electric method of determining the percentage of hemoglobin in the blood.

In addition, the following excellent exhibits are deemed worthy of special mention:

That of EBEN J. CAREY, Marquette University School of Medicine, Milwaukee, Wisconsin, illustrating a continuation of the experimental studies of bone growth, for which he received the silver medal in Class I last year.

That of ARTHUR W. ERSKINE, Cedar Rapids, Iowa, on Roentgen therapy technic.

That of C. H. THIENES and A. J. HOCKETT, on the effect of post-pituitary extract on the absorption of drugs from the gastro-intestinal tract.

CLASS II

[Awards in Class II are made for exhibits which do not exemplify purely experimental studies, and which are judged on basis of the excellence of correlating facts and excellence of presentation.]

The gold medal to PHILEMON E. TRUESDALE, Fall River, Massachusetts, for experimental demonstration of the mechanism of transposition of abdominal viscera following rupture of the diaphragm.

The silver medal to A. V. HARDY, University of Iowa, State Hygienic Laboratories, Iowa City, Iowa, for exhibit of various aspects of undulant fever.

The bronze medal to W. T. CUMMINS, Southern Pacific General Hospital, San Francisco; JOSEPH K. SMITH, Kern General Hospital, Bakersfield, California, and C. H. HALLIDAY, Baltimore, Maryland, for exhibit of various aspects of coccidioidal granuloma.

Certificates of Merit, Class II, were awarded to the following (alphabetically arranged):

RICHARD B. CATTELL and SHIELDS WARREN, Lahey Clinic, Boston, for an exhibit of the pathology of the thyroid gland.

J. J. ELLER and N. P. ANDERSON, New York, for exhibit on cancer supervention in skin diseases.

J. EARL ELSE, University of Oregon Medical School, Portland, Oregon, for an exhibit of a study of goiter.

C. C. MCCOY, H. J. GERSTENBERGER, L. P. HARSH and D. G. SHIELDS, Babies' and Children's Hospital, Cleveland, Ohio, for an exhibit of the study of bone disorders in childhood.

JOHN OLIVER MCREYNOLDS, St. Paul's Hospital, Dallas, Texas, for an exhibit of the structure of the crystalline lens system in man and the lower animals.

In addition, the following exhibits are deemed worthy of special mention:

That of C. G. SUTHERLAND, Mayo Clinic, Rochester, Minnesota, showing Roentgenograms of bone lesions.

That of GEORGE W. SWIFT, Neuro-Surgical Clinic, Seattle, Washington, illustrating choked disk.

EDUCATIONAL EXHIBITS

A special Certificate of Merit is awarded to the U. S. Pharmacopeial Convention for the best exhibit in the educational (national organizations) classification. Mention is also made of the excellent exhibit of the U. S. Department of Commerce, Bureau of Mines.

COMMENTS

The committee commends the Special Cooperative Exhibit on Fractures, and desires to thank the members of the committee in charge and also the representatives of the U. S. Army Medical Corps for supplying facilities and for carrying out the demonstrations. The committee commends the exhibit on morbid anatomy, excellently demonstrated by the members of the Committee on Fresh Pathology, which has become an established feature. The committee commends the special demonstration of the biochemical diagnostic methods and desires to express its appreciation of the excellent work of the personnel in charge of the demonstrations.

The committee is impressed by the cooperation of the four sections sponsoring exhibits among their members, and also of the educational and governmental exhibits. It desires especially to commend the exhibits of syphilis of the eye presented by the members of the Section on Ophthalmology.

The committee commends the excellent arrangement of the scientific exhibit, especially the methods used for indicating the nature of the exhibits, the new type of set-up, and the thoroughly adequate illumination, as well as the many and excellent personal demonstrations. The spirit of cooperation on the part of the exhibitors in aiding the management deserves especial recognition.

