action, causing in some cases acute suppression of urine, uremia and death. Chloroform, if administered during an operation or obstetrical case, as shown by Fraenkel, for a period of three hours or longer, may cause fatty degeneration of the renal cells and uremia. On the diseased kidney chloroform has a far milder action than ether, although occasionally a case of nephritis will be anesthetized with it and uremia follow, as in a case I observed a few weeks ago. Both, in cases of diabetes, will frequently increase enormously the sugar.

Another dangerous after-effect which can be avoided is pneumonia following ether anesthesia. A careful examination of the lungs will quickly aid us to diagnose a bronchitis or emphysema. Such persons bear ether poorly and should, if the heart permits, be anesthetized with chloroform. In regard to the latter organ, patients with heart trouble should be anesthetized either with ether or the A. C. E. mixture. In many hospitals abroad and in the East, the anesthetist is either a paid assistant, who remains for years, or is assigned to this task as an interne for many months. Slips are filled out for each anesthesia, stating the condition of the heart, lungs and kidneys before operation, etc. This is not impracticable even in small hospitals, and saves many a life.

CONCLUSIONS.

I have tried in the above to give a brief outline of the causes of syncope during anesthesia, their treatment, and some of the after-dangers or effects. Ether, with the exception of its bad effects upon the kidney, is by far the safest anesthetic. Chloroform kills quickly, ether slowly. The dangerous symptoms of the former are far less amenable to treatment than those of the latter. Children respond more quickly than adults to efforts at resuscitation.

A careful examination of patients is absolutely essential. In serious cases the urine should be collected for several days, and twenty-four hour specimens examined, especially in renal operations or laparotomies. Do not give one anesthetic, be it chloroform or ether, indiscriminately to every patient. We should consider age, condition and the nature of the operation. I append an excellent list, compiled by J. Frederick Silk, an English authority on anesthetics, which I have found very useful to remember: 1. *Age*.—Under 3 years, chloroform all through; between 3 and 12 years, A. C. E. mixture (alcohol 1 part; chloroform, 2 parts; ether, 3 parts); between 12 and 60 years, ether; over 60, induce with A. C. E. mixture, increasing the proportion of ether in long operations. 2. *Condition of patient*.—In the fat and plethoric, induce with A. C. E., and gradually increase the proportion of ether in long operations; in acute or very recent lung troubles, give chloroform all through; in chronic lung troubles—bronchitis or emphysema—give A. C. E. all through; in organic heart disease, if there is not sufficient compensation, e. g., pulmonary edema, use A. C. E. or chloroform, if compensated, ether; in marked atheroma, induce with A. C. E., and increase the ether proportion in long operations. 3. *Nature of operation*.—For an intracranial, give chloroform or A. C. E.; for those on the tongue and mouth, induce with A. C. E. and change for chloroform when the operation begins; in operations on the head and neck, begin with A. C. E., increasing the proportion of ether in long operations; in those on larger joints, always use ether, if possible; in abdominal, we do well with ether, but many prefer chloroform; in rectal and genito-urinary, use ether.

The writer can agree most heartily with most of the above, and would add, under No. 2, in kidney disease, use preferably chloroform, or A. C. E.

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THE VESICULAR MURMUR AND ITS RELATION TO PULMONARY HEALTH AND DISEASE.*

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My purpose in this writing is to individualize this one and only auscultatory sign as the criterion of pulmonary health, its absence as the positive proof of either functional or organic disease, also suggestions as to the most successful method of restoration and its application to the treatment of pulmonary tuberculosis.

In the auscultation of the normally acting healthy chest, two sounds are heard on inspiration, totally different in production, location and character. The first is the bronchial sound, caused by the friction of the inrushing tidal air, through the convective system of tubes, and is, in varying quality and pitch, always present in health and disease. It is first in regard to the time of its production in the inspiratory act, and, during the first eight to twelve years of life, is the only sound heard in health, the pulmonary system being as yet incomplete. The tidal air does not pass as such further than the third or fourth division of the bronchial tubes, consequently the murmur which follows the bronchial is entirely distinct from the bronchial in location and character, although wholly dependent on it for its production.

Where tidal air ceases, residual air commences, and fills the entire pulmonary system, the volume of which is increased about one-tenth by each normal inspiratory effort. It is this increment of tidal air imposed upon the residual air, which renders the air-sacs tense, and produces the vesicular murmur by the contraction and relaxation of their walls upon the residual air. Here the interchange of gases takes place, in accordance with the well-known law of diffusion, and the circle of the inspiratory act is complete.

