THE RELATION OF THE RAT TO THE PUBLIC HEALTH.*

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The bacteriologist, the pathologist and the epidemiologist have contributed greatly to our knowledge within the last decade or so with reference to the modes of transmission of contagious and infectious disease. They have elucidated the fact that many creatures that were formerly looked upon as pests only are in reality a means of transmission of deadly disease. Not only have they demonstrated to us the means of transmission, but in doing so they have in almost every case discovered and pointed out the means of prevention. They are rapidly giving us system, method and protection for the chaos that prevailed before.

It is a well-established fact that the mosquito transmits malaria, yellow fever, dengue and filariasis; that the tsetse fly carries the dreaded sleeping sickness in Africa; that rats, mice and ground squirrels through the fleas that infest them transmit bubonic plague and possibly leprosy. The housefly multiplies her accomplishments by being able to distribute several different diseases with the utmost impunity to herself. Many other creatures are under grave suspicion, as the cockroach, ticks, gnats, bedbugs, body lice and oysters.

But it is with the rat that this paper expects to deal mainly. From an economic standpoint the rat is an enormous factor. The loss caused by them annually in the United States is variously estimated at from thirty-five to fifty million dollars. In 1838 the number of rats killed on a single plantation in the island of Jamaica was 38,000 and the damage done to the sugar plantations that year was thought to be not less than a half million dollars. In 1881 the Indian Famine Commission reported to the English Parliament that the suffering of the populace was largely increased by the destruction not only

of food supplies, but of growing crops by the little rodents. Rewards were offered for their destruction and over twelve millions were reported killed in a short season.

Rat migrations have been reported. Pallas narrates that in 1727 great hordes appeared from the east at Astrakan, in southeastern Russia. They crossed the Volga in vast armies and devastated the country, and almost as suddenly disappeared, in all probability from some epidemic among them. An invasion of rats in the Bermuda Islands occurred in 1615. They increased to such an alarming extent that they devoured practically everything in their way, so that for a year the population was almost destitute of food. In 1877 an invasion of rats occurred into Caline and LaFayette counties, in Missouri. 'So great was their numbers that serious loss to grain and poultry resulted. In South America these migrations are to a certain extent periodical, occurring in Brazil at intervals of approximately every thirty years; and in Chili about every twenty-five years. In 1878 in the State of Parana the whole of the crops of corn, rice and mandioca were destroyed by them, causing a serious famine. In 1903 a multitude of rats spread over several counties in western Illinois. An eyewitness describes one moonlight night having heard a general rustling in a field, was greatly astonished to see an army of rats cross the road. They stretched away as far as the eye could see in the dim light. Three thousand four hundred thirty-five were killed by one farmer on his premises.

The menu of rats is much more comprehensive than is at first thought. It includes grains, cereals, fruits, vegetables, bark, bulbs, roots, stems, leaves, eggs, young chickens, ducks, rabbits and especially squabs, butter,

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cheese, meats, etc. Their feeding habits resemble squirrels in their manner of holding their food between the forepaws while eating. After eating they brush their mouth and whiskers with their paws until clean. They generally feed mostly after sunset, and are great water drinkers.

Their ferocity has been grossly exaggerated. Stories of their attacking sleeping children and sick people have slight foundation in fact. They defend themselves by biting, but their bite is not poisonous. When pressed by hunger they become cannibals, destroying the weaker ones.

They probably do far less harm in the destruction of food and crops, etc., than in their capacity as disease carriers. Their history as transmitters of disease extends back into antiquity. The book of Samuel makes mention of a pestilence having reference to rats and mice; and in the hopes of its abatement offerings of golden images of the little creatures were made by the Philistines.

PLAGUE.

The rat is a known or a suspected factor in the transmission of several different diseases, but for the present and possibly for some time to come the most important thing for us is his relation to the spread of bubonic plague among human beings. Not only is there evidence that they are the means of spreading it in epidemic form, but in all probability they are directly responsible for its going from place to place, even across continents and oceans; for they are great travelers in the holds of vessels and railway freight cars. They transmit the disease to other animals, as ground squirrels, guinea pigs, and possibly others. It is stated that in places in California trappers have caught more rats than squirrels in the squirrel burrows. This indicates the ease of transmission between these little neighbors. In recent experiments carried out by the United States Public Health and Marine Hospital Service in California a certain number of fleas were taken from rats infected with plague and allowed

to bite six ground squirrels. Three of these squirrels died in a few days of plague. Fleas from the dead squirrels were allowed to bite a second series of six squirrels and two of these died of plague. Fleas from the last dead were allowed to bite rats and again the disease resulted. Of course, this is all made possible by the activities of the flea, a parasite common to a large per cent. of living creatures.

