temperature was at all times kept below 50° C. instead of being allowed to go to 65° as before. So far five cats have been injected with the extract, the first three with two injections each and the others with one each. All injections were made beneath the skin of the back. The results are shown in Table III and are calculated to grams of glucose per hundred grams of blood as in Table I. The average for the injected cats is over 21 per cent. above that for the normal ones, and moveover the amount of sugar is greater in each injected cat than for any normal animal except the one that gave 76 mgm. This increase is very surprising and of peculiar interest. At present I am not willing to venture any explanation. There are however several possibilities which are amenable to experiment and I hope that further work will throw some light on it. In any case it would seem to put in grave doubt the idea that the pancreatic hormone always tends to increase the storage of glycogen in the liver at the expense of sugar in the blood.

There are a number of factors entering into the experiments so far performed that might cause the individual variations in the experimental results. Some of the more probable are: the length of time intervening between the injection and the death of the animal; the amount of extract injected; the age of the extract; the number of injections and the time intervening between them, etc. At present I am trying to find some of the optimum conditions.

70 (766)

On some blood pressor substances and adrenal separations in experimental immunity.

By J. P. ATKINSON and C. B. FITZPATRICK.

One of us in a work[1] on "The Preparation of Diphtheria Antitoxin" endeavored to demonstrate by charts of the systemic reaction following injections of cultures of the bacillus of diphtheria and its toxin that the real crux of the process of immunization was to determine when to re-inject. This question is still unsettled; in short, of two animals treated the same, upon being re-injected the one, which may apparently be the better prepared, dies and the other recovers.

[1] Fitzpatrick, *N. Y. Medical Journal*, April 27, 1895.

This aspect of immunization is very well brought out in the following example.

Römer and Joseph[1] re-infected two tuberculous sheep with a culture of which 1 mg. per 10 kg. killed healthy sheep in one month. One of these sheep was re-infected with 1 mg. per 10 kg. ten months after a previous inoculation with a .2 mg. per 10 kg. and 15 months after a first injection of .1 mg. per 10 kg. This animal died in 48 hours. The other one of these sheep was re-infected with the same dose (1 mg. per 10 kg.) ten months after previous injection of .2 mg. per 10 kg. This animal responded with an intense reaction. The reaction was followed by a return to health.

We have shown in studies read before this society that the blood of tuberculous animals especially when about to die of tuberculosis contains a depressor substance. The use of this blood in conjunction with tuberculin was likewise shown to give an effective immunity against fatal infection with the *B. tuberculosis* in one case, and in some others the fatal ending was delayed beyond the controls. It was also demonstrated that the injection of this serum shortly after the injection with the tuberculin rapidly caused death. We have also found depressor substances to be present in the blood serum of other diseases.[2]

The first part of our present report consists of results of the injection of blood serum obtained from animals recovering from inoculations of *B. tuberculosis* and the possible application of these observations to the practical therapy of infection and intoxication.

Protocol[3] April 19, 1912.—A 14 lb. female dog, sensitized April 18, 1912, with ¾ c.c. of crude tuberculin.

8 c.c. of the serum of a calf recovering from repeated doses of culture of *B. tuberculosis* (human type), when injected into the femoral vein of this dog gave a decided rise in blood pressure. This rise was preceded by a very slight depression. This dose was repeated in six minutes with a like result. Five minutes later the same dose was injected and gave no response.

[1] "Die Tuberculöse Re-infection," *Beiträge zur Klinik der Tuberculose*, 1910, XVII, pages 330–333.

[2] Atkinson & Fitzpatrick, PROC. SOC. EXP. BIOLOGY AND MEDICINE, 1910, VII, pp. 77–79; *ibid.*, pp. 104–107; *ibid.*, VIII, pp. 24–28; *ibid.*, pp. 49–51, 1912.

[3] 3 c.c. normal calf serum gave no response when injected into the femoral vein of dog sensitized with tuberculin.

Protocol July 13, 1912.—7 c.c. of serum of same calf, bled June 21, 1913, gave a fair rise. The extract in saline solution of the adrenal gland of this calf gave a very high rise, 1 /16 c.c. being sufficient to cause a very marked straight rise.[1] 7 c.c. of tuberculous (bovine type) dog serum gave no response. This dog was killed and was probably dying according to the autopsy findings.

Protocol August 28, 1912.—8 c.c. of serum from a dog, recovering according to autopsy findings from tuberculosis (bovine type) gave a fine rise. Repeated with same results three times.

Protocol January 5, 1910.—2 c.c. of the serum from a rabbit with tuberculosis, bovine type, gave a fair, sustained rise.

Protocol April 6, 1912.—8 c.c. of serum from a dog recovering from tuberculosis, bovine type, gave a marked rise. Repeated three times.

