R. Aurii et sodii chloridi.....gr. iss |10
 Pulv. res. guaiaci3 iss |6
 M. et div. in caps. No. xxx (dry). Sig.: One before each meal.

In the general consideration of the therapeutics of acute insanity, we must ever be mindful of the necessity to pay close attention to the constitution of the patient. Rheumatism, gout, tuberculosis and syphilis will be recognized more or less by us and will demand special consideration. The rest cure should be followed by a course of judicious exercises, some congenial occupation, and by what may be called education. The patient's mind must be in the most forceful manner directed into normal channels. The treatment above outlined should be continued for at least three months and at the expiration of that time some of the cases will be found to have made rapid progress toward recovery; such being the case the treatment should be continued until this desired end is reached; others at the expiration of three months will be found to show no improvement; the further continuation of the treatment is then not to be desired and they should be provided for in a special hospital for the insane; others will have improved sufficiently at the expiration of this time to make a return to their homes not only possible but desirable and this may be a material assistance in their progress towards recovery.

In conclusion, I desire to emphasize the opinion that many cases of acute insanity can be more certainly and rapidly restored to health in a well-governed general hospital than in any of our best special institutions for the care and treatment of the insane, and I urge on my confrères greater efforts in this direction for the relief of these unfortunate people.

THE PRESENT STATUS OF THE BEDBUG IN THE TRANSMISSION OF HUMAN DISEASES.

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Scientists, medical men and entomologists have demonstrated beyond doubt that fleas, house flies and mosquitoes carry and transmit certain dangerous diseases. Fleas carry bubonic plague; house flies, numerous pathogenic bacteria, including those of cholera, bubonic plague, tuberculosis and typhoid fever, also myasis and even some of the parasitic worms that live in the intestines of man; mosquitoes carry yellow fever and malaria and also that most horrible filarial disease known as elephantiasis. It is not strange, therefore, that at last the bedbug should come in for its share of suspicion and experiment, though rather singular that it should be the last in order.

It is the purpose of this article to point out what is now known regarding the carrying of disease germs by this insect, a question which should be of interest to all, especially those who live in large, crowded cities, where its presence is becoming a serious factor. It is also hoped that in a measure it will serve to arouse the general public against an insect whose very presence is a disgrace to our times, and which is the very personification of all that is foul and filthy, and which, besides, has now become a hidden menace to our social communities. It is indeed remarkable that civilized man, who prides himself on his cleanliness, on the comfort and decency of present-day living, and on his freedom from many diseases hitherto common, and who, in fact, at least pretends if he does not actually feel that the very idea of

uncleanliness is abhorrent, should wink at the insinuating presence of such a low-bred pest.

This disgusting creature false modesty "dooms" to ostracism and thereby fosters its safety and increase. Its widespread distribution and its abundance can not be denied; statistics are unnecessary to show this. Suffice it to say that it is surprising, even to an entomologist, to find it as numerous as it is, with all the ready means now available for its certain destruction and considering the fact that man is now civilized.

Although the bedbug has been known for centuries and its literature comprises as high as five hundred and some odd articles, but very little, at present, is really known concerning its habits and life history. On the contrary, much has been conjectured. In addition to this, its host relations are entirely unknown. If it is able to live on the blood of man only, then it is at once seen that its scope in potential transmission of diseases is limited; it could transmit but from man to man. But if it is able to subsist and breed also by attacking the small mammals found associated with man, such as mice and rats, when its preferred host is not conveniently reached by it, then its scope in potential transmission is at once greatly enlarged. It would then be able to carry diseases not only from man to man, but also from animals to man, as the flea does in the case of bubonic plague. It is certain that blood comprises its only food, in spite of what has been stated to the contrary.

Several months ago I had an opportunity of performing a few interesting experiments bearing on this question. Hungry bedbugs, obtained by shaking beds in a large mission house in the city of Washington, were confined with both living and recently dead mice, on which they fed until glutted with their blood. From all appearances they were just as fond of the blood of these mice as they are of that of man, and showed no hesitancy at all in accepting it. It was also indicated that the absence of human blood did not interfere with their continued breeding, which would probably have been the case if the blood of the mice had not proved to be of real food value. The experiments are far from conclusive, however, because of the small scale on which they were performed.

