lation between the number of attacks suffered by a person in different periods of time.

In the studies of the Abel Fund there have become available for the first time requisite data to test this theory. The data are furnished by the Student Group and the Family Group. The first group comprising chiefly students in medicine of the Johns Hopkins University reported from September, 1928, to June, 1932, or four academic years. The second group containing about 100 families residing in Baltimore reported without interruption from November, 1928, to November, 1930. For the study of frequency of attacks in the same persons in two successive years there are the records of 155 students for the first and second years of the study, of 194 for the second and third years and of 54 for the third and fourth years. There were enrolled 114 students in the first year who also were enrolled in the third year, and 56 who reported both in the second and fourth years, thus affording data on the stability of resistance after an interval of one year. Also 49 students were observed in the first and fourth years, which permits analysis of possible change after an interval of two years. The Family Group makes available for two calendar years the records of 144 persons under fifteen years of age, and of 147 of fifteen years and over.

The analysis of these data is based on the computed Pearsonian product-moment coefficient r. The coefficients of the Student Group range from $.16 \pm .10$ to $.41 \pm .05$, and the coefficients yielded by the lower and upper ages of the Family Group are $.64 \pm .06$, and $.54 \pm .06$, respectively. The coefficients of both Student and Family Groups indicate that there is a tendency for persons to remain in the same cold-number class at least for successive years; when the years observed are separated by one year the results are doubtful, and when the interval is two years, a single observation indicates no definite tendency for persons to remain in the same class.

Further available data in the records useful to test stability of resistance and susceptibility comprise the results of continuous observation for three academic years of 111 of the students, and for four academic years of 45. The trend, in general, in each group of students, of the average yearly number of colds reported by those suffering few or many colds when projected into the future or back into the past is towards the average or mean yearly number reported by the total population. With reference to stability, whether of resistance or susceptibility, the data indicate that such a phenomenon was not characteristic of either group of students.

The report will appear in full in the November, 1933, issue (Epidemiological Number) of *The American Journal of Hygiene*. The bibliography will contain a check list of the publications from the John J. Abel Fund for Research on the Common Cold.

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EXANTHEMA IN PEARS AND ITS RELATION TO COPPER DEFICIENCY

IN previous publications[1] it was shown that pear and other deciduous trees affected with Exanthema can be cured by application of $CuSO_4$ to the soil or to the trees.

In further work on this disease carried on recently it was found that treatments of Bartlett pear trees affected with the disease resulted in marked improvement following spraying with Bordeaux mixture, or after the introduction of soluble copper salts into the trunks of the trees. Similar treatments with iron citrate, manganese chloride and zinc sulfate, respectively, were without effect.

Analyses of leaves and twigs showed that the copper content of diseased leaves was lower than that of leaves from trees in a healthy section of the affected orchard and was considerably lower than that of leaves from localities free of the disease. The copper content, on dry weight basis, of leaf samples collected between June and October was as follows:

	Parts of copper per million
Leaves affected with Exanthema	3.1– 5.1
Normal appearing leaves from diseased trees	3.5– 4.9
Normal leaves from part of orchard free of the disease	5.6– 7.6
Normal leaves from localities free of the disease	11.0–20.0

These results strongly suggest that Exanthema in pear trees is due to a deficiency of copper. It should be added, however, that the copper content of healthy looking leaves from diseased trees does not vary significantly from that of the diseased leaves from the same trees. This relation is very similar to that obtained in plants affected with chlorosis due to a deficiency of iron, in which case green leaves often contain less than yellow leaves from the same trees. This relation can be explained by the larger amount of "active iron" in the green leaves.[2] Similarly, it may

[1] R. E. Smith and H. E. Thomas, "Copper Sulphate as a Remedy for Exanthema in Prunes, Apples, Pears and Olives," *Phytopath.*, 18: 449–454, 1928.
H. E. Thomas, "The Curing of Exanthema by Injection of Copper Sulphate into the Tree," *Phytopath.*, 21: 995–996, 1931,

[2] J. Oserkowsky, "Quantitative Relation between Chlorophyll and Iron in Green and Chlorotic Pear Leaves," *Plant Physiol.*, 8: 449–468, 1933.

be assumed that healthy leaves from trees affected with Exanthema contain more "active copper" than diseased leaves, although their total copper content may be smaller, or it could be assumed that the copper is more efficient in its function in healthy leaves, whatever that function may be. In any event, the fact remains that the copper content of leaves, whether diseased or healthy, from trees affected with Exanthema was found to be invariably lower than that of healthy trees in soils free of the disease.

While Exanthema in pear trees is due most likely to a deficiency of copper, no evidence is available at present to decide whether the disease is caused by a deficiency of copper *per se*, or indirectly, as, for example, by the action of copper in neutralizing the effect of soil toxins absorbed by the plant.

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THE HUMORAL EXCITATION OF THE NESTING INSTINCTS IN RABBITS[1]

OBSERVERS of animal life always remark on the skillful preparation made for the reception and care of the new-born. These activities are called instinctive and are considered to be purely nervous in origin and mechanism by the majority of physiologists. It is the purpose of this paper to suggest that the excitation of the nesting instinct may follow the injection of the urine of pregnant women.

The female rabbit living in the ground or in out-of-door cages is almost always seen to pull out the hair from her anterior body wall for a day or two before her young are "kindled." Immediately before delivery she fluffs or cards the fur with her claws until it is extraordinarily light and arranged so as to form a rounded nest. After each of the litter is born and the cord and placenta are eaten by the mother, the fur is loosely piled over the young animal (as protection against chilling and drying?).

The pulling out of large amounts of hair and the fluffing of it into a nest has sometimes been observed to follow sterile copulation or pseudo pregnancy induced by "hopping" or by mechanical stimulation. Such procedures likewise result in a transient corpus luteum formation. When, therefore, we observed nesting to follow the injection of the urine of a pregnant woman into an isolated doe, it appeared that the excitation of this instinctive behavior might well be the result of ovulation and corpus luteum formation.

A number of female rabbits were isolated for at least one month and then injected with the urine of pregnant women. A few others were injected with commercial extracts of the urine of pregnant women (Antuitrin S.) All were closely observed by repeated laparotomies for the occurrence of ovulation and corpus luteum formation and the nesting activity carefully noted. It was discovered that the animals which ovulated and developed corpora lutea showed definite loosening of the fur as determined by repeated combing tests. This occurred at the end of the second week following injection. The rabbits that developed pseudo pregnancies showed it again at the end of the third week, and the normally pregnant animals showed this second loosening at the end of the fourth week. The rabbits were seen to pull hair only when it was in a loosened condition, but all animals which showed loose fur did not pull it out.

Only seven of fourteen rabbits injected with pregnancy urine built nests. The commercial extracts all proved negative as far as the nesting activity was concerned, although they led to corpus luteum formation. In the pseudo pregnant animals nesting occurred at the end of the third week following injection.

These findings lead us to conclude that the loosening of the hair in the rabbit parallels the involution of the corpus luteum and that some additional factor is necessary for excitation of the nesting instinct. The latter activity can be induced in the absence of pregnancy and through the injection of the urine of pregnant women. The nature of this additional factor is now being studied.

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