

vast prairies, or now in the bottom lands of our rivers and the swamps of the north and the south by the mosquito alone? Most certainly not! Especially when we take into consideration that it is a well-established fact that mosquitoes, as a rule, go but a short distance from their breeding places, sometimes but a few hundred feet—average distance not to exceed half of a mile—and that in olden times, and even now in our swamp regions, the settlements were and are, scattered—often with miles intervening between them—with but little if any communication one with another.

Many of the experiments that have been made by investigators in different parts of the world during the past few years, which are claimed to have established the mosquito as the only intermediate host in the transmission of malarial diseases, were of a similar character to those made by the Cuban board on yellow fever, and are not conclusive. For it is well known that many persons living in malarial districts can be, and are, exposed year after year to every possible means of contracting malarial fever—through the atmosphere, water and the mosquito—and yet remain in perfect health; and that healthy persons from non-malarial districts can spend months where malarial fevers are prevailing—mingling with the sick and being exposed to every possible means of contracting the disease—and not have a symptom of malarial trouble. Thousands of persons living in malarial districts can testify to the truth of this. The writer, who has had years of experience living in malarial districts, both before and since he became a physician, can most positively vouch for the truth of every statement here made.

#### THE BACTERIOLOGY OF CYSTITIS.\*

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In the light of present advances in the real causes of cystitis, no one who is a student of progressive medicine will or can ignore the foreground bacteriology has taken in cystitis as other diseases, and bacteriologic investigation has proven that all cases of cystitis are due to infection of pathologic bacteria, even though trauma may first be given that organ from internal or external sources. Normal urine is free from all bacteria, whereas urine contained in the bladder under any diseased conditions of the urinary tract must necessarily contain pathologic and non-pathologic bacteria.

In cystitic urine, as a rule, both cocci and bacilli are present; either one may exist in excess of the other, both exist equally or only one form of bacteria be present. Among the cocci present are the *Staphylococcus pyogenes aureus*, *albus* or *citreus*, the *Micrococcus ureæ*, *Sarcina urinæ*, the *Uro-bacillus liquefaciens septicus*, the *Streptococcus pyogenes*, the *Zooglæa* masses and the *Gonococcus*. The bacilli are usually the *coli communis*, the tubercle and in cystitis during the middle or latter end of a typhoid attack the Eberth bacillus. Thiogenic bacteria may be present, whose peculiar function is to convert sulphuretted hydrogen into more potent compounds of sulphur, and play no small rôle in cystitis. The pathologic bacteria that are factors in most cases of cystitis are the colon bacillus, the different varieties of staphylococcus, the streptococcus, the tubercle and the gonococcus. The bacteria may invade the bladder mucosa from the meatus, urethra, or the blood may contain certain bacteria, which is true of pyemic and sep-

ticemic infections, and cystitis supervene from these conditions. The bacteria may descend through the ureter directly from the kidney, or penetrate the bladder wall from the intestine, as sometimes occurs, for the colon bacillus has been found in the blood during an attack of enteritis.

Instrumentation may frequently cause infection, even though performed under almost or seeming perfect aseptis. Vulvovaginitis in children, proctitis also, often produce cystitis, due directly to an invasion and infection of the mucosa by the bacteria in the vulvovaginal secretions, aided, perhaps, by the careless hygiene of children and the common habit of titillation of the external parts. The resisting power of the bladder mucosa against bacteria is lessened by any condition producing congestion of the bladder. This is proven by the congestions following contusions or lacerations of the urethra during labor, or after a sudden suppression of the menses from any cause excepting pregnancy. At one time the mucosa may be proof against the infection of bacteria, at another time the condition may be reversed, and an infection from certain bacteria produce an acute cystitis. Urine containing cystin has been considered infectious, during which condition of cystinuria certain bacteria produce a metabolic condition in the mucosa and muscular wall which results in an infiltration or hyperemia to a lesser or greater degree.