Experiments were also conducted with a closely related species, the fowlbug (*Cimex columbarius Jenyns*), which associates with pigeons and chickens, often in great numbers. It seemed very fond of human blood, readily attacked living mice and eagerly went to young, recently born mice, though the bodies of the latter are cold. "While placing them under the bell-jar the evening before, one of the adults accidentally fell on the body of one of the young mice, which it immediately attacked. When its beak was inserted, the mouse jumped from the pain and a struggle then ensued, the almost helpless little animal trying desperately to dislodge the sucking insect by rolling and kicking. Several times the bug lost its hold, but turned at once and renewed the attack, until at last it obtained a position on the breast of the mouse, between the forelegs, where it was simply impossible for it to be reached. Here it fed until satisfied." These experiments are pregnant with suggestions, viewed in the light of our present knowledge of the relations of certain insects to the transmission of human disease. It may be interesting to note in this connection that no marked differences could be found in the behavior of these two species toward the hosts mentioned in foregoing.

The history of the pathogenic relations of the bedbug is brief and rather obscure. Unlike that of the mosquito,

no romance is intertwined with it, no new martyrs have been made in the cause of science. It has arisen quietly, at first mere conjectures being made at the end of an article which discussed the general pathogenic relations of insects, or generalizations were made including insects of its kind. Gradually, as the knowledge of the rôle played by mosquitoes, fleas and flies (insects closely related to the bedbug by essential habit) became better and more generally known, and their true relations to human diseases determined, medical writers began to assume also that the bedbug played a rôle, at least in part, similar to that of those insects. Brief statements to that effect were made, which from their very nature were not more than mere suggestions. Hence quite a number of years elapsed from the time of the rise of the idea of the transmission of diseases by the mosquito and other sucking and biting insects, and that marking the origin, from analogy, of a similar idea in regard to the bedbug. As has just been intimated, medical men were the first to call attention to this phase of the insect's economy. A complete survey of the world's scientific literature, as far as the bedbug is concerned, will show that the idea has been developed almost entirely by them.

On account of the nature of the publications in which these ideas were brought out, the general public, probably, did not even dream of such a thing, until years afterward, or until within the beginning of the present century. It was not until "consumption's ghastly form" arose, and the popular magazines and newspapers began to tell of this disease, and others as they became prominent, and thus aroused public opinion, within the last two years perhaps, that a vague idea of this insect's probable rôle began to be formed.

Even then, although seemingly tending in that direction, no definite statements were made concerning the bedbug as a carrier of specific diseases, except those made in reference to relapsing fever in a New York magazine early in 1905. This is, apparently, all that the public knew of the matter; the rest was hidden in more or less obscure scientific journals. At various colleges and universities, however, the general idea of the bedbug as a transmitter of disease was brought out by some teachers in class lectures as early as 1898, or earlier, and the practice has now become more common.

In 1887, Metchnikoff, in an article on certain phases of relapsing fever, published in a well known medical journal of Berlin, made general references to the bedbug as a carrier of disease. This is believed to be the first time that the idea was definitely mentioned, and Metchnikoff may be held to be the originator of it.

A period of about five years then elapsed before anything more was said about the question, when in 1892 a Dr. Dewèvre published in Paris¹ an account of a supposed case of the transmission of tuberculosis, which he discussed at length, and tried to establish. His evidence was quite insufficient, and the whole case did no more than throw grave suspicions on the bedbug. Since then the case has been quoted and reviewed from time to time in medical journals and general treatises on medicine. It was founded on suspicious circumstances only.

In 1895, M. Morau,² a Frenchman, published an article on the contagiousness of cancer, in which he tried

to establish, by means of experiments, that bedbugs carried the causative agent of that disease. The experiments were entirely negative.

Two years later, articles ascribing to the bedbug means of spreading diseases became more or less common. Dr. George H. F. Nuttall, formerly of Johns Hopkins University, Baltimore, then began his series of important experiments on the rôle of insects in the spread of diseases, which were continued over several years, and then, in the year 1900, summarized, together with a critical and historical study of the whole question. The possibility of the transmission of relapsing fever by bedbugs was considered by Dr. Tictin, with negative experiments, while a Japanese writer, M. Yamagiwa, stated definitely that out of a large number of clinical cases of bubonic plague, one case was caused by the bite of a bedbug.

