parasitized flies for insecticidal tests. Once this mite is established, it is exceedingly difficult to eradicate. Thorough treatment with steam of all apparatus and media is necessary, and one is forced to start entirely new cultures.

In studies made for the rearing of large numbers of houseflies continuously throughout the year, it was found that a wheat bran-alfalfa meal mixture, supplemented with small amounts of yeast and diamalt (a commercial product composed of a large percentage of malt sugar) provided a very satisfactory larval medium. The materials that make up this rearing medium are readily available to any laboratory. They are clean and easy to handle. Most important, no parasitic mites are present on them. Furthermore, it appeared that this medium contained more nutriment per unit than a horse manure medium, and with it, larger numbers of flies could be reared. The formula which was found most satisfactory is given as follows:

Wheat bran	3½ lbs.	Mix thoroughly
Alfalfa meal	1¾ lbs.	
Water	5000 cc	Mix thoroughly together
Yeast suspension (prepared from 1 lb. baker's yeast to 2 liters of water. This stock suspension should be kept on ice and used as needed)	300 cc	
Diamalt (a product of the Fleischmann Yeast Co., containing a large percentage of malt sugar)	25 cc	

Add the water mixture to the bran mixture and stir thoroughly. The housefly eggs may be added immediately. The quantity of yeast suspension necessary can probably be lessened considerably by preparing the entire mixture one day before use, so that the yeast cells will have time to multiply. Flies are attracted to and readily oviposit on this medium and small amounts of it can be used in the breeding cages for this purpose. The housefly eggs can then be added to the larval mixture, and the jars containing it can be incubated at 90° F. Fresh diluted milk appeared to be a satisfactory food for the adult houseflies.

With this larval medium houseflies in large numbers have been successfully reared at Ames, Iowa, throughout the year. During the winter of 1931 and 1932, F. L. Campbell and Sullivan, of the U. S. Bureau of Entomology at Washington, D. C., have used it with very good results.

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SPECIAL ARTICLES

NOTE ON THE GROUP SPECIFIC SUBSTANCE OF HORSE SALIVA

IN previous work on the so-called Forssman hapten, active fractions were prepared from alcoholic extracts of horse kidney which were richer in carbohydrate than the known cerebrosides, thus suggesting that the specificity of the substance may be due to carbohydrate groupings[1] (not improbably in a combination with lipoids). Evidence pointing in the same direction was afforded by investigations[2] on the Forssman substance of bacilli which behaves similarly to, and could not be separated from the precipitable substance consisting largely of carbohydrates. Closely related to these investigations are those on the human group substance A whose relationship to the Forssman substance has been demonstrated by Schiff.[3] From human serum of group A individuals, Brahn and Schiff[4] obtained a serologically active preparation, which on hydrolysis yielded sugar, and quite recently Freudenberg, Eichel and Dirscherl[5] reported briefly on an active substance from the same source, of an elementary composition resembling that of a polysaccharide, and strongly reducing Fehling's solution after hydrolysis.

Continuing the studies quoted above, horse saliva was investigated, which, as Schiff[4] has shown, reacts with immune sera specific for the human group substance A. In these preliminary experiments an active

1 Landsteiner and Levene, *Jour. Immunol.*, 14, 81.

2 Brahn and Schiff, *Deut. Med. Wschr.*, 1930, p. 1207; Kurt Meyer, *Ztschr. Immunitätsf.*, 68, 69; Landsteiner and Levine, *Jour. Immunol.*, 22, 75.

3 *Kl. Wschr.*, 1924, 679; Schiff and Adelsberger, *Ztschr. Immunitätsf.*, 40, 335.

4 "Ueber die gruppenspezifischen Substanzen," etc., Jena, G. Fischer, 1931, p. 102. Another substance reacting with anti A immune sera and rich in carbohydrate was found by these authors in commercial pepsin (*Kl. Wschr.*, 1932, p. 1592).

5 *Naturwiss.*, 1932, p. 658.

preparation was obtained by treatment with acid and acetone and fractionation with alcohol, which gave only a weak biuret reaction and on hydrolysis yielded 48.5 per cent. reducing sugar (calculated as glucose). Another preparation made in a different way from saliva adsorbed with kaolin and charcoal, reacting strongly with anti A immune sera, had the composition C, 44.65 per cent.; H, 6.76 per cent.; N, 7.43 per cent. (calc. for ashfree substance; ash 3.37 per cent). It is intended to describe the results later in detail.