Pathologically there is little of unusual interest in a rat infected with plague. But it is well to study the rat in its reaction to the bacillus pestis. The characteristic lesions produced by plague in man and laboratory animals are so marked that we would expect to find the same in rats, and such is the case. It is comparatively easy to make a diagnosis from the gross lesions in all but the atypical cases, with a reasonable degree of certainty. Even the unskilled attendants in the quarantine service in the infected area are soon able to recognize it. The bubo is the most reliable sign and is enough to base a diagnosis that rarely proves wrong. In rat leprosy the lymph glands enlarge to greater proportions.

There is a form of glandular enlargement in old rats that is entirely benign. To the practical observer the differentiation is a relatively easy matter. The bubo is caseous and is easily shelled out, but the feel is hard and firm, it never reaches the large proportions of the leprosy gland. The latter are recognized mainly by their large size and lack of surrounding infiltration. The large indolent gland of the old rat is elastic and leathery and without any evidence of illness in the animal. Observers differ as to the location of the primary bubo; axillary inguinal, submaxillary and cervical glands being variously accused by different authors. Two different lesions of the liver are looked for in a plague-stricken rat, viz., what is termed by the Indian Plague Commission as fatty liver and striped liver; the former found by the microscope to be minute necrotic areas, while the latter is or appears to be a sort of mela-

nosis. The spleen is found to be markedly dark, firm and granular and friable. Pleural effusion is a constant symptom in rat plague, but is rarely ever found in other rat diseases. The gross lesions in rat plague are often so inconclusive that the microscope is necessary to determine the disease. The B. Pestis can scarcely ever be isolated except by cultures. But it has been found unsafe to depend entirely upon cultures, inoculations being resorted to when great certainty is desired.

A large percentage of rat immunity was found to exist both by the Indian Plague Commission and the officers of the United States Public Health and Marine Hospital Service in San Francisco. At least fifty per cent. of those artificially inoculated failed to become infected.

Summarized from reports of the Indian Plague Commission and of the U. S. Public Health and Marine Hospital Service.

Medical News From Florida

On the 8th, 9th and 10th of May there was held at Tampa the annual meeting (of which we give a report on another page) of the Florida State Medical Association. Dr. J. S. Helms, of Tampa, was elected President for the ensuing year, and Miami was chosen as the place of meeting for the annual gathering in 1913.

Honorary Degree Conferred

At the eighty-first annual commencement of Wesleyan University, at Middletown, Conn., held on June 19, the degree of Doctor of Laws was conferred upon Dr. Amos J. Givens, proprietor of Givens' Sanitarium for nervous diseases at Stamford, Conn.

Rural Sanitation

By W. C. RUCKER, M.S., M.D.,
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and Marine Hospital Service.

The happy days of childhood
I often call to mind,
I love to live them o'er again
By memories' light refined—
The orchard and the meadow,
And the loft of fragrant hay,
The garden and the privy,
And the well not far away.

The farm yard with its litter
Of manure round about,
The milking shed where flies galore
Flew buzzing in and out.

The pig-sty and the chicken house,
The hens that scratched all day
In the ground beneath the privy
With the well not far away.

We took our joys and sorrows
As they chanced to come along,
My brother had the ground-itch
And he didn't grow up strong,
And Mary died of fever—
It was might sad that day—
But we didn't blame the privy
Nor the well not far away.

In the summer time, mosquitoes
Used to sing the whole long night,
But we would keep the windows closed
And thus avoid the bite,
But Billy got the ague
And Lizzie pined away—
Mosquitoes—foul air—privy,
And the well not far away.

We used to think that death was just
A punishment for sin—
The sin of ignorance I say!—
So let us now begin
To try and get the windows screened
Put open night and day,
And a sanitary privy
With the well quite far away.

Let's clean the cows at milking time,
Let's clean the barn yard, too,
Let's rid ourselves of fevers
And the chills and ague crew,
Let in the air and sunshine
But drive the fly away,
With the ancient typhoid privy
With the well not far away.