at the beginning of the experiments, whereas those used by György and by us averaged about 10 gm. heavier. Further experimental and clinical data are necessary before the specific character of a goat's milk anemia can be established.

Conclusions. 1. Exclusive feedings of goat's milk to young white rats produced an anemia that was not significantly different from the type of anemia produced with cow's milk. 2. The anemia from goat's milk showed maximal responses to iron and copper therapy.

8245 C

Phagological Identification of Streptococcus epidemicus.

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Davis and Rosenow[1] described the streptococcus which caused the Chicago epidemic of septic sore throat of 1911-12. They considered the disease to be a definite clinical entity like the Boston epidemic of 1911. The latter epidemic was described by Winslow,[2] who regarded it as the first of its kind to be described in this country. It was distinguishable from the throat disease which resembles atypical scarlet fever and which may be associated with definite scarlet fever cases.

Davis[3] gave the streptococcus of the Chicago epidemic the specific name *epidemicus*. Only 2 characters have been mentioned by investigators of this organism by which it may be differentiated from other hemolytic streptococci of human origin—the appearance of a capsule in young, moist cultures and the marked moisture and rapid drying of the colonies. Rosenow and others who studied *Streptococcus epidemicus* soon recognized the indefiniteness of capsule formation and moistness of colonies as specific characters. Rosenow reported that on artificial cultivation the epidemic sore throat strains assumed the characters of *S. pyogenes;* and that when cultivated in unheated milk *S. pyogenes* became modified so as to correspond with the streptococcus of epidemic sore throat. Ward and Lyons[4] and other investigators cited by them have recently

1 Davis, David J., and Rosenow, E. C., *J. A. M. A.*, 1912, **58**, 773.

2 Winslow, C.-E. A., *J. Inf. Dis.*, 1912, **10**, 73.

3 Davis, David J., *J. A. M. A.*, 1912, **58**, 1283.

4 Ward, Hugh K., and Lyons, Champ., *J. Exp. Med.*, 1935, **61**, 515.

shown that capsule formation and mucoid growth are characters of one of the variants of the hemolytic streptococcus of which another variant may occur with these characters lacking.

In studying a large collection of strains of hemolytic streptococci from a great variety of human and animal disease sources, the writer found that phagologically there is a distinction between a small group which is made up largely of septic sore throat strains and the large group which contains the majority of the scarlet fever strains of the collection. Fortunately, a strain from the Chicago epidemic was available for study. It fell into the small group, which thereby receives the name *epidemicus,* because the Chicago strain was the type strain of the species so designated by Davis.

The specific phagological characters of *S. epidemicus* will be considered here, leaving for a later publication the detailed description of other characters of the organism, its distribution, and the various kinds of infections which it may produce.

Sensitivity to nascent phage as a character for the differentiation of the beta type of streptococci was discussed in a previous publication,[5] and in another paper[6] a description was given of the 4 races of phage used in the classification studies. The histories of the streptococci used as substrata were also given in the earlier paper. The races of phage are designated A, B, C, and D. A lytic filtrate is designated by a letter for the race of phage and a number which designates the strain of streptococcus which served as a substratum, as, for example, A/751.

Every strain of streptococcus in the collection was tested for sensitivity to phages A/751, B/563, C/594, C/646, and D/693, in the nascent state. Two strains of phage C were used because it was found that the streptococcus serving as the substratum for the development of a phage influences the range of its activity, and the difference in the range of activity of C/594 and C/646 was found to be useful for classification purposes.

The stock supply of lytic filtrates was prepared as follows: Tubes containing about 10 cc. of broth were each planted with one drop of sensitive culture and one drop of lytic filtrate of the phage to be prepared. After incubation over night the contents of the tubes in which clearing occurred were filtered together through a Berkefeld N filter, tubed, and stored in the refrigerator for use.

The test for sensitivity of a streptococcus strain to one of the races of phage in the nascent state can be most clearly described by an

[5] Evans, Alice C., *Pub. Health Rep.*, 1934, **49**, 1386.

[6] Evans, Alice C., *J. Bact.*, 1935, **29**, 40.

example. In testing Streptococcus 599 for sensitivity to phage A/751, a drop of diluted filtrate A/751 and a drop of culture 751 are added to each of 2 tubes of broth. One of these tubes serves for the phage control. A control tube of broth is also planted with a drop of culture 751 alone. Then one of the tubes containing the diluted phage and culture, and a tube of sterile broth, are each planted with a drop of culture 599. All the tubes are incubated over night and examined the next morning. If the broth cultures 751 and 599 are turbid and the phage control is clear, readings are recorded. If the tube containing phage and planted with culture 599 is clear, or if it is definitely less turbid than the broth control, the reaction is recorded as positive; if the culture of 599 plus phage and the broth control culture 599 are equally turbid the reaction is recorded as negative.

The test for sensitivity to the other races of phage follows the same technic except that other strains of streptococci serve as substrata.

Streptococci were available for study from 21 epidemics of sore throat. The writer is indebted to many investigators for these strains. The collection contains more than one strain from many of the epidemics, but only one representative strain is considered in these data, except in the cases of the Boston 1917, Lee and Walton epidemics, from which the strains fell into 2 groups, and strains representing both groups are included. Strains from sporadic cases of tonsilitis or sore throat are not included in these data.

