

greatest problems—the population explosion. In the future, even newer compounds and newer methods discovered by research-oriented pharmaceutical companies will play an even greater role in population control.

Penicillin, and its availability for use on a mass production basis, and chloramphenicol, a widely used broad-spectrum antibiotic, were also the results of work in government, university, and industrial laboratories. Today the search for soil samples that may contain micro-organisms which will produce as yet unknown antibiotics, useful against viruses and cancer as well as against larger micro-organisms infecting man and animals, is an expensive research operation. The venture capital being plowed into it comes almost entirely from the research-oriented drug firms. In spite of continued large-scale efforts to find new antibiotics, few have emerged in recent years. Nevertheless it is important that these costly industrial research programs be continued.

You have occasionally heard references to “molecular manipulation” and the implication that this is bad and wasteful. It is a rare instance when a company markets a product that doesn’t have some superiority over existing ones. There are many instances where molecular modification has led to major advances in medicine. Sometimes the drugs have been useful in new diseases and in other cases new clinical values of such drugs turn up months or even years after they have been marketed.

The discovery of aspirin as an analgesic was the result of attempts to improve the properties of a plant constituent, salicylic acid. The local anesthetic, procaine hydrochloride, was found in attempts to synthesize a simple molecule retaining the structural features of the complex alkaloid, cocaine.

Studies in which attempts were being made to simplify the chemical structure of quinine led to synthesis of Atabrine and other antimalarials. Later studies of pharmacologic properties of the synthetic antimalarials led to observation of an unexpected, new effect which was interpreted as an antagonistic action to histamine. These observations culminated in synthesis of an important new class of drugs, antihistamines. Later observation of the sedative effect of one of these on mental patients in France led to discovery of a very useful tranquilizer, chlorpromazine. This drug has played a major role in decreasing the number of patient beds in use in mental hospitals for 11 consecutive years. Thus, antihistamines and tranquilizers can trace their history to an ancient remedy, quinine, and its molecular modification.

Chance pharmacologic observations on existing drugs led to many important new drugs and to new uses for old drugs.

Today’s new drug research is complex. Industry chemists are engaged in large-scale chemical synthesis programs. Various members of the biomedical research team screen these compounds for activity in animals. The promising compounds are then tested for toxicity and if the mass of data from this screening suggests that the compound is safe and may have utility in the treatment of human illness, a “Notice of Claimed Investigational Exemption for New Drugs” (IND) is filed with the Food and Drug Administration.

I do not want to take the time here to describe in detail the complicated processes of research that lead to new drugs; however, Mr. Chairman, with your permission I would like to submit for the record a chart describing the process.