seems admirably adapted. It is hoped that it will secure the widest possible circulation.

C. B. DAVENPORT

ENTOMOLOGY

General Entomology. By S. W. FROST. 9 × 6 inches. x + 524 pp. Frontis., 406 illus. New York: McGraw-Hill Book Company, Inc. 1942. $4.00.

THIS book, which is a text for elementary college entomology, covers a wide field in a general manner, and stresses the study of insects in their native habitats. Its 23 chapters are devoted to the position of insects in the animal world; the origin and distribution of insects, using Wallace's 1876 figures to show distribution trends; the abundance and reproductive capacity of insects, as indicated by the prolificness of aphids, flies and some scale insects; beneficial and injurious insects, including poisonous ones and those transmitting human diseases; the different orders, with keys for their separation; metamorphosis; immature insects, with special consideration of various types of eggs, nymphs and pupae and their adaptations; insect morphology; color, including color changes, sexual coloration, varietal coloration, insect color perception, photogenic insects, etc.; sonification, using the cicada, crickets and grasshoppers as examples; insect behavior mostly from the view-point of tropotaxes; insect associations, including hibernating, protective, migrating, swarming and sleeping aggregations as well as social aggregations; solitary insects, their food and nesting habits; scavengers, predators and parasites; associations of plants and insects, including mutual associations, adaptations of flowers and insects, and insectivorous plants; leaf-mining insects; leaf-rolling insects; gall insects; boring insects; subterranean insects; aquatic insects; case-making insects; and cessation of activity, including diapause, suppressed development, sleep, death feigning and factors causing the death of insects.

Each chapter, which is a complete essay in itself, is accompanied by a bibliography of the more important papers in that field. In addition there is an appendix consisting of field keys to the immature forms (except eggs and pupae) of the Orders, keys to common groups of Coleopterous and Lepidopterous larvae, a table of the synonymy of Order names, a table showing schemes of the classification of orders from 1735 to 1937 and a summary of the important groups of leaf-mining and subterranean insects. An adequate index ends the volume. The illustrations are numerous and uniformly good.

Because of the enormous field covered by Professor Frost, the discussions are, of necessity, brief. Nevertheless, his summaries are adequate and sound and represent the matured and extensive knowledge of many years of experience and research. In addition, Professor Frost has incorporated in his book various topics not usually found in our text-books, such as Bryson's table for the identification of soil insects by characteristics of their burrows, discussions of the food habits of large groups of insects, of the fecula of insects, of the amounts of foliage consumed by certain species and of other important discoveries by entomologists. These facts, together with his presentation, make this volume an extremely interesting one and an ideal and stimulating introduction of the subject for college students.

HARRY B. WEISS

SPECIAL ARTICLES

CLOSE RELATION BETWEEN RUSSIAN SPRING-SUMMER ENCEPHALITIS AND LOUPING-ILL VIRUSES[1]

IN 1938 Russian scientists isolated and described a virus obtained from the brain tissue of fatal cases of encephalitis occurring in Russian woodsmen.[2] They placed their virus in the St. Louis-Japanese B encephalitis group on the basis of reactions in laboratory animals but then differentiated it sharply from St. Louis and related it slightly to Japanese B virus as a result of immunological tests.

The Russian virus sent to Dr. R. R. Parker in this country[3] was made available to us for study through the agency of the Commission on Neurotropic Virus Diseases of the United States Army and the cooperation of Drs. Dyer, Parker and Cox, of the U. S. Public Health Service.

We have found this strain of Russian virus to be similar to a strain of louping-ill virus, the causative agent of an encephalitis of sheep in Scotland[4] and possibly of Australian X disease of children.[5] The strain of louping-ill virus in our laboratory was obtained from Dr. T. M. Rivers in 1932, shortly after he had received it from Scotland.

Our observations on the Russian virus are briefly

[1] These investigations were aided through the Commission on Neurotropic Virus Diseases, Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, Preventive Medicine Division, Office of the Surgeon General, United States Army.

[2] E. N. Levkovich, A. K. Shubladze, M. P. Chumakov and V. D. Soloviev, *Arch. sc. biol.*, 52 (1): 162, 1938; A. A. Smorodintseff, *Arch. ges. Virusforsch.*, 1: 468, 1939–40.

[3] R. R. Parker, *Public Health Rep.*, 57: 1963, 1942.

[4] J. M. Alston and H. J. Gibson, *Brit. Jour. Exp. Path.*, 12: 82, 1931.

