and sodium chloride as for water alone, (*b*) since the fall in oxygen capacity is not so great for dogs with lower original values as for dogs with greater values, there is an arrangement for protecting the concentration of the blood against disturbing influences, (*c*) no methemoglobin is formed when potassium chlorate is fed under the above named conditions.

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Studies concerning the significance of Streptococcus hemolyticus in scarlet fever.

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The more or less constant presence of *Streptococcus hemolyticus* in the throats of individuals suffering from scarlet fever has been generally recognized for many years. This organism is also the preponderant causative agent of such septic complications of the disease as otitis media, adenitis, interstital nephritis, arthritis, and septicemia. Such widespread and general relationship of streptococcus to scarlet fever naturally gave rise to the view, supported by a number of investigators, that streptococcus might be the etiological agent of the disease. Belief in the validity of this conception led to the preparation and trial of antistreptococcic sera for therapeutic purposes. For some of these efficacious results have been claimed. On the other hand another group of investigators has asserted that streptococcus bears only a secondary relationship to scarlet fever and cannot be assigned the principal causative role. Discussion of this question was carried on for many years and became part of the larger controversy concerning the nature of the whole group of organisms generically designated as *S. hemolyticus*. The balance was finally tipped against the etiological importance of *S. hemolyticus* by Jochmann, who claimed that it is unreasonable to suppose that a specific disease such as scarlet fever can be caused by an organ-

ism giving rise to such varied manifestations as *S. hemolyticus* and furthermore that the presence of this organism cannot be demonstrated in certain rapidly fatal malignant instances of the diseases.

In 1919 Dochez, Avery and Lansfield developed a technique for the differentiation of biological types of *S. hemolyticus.* This discovery led to a reexamination of the type of streptococcus associated with scarlet fever. As a result of these studies it has been found by Bliss, by Tunnicliff, by Gordon, and by Stevens and Dochez that the type of hemolytic streptococcus found in the throats of scarlet fever patients is in general a specific type readily distinguishable from the types of *S. hemolyticus.* causing other kinds of angina and septic conditions in general. Furthermore this specific streptococcus has been isolated from the local wound in wound scarlet, from the infected burn in burn scarlet, from the lochial discharge in puerperal scarlet and from both patients and contaminated milk in a milk-borne epidemic of scarlet fever. More careful study of the throat secretions of patients with scarlet fever has demonstrated the organism to be present at some time during the disease in 100 per cent of instances. It would seem therefore that the two main objections of Jochmann to the etiological significance of *S. hemolyticus* in scarlet fever have been answered. As a result of these studies the question again assumes renewed importance.

Ever since the initiation of these studies we have made more or less continued efforts to produce in animals, with a scarlatinal type of *S. hemolyticus,* a disease resembling scarlet fever. At first these efforts met with questionable success. More recently, with a special technique we have been more successful and have produced in guinea pigs a condition resembling in its main features certain of the phenomena of scarlet fever. The animals develop fever, leucocytosis, lose weight; on the second and third day show a transient erythematous flush; and on the 8th to the 12th day more or less general desquamation appears, most conspicuously on the pads of the feet. Dick and Dick have recently published the results of some human inoculations with *S. hemolyticus* which were followed by what may have been mild attacks of scarlet fever.

In view of the similarity to scarlet fever of the symptom complex produced in guinea pigs we decided to immunize a horse by

a similar procedure. We have recently obtained from this horse an immune serum which has been tested by Dr. Francis G. Blake for its capacity to neutralize the rash locally in the skin in human cases of scarlet fever. In all the cases tested so far a positive neutralization has occurred which is somewhat more conspicuous than that obtained under similar circumstances from the use of convalescent scarlatinal serum. We propose in the near future to test the serum therapeutically. Such a sequence of observations undoubtedly again throws the balance of evidence in favor of *S. hemolyticus* as the causative agent of scarlet fever. It would seem that the disease may not be unlike diphtheria in that the principal localization of the infection is in the throat where the organism produces a toxin which gives rise to the general symptoms and the rash. The immunity produced is in all likelihood antitoxic in character and the blanching reaction represents the neutralization of the toxin *in situ*.

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On the pharmacological action of the anti-rachitic active principle of cod liver oil.

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We pointed out some time ago that the diets used to produce rickets in animals have an appreciable excess of base over acid and that rickets is not produced if such diets are made more acid. We also noted that the hydrogen ion concentration of infants' stomach contents is lower than that of adults, and that a further depression may appreciably decrease the amount of soluble calcium and phosphoric acid available for absorption. In looking for a possibility of explaining the action of cod liver oil in rickets, we studied its effect on the reaction of the intestinal contents. The feces of rats on the rickets producing diet No. 84, used in this laboratory, when made into a suspension with water, give a pH of 7.4 to 8.0 with an average of about 7.6. When such rats are