In the simple non-suppurative cystitis, caused by non-pathogenic bacteria, the urine is decomposed by these bacteria and produce a condition known as bacteriuria, but do not penetrate the mucosa. The streptococcus does not decompose urea, whereas the staphylococcus in most varieties do, and are present in alkaline urine. The saprogenic bacteria are not factors in the non-suppurative cystitis, and only rarely are present in the suppurative form, then in necrotic conditions. A group of bacteria, saprophytic in action, are the nitrifying and denitrifying bacteria, whose function may later produce ammoniacal urine, or add to it, when caused by other before-named bacteria. When the urine is ammoniacal, the nitrifying bacteria if present, oxydize ammonia into nitrous acid, and under reversed conditions the denitrifying bacteria, if present, convert nitric acid to ammonia and nitrous acid. In cystitis zymogenic bacteria rarely if ever enter into the fermentation process, as they do in beer, wine, butter and cheese manufacture, from whose bacterial action the necessary fermentation must result to produce these domestic articles of commerce. The *Proteus of Hauser* acts decidedly on urea, produces ammoniacal urine and may often be found in such urine caused by other bacteria. The *Proteus vulgaris* is often found in urine and is an important factor in the causation of pyelonephritis, as these bacteria descend with the urine into the bladder and find a host in the mucosa. In the suppurative cystitis the urine, which may be acid from the *Bacillus tuberculosis*, may also contain the *Bacillus coli communis*. Ammoniacal urine may contain other than decomposing bacteria, may contain only the *Bacillus coli communis* due to outside infection, as by instrumentation or other procedures by the patient. When ammoniacal fermentation of urine occurs it is not due to the *Micrococcus ureæ*, but results from the then or pre-existing cystitis in less or greater degree from other bacteria. In ammoniacal urine cystitis to a less or greater degree precedes the ammoniacal condition, oftentimes from the action of thiogenic bacteria on urea, previously mentioned. The acid urine in cystitis is rarely, if ever, caused by instrumentation. In some

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forms of cystitis the alkalinity of the urine is due to certain bacteria which decompose urea, such as the *Bacillus pyocyaneus*, with or without the aid of the *Bacillus coli communis*, and even when the latter bacillus is present in large numbers.

The *Bacillus tuberculosis* plays an important rôle in cystitis, due generally to a secondary infection from pus, as in a tubercular kidney or tuberculosis of the urinary tract, in which the pus infected with the *Bacillus tuberculosis* is washed down through the ureter to the bladder mucosa. Not infrequently an ulcer of tubercular origin gives direct infection to the mucosa at a point remote from the ulcer. Disease of the anus, rectum or colon is often the cause of cystitis, as the pathologic bacteria migrate directly through the bladder wall. Cystitis in children is usually caused by the *Bacillus coli communis*; the invasion announced by pyrexia of an uneven course, followed by frequent, painful urination and the presence of blood more or less in the urine, which is subsequent to the marked vesical tenesmus. The urine voided under these conditions will exhibit mucus, pus cells, epithelial cells, blood cells and the *Bacillus coli communis* in large numbers.

The gonococcus as a primary cause of cystitis is not common, but most frequently produces prostatitis, but when cystitis is caused by gonorrhoea the other bacteria will be found as coexisting with the gonococcus as factors in the causation. The *Streptococcus pyogenes* may invade the bladder from a nearby suppurating process, which is spreading in character, or the *Staphylococcus pyogenes aureus* may, and often does, penetrate the tissue of the bladder from a circumscribed abscess formation or a pocket of pus near the bladder. Ischiorectal abscess has produced cystitis, due to the *Staphylococcus pyogenes aureus*, and the streptococcus was found present also, proving the penetrating powers of the bacilli. A pyosalpinx, or a suppurative peritonitis, pyelitis or a pyelonephritis may liberate the staphylococcus or streptococcus directly into the bladder or urinary tract.