The vesicular murmur begins as soon as the residual air is increased to the extent of rendering the air-sacs tense. In full breathing, it is heard before the tidal friction sound of the bronchi ceases, producing the bronchovesicular murmur, and is continuous after the bronchial sound ceases.

The production of the vesicular murmur may be prevented, or interfered with in part, by various influences and conditions of disease, some of which are not incompatible with a considerable degree of comfort and usefulness, for a limited period.

The conditions of this period, we are to take particular notice of, as it is the true pretubercular period.

We very commonly meet with cases in which the vesicular murmur is entirely absent, except in forced inspiration.

In women, this is very often the case, as a result of tight clothing, with the outward and upward movements of the chest, and the murmur can not be produced in the lower lobes of the lungs until the constriction is removed.

We often hear the expression "weak lungs," as ap-

* Read before the Clinical Society of the Elizabeth General Hospital, Nov. 20, 1900.

plied to people of sedentary pursuits, or to those who by heredity or environment are lacking in energy and vitality. I prefer to call them "lazy lungs," as better indicating an exact condition, and as a means of impressing the patient with the fact that by his own exertion he may have strong lungs. Lazy lungs are those in which the pulmonary function is imperfectly performed in the absence of all organic disease, resulting in a disproportion of blood and air in the lungs, the former being in excess, and its progress through the lungs being retarded.

As the blood current rushing into the heart excites it to forceful contractions, so too the air-currents, rushing into the lungs, with each inspiration increasing the tension of the alveolar walls, stimulates them to contraction as evidenced by the vesicular murmur. The necessity for a proper volume of air is just as important for the lungs as a due proportion of blood is required for a perfect and forceful contraction of the heart. The contraction of the air-sacs produces not only a more rapid interchange of gases, but also aids in the propulsion of the blood through the pulmonary capillaries, relieving stasis, and preventing exudates.

An incomplete pulmonary function produces blood stasis, and stasis produces exudation, which may take place into the bronchi, the intercellular spaces, and upon the surface of the pleura. When these exudates occur, there is more or less muffling of the vesicular murmur, and according to degree and location the production of râles, either bronchial or interpleural. That which is exuded into the intercellular spaces causes no sound, but interferes with the production of the normal vesicular murmur. These exudates often occur simultaneously, and are found most frequently in the apices, about the third intercostal space in front, and reaching directly through to the pleura in the interscapular space. These exudates, which are purely of a non-inflammatory character, when stirred by respiration, produce râles which are usually diagnosed as bronchitis, but in consideration of their etiology in obstructed circulation, more properly called bronchial catarrh, or catarrh of the apex, a result of pulmonary inactivity, a passive condition rather than an active process.

There are many direct causes of this passive condition. I have already mentioned the effect of tight clothing in women, which is so often persisted in to such an extent as to produce an arching of the sternum compensatory to the constriction. This takes place only in vigorous breathers, with good muscular development.

Sedentary occupations are productive of pulmonary inactivity. Underfeeding and overworking, the hard side of life, worry and care and many others; any one of the many influences in life which weaken the muscular system indirectly through the nervous and digestive systems, exerts a depressing influence on the respiratory system by decreasing the activity of the diaphragm and chest muscles, and thereby impairing the function of respiration, in the complete oxygenation and vitalizing of the blood, which process is announced by the vesicular murmur.

Big breathers are good eaters, and big eaters are good breathers as a rule, because the muscular and nervous systems are well nourished.

Tuberculous infection becomes a possibility only when the soil is prepared for the reception and propagation of the bacilli. Our attention has been directed so much during the past dozen years to the bacillus, and the means of combating it with drugs and serums, all of

which have proved of doubtful utility, that it seems to me that we should take a new departure, not only in our pathological views relative thereto, but also in our practice.

Much has been said and written in regard to "suitable soil," without defining exactly what that soil is, how it is produced, and how immunity may be acquired. It used to be taught that man possessed a surplus of pulmonary tissue, which was not always required to be in complete action, but was kept in reserve for emergencies. This was certainly a fatal mistake, for all that a tubercle bacillus wants for a comfortable home is a choked capillary bronchus, either the result of insufficient expansion of a lazy lung, or of an active process of congestion or inflammation. The tubercle bacillus fails in its attack upon healthy tissue; it succeeds only when it finds either functional or organic abnormalities.