[5] J. B. Cleland, *Proc. Roy. Soc. Med.*, 12 (Sec. Path.): 33, 1918–19; A. Breinl, *Med. Jour. Australia*, 4: 454, 1917.

as follows: Rabbits and guinea pigs remained well following intracerebral inoculation with large doses. Mice, however, were highly susceptible to the virus whether injected by intracerebral, intraperitoneal or subcutaneous routes. Lesions in the brains of mice following intracerebral inoculation were similar to those of louping-ill and Japanese B encephalitis. Altogether these findings suggested that the Russian virus might be related to the Japanese B or louping-ill group.[6]

TABLE I

COMPLEMENT-FIXATION TESTS
MOUSE HYPERIMMUNE SERA

Serum	Antigen		
	Russian spring-summer encephalitis	Louping-ill	St. Louis encephalitis
Russian spring-summer encephalitis	1/64*	1/32	0
Louping-ill	1/32	1/64	0
St. Louis encephalitis	0	0	1/64

* Highest dilution of serum giving a 2+ or better fixation. The first dilution of serum was 1:2 in all cases.

Immunological studies comprised complement-fixation and serum-protection tests with hyperimmune and convalescent sera, as well as cross-resistance tests. Complement-fixation tests with hyperimmune sera showed no relation between Russian and any known central nervous system virus except that of louping-ill. In the case of the Russian and louping-ill viruses, however, there was cross-fixation nearly to titre (Table I). Similar crossing was obtained when the antigens were titrated against a constant amount of serum. Serum-neutralization tests with hyperimmune sera showed that the Russian serum, although prepared with difficulty, neutralized Russian and louping-ill viruses equally well, whereas the louping-ill serum, although easily prepared, neutralized the Russian virus only to part titre. Sera from three human convalescents were also tested. The first two cases survived what was presumably a laboratory infection with louping-ill[7] in 1933. The third survived an infection probably also contracted in the laboratory in 1942. Sera from these cases all fixed complement equally well in the presence of Russian or louping-ill antigen (Table II) but neutralized louping-ill somewhat better than Russian virus (Table III).

TABLE II

COMPLEMENT-FIXATION TESTS
HUMAN CONVALESCENT SERA

Serum	Antigen		
	Russian spring-summer encephalitis	Louping-ill	St. Louis encephalitis
Human No. 1	1/8*	1/8	0
Human No. 2	1/8	1/8	0
Human No. 3–I	1/16	1/16	0
Human No. 3–II	1/32	1/32	0

* Highest dilution of serum giving a 2+ or better fixation. The first tube in each case contained undiluted serum.

TABLE III

NEUTRALIZATION TESTS
HUMAN CONVALESCENT SERA

Serum	Neutralization index for:		
	Russian spring-summer encephalitis virus	Louping-ill virus	Japanese B encephalitis virus
Human No. 1	150	1500	−10
Human No. 2	10	500	−20
Human No. 3	150	500	− 1
Normal human control	1	1	1

Cross-resistance tests showed that mice vaccinated with non-virulent Russian virus were protected against at least 10,000,000 intraperitoneal lethal doses of Russian virus and 100,000 intraperitoneal lethal doses of louping-ill virus, and that mice vaccinated with non-virulent louping-ill virus were protected against at least 100,000 intraperitoneal lethal doses of both louping-ill and Russian viruses (Table IV).

TABLE IV

CROSS-PROTECTION TEST

MICE VACCINATED WITH EITHER RUSSIAN SPRING-SUMMER ENCEPHALITIS, LOUPING-ILL OR WESTERN EQUINE ENCEPHALOMYELITIS FORMOLIZED, AVIRULENT, MOUSE BRAIN EMULSIONS. TESTED INTRAPERITONEALLY FOR IMMUNITY AGAINST RUSSIAN SPRING-SUMMER ENCEPHALITIS AND LOUPING-ILL VIRUSES

Vaccine (0.25 cc × 2) subcutaneously	Fate of mice following intraperitoneal injection of 0.5 cc of virus in dilutions:														
	Russian spring-summer encephalitis virus									Louping-ill virus					
	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}	10^{-9}	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}
Russian spring-summer virus	2/5*	1/5	1/5	0/5	0/5	0/5				3/6	0/5	1/5	0/5	0/5	0/5	
Louping-ill virus	5/5	4/5	2/5	2/5	0/5	0/5	0/5			0/5	0/5	1/5	0/5	0/5	0/5	
Western equine encephalomyelitis virus			5/5	5/5	5/5	5/5	5/5					3/5	5/5	4/5	0/4	
No vaccine—controls			5/5	5/5	5/5	5/5	5/5	5/5	0/5		5/5	4/5	5/5	3/5	3/5	3/5

*2/5 = Two mice out of five died following inoculation.

