THE NECESSITY FOR RODENT EXTERMINATION IN AMERICAN SEAPORTS *

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The rodent is the twentieth-century anachronism. He is as archaic as the neolithic midden to which he is coeval, and yet to-day we tolerate him, permit him to devastate our storehouses and to act as the intermediary vehicle for the transference of the organisms of disease between his loathsome carcass and the body of man. The toleration which we have shown for this inhabitant of the sewer and frequenter of the dump is perhaps due to the fact that man is by nature a lazy animal and will make no unnecessary effort unless spurred to it by some circumstance in his environment. It has been necessary for plague to ravage the world many times before man has learned well the lesson that the rat and his confrères, the mouse and the ground-squirrel, are among the most deadly animals with which he has to deal.

That rodents are the carriers of plague is too well known to merit more than a passing reference here. They are also afflicted with a leprosy-like disease which closely resembles, both in its etiologic factor and in its pathology, the leprosy of man. A number of other diseases exist commonly among them, the organisms of which are believed to be capable of producing human disease. They are also the hosts for a legion of entoparasites, while ectoparasites, such as fleas, lice and ticks, infest their hairy bodies. Furthermore, they are afflicted with new growths both of the benign and malignant types, and if we were to accept the parasitic theory as to the etiology of the latter, it might be that we would find that the rodent played a rôle in the dissemination of cancer.

The rat, then, is a menace to us physically. He also threatens us commercially. Traveling in the bodies of ships, and dogging the commercial highways of the world, he is the veritable "old man of the sea" whose appearance in the community is the sign of impending pestilence and the resultant commercial disaster. Plague is essentially a disease of commerce and not only does harm through the human sacrifices which it claims, but also because of the great fear it engenders levies a heavy commercial tribute. In addition to the depredations thus produced by this murine enemy, the mere item of subsistence alone is enough to warrant us in attempting the limitation of this species. A rat will consume approximately a bushel of grain in a year. If the cost of this be taken at $1, it can thus be seen that the community suffers an enormous loss in this way. But the depredations of rats are not confined to relatively cheap articles; the choicest fabrics and leathers, books and objects of art — none of these is spared; poultry and eggs, seeds and bulbs — all are destroyed by these vermin; and still the indictment against the rat is not complete unless we mention the many disastrous fires which have been caused by the rats' fondness for phosphorus which leads them to gnaw matches which have been carried to their nests. These are composed of dry and very inflammable material and are usually hidden in some secret labyrinth between floors and walls, and the fire reaches unquenchable proportions before its discovery. We must add to the charge of arson that of theft, for there are numerous instances on record in which rodents have carried away, for pure wantonness, jewelry and other articles of considerable value.

Aside from the extensive work which has been carried on in California, no effort of any magnitude has been made to check the inroads of these vermin or to determine whether or not they are infected with plague or some other disease which is pathogenic for man. It is a well-known fact that plague may smolder in a rodent community for a considerable time before accident brings about a closer contact between infected animals and man, thus giving rise to an epidemic. The effort of the sanitarian should be to discover the epizootic foci of the disease and to eradicate them before the opportunity for the transference of the disease to man occurs. It is equally important that the importation of rats, particularly infected rats, into a clean community, or the exportation of rats from a plague focus, be prevented.

The prerequisite to this is the trapping of rats, and it is the duty of every maritime city in this country to begin a sanitary survey of its rodent population. The methods for the trapping and examination of rats have been thoroughly discussed elsewhere[1] and it will be sufficient to indicate here that trapping, to be of value, should be systematic, that captured rodents should be carefully labeled, and that they should be examined by a competent bacteriologist. An accurate record of every rodent taken should be kept and the data obtained by such a survey should be intelligently tabulated. This is important for many reasons, not the least of which is the value of a record of the rat catch on premises on which it is desired to force sanitary improvements. No property owner was ever known to admit the presence of rodents on his premises, but confrontation with the register of the rats taken on his holdings is an unanswerable argument. Moreover, this is the preliminary step toward the securing of adequate ordinances bearing on the proper disposal of garbage and other wastes, the sanitary construction of stables and chicken-yards, the regulation of places in which foods are prepared, stored or sold, and the rat-proofing of buildings used for human occupation. It will thus be seen that the sanitary surveillance of the rodent population is the starting-point of a series of sanitary reforms which have a vital bearing on the public health. This is important, not only because of the security from plague secured thereby, but also because the measures which are directed against pest exert a preventive action against many other communicable diseases. Thus, it was observed that the plague-eradicative work in California was accompanied by a subsidence not only of plague but also of most of the acute infectious diseases both of man and of domestic animals.

Perhaps the most important single result of the attempt at the limitation of rodent activities is rat-proofing of buildings. This is a form of insurance — insurance against fire and pestilence. It is more than this, it is a plague-eradicative measure of the first magnitude, because it is axiomatic that he who dwelleth rat-free taketh no plague. The ideal agent to be used in this "building the rat out of existence" is concrete. Next to it in value come metal and other substances through which rats cannot pass. It should not be forgotten that the concreting of basements and the erec-

* Read in the Section on Preventive Medicine and Public Health of the American Medical Association, at the Sixty-Third Annual Session, held at Atlantic City, June, 1912.

1. The Rat and Its Relation to the Public Health, Pub. Health Bull. 30, U. S. Public Health and Marine-Hospital Service, Washington, Government Printing Office, 1910.

tion of area walls benefits the health of the householder by reason of the exclusion of dampness, and the removal of planked-over back yards and their replacement by cement makes for the general cleanliness of the premises. Permanent rat-proofing is therefore not an expense but a permanent health investment paying good dividends.

