then was required to ingest the diet selected during the course of six periods of four days each. Ten university students served as subjects. Quarters were provided where the men could easily be observed as to certain regulations of sleep and diet. The body weights of the subjects ranged from 53.1 kg. to 76.7 kg. and their ages varied from 19 to 29 years. There were no athletes among the subjects so that no individual took excessive or violent exercise, but all lived the life of the average, normal university student. The Folin-Shaffer method for the determination of uric acid was employed.

CONCLUSIONS.

1. The average daily excretion of uric acid for ten men ranging in age from 19 to 29 years, and fed a normal mixed diet, was 0.597 gram, a value somewhat lower than the generally accepted average of 0.7 gram for such a period.

2. The average daily protein ingestion for these same subjects, when permitted to select their diet, was 91.2 grams or 1.33 gram per kilogram of body weight.

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## Hemolysins in the sera of carcinoma and syphilis.

By **S. PESKIND.** (By invitation.)

[*From Dr. Peskind's Private Laboratory, Cleveland, Ohio.*]

A few years ago the writer commenced a research, the object of which was to determine in what diseases hemolysins commonly occurred and whether or not they were specific for these diseases. The ultimate purpose was to obtain data that one could use in diagnosis.

A preliminary report was published.[1] The work had to be abandoned shortly thereafter. Since then, other investigators — notably Kelling — have taken up the study of hemolysins in connection with their use in diagnosis.

It occurred to the writer that it would be very desirable to determine the question as to the specific nature of the hemolysins found in various diseases. With this object in view, a study of

[1] Peskind: *American Medicine*, 1903, v, p. 918.

the serum in several diseases has been undertaken. In this brief report are given the results obtained in carcinoma and syphilis.

The sera and corpuscles of 12 cases of carcinoma and 7 cases of tertiary syphilis were examined. In 10 other cases of tertiary syphilis, the corpuscles alone were examined.

The experiments were planned in groups. In each group, the corpuscles of at least one normal person, and several cases of syphilis and carcinoma were exposed to the action of sera derived from syphilitic and carcinomatous patients.

The customary technic was employed, special care being taken to use only fresh specimens of blood. Equal parts of serum and of a one per cent. saline suspension of corpuscles (washed four times) were incubated at 37° C. for one or two hours, sedimented on ice over night, and compared with control tubes of the serum.

In all 290 serum-corpuscle combinations were made.

In this way were studied the actions of syphilitic and carcinomatous sera on their own corpuscles, on normal corpuscles, and on the corpuscles of other cases of syphilis and carcinoma.

The following results were obtained:

## SUMMARY OF RESULTS.

Out of the 12 cases of carcinoma, 4 showed the presence of hemolysins in their sera, which caused laking of the erythrocytes derived from normal human individuals.

Out of the 7 cases of tertiary syphilis whose sera were examined, 6 showed the presence of hemolysins which dissolved the corpuscles of normal persons.

The corpuscles showed the following behavior:

The corpuscles belonging to a hemolytic carcinomatous blood were found to be immune to the action of the hemolysins in its own serum or any other carcinomatous serum.

The corpuscles belonging to a non-hemolytic carcinomatous blood were readily laked by a hemolytic carcinomatous serum.

Similarly the corpuscles of a hemolytic luetic blood were found to be immune to the action of its own serum or any other syphilitic serum.

The corpuscles of a syphilitic blood, whose serum did not contain hemolysins were laked by any hemolytic syphilitic serum.

In every instance, it was found that the corpuscles belonging to a hemolytic carcinomatous blood were immune to the action of the hemolysins found in syphilitic serum. Conversely, the corpuscles present in a hemolytic syphilitic blood were immune to the action of the hemolysin present in carcinomatous serum.

However, the corpuscles of a non-hemolytic carcinomatous blood were readily laked by hemolytic syphilitic serum and similarily the corpuscles of a non-hemolytic syphilitic blood were laked by a hemolytic carcinomatous serum.

Judging from the behavior of the sera towards the corpuscles derived from various normal and diseased persons, one could not distinguish a hemolytic syphilitic serum from a hemolytic carcinomatous serum.

This would suggest that the hemolysin found in syphilitic serum is identical with one found in carcinomatous serum.

It would seem, from the above results, that there is some connection between the presence of a hemolysin in the blood and the immunity of the corpuscles contained in that blood.