Imperfect function, as evidenced by the absence of the vesicular murmur, must always result in organic disease sooner or later—not necessarily tuberculous—and it is all that is required, as the primary condition in furnishing a suitable soil for the bacillus in the pulmonary tissues.

The pulmonary apices are primarily infected as a rule, because they are not as continuously and thoroughly expanded as the middle and lower portions, consequently blood stasis occurs, producing exudation as revealed by the "mucus click." This symptom has been regarded by many good clinicians as a positive evidence of tuberculosis without the evidence of the microscope. I have seen many such cases of catarrh of the apices under the practice of systematic expansion make a complete recovery of the function, with the removal of all abnormal auscultatory sounds, and the return of the pure vesicular murmur which is the evidence of pulmonary health.

We might as well try to strengthen a weak arm by carrying it in a sling, and by the administration of drugs, as to strengthen weak lungs by any and all the drugs known to medical art, without attention to the deficient function. In the treatment of such conditions we must use the same common sense which would guide us in the treatment of weak muscles or organs in any other part of the body.

Use, and use only, makes strong muscles and strong lungs. The better the oxygenation of the blood, the greater is its capacity for the reception of nutritious pabulum, with an increase of red corpuscles. The cold, livid finger tips become warm and of a healthy pinkish color, the appetite is improved, and every function is benefitted to a remarkable degree, with increase of body weight and endurance.

In the examination of the chest, our attention should be directed first, not so much as to what abnormal sounds are present, but as to the degree in which the normal sounds are present or absent, for the purpose of ascertaining whether an anatomical recovery may be obtained, in order that we may obtain a clinical recovery. In any impairment of pulmonary function, whether the microscope reveals the bacilli or not, it is safe always to suspect that such a development may occur, because the soil is prepared for the seed, and our efforts should be immediately directed toward the cleaning up of that soil, so that there shall be no suitable habitat for the bacillus. The vitality of the tubercle bacillus is very low, and unless it finds a location exactly suited to its growth and development it perishes.

If, according to Nuttall, a tuberculous patient expectorates about three billions of bacilli in twenty-four hours, certainly only a very small number find a suitable soil for their support, and yet when we take into account Naegeli's statistics in the pathologic institute of Zurich it appears that the infection is almost universal, as active or latent, being 97 per cent. of those over 18 years of age, with positive evidence at autopsies of non-fatal tuberculosis.

The human system then is able to resist the infection of tuberculosis in a very large majority of cases, and it must be from nature that we may expect to learn the method of successful treatment, for our art has failed by drugs and serums alone. Even should we be able to cure a specific case by tuberculin or other serum, what is to prevent a new infection if we leave the lungs in the same condition as they were in before the bacilli were rendered innocuous, for it is through the respiratory apparatus, much more than through all the other organs or tissues, that the infection is received?

This brings us to face the stubborn fact of the suitable soil, which Nature by its own processes succeeds in changing to an unsuitable soil, and as Vergely has tersely expressed it: "The soil is everything, the microbe nothing," and another, "that Koch's bacillus is not enough to produce tuberculosis."

There are no doubt other factors which go to make up this preparatory condition beside deficient pulmonary function. We may yet learn that good rich blood contains an antitoxin principle, which it may not always possess, particularly when deteriorated, and that the loss of this antibacillary power is the cause of the system succumbing in rapid miliary tuberculosis. Mays believes that tuberculosis may be primarily a neurosis, and adduces plausible argument in support of his theory, but from my present standpoint I look upon the neurotic condition as contributory to that condition of pulmonary inactivity which may be both a cause and an effect in the preparation of the suitable soil.

It can not be denied that the tuberculous infection is well-nigh universal, and that but few in comparison to the great number infected, live the average life of man, without at some time being infected by it. Autopsies made upon those dying of other diseases and by violence prove this.

The greater number of those infected recover without the knowledge of the fact of infection. Nature can and does get rid of the bacillus, and although there may not be a complete anatomical recovery, as indicated by the scars left after the healing of cavities, yet there is a complete clinical recovery, and full functional activity of all the remaining pulmonary tissue. Fibrinous exudations upon the pleural surfaces form adhesions between the opposing surfaces when there is deficient pulmonary activity, and, according to their closeness and thickness, prevent the expansion of the subjacent lung tissue, as evidenced by the muffling or complete absence of the vesicular murmur.