In the following year, 1898, Dr. Charles F. Craig, then acting assistant surgeon, U. S. army, quoted the cases of Tictin and Morau, and called attention to the lack of knowledge of the question involved. Experiments on the transmission of anthrax by bedbugs were recorded by M. Joly, with negative results, while one of his fellow countrymen, Dr. Simond of the Pasteur Institute, stated in a lengthy article on bubonic plague, that the flea and the bedbug were the two "parasites," *a priori*, which were able to assume a rôle in the transmission of that dangerous disease. He thought it probable that the bedbug intervened in the transmission of that disease from man to man.

During 1899, MM. Calmette and Salembni³ wrote of a case of bubonic plague in which the bedbug's bite formed a starting point of the disease. During the same year Dr. Carmichael of the U. S. Public Health and Marine-Hospital Service, said, "It is suspected that certain insects play a part in the transmission of leprosy, the common house fly, mosquito and bedbug being the principal carriers of infection." In 1899 Dr. Coplin of the Jefferson Medical College proved that pure cultures could be inoculated from infected bugs; the infections were those of typhoid fever. After discussing the parts played by household insects in spreading certain diseases, he concludes by saying, "The danger from the bedbug and roach would probably be great in diphtheria, and all would share in the possible dissemination of tuberculosis, anthrax and similar bacterial diseases." Conclusions opposite to this, however, were reached by Mühling in a paper published at Jena about the same time. He concluded that of themselves, bedbugs could not carry contagions, but that their bites would naturally form a *porte d'entrée* for pathogenic bacteria.

With the exception of minor articles, the only other important writing which has been published on bedbugs and their relations to human diseases, is that of Dr. Nuttall, above mentioned. This was first published at Berlin in 1899, and reprinted the following year in the *Johns Hopkins Hospital Reports*. It critically discussed all the experimental evidence then recorded concerning the transmission by bedbugs of anthrax, bubonic plague, mouse septicemia, chicken cholera, *Bacillus septicus*, relapsing fever, and tuberculosis. Nuttall concluded that nothing had been positively proved, and his conclusion holds up to the present.

Before closing, a pertinent quotation may be taken from an address made by Dr. George Homan to the Division of Maritime Hygiene and Quarantine at the third Pan-American Medical Congress, Havana, in February, 1901. Among other things, he says, in conclusion:

1. This article was reprinted in the Medical Record of New York, and in the year following it was reviewed in Insect Life, a periodical published by the then Division of Entomology, U. S. Department of Agriculture, and in the American Monthly Microscopical Journal of Washington.

2. Revue Scientifique, Paris, lv, series 3, pp. 42, 43.

3. Annales l'Institut Pasteur, Paris, xiii, p. 883.

One of the most cosmopolitan and formidable of human parasites remains to be mentioned—*Cimex lectularius*—and one whose potency for harm in a public health sense has hardly been adequately measured perhaps by reason of its . . . nocturnal habits, . . . but its activity in temperate climates coincides very nearly with the usual maximum prevalence of yellow fever and malarial diseases . . . Its stubborn inhabitancy of human dwellings, however, points significantly to it as at least a coadjutor in the persistence of the first-named disease, where it is endemic, and as an influential agent in the spread of other infections as certain forms of tuberculosis, syphilis, leprosy, carcinoma and peradventure, bubonic plague.

Notwithstanding the fact, therefore, that as yet nothing definite has been proved against the bedbug, it is plainly evident that the investigation of the question has just begun. Comparatively few experiments have been performed, and the most enthusiastic optimist would find it a difficult matter to conclude that no danger is to be apprehended from this source. Hence every consideration, that of personal cleanliness, that of personal health, that of self defense, uniting for the welfare of all, bids us look to this filthy creature with a cry of "Wherefor?"