The corpuscles found in hemolytic bloods — whether from cases of carcinoma or syphilis — are immune to the action of the hemolysins in those sera. The corpuscles of non-hemolytic bloods are vulnerable and are readily laked by the hemolysins contained in either carcinomatous or syphilitic sera.

The reverse proposition could be argued from the results of the above experiments. That is, if the corpuscles of a given blood are immune to the action of a hemolytic serum, then the blood in question contains a hemolysin. If the corpuscles are laked by a hemolytic serum, then the blood in question does not contain hemolysin.

The corpuscles of 10 other cases of tertiary lues (whose serum was not obtained) were tested against the hemolysins in carcinomatous and syphilitic sera.

The corpuscles of 3 of these cases were easily laked by hemolytic sera derived from carcinomatous or syphilitic persons.

The corpuscles of the other 7 cases were found to be immune to the action of the hemolysins.

It is reasonable to suppose that the 3 bloods with the vulnerable corpuscles did not contain hemolysins, while the 7 bloods containing immune or resisting corpuscles did contain hemolysins.

It was found that the addition of 30 per cent. of normal serum was sufficient to inhibit the action of the hemolysins in both the syphilitic and carcinomatous sera.

Normal serum seems to possess protective substances which inhibit the action of the hemolysins. Hemolytic sera also may possibly contain the same protective substances as normal sera. These substances, if present, would neutralize a certain amount of the hemolysin existing in the serum.

If only a small amount of hemolysin be present, it would, if the above conditions actually exist, be neutralized and rendered incapable of detection by the technique used at present. The corpuscles belonging to such a serum, however, would still be immune to hemolytic carcinomatous and syphilitic serum.

The serum of one case of tertiary lues was found to contain so little hemolysin as to be barely demonstrable. The corpuscles of this blood, however, were perfectly immune to either carcinomatous or syphilitic sera.

The results of this research have some bearing on the subject of transfusion. Inasmuch as some cases of carcinoma possess hemolytic sera, we could not transfuse such cases with normal blood. If transfusion of such a carcinoma case be found necessary — as a preliminary to operation or for other reasons — it will be necessary to secure as donor a person whose blood corpuscles are immune to the serum of the carcinoma case and vice versa.

According to our observations, the desired blood could be found in cases of tertiary lues that have just recovered from their lesions.

The hemolysins found in syphilis and carcinoma appear to be true isolysins. In experimental isolysin-formation the isolysin is a reaction product of the organism in which it is formed. The corpuscles of the animal in whom the isolysin is produced are immune to that isolysin. No anti-hemolysins are present in the sera of such animals.

The evident immunity of the corpuscles in the hemolytic syphilitic and carcinomatous bloods towards the hemolysins in their sera indicates that the hemolysin is a true isolysin, and, like the experimental isolysins, is probably a reaction product of the organism in which it occurs. Some toxic substances absorbed from the dis-

eased focus could be assumed as the exciting cause of such an isolysin formation.

In conclusion, the writer wishes to acknowledge his indebtedness to Dr. J. E. Tuckerman, who collaborated in the research.

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## The effect of instilling adrenalin chloride into the mammalian eye.

By **W. H. SCHULTZ.** (By invitation.)

[*From the Division of Pharmacology, Hygienic Laboratory, Washington, D. C.*]

Certain writers have concluded that mydriasis cannot be produced by instilling adrenalin into the eye of higher animals except under pathological conditions such as lesions of the pancreas or the removal of the superior cervical ganglion. Perhaps this conclusion results from an oversight of the antagonism existing between the influence of instilled adrenalin and light stimuli when simultaneously acting upon the intact eye. At any rate the conclusion is not supported by more recent experiments and is misleading when used as a basis for diagnosing certain pathological conditions.

I have found that mydriasis can be produced in these animals with relative ease and certainty. In making a comparative study, however, of different degrees of susceptibility to adrenalin, due care must be taken to keep the intensity of light stimuli constant. This is essential, since in the eyes of higher mammals where the light reflex is well developed, strong light may cause the pupil to constrict to such an extent that any antagonism of this process by adrenalin may be lost sight of. For instance, by instilling adrenalin into the normal cat eye for some minutes and then examining the eye in light bright enough to constrict the untreated eye to a small slit-like aperture, no difference in the drugged and undrugged eyes can be detected; but the same eyes examined in a dark corner may show a distinct difference in the pupils, the drugged pupil dilating more than the normal one. Thus the early dilating effect of adrenalin can be detected more easily by reducing the intensity of the light stimuli. In this preliminary com-