consideration.

This review, although somewhat less complete than the title might indicate, is perhaps timely and should be studied carefully by all writers and teachers who are concerned with drug actions. It can be recommended heartily to those in this class who have yielded to the temptation to bridge the enormous gaps in our present knowledge concerning the reactions of cells to changes in their chemical environment by dogmatically invoking "enzyme actions."

The critical reader can not finish many sections of this review without being conditioned, by repetition, to the fact that correlations between pharmacological and enzyme action apply, for the most part, in isolated instances only, and under strict and limiting conditions of dosage, physiological state, animal species, etc. A few notable exceptions such as cyanide and physostigmine prove the rule. The evidence, for example, which relates the pharmacological actions of cyanide to its inhibiting effect on cytochrome oxidase, and physostigmine to its inhibitory action on cholinesterase, is definitive and convincing. On the contrary, as the author infers, a generalization such as the one which invokes the cholinesterase mechanism to explain all the diverse pharmacological actions of morphine, strychnine, curare and methylene blue is premature and unjustified on the basis of the facts now available.

Some reasonably good correlations are possible regarding the *in vivo* degradation of certain drugs as a result of enzymic catalysis. The hydrolytic deacetylation of heroin by a specific esterase and the oxidation of alcohol by a liver oxidase are good examples.

The author, a pioneer in the field of which he writes, takes the only position which appears to be tenable at the present time, *i.e.*, he reviews the facts, indicates the possible mechanisms which may be involved, suggests trends and methods of study and carefully refrains from personal opinions and from broad generalizations. He is frank to admit that one of the principal purposes of this review is to invite greater investigative effort in this field. The review will be welcomed by those engaged in this line of endeavor and should provide great satisfaction to the casual reader whose search is for questions, rather than answers.

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SPECIAL ARTICLES

THE LETHAL EFFECT OF TRIETHYLENE GLYCOL VAPOR ON AIR-BORNE BACTERIA AND INFLUENZA VIRUS[1]

IN an attempt to gain further insight into the mechanism of the bactericidal and viricidal action exhibited by propylene glycol vapor for air-borne disease agents[2, 3] a number of glycols and related compounds were tested with the same techniques employed in the studies on propylene glycol. Among the compounds investigated were other members of the aliphatic glycol series such as ethylene glycol, diethylene glycol, triethylene glycol, trimethylene glycol, dipropylene glycol, various butylene glycols, a number of aliphatic and aromatic ethers, alcohols, ketones and amines and compounds containing various combinations of these active chemical radicals.[4] Some of these substances were found to be fully as effective as propylene glycol and several of them considerably more lethal for air-suspended bacteria. However, with two notable exceptions most of these latter compounds were unsuitable for practical use because in the concentrations required they were toxic or possessed a disagreeable odor. The two substances which exhibited a high degree of germicidal potency and were odorless were triethylene glycol and dipropylene glycol. There is not much data available on the

[1] This investigation was aided in part through the Commission on Cross Infections in Hospitals, Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, Preventive Medicine Division, Office of the Surgeon General, U. S. Army.

[2] O. H. Robertson, E. Bigg, T. T. Puck and B. F. Miller, *Jour. Exp. Med.*, 75: 593, 1942.

[3] O. H. Robertson, C. G. Loosli, T. T. Puck, E. Bigg and B. F. Miller, SCIENCE, 94: 612, 1941.

[4] A detailed record of these experiments together with a theoretical analysis of the mechanism of action of glycol vapors will be presented elsewhere.