The starting-point of a tuberculosis may have been years before the actual onset of the disease, occurring in a pleurisy, or a pleuropneumonia, in which the exudates have not been absorbed, but remain as an organized barrier to perfect respiration, either in the lung tissue or on the pleura, and thus furnish the suitable soil for the bacillus. After the clinical recovery from a pneumonia or pleurisy, the closest attention should be given to the anatomical recovery, by systematic expansion of the lungs until the pure vesicular murmur

is heard without muffling, when there will be no soil suitable for the bacillus. The expansion of the lungs is very materially aided by cold friction baths. There is a direct nervous connection between the skin and the lungs.

The nervous center which governs inspiration is situated in the gray matter of the medulla, opposite the roots of the pneumogastric nerves, and the nerves which have their center here are the pulmonary branches of the pneumogastric and sympathetic, the latter containing fibers from the spinal cord, also the cutaneous nerves of the face, arising from the fifth cranial pair, and the cutaneous nerves of the body generally. Through these excitator nerves, a stimulating impression is made upon the center by cold friction baths, and this is immediately followed by deeper inspirations.

It is through the intimate nerve connections between the skin and lungs that such remarkable results in the treatment of tuberculosis have been obtained by Winternitz and others in hydropathic institutions, and distinguishes cold bathing as a most valuable adjunct in bringing about a clinical recovery of the lungs, in which the bacillus can not grow and in which the inspiratory act is complete in the pure vesicular murmur.

We should early discover the evidences of tuberculosis, in order to treat it successfully, but we should much earlier discover whether the soil in any suspected chest is prepared for the ever-present bacillus, and by attention to the function of the lungs put them in such condition that infection shall be an impossibility. This is to be done by systematic mechanical expansion of the lungs by appropriate exercises, by the daily use of cold friction baths, by regulation of the diet, by the administration of such medicines as shall strengthen the nervous system and enrich and invigorate the blood cells, by attention to the sanitary condition of the home, by the proper ventilation of living and sleeping rooms, by life out of doors, by cheerful surroundings and cheering company, by a full and clear statement of the case to the patient, concealing nothing of the dangers of such conditions, by the assurance of rapid improvement and perfect restoration to sound health, as a result of strict fidelity to the requirements as directed by the physician.

In a recent article, "On the Early Recognition of Tuberculosis," a physician detailed a series of symptoms which to me appear as very late symptoms. Clubbed fingers, emaciation, capricious appetite, cog-wheel rhythm, intermittent albuminuria, and hemoptysis present to me a picture far on the way to a dangerous and probably incurable stage.

The difficulty of diagnosis—of which much has been written—and the dangers of becoming tuberculous become as nothing if we accept the clinical evidence of an impaired function, producing the suitable soil for the bacillus, and when we act upon that evidence, in Nature's method of restoration, by opening up and clearing out every tube and cell, by systematic expansion of the chest.

Where purulent infection has taken place, as in an ovarian tube, or the appendix vermiformis, or in any locality of the body, we put in the knife, and clean out the cavity and thus get rid of the infection. In choked bronchial tubes, which are the starting points of the active process of infection, we can put in air, which is quite as incisive and effective in the relief of such conditions as the knife is in the others.

Why should we wait until the infection has been proved by the microscope, before commencing radical

treatment, when the clinical features of the case warrant us in declaring that such a chest is prepared for the bacillus, through imperfect function, or through exudations resulting therefrom. In this respect we have been leaning too much upon the evidence of the microscope, and too little upon equally as positive clinical evidence, of far more valuable diagnostic importance, viz.: imperfect function, as shown by the absence or muffling of the vesicular murmur. If we accept the clinical evidence, the fight with the bacillus can be easily carried to a successful issue outside the walls. But if we find that the bacillus has already taken possession, the fight will be longer and harder, and accompanied with many dangers, although it may yet be carried to a successful result if we follow the teachings of Nature, so far as we know.

It is impossible to describe in words the sound of the vesicular murmur. Every individual physician must acquire a knowledge of it through his own independent discovery, by carefully listening to many healthy chests, until his own senses are forcefully impressed with its character and language. It is a gentle breezy sound, exactly like nothing else in the world, but when thoroughly appreciated one of the most delightful sounds the ear can listen to, for it means absolute health; its absence, absolute disease sooner or later, unless restored by appropriate means intelligently directed.

