

having received the minimum effective dose (M. E. D.) or over. That dose is the M. E. D. which is effective in reducing the organisms to 1,000 or less per cu. mm. in two of the three rats injected therewith.

It has been found that the virulence of the organism is subject to many variables and for this reason it is highly desirable to inject part of the rats on a given infection with a control preparation. By this means the accuracy and value of the method are considerably increased. For the past two years this laboratory has used a preparation of Salvarsan as a control.

It should be noted that the M. E. D. is not the dose which gives an absolute cure but is merely the dose which clears the blood stream of organisms for a short period. Voegtlin and Smith have shown it to be a function of the curative dose, therefore, it is permissible to use it as a means of measuring the relative parasitocidal value of different compounds and to assume that a product having a high M. E. D. as compared to the standard product (Salvarsan) will also have a relatively high curative effect in the treatment of disease. In using this method it is possible to get results in forty-eight hours after inoculating the animals with organisms whereas in the determination of the curative or sterilizing dose of earlier investigators at least sixty days' observation was necessary in order to be sure that no relapses would occur.

The method of injection of the drug in this test is that described for the toxicity test, using more dilute solutions since the M. E. D. is but a fraction of the tolerated dose. At present a uniform volume of 50 cc is used in order to allow a greater accuracy in weighing the drug.

Twenty-four hours after treatment a drop of blood is taken from the tail of each animal and a smear made. Those specimens showing organisms are noted and a count made to determine the number of parasites per cu. mm. This information is used to determine the M. E. D. as described above. The counts are made by diluting the blood with a carbol-fuchsin staining fluid and counting in the ordinary chamber used for counting blood cells.

Recent years have seen much progress in the application of quantitative methods to the biological testing of drugs. The improved methods of evaluating pharmaceutical arsenicals have had a two-fold aim in this laboratory: first, to give to the physician a Salvarsan and a Neosalvarsan of as low toxicity as is compatible with a high therapeutic activity thereby maintaining the most favorable chemotherapeutic ratio or index; second, to ascertain for the medical profession the toxicity and parasitocidal values of such new compounds as are synthesized by chemists for use in the treatment of disease.

COÖPERATION IN PHARMACEUTICAL RESEARCH.*

BY H. V. ARNY.

Two years since it was my privilege to present a paper before this association under the title "Research and the Cash Register" wherein it was pointed out that the publication of high grade research was of direct personal benefit to every mem-

* Read at the 53rd annual convention of the New Jersey Pharmaceutical Association, held at Spring Lake, June 12-15, 1923.

ber of the calling to which the research worker belonged. The paper was a plea for more interest in pharmaceutical research by all pharmacists; retail, wholesale or manufacturing. It urged encouragement of research by all pharmaceutical associations. It pointed out the desirability of research (especially along the line of problems in galenic pharmacy) by retail pharmacists. It revealed the hopes of some of us as to the development of agencies devoted to the proper recognition of pharmaceutical research.

During the two years that have elapsed since the reading of that paper gratifying progress has been made. The great research center of America, the National Research Council, now has a pharmaceutical sub-committee in its Division of Chemistry and a sub-committee on pharmaceutical botany in its Division on Biology and other points of connection with pharmacy are now being discussed.

THE NATIONAL CONFERENCE ON PHARMACEUTICAL RESEARCH.

While we must all admit that these affiliations of Pharmacy with the National Research Council are highly desirable there is need for a still closer coöperation, a clearing-house where all research workers in pharmacy may fore-gather for the interchange of views, for the giving and receiving of advice on research problems, for the devising of plans of coöperative research. This need was met by the organization last year of the National Conference on Pharmaceutical Research, which now includes among its members the following national associations.

- American Conference of Pharmaceutical Faculties.
- American Drug Manufacturers Association.
- American Pharmaceutical Association.
- Committee of Revision, United States Pharmacopœia.
- National Association of Retail Druggists.

The following national bodies have expressed themselves as favoring affiliation in the Research Conference but have not yet become members.