NEGRI BODIES IN HYDROPHOBIA.*

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Negri,¹ an Italian investigator of the University of Pavia, in 1903 described certain bodies, which he observed in the nervous system of animals dead of hydrophobia. He detected a definite structure in them, believed them to be protozoan in character, and associated them with the etiology of the disease. Since that time many workers, especially Italians, have corroborated his findings and extended the work along various lines. Much of it has been done with a view of utilizing the presence of these bodies as a rapid and reliable means of diagnosis and it appears that in this respect marked success has been attained. Negri first reported the occurrence of these bodies in animals, finding them in nearly every case of suspected rabies, which gave a positive result by the inoculation method. In 75 animals, mostly dogs, suspected of this disease, the inoculation test was positive in 52, and 50 of these 52 animals showed the presence of the bodies. They were not found in any of the remaining cases which were negative also to the inoculation test.

These bodies, which have now come to be universally known as Negri bodies, are found in the protoplasm and occasionally in the processes of the nerve cells. They have not been seen in the nucleus, but are frequently in immediate contact with it. Their distribution in the nervous system varies. In general they are more numerous and larger in the hippocampus major than elsewhere, but are frequently found in the Purkinje cells of the cerebellum, in the pyramidal cells of the cortex and in the cells of the pons, Gasserian ganglia, spinal ganglia and spinal cord. Negri claimed that their distribution depended on the point of inoculation. In animals in which rabies are produced by inoculation in the sciatic nerve the bodies are found chiefly in the cord and spinal ganglia; in the brain in these cases they are rarely found, or if present are small. This is questioned, however, by Bertarelli, who never failed to find them in the hippocampus major in animals inoculated in the sciatic nerve.

The bodies vary a great deal in size and shape, depending on their location in the nervous system, the stage of the disease and on the animal in which they are found. Some forms are so small that they may just be seen with the highest power of the microscope. They vary from this size to bodies 25 to 30 micra in diameter. Usually they measure from 4 to 10 micra. They are, as a rule, oval or round, not infrequently irregularly oblong, and have a distinct internal structure. Negri pictured in his first paper the bodies as containing definite, ring-like structures. Frequently they are arranged around the periphery and in the center is a distinct body, thus representing a rosette-like appearance. The smaller bodies are usually homogeneous. They are all strongly eosinophilic, but by proper staining, basic staining granules are seen within the body, which are different from the ring-like structures. Further details concerning the staining of these bodies will be considered later.

The number of these bodies found in a single nerve cell varies from one to a very large number, this depending on the animal and also on other factors, such as the stage of the disease and the locality in the nervous system. In many of the cells only one body is seen, but it is very common to see two, three or four bodies in the same cell, and occasionally a very much larger number.

Negri found these bodies in dogs, cats, rabbits and in the human, and observed them in experimental rabies, street rabies and in rabies produced with the fixed virus. Since that time a considerable number of workers have reported their results and it now appears that they are found in all animals, with, perhaps, few exceptions, dead of rabies and are never found in any other condition. Without going into the details of the reports of the various investigators, it may be said that up to the present many hundreds of examinations made by numerous workers in various countries have confirmed the first observations of Negri in nearly every detail. Among these reports may be mentioned as most important those of Volpino, d'Amato, Daddie, Bertarelli, Guarnieri, Luzzani, Schiffman and Frothingham. The bodies have been found in man, in dogs, cats, rabbits, guinea-pigs, rats, horses and cattle. Negri also investigated a large number of animals which were not rabid and in no instance could these bodies be found. Others have corroborated this also. Brains from animals and from man dying from various infections, strychnin poisoning, tetanus toxins and the like have been examined carefully and in no instance have bodies corresponding to these been found.

The fact should be emphasized that occasionally in undoubted cases of rabies these bodies are not found. Negri called attention to this in his first paper and thought it was due to an anomalous distribution. In dogs and rabbits in reports thus far made such cases do not amount to more than 2 per cent. And it is probable with improved staining methods and better knowledge of their distribution this number will become much less. As to their general occurrence in animals susceptible to the disease it may be said that Bertarelli could not find them in 5 marmots which he inoculated with the virus and which died of typical symptoms of this disease. With this exception they have been found in all the varieties of animals examined.

The time at which the bodies make their appearance in the nerve cells has been determined at 1 to 3 days before the onset of the symptoms. Negri found, for instance, that in animals inoculated with a virus which caused death in from 12 to 13 days they were present

* From the Pathological Laboratory of Rush Medical College.
1. Zeit. f. Hyg. u. Inf., 1903, 43, p. 507.