Because of these findings we regard the specimens

[6] Leslie T. Webster, *Jour. Am. Med. Asn.*, 116: 2840, 1941.

[7] Thomas M. Rivers and Francis F. Schwentker, *Jour. Exp. Med.*, 59: 669, 1934.

of Russian and louping-ill viruses as received in our laboratory as similar. Final proof of the identity of these two agents awaits the testing of fresh specimens of virus obtained from Russia and Scotland. Meanwhile we call attention to the possibility that the tick-borne spring-summer virus encephalitis of man in the timber country of Russia and the tick-borne virus encephalitis of sheep in Scotland may be caused by one and the same infectious agent.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN INEXPENSIVE DISPOSABLE FILTER FOR BLOOD AND PLASMA TRANSFUSIONS

ACCUMULATION of fibrin and gelatinous material in stored blood and plasma is commonplace despite the use of sufficient sodium citrate solution. The macroparticles become more numerous with increased age of the stored product and are a serious hazard in the administration of blood and plasma.

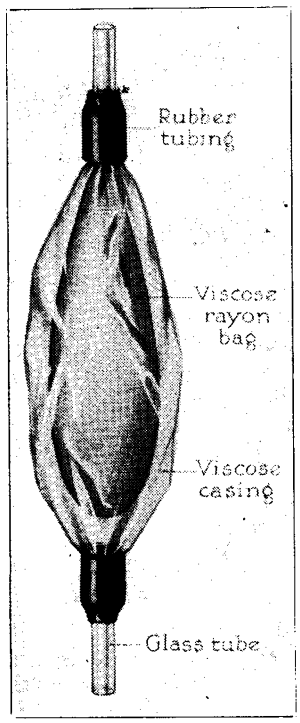

FIG. 1

There is universal agreement among reputable authorities that filtration of blood and plasma must be carried out previous to intravenous administration, and yet an entirely satisfactory filter does not exist. Metal screens in common use are expensive, difficult to clean and are either too coarse to retain the undesirable material or else they are so fine that they become clogged easily. The use of cotton gauze should be condemned, for cotton fibers may be liberated into the filtered product and the open method usually employed allows air contamination with bacteria to take place. Other methods which have been proposed are impractical from the standpoint of breakage and difficulty encountered in cleaning the apparatus.

The essential problem then is the need for a filtering mechanism which will: (1) Yield a filtrate free of fibrin or gelatinous accumulations; (2) not clog or leak while in use; (3) allow continuous filtration during administration of the blood and plasma; (4) allow filtration under aseptic conditions; (5) eliminate the uncertain and laborious cleaning procedures; (6) be relatively inexpensive.

A simple apparatus which fulfils these requirements reasonably well is illustrated in Fig. 1. It consists of a cone-shaped viscose rayon sheer cloth bag made by sewing together two triangular pieces of the material; each piece having a base of 4 inches and an altitude of 8 inches. This allows a large filtering surface and eliminates the possibility of clogging. The bag is attached to a short glass tube by means of a $\frac{1}{2}$-inch piece of rubber tubing and then enclosed in an 8-inch length of $1\frac{5}{8}$-inch viscose sausage casing. The casing is gathered at either end around glass tubing and attached by means of $\frac{3}{4}$-inch pieces of rubber tubing which act as tight-fitting rubber bands. The apparatus may be wrapped separately and autoclaved or attached directly to the transfusion set just above a Murphy drip and sterilized with the set.

Chief advantages of the filter are its efficient and rapid filtering action without clogging made possible by the large filtering area. It does not leak. Its construction is simple and inexpensive so that it need be used but once and then discarded. Its lightness, compactness and disposability are features especially suitable to military conditions.

The cost of labor and materials required to make an entirely new filter for each transfusion is less than the cost of labor and breakage involved in cleaning the metal or glass filters now in common use. The problem of reactions attributed to unclean filters is eliminated. In actual use at the Research and Educational Hospitals of the University of Illinois it is preferred to other types of filters.

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