
PROGRAM

PROGRESS

REPORT

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16 AMEDS RESEARCH AND DEVELOPMENT PROGRAM

Research

1. Biological and Medical Aspects of Ionizing Radiation

a. Construction of a nuclear pulsed reactor at the Forest Glen section of Walter Reed Army Medical Center is scheduled for completion early in 1961. The reactor will be operated by the Diamond Ordnance Fuze Laboratories and will be available to the Army Medical Service for about 10 percent of its normal operating time. The best estimate now is that a period of six to nine months will be required to establish dosimetry values for both the gamma and neutron radiations. Once these values are established, neutron radiation of small animals, mice and rats, will begin. Part of the biological program to be associated with the reactor will concern the chemical protection of rodents against thermal neutrons. Other facets of the biological program will concern relative biological effectiveness studies, sodium-24 studies, and repetition of some of the studies which have been evaluated using an x-ray machine as the only radiation source. It is also anticipated that isotope production and activation analysis will be done when the reactor is operational. The reactor will be capable of delivering high doses of radiation (5, 10, 15,000 rads) consisting of a mixture of both gamma rays and neutrons for periods not exceeding several minutes. In this sense it will be a nuclear weapons simulant. The reactor will be used as a radiation source on biological specimens of all sizes.

b. The U. S. Army Medical Research Unit, Europe, has a whole body counter in operation at Landstuhl, Germany. It has been of major value in obtaining data on the potassium and cesium burden in German civilian population and in basic problems of absolute calibration of whole body counters. This system is thorough and precise and agreement between Walter Reed Army Institute of Research and Los Alamos Scientific Laboratory is very good. Excellent data has been obtained on a large population group. Landstuhl has turned out to be an excellent location for this instrument and it lends itself to important studies in clinical diagnosis using radioactive tracers at low levels.

c. Studies on expected casualties from nuclear weapons have been finalized for certain parameters. A classified report entitled: "A System for Estimating the Medical Load in Nuclear Warfare," dated 14 December 1959, was completed at the close of the previous quarter.

2. Anti-Radiation Drug Program

Progress in protecting animals against the lethal action of radiation has been achieved by the discovery of two additional chemical families which enhance the protective action of amino mercaptans. However, these new families do not have much protection action if given alone without mercaptans. The mercaptans, which are being developed primarily on a contract program with universities, research institutes and industry, are just becoming available for large animal testing. These agents were also shown to protect against a central nervous death

Research

syndrome (or immediate incapacitation) or a gastro-intestinal death syndrome. These new findings in dogs are of fundamental theoretical and practical importance and further demonstrate the utility which might be expected from a useful agent.

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3. Ecology and Control of Disease Vectors and Reservoirs

a. Strains of sandfly fever virus have been recovered from sandflies and patients in Pakistan and Iran. This was accomplished by a team from the Walter Reed Army Institute of Research in collaboration with the University of Maryland Medical School and represents the first opportunity to study this virus with modern techniques. The virus was isolated from Sergentomyia sandflies for the first time, as well as from the classical vector, Phlebotomus.

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b. Q-fever rickettsiae have been isolated from ticks in the Kuala Lumpur area (2 pools from Haemaphysalis and 1 pool from Ixodes ticks.) This is the first isolation of Q-fever rickettsiae in Malaya. There is evidence that a new species of chigger (Leptotrombidium arenicols) may be a vector of scrub typhus in Malaya; and, at least 4 viruses in the "dengue group" causing human disease.

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c. Significant advances have been made in knowledge about the ecology of viral and rickettsial diseases in Southeast Asia, including the dengue group of viruses and other members of the "Group-B" arthropod-borne viruses, as well as sandfly fever, and scrub typhus. Valuable data have been obtained on the control of vectors of disease in this area, i.e., highly effective repellents against mosquitoes and terrestrial leeches and an insecticide which remains effective against chiggers for more than two years after application. Knowledge about the habits and identification of potential vectors and reservoirs of disease has also been enhanced. It is anticipated that work will continue along similar lines in FY 1961 but there will be increased emphasis on obtaining information about potential vectors and reservoirs of disease in strategic areas and on new approaches regarding insect control.

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4. Psychophysiological Studies

The first definitive study on the measurement of impulse-type noise has been completed with the recording and analyzing of sounds produced by a variety of Army weapons. Recent investigations have demonstrated the possibility of protecting the ear from impulse-type noise by the automatic activation of certain inner-ear muscles just prior to the gun fire.

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5. Oral Diseases

a. Studies on new methods for control of dental calculus are continuing since it is now possible to produce this most important cause of periodontal disease for the first time in experimental animals by alteration of diet. Progress continues to be made in the effort to produce a vaccine for immunization against dental caries; and, in the study of pathologic keratinizing processes.

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Research

b. During FY 1961, investigations on dental caries, periodontal disease and other oral diseases will continue with emphasis placed on prevention and control. Studies will continue on the development of new dental materials and improvement of present materials.

6. Traumatic Surgery and Shock

a. A completely disposable dialyzing unit for the compact Macneill-Collins artificial kidney has been developed by a contractual investigator. This development further simplifies the operation of this unit.

b. Focused ultrasound was found to be a highly effective method for treating painful and recurrent neuromas which occur rather frequently in amputation stumps or as the result of other trauma. The use of focused ultrasound in the treatment of experimental traumatic epilepsy also has been highly successful, and trials of this method in the treatment of lesions of the brain in humans are being initiated.

c. By the use of an initial large dose of total body irradiation supplemented intermittently throughout early post-operative course by cortisone and smaller doses of radiation, investigators have succeeded in obtaining at least eighteen months survival of a homotransplanted kidney in nonidentical human twins. This is one of the first, if not the first, successful efforts of this kind. Although the investigators admit that the empirical methods by which they achieved this apparent success are probably not the real answers to the problem of obtaining permanent survival of tissue homotransplants, they believe that this effort has revealed certain important leads relevant to the understanding of the homotransplant problem.