Although it can not be claimed that any group specific substance isolated so far is a chemical individual, and in spite of differences in their immunological behavior from that of bacterial polysaccharides, it would seem probable from the foregoing data that the group substance A owes its peculiarity to carbohydrate groupings. Taking into account its relationship to other non-protein substances specific for species or organs, one is led to think that carbohydrates may play a rôle in the specificity of materials of animal origin comparable to their significance for the specificity of bacilli, as demonstrated by Heidelberger and Avery.

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THE PRESENCE OF COMPOUND CHROMOSOMES IN THE PRIMARY SPERMATOCYTES OF CIRCOTETTIX VERRUCULATUS (ORTHOPTERA)

THE hypothesis of segmental interchange[1] is based upon the assumption that homologous elements attract each other at synapsis. If an interchange of parts between two non-homologous chromosomes should occur in the spermatogonia the resulting attraction at synapsis should bring about the union of chromosomes which are not wholly homologous. The chromosomes involved in such an interchange should appear as multiples or rings in the first maturation division. Multiples of this nature are commonly found in the primary spermatocytes of *Circotettix verruculatus* after irradiation with x-rays.

In all irradiated individuals there are some cysts containing first spermatocytes in which the chromosome structure seems to be unmodified as well as other cysts whose cells contain multiples or rings formed as a result of a translocation occurring in the spermatogonia. Since it is known that all the cells within a single cyst are the descendants of one spermatogonium, the presence of the same multiple in all the cells would be expected. All individuals, however, whose spermatocytes show multiple chromosomes

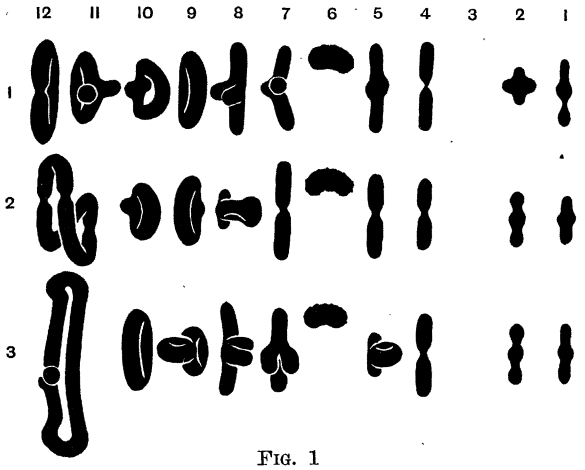

FIG. 1

have the normal spermatogonial number of twenty-one.

The drawings were made from the primary spermatocytes of a single individual which had been irradiated before hatching. The chromosomes figured in the first row are from a cell which seemed to have been unaffected by the irradiation and, therefore, represents the normal condition for this animal.[2] The multiples or rings formed as a result of a reciprocal translocation are shown in the second and third rows. This interchange of parts between one of the homologues of chromosome eleven and that of chromosome twelve has resulted in the formation of a closed ring similar to those found in Oenothera. The configuration of the ring in the second row is such that the segregation of the homologous elements would be complete; whereas, in the ring figured in the third row the structure is such that segregation would be only partial.

Many different multiple chromosome forms are found, but the translocations involved in their formation are so complex that a description of them will be reserved for a more complete paper on the effects of x-rays upon the germ cells of *Circotettix verruculatus*.

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MILLER, DAYTON C. *Laboratory Physics.* Second edition. Pp. xviii + 438. 197 figures. Ginn. $3.00.

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SHORR, PHILIP. *Science and Superstition in the Eighteenth Century.* Pp. 82. Columbia University Press. $1.50.

[1] J. Belling, *Jour. Genetics,* 18: 177–205, 1927; J. Belling and A. F. Blakeslee, Proc. Nat. Acad. Sci., 12: 7–11. 1924.

[2] For a more complete description of the chromosomal conditions in *Circotettix verruculatus* see a previous paper by the same author in *Jour. Morph. and Physiol.,* 47: 1–36.