

during the normal winter hibernating period, practically no food is consumed for seven or eight months.

Of thirteen additional animals which have been in our possession now for ten months, nine (4 males, 5 females) have been kept in constant cold from October 1, 1956, to the present (July 1957), and all but one of these hibernated over the winter months, and again with the exception of one, all became active in the spring. It should be noted here that a gradually decreasing length of the artificial day in the autumn, down to 7 hr., did not induce hibernation earlier than those in a constant 12-hr. day. Furthermore, in March, prior to the animals becoming active, the length of the day in three cases was reduced to 4 hr. and in two cases increased to 20 hr., but even this caused no significant difference in the time at which the animals became active and continued in that state. It seems, however, that access to an exercise wheel in the autumn tends to delay the onset of hibernation for about a month, but once the animal enters hibernation it continues in this state until approximately the same time as those which are denied an exercise wheel.

It is still conceivable that the organisms we have studied have received clues concerning the seasons from some other variations such as noise level, from barometric pressure changes or from variations of the water content of the air. None of these factors seems likely to us to be of appreciable significance however. Instead, it seems necessary to conclude that the species in question possesses some form of 'internal seasonal clock' which determines the periods of hibernation and activity, and which is independent of the normal seasonal fluctuations of temperature and light, and is not governed by the food supply.

The Columbian ground squirrel (*Citellus columbianus*) and the thirteen-lined ground squirrel (*Citellus tridecemlineatus*) also seem to show the same type of phenomenon, though our results from these animals is as yet rather scanty.

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Susceptibility of the Hedgehog (*Erinaceus europaeus*) to Infection with *Leptospira pomona*

Leptospira pomona is widely distributed in New Zealand, and outbreaks of leptospirosis among farm animals cause considerable economic loss to the livestock industry. While it is generally accepted that the domestic pig is the normal reservoir of infection it is rarely possible to inculcate the pig directly in ovine outbreaks of leptospirosis, and many outbreaks also occur on dairy farms on which no pigs are kept.

In view of its feeding habits, the hedgehog, which was introduced into New Zealand some sixty years ago and has now become extremely numerous in most districts, suggested itself as a possible alternative reservoir of infection.

I have recently caught some thirty hedgehogs in a suburban garden area and inoculated them with a culture of *L. pomona* which has been maintained in

this laboratory since its isolation from an ovine outbreak of the disease in 1953. Every hedgehog contracted a clinical leptospirosis, and the disease appears to run a remarkably characteristic course in this species.

Small young and half grown individuals almost invariably die with some or all of the signs of classical Weil's disease (*i. icterohaemorrhagiae*), that is, recurrent febrile peaks with sub-normal intermissions, icterus, meningitis, 'butterfly' lungs, and typical degenerative lesions in spleen, liver and kidneys. Those surviving long enough commence urinary excretion of the organisms around the 16th-18th day.

Adults usually survive the challenge infection but excrete the organisms in their urine over a period and develop high agglutination-lysis titres to *L. pomona* antigen. Pregnant females may abort.

Guinea pigs inoculated with emulsified liver and kidney substance obtained from infected hedgehogs at post mortem and also with the stomach content of aborted fetuses gave a typical response and the organisms were recovered from them.

By the time these experiments were completed winter had set in and most hedgehogs were in hibernation; but I have just examined two individuals found after a careful search on a dairy farm on which a severe outbreak of leptospirosis had recently occurred. Both these adult hedgehogs revealed typical leptospiral lesions on post-mortem examination; the organisms were present in the urine of one, and the blood serum of both had agglutination-lysis titres in excess of 1/3,000 against *L. pomona* antigen.

The hedgehog has thus proved highly susceptible to experimental infection with the strain of *L. pomona* used here and it has also been established that natural infection may occur in the field. As soon as these animals become active again in the coming spring it is intended to carry out a survey to determine the extent of natural infection.

Hitherto the hedgehog has only found a very limited use as a laboratory animal in virology research, but in the light of the results here reported it may prove a useful tool in leptospiral research in general.

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The Sheep Lungworm *Protostrongylus brevispiculum* in Great Britain

DURING the past year observations have been made to assess the seasonal pattern of lungworm infection in a flock of sheep grazing on the Wiltshire Downs. In the course of the examination of faecal samples from some of these animals first stage lungworm larvæ of an unusual type were encountered. A description of such larvæ could not be found in the literature. A search for the adults was, therefore, made. This proved to be more complex than had been anticipated as a number of lungworm species new to us were found. One of these has been identified as *Protostrongylus brevispiculum*, and the present record is thought to be the first of the occurrence of this lungworm in sheep in Great Britain.

The only records and descriptions of this lungworm are those of Mikaïdî¹, who found specimens in sheep