In this connection should be mentioned screening, because no matter how well the lower levels of a house may be fortified against rats, such efforts are nugatory unless the windows and other openings are screened. This means the exclusion not only of the rat but also of the fly and the mosquito, thereby affording protection against the diseases which these insects carry.

When we campaign against the rat, we not only destroy his abiding-place and exclude him from the home of man, but we also endeavor to separate him from his food-supply as well, because the famished rat does not linger. The point of attack is the garbage-can. This probably is the most misused of all the household utensils; hated by the housemaid, bumped and dented by the garbage-man, overturned by hungry cats and dogs, the receptacle for filth, and the begetter of noisome odors, it is at once a most useful and a most dangerous sanitary instrument. If we could ensure that every garbage-tin in a city was water-tight, well covered and maintained in a cleanly condition, we could feel a reasonable security from rats and flies. It is not enough, however, that garbage-cans be tight and clean; the collection and disposal of their contents requires careful supervision. This comprehends a study of the city's entire refuse-disposal system and if necessary its reorganization to meet the sanitary needs.

The stable, furnishing as it does both a harbor and a commissary for the rat, should receive careful attention. In the first place, let it be said that unless they are as carefully regulated and as cleanly administered as a human household, stables have no place in the scheme of the modern city. Thanks to the advent of the automobile and the motor-truck, the day is not far distant when the rat-infested, fly-breeding stable will have been relegated to the age of sanitary darkness. Stables to be rat-free should be rat-proofed by the installation of concrete floors; the manure should be kept in air-tight metal-lined boxes, and the stable itself should be screened and connected with the sewer.

The hungry and homeless rat may be poisoned with ease. This requires relatively little labor and every householder should be encouraged to poison the rats on his premises. Various agents have been employed for this purpose, but all things considered, phosphorus seems to be best for the purpose. It may be said in its favor that rats like it, that it is cheap and that it is certain in its action. The fact that it deteriorates on exposure to sunlight is not an unmixed evil, because if poison lies about for a considerable time it may be taken by some animal other than the rat. A very effective formula contains 4 per cent. of phosphorus in a glucose base. Rat-poisoning is a duty too frequently overlooked, and we shall do well to follow the example of our European cousins, and institute rodent extermination campaigns in all our large cities.

We have thus seen into what a varied field of public health activity the efforts at rodent extermination logically lead us. Supposing, that in our examination of the captured rodents we uncover a plague focus, what will be our method of procedure? In the first place we have, so to speak, the "choice of position," which is no mean advantage. We can strike before the epizootic becomes an epidemic and we can strike so quietly and so surely that no disastrous result need come to commerce. In this lies the great argument for rodent exterminative work in cities in which plague is not known at present to exist or in which plague has never been found. Plague has left its spoor at almost every junction of the trails of trade, yet it has not been recognized until it has signalized itself by the occurrence of human cases. Who can doubt that if the rats of the great seaports of the world were examined, the infection would be found in many cities heretofore considered plague-free? And who can controvert the statement that if the infection is recognized now and promptly up-rooted many lives and millions of money can be saved?

The first thing to be done on the discovery of a plague focus is to wipe it out. In order to wipe out a plague focus it is necessary to kill the rats therein. It is impossible by any single known method to accomplish this. Hence, reliance must be placed on a combination of methods which will attack the rat along every avenue of his existence. There is more to this than the mere killing off of the rat, because when an attack is made on any species which lives in more or less close proximity to man, there is a coincident improvement in the environment in which man lives, and hence there is a decided falling off of the diseases which are essentially environmental in character. Rats may be killed by starvation, prevention of multiplication, eviction, poisoning, trapping and the employment of natural enemies, such as the dog or the cat. The technic of these methods has been discussed elsewhere, and it need be only mentioned here. The reduction of the rodent population in an infected zone is in reality a question of dilution of the infectable material, and even though the rats which remain have a better opportunity for securing food than they had previously, the fact that they are widely separate from one another causes the disease to die out among them.

Since plague is a disease of commerce, and since plague is a disease of rats, and since rats journey over the world in ships, it is the duty of persons who are charged with the protection of the health of marine ports, to kill rats in ships. This is best done by periodic fumigation, either by sulphur dioxid gas, carbon dioxid, carbon monoxid or funnel gases. This is cheaply and easily done, and if these remedies were periodically applied at all of the ports of the world, it would not be very long before the disease ceased to follow the track charts of marine commerce. In order to secure such action, it would be necessary for the powers of the world to enter into an international sanitary agreement. This would entail considerable labor and expense, but if it were accomplished, it would prove a measure of great good. Couple this with the extermination of rodents in seaports and plague would soon be relegated to the museum of paleolithic sanitation.

Sanitary Milking.—A Florida inventor (*Scientific American*, May 25, 1912) has come forward with an appliance in the form of a screen to be used during hand milking. It consists in a vertical partition interposed between the cow and the milker with a large opening in which is fitted a flexible screen made of rubber, skin or fabric, having holes for the insertion of the cow's teats. This is so applied as completely to exclude foreign substances from the milk-pail. This appliance requires that each cow be taken to the structure provided with the screen and confined there while being milked, the milker being in an adjoining apartment and not in contact with the cow. Though a little more trouble than the ordinary method, this would seem to be an admirable arrangement hygienically, but large dairies would require a number of these appliances.