- American Chemical Society.
- American Pharmaceutical Manufacturers Association.
- Bureau of Chemistry, U. S. Department of Agriculture.
- Committee on Revision, National Formulary.
- National Association of Boards of Pharmacy.
- Proprietary Association of America.

All six of these organizations will have delegates or "observers" at the second annual meeting of the Research Conference which will be held next September in Asheville.

A few words as to the research activities of the organizations just mentioned may be in order.

American Conference of Pharmaceutical Faculties, constituting the leading colleges of pharmacy in this country, is of course deeply interested in research. It has a Committee on Research, which has done good work in the past and has much more yet to do.

American Drug Manufacturers Association has a strong Scientific Section, which is doing magnificent work on unification of assay methods and on the study of monographs of the Pharmacopœia and of the Formulary. A visit to the sessions of the Section is an inspiration to any pharmacist fortunate enough to be present.

American Pharmaceutical Association, the mother of our national pharmaceutical organization, is the fountain head of American Pharmaceutical research. Not only are the most notable reports on research read at its annual meetings and published in its JOURNAL but research is also stimulated by the A. Ph. A. YEAR BOOK, by its Ebert Prize and by the annual grants now made from its Research Fund.

Committee of Revision, United States Pharmacopœia is a research agency without peer in this country. It is remarkable in the first place, as an organization that has been conducting research for over a hundred years. It is moreover one of the finest examples of practical coöperative research that the world possesses. Were its activities along lines other than medical and pharmaceutical, were it in the hands of people more expert along the lines of publicity, it would be known throughout the length and breadth of this land even as it is known to us pharmacists, as one of America's greatest scientific institutions.

National Association of Retail Druggists is more than an organization devoted to the commercial interest of retail pharmacy. Its leaders have ever felt the importance of research especially in the field of galenical pharmacy, as manifested in the valuable work of its Committee on U. S. P. and N. F. Propaganda.

The American Chemical Society, that great organization of 15,000 chemists of this country, includes in its membership practically every American pharmacist conducting research along chemical lines. These pharmaceutical chemists foregather at the sessions of the Division on Medicinal Chemicals held at the semi-annual conventions of the Society. A number of its non-pharmaceutical members are doing research that our own pharmaceutical group should be doing; thereby showing that research in pharmaceutical chemistry is of wide-spread importance and interest.

The American Pharmaceutical Manufacturers Association is doing work of great value to manufacturing pharmacy in the activities of its Committee on Formulas.

Bureau of Chemistry, U. S. Department of Agriculture, is not only known to us as the agency having on its hands the enforcement of the national food and drug law but also as an important factor in American research. Some of the finest research work along the lines of pharmaceutical chemistry and pharmaceutical botany is being conducted by the scientists of the Bureau.

Committee on Revision, National Formulary, like the U. S. P. Revision Committee, is doing coöperative research work of great value to American science in general and to American Pharmacy in particular.

National Association of Boards of Pharmacy is doing great work along the lines of pharmaceutical statistical research. In this line it occupies a unique field of service.

Proprietary Association of America has among its membership, firms whose chemists are doing noteworthy research work. The Association is also planning to have a research laboratory in the new Headquarters that it is building in Chicago.

The foregoing roll call of national organizations interested in pharmaceutical research covers rather fully but by no means exhausts the list of national organizations that should be affiliated with the National Conference on Pharmaceutical Research. The list however, justified the creation of the Research Conference and encourages the belief that with such support, the Research Conference will be able to accomplish much for American Pharmacy.

OBJECTS OF THE RESEARCH CONFERENCE.

Perhaps the question may be raised; what is the use of such a research conference?

There are so many things that the Research Conference can do, that it is impossible to relate all of its potentialities, but three or four items may suffice to show its need. In the first place there is a distinct need of an annual opportunity of getting together the workers in pharmaceutical research for an interchange of views.

