(6) Although the average number of units exhibiting independent differentiation might suggest that only Hall's "units of the first order" possess this capacity, nevertheless the irregular distribution in individual cases, the tendency to occur in aggregations, and complete failure of all units to develop in many cases, do not favor this hypothesis.

(7) Posterior to the sexual region differences between operated and unoperated sides are less extreme, due to the more recent development of these units. The percentage of tubules capable of independent differentiation is, however, about the same as for the "sexual kidney." A study of older larvae will be necessary before final statements can be made regarding this region.

(8) The fundamental distinction between units capable of independent differentiation and those whose development is arrested at the vesicle stage, remains to be determined.

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Susceptibility of the "Gopher," *Citellus richardsonii* (Sabine), to *Leptospira icterohemorrhagiæ*.

JEROME T. SYVERTON, WILLIAM W. STILES AND GEORGE PACKER BERRY.

From the Department of Bacteriology, University of Rochester, School of Medicine and Dentistry, Rochester, N. Y.

Rats *(Rattus norvegicus* and *Rattus rattus)* are responsible for the world-wide dissemination of bubonic plague and Weil's disease (infectious spirochetal jaundice or spirochetosis icterohemorrhagica) and for the presence of plague in the extensive rodent population that is native to the United States. Plague was originally introduced among the native rodents through the association of infected rats from the wharves of San Francisco with members of the ground-squirrel genus *Citellus*. The disease is continuing to spread in the ground-squirrel host. Today, it is present throughout an extensive area and constitutes a public health problem of major importance. Might ground-squirrels play a similar rôle in Weil's disease? An investigation was undertaken to throw light on this point. In the present communication, evidence is summarized which shows that the "gopher," *Citellus richardsonii* (Sabine), a rodent closely related to the California ground-squirrel, is sus-

ceptible to infection by the etiological agent of Weil's disease, *Leptospira icterohemorrhagiæ*.

The Richardson ground-squirrel, *Citellus richardsonii* (Sabine), is representative of a large number of closely related species which are distributed throughout much of the United States and Canada. In the north central states, and spreading over into Alberta and Saskatchewan, an area in which it is the commonest wild animal, it is known by the local name of "gopher". The adult animal, grayish-brown in color, measures 7 to 9 inches over-all. It is characterized, as are the related species, by the possession of long claws and powerful limbs with which it burrows into the ground. One litter of from 6 to 11 offspring is born during the summer months. This explains the great increase in numbers as well as the marked activity during this period.

The natural habitat of the gopher is pastures and fields, where grain, roots, and other vegetation provide an ample food supply. Not infrequently, however, it lives in close proximity to buildings, such as barns and granaries, which are infested with rats. Thus, the rats are able to invade the burrows of the gophers and to manifest their predatory habits. It is significant, also, that gophers are sufficiently carnivorous to kill and devour sick and weakened members of their own or related species. This characteristic promotes the transmission of disease from animal to animal and from species to species.

Two strains of *Leptospira icterohemorrhagiæ* were employed in the present studies. One of these strains (the K. strain, which was isolated from a human case) had been carried through 32 passages in guinea pigs before being used to initiate a series in gophers. The other strain, Rat No. 45, was isolated from rats captured at Rochester, New York.

Blood was used as the infective medium for the initial infection of the gophers with each of the strains of *Leptospira icterohemorrhagiæ*. The rat strain was carried through 5 successive passages in gophers, passage being effected by the intraäbdominal injection of 1 cc of blood. The human strain was carried through 5 passages in gophers, using blood as the inoculum. Then, for an additional 10 passages, the strain was maintained in gophers by the subcutaneous inoculation of 1 cc of a 10% kidney-suspension from which the larger particles had settled out on standing. The kidney-suspension was prepared by trituration (without an abrasive) with 0.85% NaCl solution.

In the gophers of both passage-series, the experimental disease was uniformly fatal. The period of survival varied from 4 to 9

days. The clinical manifestations of the infection in gophers were as severe, if not more so, as in guinea pigs. The pathology was essentially similar, although jaundice was not as readily discernible in the gopher as in young white guinea pigs.

Successful passage of the disease was also effected when gophers, dying or dead of the spirochetal infection, were permitted to remain in a cage with normal gophers. Under these circumstances, the normal animals ate portions of the infected animals, thereby contracting a fatal infection.

No change in the virulence of the organisms was revealed on testing in guinea pigs, after 15 serial passages in gophers.

Summary. Evidence is presented of the susceptibility of the gopher or Richardson ground-squirrel, *Citellus richardsonii* (Sabine), to the etiological agent of Weil's disease, *Leptospira icterohemorrhagiæ*. Two series of 5 and 15 passages through gophers, respectively, were effected by the parenteral introduction of blood or tissue-suspensions. The organisms were tested in guinea pigs following the serial passages in gophers; no changes in pathogenicity were noted. Passage was also accomplished by permitting normal gophers to feed on infected gophers, dying or dead of the spirochetal disease.

The findings presented in this note suggest that gophers, or similar wild rodents, might act in nature as hosts for *Leptospira icterohemorrhagiæ*.

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Rate of the Flow of Bile. Experimental Data on the Rabbit.

BÉLA HALPERT. (Introduced by R. Ashman.)

From the Department of Pathology and Bacteriology, Louisiana State University School of Medicine, New Orleans, Louisiana.

Incidental to investigations on the function of the gallbladder the writer and his coworkers[1-4] accumulated data relative to the amount of bile produced by the rabbit. Information obtained under similar

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