The methods which I have used for many years were described in an article entitled "Personal Observations in Pulmonary Phthisis," published in the *Medical Record*, March 14, 1898, and in *THE JOURNAL A. M. A.*, Feb. 5, 1898. In the absence of more effective means, I still hold to the same methods, for the reasons there given.

The principle of the action of the pneumatic cabinet is correct, and indispensable in many cases, and should be applied where it is possible to obtain it, for it is a very difficult thing to wake up the almost paralytic chest muscles to perform their natural function, and is only obtained by persistent and continuous effort.

I have observed a very great lack of appreciation among medical men of the importance of this fundamental symptom of the vesicular murmur, and many lives are irretrievably lost by neglect of the methods required for its restoration, which otherwise might have been saved by prompt and early mechanical expansion.

ON THE RELATION BETWEEN THE VARIETY OF MICRO-ORGANISMS AND THE COM- POSITION OF STONE IN CALCULOUS PYELONEPHRITIS.

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No subject in renal diseases has been more discussed than calculus, especially as regards the etiologic factors involved in the production of the stone. Many theories have been held regarding the origin of stone in nephrolithiasis, but of these most have been finally abandoned from insufficient evidence; thus the idea that telluric conditions play an important rôle in this connection has been practically abandoned by all, as also the belief that gout was the most important etiologic factor in the development of such a condition, while Senator, Von Noorden and numerous other observers have definitely shown that the method of living and the variety of diet play, speaking generally, but a small part.

Our ideas regarding the formation of uric acid in

the body have undergone a marked change, through the work of Horbaczewski and Kossel, who showed that in a large number of cases, at least, the uric acid output was directly dependent on the amount of nucleins destroyed in the various vital and metabolic processes of the body.

That, however, simply an increase in the uric acid output is in itself not sufficient to bring about calculus formation is shown in the first place by the fact that in childhood, when the uric acid output is extremely high, renal calculi are extremely uncommon, while in various conditions, pathologic and otherwise, which are associated with an extremely high output of uric acid, such as splenomyelogenous leukemia, calculus formation is rarely met with. Also in cases of experimental phosphaturia, we practically never meet with phosphatic stones.

It will thus be seen that some other factor besides the formation of excessively large amounts of various of the chemical constituents of the urine is necessary for the formation of the different varieties of stone, at least in the great majority of cases. This conclusion and also the discovery of an albuminoid center or nucleus in the case of a number of stones, has led some observers to believe that the stone is formed by deposition of some of the urinary constituents about a proteid mass made up of epithelial cells, pus cells, red blood cells, etc. Comparatively recently, however, bacteria have been assigned an important rôle in this connection, due in the first place to the frequent association of calculus with certain forms of renal infection, and in the second place to the demonstration of bacteria in the center of a number of renal calculi. Thus, according to Harris, who has recently reviewed the subject, various micro-organisms have been found in the center of several renal calculi, by Galippe, in one case by Begoyne, and in an especially interesting case by Lenander, who demonstrated zoögleal masses of the colon bacillus in the center of a calculus composed of calcium oxalate and urates. Harris himself also reports three cases in which cocci or bacilli or both were found in the center of uric acid calculi; in these cases, however, cultures of the bacteria were not made, but their presence was demonstrated only by microscopic examination.

In all the cases which I wish to report, careful bacteriologic examinations were made of the urine, while the chemical composition of the stone was definitely determined in every case by the qualitative methods of chemical analysis usually in vogue. These cases, seven in number, were all those in which infection of the renal pelvis or the substance of the kidney was associated with the presence of stone, and in all cases except one the symptoms definitely pointed to the condition being unilateral, and this was subsequently verified by the bacteriologic, chemic and microscopic examination of the urine on either side. The means of making this examination was as follows: Through the cystoscope a sterile ureteral catheter with a sterile rubber cuff on its distal end was introduced into the ureter and, after the urine had been allowed to flow for a short space of time, the rubber cuff was withdrawn and a certain amount of the urine collected in a sterile test-tube from which, subsequently, the bacteriologic, chemic and microscopic studies were made. This method absolutely eliminates any chance of contamination from the bladder or from external sources if carried out with rigorous care. From the urine thus obtained, cultures were made upon agar plates, and from the colonies that grew thereon the species of micro-organism was determined.