Of course we have such a forum in the A. Ph. A. Scientific Section but that is a body designed to hear the results of research rather than to discuss research procedure. Then there are a number of chemists performing work along the lines of pharmaceutical chemistry, who do not attend the meetings of the American Pharmaceutical Association. It is hoped that in the Research Conference we can have all of these workers as delegates from the organization to which they give their primal allegiance.

Having gotten these research workers together, the next desirable aim is to plan coöperative research or what is of equal importance, to prevent duplication of research efforts. Taking a tangible illustration of each phase just suggested; here is a problem of pharmacopœial revision that needs solving. The dozen men constituting the U. S. P. subcommittee entrusted with the work on hand have enough to do with routine tasks and this particular problem requires expert handling. Of course, even now the expert in such work is sought out for advice, but if the Research Conference functions as it should, we will have a census of all workers in pharmaceutical research and know instantly who is the best man to consult on the special work on hand. On the other side, it has happened that after a member of the U. S. P. Revision Committee has worked as special referee on a certain topic, he finds the very work he has just done covered in a paper published just as the referee work is completed. If the census of pharmaceutical research workers includes work in contemplation as well as work already accomplished a good deal of lost effort will be eliminated.

A third aim will be the financial encouragement of pharmaceutical research. Of the millions that have been poured into research funds practically none has gone to pharmaceutical research. This statement may be challenged from one standpoint. Much money is going to pharmaceutical research or research that should be done by those trained in pharmacy but it is masqueraded under the names of medical research, chemical research or what not.

We pharmacists should have no objection to our friends in the sciences doing pharmaceutical research. It shows how great a field is open to the highly trained pharmacist. Nor have we the right to repine over the fact that money is going to pharmaceutical research under other names. It simply means that we pharmacists have not given sufficient publicity to the fact that there are many of us who are

capable, ready and anxious to do certain research work if only properly encouraged. A very important part of the work of the Research Conference will be to show what research work has been done in the past by trained pharmacists and how much more there is remaining to be done if only the proper financial encouragement is given.

Above it was stated that very little money is available for pharmaceutical research. The only considerable amount is in the American Pharmaceutical Research Fund, the available income from which affords grants now totalling \$400 per annum. It seems more than likely that other national bodies when properly approached will make a provision for similar annual grants for pharmaceutical research; another specific illustration of the kind of work that can be performed by the Research Conference. However were I to enumerate all of the specific work which the Research Conference has before it, I would tire my auditors.

OTHER RESEARCH CONFERENCE AFFILIATIONS.

At this time the members of the New Jersey Association might ask; "What has all of this to do with us?"

In my previous paper I emphasized that all fine pharmaceutical research redounded to the credit of every member of our calling, but there is likely to be a more personal interest in the Research Conference by the members of the New Jersey Association in the near future.

Up to now the organizing efforts of the Research Conference have been directed solely toward national bodies but now that practically all available national bodies are lined up for the Conference, we are giving some thought to the affiliation of units other than national.

First there are all the colleges of pharmacy. These are now affiliated with the Research Conference through the national body the Conference of Faculties, but we all believe that a direct contact of the individual college and its research staff (which should mean its entire teaching staff) with the Research Conference is much to be desired. Then we have possible point of contact, giving promise of valuable results, between the Research Conference and the State pharmaceutical associations through their committees on papers and queries and similar scientific committees. As several of our State associations do not appear to have such scientific committees the proposition must be handled with State associations as individual organizations.

Nothing definite in this direction has been considered by the Research Conference, but it is likely that there will be created by the Research Conference an auxiliary committee consisting of the chairman of the committee on papers and queries or of a similar scientific committee of each State association having such a committee. Such a point of contact between the Research Conference and a State association would be of benefit to both, since each body would then have the opportunity of knowing what the other one was doing for research.

As just mentioned this is merely a possible activity of the Research Conference and I am not empowered to say anything more specific; but the topic is well worth our careful thought.

CONCLUSION.

In conclusion, I hope that I am leaving with you the impression that pharmaceutical research is well worth our sympathetic thought and that the National Conference is deserving of your confidence and support.