8 c.c. of this serum, injected into a dog sensitized with tuberculin, gave a marked rise, when added to 10 drops of tuberculin No. 5, which ordinarily caused a fall.

Further observations of the occurrence of pressor substances were made as follows in animals about to die from hydrophobia.[2]

Protocol 16.—7 c.c. of serum obtained from a rabbit (June 21, 1912), sick with hydrophobia, gave a marked rise. Femoral injection.

7 c.c. of serum from a goat with hydrophobia gave a slight rise. Femoral injection.

Protocol March 17, 1911.—7 c.c. of serum from a dog with hydrophobia, gave a slight depression.

Protocol April 8, 1911.—5 c.c. of serum of rabid dog, bled April 8, 1911, gave marked rise. Repeated once.

4 c.c. of serum from collie with hydrophobia also gave a marked rise.

7 c.c. from a dog with dumb rabies gave a rise, bled April 5, 1911.

7 c.c. from a dog with rabies (March 17, 1911) gave a rise.

[1] The extract of the adrenal glands of rabbits which died of tuberculosis showed little or no pressor substance.

[2] We found the pressor substance present in the serum of animals (dog and goat) suffering from street rabies, bled just before their death. These animals with the exception of the rabbit were naturally infected.

6 c.c. from a collie with rabies gave a marked rise, bled March 24, 1911.

Protocol of March 31, 1911.—3½ c.c. of serum from collie with hydrophobia gave a very marked rise. Repeated three times.

6 c.c. of serum from fox terrier, with hydrophobia, tested March 17, 1911, gave a very marked rise. Repeated twice.

Protocol November 9, 1910.—1½ c.c. of serum from a dog with hydrophobia, bled November 3, 1910, gave a slight rise; 5 c.c. gave a fair rise.

Protocol January 6, 1912.—7 c.c. of serum from a hydrophobia dog, of January 2, 1912, gave a fair rise.

The apparent contradiction between the recovering tuberculous animal and the dying hydrophobia animal may be explained by our previously reported observations,[1] where the continued injection of a depressor substance instead of causing death led to an actual increase in blood pressure.[2]

It would appear that animals possessing these pressor substances do not die as readily from infection or intoxication as those which do not have these pressor substances. It appears to us that we may have here a general law for many, if not all infections and intoxications.

We have found two substances in adrenal gland preparations.

A substance causing increased pressure and a depressor substance.

In commercial preparations we found these two substances to be present.

Separations were made by alcohol, ether, chloroform and normal saline solution.

In saline extracts of fresh glands, the substance causing increased pressure was present alone or so greatly in excess as to dominate the reaction.

In the adrenals of certain diseased animals (tuberculosis,

---

[1] PROC. SOC. EXP. BIOLOGY AND MEDICINE, 1912, IX, pp. 49–51.

[2] It would also be of interest to study the origin of these pressor substances in normal and diseased tissues. Protocol of January 16, 1913, for example shows that the injection of 5 c.c. normal dog brain extract, gave no response, while the same doses of tuberculous and hydrophobia brain extracts gave a slight rise. These extracts were made with saline solution.

vaccinia, septic pneumonia, etc.) the substance causing increased pressure and the depressor substance were found.

The organs which possess pressor substances are apparently important organs of immunization. The organs with the depressor substances are possibly eliminating or fixing the split-products or poisons arising from the disease. The adrenals are probably simply one of a number of organs, which possess pressor producing tissues, and which when acting altogether in the whole living organism produce the general pressor substances or immuno-pressor substances. In vivo these pressor substances are probably present in every tissue and form part of the factors which overcome infection. They may be the first step or a very important step in overcoming infection.

These results apparently furnish an indicator as to when and how to re-inject animals already afflicted artificially or naturally with an infection or intoxication, with the purpose of immunizing and healing the diseased animals. That the rôle of these pressor substances, present in experimental immunity is important, we do not doubt. The use of an immunizing dose which is just sufficient to cause their production may be what these observations indicate.

71 (767)

Preliminary communication on a complement deviation reaction exhibited in pregnancy.

By G. H. A. CLOWES, FRANCIS C. GOLDSBOROUGH, and F. WEST.

[*From the Laboratory of Biological Chemistry, State Institute for the Study of Malignant Disease, Buffalo, N. Y.*]

In a series of twenty-five normal pregnant women at term in which syphilis could be excluded the blood of the mother was taken from the vein during labor and the blood of the infant from the cord at the time of delivery. The sera after separation from the clots were frozen and allowed to remain in the icebox 48 hours before being employed. A series of complement deviation tests were carried out, using both unheated and heated sera of mothers