According to fermentation reactions 2 sore throat strains—the Barraboo, Wisconsin, 1929 strain and Griffith's[7] strain "Beatty" (Type 17)—were differentiated from the others by their fermentation reactions. They will not be further considered here. The remaining 22 strains were alike in their fermentation reactions,

TABLE I.

Phagological Characters of the Streptococci of Scarlet Fever and of Septic Sore Throat.

Group	Sensitivity to phage					No. of scarlet fever strains	% of scarlet fever strains	No. of sore throat strains	% of sore throat strains
	A/751	B/563	C/594	C/646	D/693				
I	+	+	+	+	—	66	58.9	4	16.6
II	+	+	+	—	—	1	0.9	2	8.3
III	+	+	—	+	—	12	10.7	8	33.3
IV (*Epidemicus*)	+	+	—	—	—	2	1.8	8	33.3
Total						81	72.3	22	91.5

[7] Griffith, F., *J. Hyg.*, 1935, **34**, 542.

agreeing with the majority of the 112 scarlet fever strains of the collection in fermenting lactose, salicin and trehalose, but not mannite nor sorbitol.

The phagological reactions of the 22 sore throat strains are given in Table I. For comparison, there are also included in the table 81 scarlet fever strains which were indistinguishable from the sore throat strains. There are in the collection 31 scarlet fever strains not included in the table because they differed from those of the 4 groups either phagologically or in fermentation reactions.

The groups are designated by Roman numerals in the table, leaving for a later communication the discussion of what the names of the first 3 groups should be.

The septic sore throat strains were distributed among the 4 groups as follows:

Group I. Canton, Mass., 1913; Lee, Mass., 1928; Pittsfield, Mass., 1928 (Lee and Pittsfield are about 10 miles apart); and Griffith's strain "Symons" (Type 9).

Group II. Clyde, N. Y., 1930; Waterloo, N. Y., 1931 (Clyde and Waterloo are about 15 miles apart).

Group III. Boston, 1911; Boston, 1917; Plymouth, Mass., 1928; Kingston, N. Y., 1930; Kirkland Lake, Canada, 1931; Walton, N. Y., 1931; Topsfield, Mass., 1932; and Griffith's strain "Carter" (Type 13).

Group IV. Chicago, 1912; Boston, 1917; Saugerties, N. Y., 1925; Lee, Mass., 1928; Savannah, N. Y., 1929; Wayland, N. Y., 1929; Millbrook, N. Y., 1930; Walton, N. Y., 1931.

Whereas the majority of scarlet fever strains fell into Group I, only 16.6% of sore throat strains fell into that group. On the other hand, the majority of sore throat strains fell into Groups III and IV, which differ from Group I in resistance to phage C, either completely, as indicated by resistance to C/594 and C/646 (Group IV), or partially, as indicated by resistance to C/594 but not to C/646 (Group III). Group II is a small intermediary group. The *epidemicus* type strain fell into Group IV.

Only 2, or 1.8% of scarlet fever strains agreed with *S. epidemicus*. One of these strains was received from Budapest, with no history other than that it came from a case of scarlet fever. The other is Hooker and Follensby's[8] scarlet fever strain "Cook" which they found to produce "B" toxin almost exclusively.

Summary. *Streptococcus epidemicus* may be distinguished from

[8] Hooker, Sanford B., and Follensby, Edna M., *J. Immunol.*, 1934, **27**, 177.

the streptococcus which causes the majority of cases of scarlet fever by its lack of sensitivity to phage C. *S. epidemicus* rarely causes scarlet fever.

8246 P

Cytological Changes in Frog Pituitary Considered in Reference to Sexual Periodicity.

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Recent experiments with Amphibia indicate that the anterior lobe of the pituitary exerts a controlling influence not only on the development of the primary sex organs, but also on the release and discharge of the sex products. Wolf[1] and Rugh,[2] working with various Anura, have demonstrated that amplexus and shedding of the sex products can be induced in mid-winter by simple hetero- or homoplastic implantation of anterior lobe tissue. Houssay and Lascano-Gonzales[3] observed a degeneration of the testes following hypophysectomy in the toad. The writer wishes to present briefly the results of a cytological study of the frog anterior lobe, and on the basis of cytological evidence to postulate the rôle played by the pituitary in the mechanism of sexual periodicity.

Several species of the genus *Rana* were used in this study. At regular intervals throughout this annual cycle specimens were killed and the cytological condition of the anterior lobe pituitary was noted. Various sublimate and osmic acid fixatives were used in preparing the tissue for microscopic examination. Staining procedure most consistently used was a modification of the acid fuchsin-methyl green technique.

The general pattern of the winter frog anterior lobe is similar to that found in the other vertebrates. The numerical proportion, the inclusions and the structure of the cell types, however, do not conform entirely to those of the higher vertebrates, particularly mammals. The basophiles are small cells, few in number, and their general appearance does not suggest high secretory activity. True acidophiles, on the other hand, are larger and are filled with densely

1 Wolf, O. M., PROC. SOC. EXP. BIOL. AND MED., 1929, **26**, 692.

2 Rugh, Roberts, *Biol. Bull.*, 1934, **66**, 22; *Biol. Bull.*, 1935, **68**, 74.

3 Houssay, B. A., and Lascano-Gonzales, J. M., *Compt. rend. Soc. Biol.*, 1929, **101**, 938.