action seemed to depend on improvement of the circulation, and the uncertainty of this effect may explain the uncertain action of camphor as a respiratory stimulant.

Digitalis alone, when it raised blood pressure, sometimes produced definite improvement of respiration. Digitalis and caffeine together proved to be the most reliable form of respiratory stimulation.

Inhalations of CO_2, when expiration was completely passive, often increased the depth but slowed the rate of breathing, and this sometimes actually decreased the minute volume. Frequently CO_2 inhalation was followed by permanent respiratory failure, after a period of gasps of diminishing rate and depth, in dogs and rabbits whose ventilation was adequate before the inhalation. The appearance was that of inhalation of a depressant concentration of CO_2, though the same gas mixture had previously produced only stimulation of respiration.

A study of the clinical records of patients with morphine or opium poisoning in this hospital showed that wherever observations of the circulation were made on patients in a critical condition there were signs of serious circulatory depression, and that as the condition improved under treatment the circulation also improved. One patient died of morphine poisoning, and the pulse could not be felt ten minutes before respiratory failure; pulmonary edema was present, for which the autopsy showed no organic or infectious cause, so that it may have been due to extreme circulatory depression. It is possible that circulatory depression plays a larger part in the dangers of morphine poisoning than is generally realized.

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The types of tetanus bacilli isolated from stools in Peking.

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We had not seen any confirmation of Tulloch's seriological classification of tetanus bacilli and as we had a number of strains of this organism, isolated from the stools of man, we thought

it worth while to see if they could be differentiated into groups by the agglutination reaction. Tulloch not only sent us transplants of his four type cultures but has been most kind in answering our questions and has sent us an impure culture of a strain of tetanus bacilli that did not agglutinate with his type sera. This culture he received from France in 1918 but since no data accompanied it and since it was the only culture that did not agglutinate with his type sera he did not mention it in his work. This culture, which we have called Type V, has interested us very much for, as will be seen in the table, it is a type that we have found most frequently in Peking.

Agglutinating sera were easily prepared by the injection into rabbits of washed bacilli from actively growing 24 hour bouillon cultures. The first injection was subcutaneous and was followed at intervals of a week by three intravenous inoculations. The animals withstood the treatment well and ten days after the last injection their sera agglutinated the type bacillus used in a dilution of 1/6000 or higher. The differentiation of the types is quite striking as the other organisms were not, as a rule, clumped in dilution as low as 1/100.

The results of our tests are given in the table where we have included the findings of Tulloch for comparison.

Results obtained by	Number of tetanus cultures agglutinating in serum type				
	I	II	III	IV	V
Tulloch on cultures from wounds	60	25	35	5	1
Tulloch's with fecal cultures	9	2	1	0	0
Our fecal cultures	3	0	9	0	18

It will be noted that we have confirmed the seriological grouping of tetanus bacilli though we have not, in the small numbers of cultures studied, found Types II or IV. It is interesting that the fifth type that Tulloch found only once is so common here. We have found it not only in human feces but have isolated it from cases of tetanus infections and from the feces of animals. In addition to the types noted above we have twice obtained non motile tetanus bacilli, once from human and the other time from

guinea-pig feces. These two strains fail to agglutinate in any of the five type sera but the serum produced by the injection of the human strain agglutinates the guinea-pig as well as the human strain.

While tetanus bacilli can be readily separated by the agglutination reaction we have so far been unable to show that they have any cultural difference except that the Type III bacilli clump spontaneously. This is true not only of Tulloch's culture but of our nine strains. This spontaneous clumping is very constant for this group and makes agglutination tests difficult to read. We have endeavored, by various means, to avoid it, but so far have not been successful.

Tulloch has shown that the antitoxin prepared by the injection of toxin produced by one type of bacillus neutralizes the toxin formed by the other types. We have not studied this point to any extent but have found that commercial antitoxin neutralized the toxin formed by all of our cultures. While he was not able to show conclusively that antibacterial, as well as antitoxin antibodies, are desirable in sera his results point to this and also to the fact that the anti-bacterial antibody is specific for the type bacillus used for its production. This is an exceedingly important point and is worthy of more extended investigation.

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Tetanus carriers in experimental animals.

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The demonstration that human carriers of tetanus bacilli have antitoxin in their blood has opened up a number of problems, which we are attempting to solve on experimental animals. We had first to determine whether carriers could be produced in these animals and if so whether antitoxin would be formed. The results of this preliminary experiment we will report on here and subsequently we hope to give the results of our further studies.