7. Blood, Blood Derivatives and Artificial Expanders

A Department of Defense project has resulted in successful preservation of glycerolated frozen red blood cells for as long as three years. Nearly 1,500 successful transfusions of blood preserved by this method have been administered clinically to patients with less than the usual incidence of transfusion reactions and a lower incidence of serum hepatitis. Although at present the method has not been developed to the point of practicality for large scale military operations, further improvements and simplification of techniques are expected. Even now, the method provides a means for long term storage of appreciable quantities of rare types of blood.

8. Clinical Investigations

A study of the post-operative convalescence of over 400 military patients revealed that Army men over 30 could be returned to duty earlier than those under 30 who had undergone comparable operations. It was found that, in general, the group over 30 was composed of career military men who had "better education, better motivation and better protoplasm" than their younger confreres and, also, that the doctor is frequently the one who prolongs surgical convalescence. It is believed that a doctor who knows and evaluates his patients individually will be able to return many

Research

of them to duty earlier and avoid many more noneffective days than his colleague who is less acquainted with his patients and blindly follows a stereotyped routine regarding surgical convalescence.

9. Environmental Medicine

Research on cold acclimation has shown that man can be adapted to cold, and that this adaptation can exist coincidentally with heat acclimation. Further tests of cold adaptation will be conducted in the field to prove the practicality of preconditioning troops for operations anywhere in the world. During the cold studies, it was determined that, in the adapted man, there was a decreased heat loss, a change in the method of heat production, and increased resistance to cold injury. It has been determined that man not acclimatized to heat performs poorly when exposed to it.

10. Nutrition

a. Studies have shown that folic acid in tablet form is apparently much more potent than the folic acid consumed in daily diets. This has been a major factor for consideration by the Food and Drug Administration in curtailing the inclusion of folic acid in multivitamin preparations.

b. Research continues in an effort to find a suitable intravenous fat emulsion. A new emulsion of cottonseed oil, identified as S-R Emulsion 659, promises to be better than our present lipomul, but this emulsion has not yet undergone human testing.

11. Accidental Trauma

a. Careful studies of Army aircraft accidents are providing data on how to delethalize the cockpit, cabin structure, and interior of small aircraft in order to prevent injury or death of the occupants when these types of aircraft are involved in crashes.

b. The cause and prevention of motor vehicle accidents has been recognized as a national problem; therefore, support for this research is being transferred from the Army to the U. S. Public Health Service.

12. Studies in Immunization

a. Studies conducted under the auspices of the Armed Forces Epidemiological Board Commission on Influenza, supported by Army Medical Service funds, have resulted in the development of a method which may enable more rapid production of influenza vaccine. It has been shown that by recombining an inactive, adapted influenza virus (PR8) with an infective, recently isolated Asian influenza virus (A2), a virus is obtained with characteristics that result in increased yields when grown in eggs to produce influenza vaccine. Asian influenza virus (A2) has been used in the production of Asian influenza vaccine since 1957. Difficulty in large scale production arises from the fact that eggs have an inhibiting substance which makes it difficult for the vaccine to adapt and flourish on the chick embryo growth medium. The PR8 virus, on the other hand, is

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more resistant to this inhibiting substance found in eggs. By combining the PR8 virus with the A2 virus, genetic reactions will result in an Asian influenza virus which has the growth characteristics of the PR8 virus, while at the same time retaining the capability of immunizing against influenza.

b. A measles vaccine of the live attenuated type with its lack of undesirable reactions, together with excellent antibody response and antibody duration is being extensively field tested. A new "B" vaccine, designed to obviate the febrile responses observed in the original vaccine, has been produced by additional chick embryo and culture passage for greater attenuation.

Development

13. Development of Medical, Dental & Veterinary Equipment & Supplies

a. The following recapitulation of the FY 1960 AMEDS Medical Equipment Development Program reflects the major changes for the fourth quarter activities:

Items of Supplies & Equipment	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
Initiated	3	-	-	7	10
Superseded	-	-	-	2	2
Cancelled	-	1	17	-	18
Completed	5	5	5	5	20
Type Classified	-	1	1	-	2
Service Tested					
Initiated	7	7	11	5	30
Completed	2	1	5	7	15

b. Total funds contributed by the three military services for the FY 1961 Research and Development Program amounted to \$360,000 (\$160,000 for Army), the same amount allocated in FY 1960. As a result of the In-Process review, a realignment of priorities have been effected.

c. Emphasis was continued on improvement of medical equipment for field medical units to reduce the weight and cube and to increase efficiency. Representative of some of the items in the development cycle are the Bed, Field, Folding where a weight decrease of 60 percent and a reduction in cube of 55 percent was effected, and the Sterilizer, Dressing Pressure Field, 16 x 24, which now weighs 70 percent less and has a reduced cube of 30 percent.

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Development

14. Contracts

A summary of contracts administered by the Medical Research and Development Command at the close of FY 1960 is shown in the table below:

Type of Contract	Number
Cost Reimbursement	384
Cost Plus Fixed Fee	13
Fixed Price	5
Total	402

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