C. R. BARDEEN, Madison, Wisconsin, *Chairman*
G. C. LANE, Boston
WILLIAM OPHULS, San Francisco
W. W. WASSON, Denver
O. H. WANGENSTEEN, Minneapolis
G. B. WEBB, Colorado Springs

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A METHOD FOR OBTAINING A BREEDING STOCK OF RATS FREE FROM INTESTINAL PROTOZOA[1]

IN planning cross-infection or host-parasite relations studies one of the most serious difficulties encountered is the lack of experimental animals that are parasite-free. As a rule laboratory rats are infected with several species of intestinal protozoa, although different colonies of rats may differ as to

[1] From the department of protozoology, Johns Hopkins University School of Hygiene and Public Health. This work was aided by a grant from the committee on scientific research of the American Medical Association.

the species present. Kessel[2] and Chiang[3] have both reported that amebae-free rats may be selected from colonies in which amebic infections are present. It is possible to find older animals that appear to be entirely free from amebae but, when these animals breed, the young are invariably infected with amebae at the time they are weaned, even though they have not been in contact with any rats except the apparently amebae-free mothers. In view of Kessel's statement that "the most advantageous time to choose rats for feeding experiments is shortly after they are weaned or about the age of two months. Among rats of this age will be found the greatest number free from amebic infections . . ." it seems that his method for detecting amebic infections is not very effective with young rats. Out of two hundred examinations on young rats between four and twelve weeks of age that had been left with infected mothers until they were weaned, not one has been found free from amebae.

In the course of observations on the intestinal contents of rats between ten and thirty days old, it was noted that protozoa did not appear in the intestine of young rats until the rats were twenty to twenty-five days old, and had begun to eat solid foot. It seemed, therefore, that if it were possible to separate young animals from the mothers sixteen to eighteen days after birth, before they became infected (that is, before they began eating solid food) and raise them without further contact with infected rats, that they should remain free from intestinal protozoa.

Accordingly, fifteen young rats, seventeen days old, were separated from the mothers and placed in a clean cage on shavings. During the first two days they were fed whole milk powder dissolved in warm water, the milk being prepared and given fresh three times a day. At first, only a few of the rats would drink from shallow dishes of milk placed in the cage. The others had to be fed by means of a pipette, but after being fed in this way several times they, too, began drinking. On the third day they were started on the stock ration which consists of whole wheat flour 60, whole milk powder 15, unpurified casein 15, butter 5, calcium carbonate 2, ferric citrate 2 and sodium chloride 1, and given water and green vegetables.

Four of these rats died during the first three days, but, from then on, the other eleven grew rapidly. When they were four weeks old, five of them were killed and the contents of the large and small intestine and cecum were examined microscopically for protozoa. The remaining six were similarly examined when they were eight weeks old, and all of them were apparently uninfected. This first group of rats came from two litters, seven in one and eight in the other, and it seemed that better results might have been obtained had the litters been smaller. Hence all the other rats employed came from litters that had been reduced to four animals each. These young were separated from the mothers at sixteen days of age, and none of them died.

The second group, raised in the manner described above, consisted of eight animals. They were kept until they were eight weeks old, then killed and examined, and were negative for intestinal protozoa. The third group also consisted of eight rats, five females and three males. When these animals were twelve weeks old 0.2 cc of material was removed, by surgical operation,[4] from the cecum of each and examined microscopically for protozoa, but apparently these rats were also uninfected. This examination has been found to be entirely sufficient to determine the presence of protozoa that live in the cecum of rats, but does not allow an examination of the small intestine for *Giardia*. Hence these rats were allowed to breed, and half the young from the first litters were killed and examined when they were weaned, but were found to be uninfected. It seems safe to say, then, that a breeding stock of "protozoa-free" rats may be established by this method.

HERBERT L. RATCLIFFE
National Research Council Fellow
(Medical Sciences)

SPECIAL ARTICLES

ACCUMULATION OF GAS IN CLOSED COLLODION SACS IMMERSED IN FLOWING TAP WATER

COLLODION sacs, 16 mm in diameter and about 60 mm long, filled with water or with aqueous solutions of various salts or gases and firmly closed without inclusion of free gas bubbles, when placed in slowly flowing water direct from the Baltimore City water system in April and May of this year, became completely filled with gas in from six to seven days; then during the next few days the amount of gas continued to increase until the walls became quite tense from the evident development of a pressure within the sacs markedly greater than atmospheric. Professor W.

[2] J. F. Kessel, 1923, "Methods of Obtaining Amebae-free Rats for Experimental Infection with Intestinal Amebae." Univ. Calif. Pub. Zool., 20: 401–408.

[3] S. F. Chiang, 1925, "Study of Parasitic Amebae by Experimental Cross-infection of Laboratory Animals," *Nat. Med. Journ. China*, 11: 440–482.

[4] H. L. Ratcliffe, 1928, "The Numbers of Trichomonads in Rats on Diets of Different Protein Content in Relation to the pH and Bacteria in the Cecum," *Amer. Journ. Hyg.*, 8: 910–934.