129 (2652)

# Hereditary visceral abnormalities in the descendants of irradiated mice.

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About a year ago[1, 2, 3, 4] the writer mentioned the occurrence of several mice with kidney defects that were descendants in the sixth and subsequent generations of certain x-rayed animals in which an attempt had been made to alter the germ plasm by physical agents. For details concerning the work leading to these studies, and the data so far recorded, the reader is referred to the references given below.

The present communication deals with the results of 1817 autopsies of the descendants of mice with visceral abnormalities, which are mainly of the urinary system but are also associated with other visceral disturbances. Preliminary genetic results are also given to show the nature of the inheritance of these abnormalities. The following is a brief summary of the types of visceral abnormalities so far observed with the number of individuals in each group recorded in parenthesis:

A. In adult animals:

1. Kidneys moderately unequal in size, with no hypertrophy of the larger (5).

2. One kidney nearly completely missing and hypertrophy of the other (3).

3. One kidney normal and the other pathological; polycystic kidneys (3), hydronephrotic kidneys (3).

4. Kidneys in reversed position, *situs inversus viscerum* (1).

5. Absence of one kidney (285). The solitary kidney is usually, but apparently not always, hypertrophied.

B. In 1142 animals examined within a few hours of birth:

1. Kidneys unequal in size (8).

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[1] Bagg, H. J., and Little, C. C., *Am. J. Anat.*, 1924, xxxiii, 119.

[2] Bagg, H. J., PROC. SOC. EXP. BIOL. AND MED., 1924, xxi, 228.

[3] Bagg, H. J., *Am. J. Obstet. and Gynec.*, 1924, viii, 2.

[4] Little, C. C., and Bagg, H. J., *J. Exp. Zool.*, 1924, xli, 45.

2. Congenital absence of one kidney (132). No hypertrophy of the solitary kidney was noted within 24 hours of birth.

3. Congenital absence of one kidney and reduction in size of the other (11).

4. Congenital hydronephrosis (9). In five instances the hydronephrotic kidney was solitary, while in 4 an apparently normal kidney was the mate of the abnormal one. A tortuous and much distended ureter is associated with this condition.

5. Congenital absence of both kidneys (149). The adrenal glands are apparently normal. The animals are born alive, of apparently normal size and activity, and live for about 24 hours.

Localized fetal hemorrhages of the viscera have been noted associated with kidney abnormalities in the following locations: region of the kidneys (3); liver (7); testis (9), there was one animal with a missing testis; pancreas (1).

C. Summary of anatomical results:

140 animals with right kidney missing; males 76, females 64.
145 animals with left kidney missing; males 77, females 68.
149 animals with both kidneys missing; males 85, females 64.
92 animals with one kidney missing and right eye abnormal.
101 animals with one kidney missing and left eye abnormal.
21 animals with one kidney missing and both eyes abnormal.
71 animals with one kidney missing and eyes normal.
40 animals with both kidneys missing and right eye abnormal.
59 animals with both kidneys missing and left eye abnormal.
10 animals with both kidneys missing and both eyes abnormal.
40 animals with both kidneys missing and eyes normal.
100 animals with the eye and kidney defects on the same side of the body.
96 animals with the eye and kidney defects on opposite sides of the body.
30 animals with the kidney, eye and foot defects present in the same individual.

D. Preliminary genetic results:

Crosses were made between normal albino female mice and males from the experimental strain showing kidney, eye and foot defects. The albinos were selected from a carefully inbred strain that I have had under my observation for about 12 years.

At the present time 41 first generation animals, all apparently normal, were obtained from mating 8 normal albino females with

3 males, each with a solitary kidney associated with eye defects as well.

Four hundred forty-one second generation animals were obtained from 52 *inter se* matings of first generation animals. The average number of young per litter was 8.4. One hundred and one, or approximately 20 per cent of these animals was abnormal, either in the kidney, eye or foot regions; and 340 were apparently normal in all respects. The expected 3 to 1 mendelian ratio in this instance is approximately 110.25 to 330.75.

The examination of the second generation animals was obtained from complete autopsies made at birth. One or both kidneys were missing in 60 of the 101 abnormal animals.

In back-cross matings between 16 first generation females and the abnormal male parent, 292 offspring were obtained from 50 matings. The average number of young per litter was 5.8. One hundred sixteen animals were abnormal in either the kidney, eye or foot regions, and 176 were apparently normal in all respects. Sixty-nine of the abnormal young had one or both kidneys missing. The records were made from autopsies at birth. The expected ratio of abnormal to normal animals in the above matings is 1 to 1. The results show, however, that 40 per cent of the back-cross animals were abnormal, and 60 per cent apparently normal.

## 130 (2653)

## The metabolism of glycerol in phlorhizin diabetes.

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It has been commonly accepted that glycerol can be completely converted into glucose by the diabetic, although no convincing evidence for this has been published. The early experiments of Cremer[1] on a phlorhizinized dog and of Lüthje[2] on depancreatized

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[1] Cremer, M., *München. med. Wchnschr.*, 1902, xlix, 944.

[2] Lüthje, H., *Deutsch. Arch. f. klin. Med.*, 1904, lxxx, 98.