In pregnant and non-pregnant women the vagina and cervix uteri are hosts to many forms of bacteria. Often the secretions contain streptococcus of a saprophytic nature, that become virulent under certain conditions of less resistance by the mucous membrane, migrate into the bladder, lodge in the mucosa and produce a form of cystitis occasionally met in gynecologic practice. In uterine displacement, causing congestion, hyperemia, or even hyperplasia, the *Streptococcus pyogenes*, the *Staphylococcus pyogenes aureus* or *albus* have frequently been found in the vagina, at or near erosions of the cervix, ulcers of the vulva or vaginal wall, which have caused an attack of cystitis. Such a case came to the notice of your essayist last March, which occurred in the practice of Dr. Houseman, Fostoria, who sought a bacteriologic examination of a urine, which disclosed the *Staphylococcus pyogenes aureus*, *Streptococcus*, *Bacillus coli communis* in large numbers, from which colonies were started, cultures made and kept alive by transplantation. The growth of the *Bacillus coli communis* from this urine on potato media revealed bacilli of such hearty proportions as to remind one of the "Huntswurst" of the up-to-date sausage factory. That urine also contained *Micrococcus ureæ*, sarcina, tetrads and other cocci.

Now and then, during typhoid fever, a cystitis appears, which is due to the invasion and infection of the Eberth, or *Bacillus typhosus*. Such cases of cystitis occur from the last of the second week to the fourth week of typhoid fever. Occasionally a cystitis will supervene during a relapse of the fever, of short or longer duration,

which is due to the renewed activity of the *Bacillus typhosus*.

A new factor in the bacteriologic causation of cystitis is the *Bacillus dysentericus* of Shiga, the Japanese investigator. This bacillus is the cause of that virulent form of dysentery which has attacked our soldiers in the Philippine Islands. This bacillus varies but little from the *Bacillus coli communis* or the *Bacillus typhosus*, and certainly belongs to the colon family. It has been reported as the cause of a severe attack of cystitis supervening the acute attack of dysentery, when the dysentery becomes of a chronic character. As our soldiers return to this country, bringing cases of the acute and chronic tropic dysentery, these bacilli may in the future be added to the long list of "home bugs now doing business at the old stand." In suspected infection of the bladder by the bacillus tubercle it may be necessary to obtain the urine free from contamination from the meatus, urethra or external parts, which can best be accomplished by sterilized catheter under aseptic conditions. The *Bacillus smegmæ* is apt to contaminate the urine and might be mistaken for the *Bacillus tuberculosis*. The same holds true of the *Bacillus Lustgarten*, the so-called bacillus of syphilis and the bacillus of leprosy, but the latter—so rare in this country—is not a factor in pathologic examinations for *Bacillus tuberculosis*. For ulcerative nodular elevations at the urethral orifice, or in the bladder, the differentiation of the *Bacillus tuberculosis* and the *Bacillus Lustgarten* must be made, but the local and constitutional condition will usually be sufficient to decide between the last two if present, and the method of procuring the urine will greatly decide the possibility of contamination of the *Bacillus smegmæ*. The cystoscope is an invaluable aid in the early diagnosis of vesical ulcers, nodules, etc., and catheterization of the ureters in complex cases may be necessary for a differential investigation. The platinum loop or curette may be utilized, scrapings secured of suspected ulcers or nodules, colonies started, if possible, for the culture and staining differentiation in complex or obscure cases.

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## GASTROINTESTINAL PERFORATIONS AND THEIR DIAGNOSIS.

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(Concluded from p. 833.)

### PRESENT ACCEPTED METHODS. B. EXPLORATORY LAPAROTOMY.

So we see there are but two recognized methods of arriving at a diagnosis of perforation, i. e., awaiting peritonitis or performing laparotomy. The former is unreliable and of little value; the other, while it may be of great value, is of considerable real danger. As to a choice between them the consensus of opinion is in favor of the latter. Fewer cases will die after performing an exploratory laparotomy on all suspected cases than will be lost after awaiting the development of a peritonitis to corroborate the diagnosis. By awaiting the symptoms of a peritonitis in all such cases some few will not develop them and will recover without being exposed to all the dangers of an unnecessary major operation. To perform laparotomy in all such cases will of necessity result in some few being needlessly exposed to the many dangers of a major operation. But in the first instance the chances of a satisfactory outcome are as