

**THE THERAPEUTICS OF SELF-REPAIR.<sup>1</sup>****BY S. J. MELTZER, M.D., LL.D.,****HEAD OF THE DEPARTMENT OF PHYSIOLOGY AND PHARMACOLOGY OF THE ROCKEFELLER  
INSTITUTE FOR MEDICAL RESEARCH, NEW YORK.**

NUMEROUS facts in biology justify the conception that the living organism represents a mechanism, and is in very many respects comparable to a complex human-made machine. Such a view proved also to be practical and very fruitful in the investigations of biology and medicine, since it encouraged the extensive study of the details of the living mechanism by the well-established methods of physics and chemistry. For therapeutics, however, this view seems to contain an inimical and discordant element. Therapeutics means the principles and methods employed in the repair of the disordered living organism. Now, the efficient repair of the mechanism of a human-made machine justly presupposes a familiarity with its normal structures and construction, and also a complete understanding of the nature of the disorder. But what is the status of our understanding of the living machinery and its disorders? Well may we point with pride to the great strides we have recently made in this understanding. But what is the actual extent of our knowledge? It may be freely admitted that it is very small, and is only an infinitesimal fraction of that knowledge which would enable us to comprehend the living machine as a competent engineer understands the human-made machine. And what is more, in the human machine physical and chemical forces may be, and probably are, active, but of their nature the present sciences of physics and chemistry have not even an inkling. Shall we follow the requirements of the human-made machine and wait with our therapeutics until we know all that?

While, thus, no man would be permitted to meddle with some serious disorders of a human-made machine with only a fraction of knowledge of its construction, we find that with the disorders of the mechanism of life for thousands of years millions of men meddled with their repair with a knowledge infinitesimally small indeed, even when compared only with the present-day understanding of the processes of life and their disorders. The contrast is still more striking when we consider the difference in the results. No man can be in doubt as to the outcome of an ignorant meddling with a human-made machine; it would lead, in the great majority of instances, to its complete destruction. But with the human organism, no such disastrous results followed the innumerable ignorant meddlings with its disorders; at least, such evil results were not

<sup>1</sup> Read at the meeting of the Association of American Physicians, Washington, D. C., May 12 and 13, 1908.

readily recognizable: otherwise medicine would long ago have been wiped out of existence.

The truth of the matter is, that with regard to therapeutics the living animal body ought not and cannot be compared with an artificial machine. With respect to repair, there is a fundamental difference between a human-made machine and a living organism. The disorders of a machine can be repaired only by human hands. No machine has yet been invented which can automatically repair its own disorders. The living organism, however, is well provided with such automatic arrangements for self-repair. This fact has a far-reaching theoretical and practical importance. The fact itself, namely, that the living organism can master, unaided, its own disorders, was recognized very early in the history of medicine. Its true significance, however, was never fully grasped. In olden times, as well as in our modern era, it was utilized only as a weapon to discredit the claims of artificial therapeutics. It was pointed out over and over again that patients get well without any treatment, and if they get well under treatment, it might be that they do so, not because of it, but perhaps even in spite of it. The scientific labors of recent years, however, demonstrated clearly that the knowledge of the body's great ability for self-repair, far from being an inimical element to therapeutics, can be utilized as an element of great strength in support of the human efforts to cure or to hasten the cure of its ills. In the brief time at my disposal I shall devote my attention chiefly to a discussion of the aspect of therapeutics from the point of view of our knowledge of self-repair. I wish, however, to preface my remarks with the following brief statements, which, although self-evident, are nevertheless not superfluous.

Science and practice of medicine exist for the benefit of the sick, and therapeutics is the most important part of medicine. To be content with the mastery of pathological anatomy and diagnosis, and to have a contempt for treatment, is a moral and intellectual anomaly. This is, as suggested above, a self-evident truth, which, however, is frequently sinned against, and the sinners are to be found more among the leading clinicians than among the average practitioners. Furthermore, the fact that the living organism is provided with means of self-repair does not relieve us of the duty to strive to discover and procure also artificial remedies. Evidently, Nature's store of means of repair is insufficient; otherwise there would be no suffering and no premature deaths.

Two methods of treatment competed in the past in the domain of internal medicine: the rational and the empirical. I shall not discuss them further than to say that the rational method possesses mainly negative virtues and leads essentially to inactivity. The empirical method, which satisfies its followers by the activity to which it inspires, repelled the active minds in the profession by the vagueness of its inceptions, by the tediousness of its procedures, and

above all by the unreliableness of its results. In this despair the active minds found consolation in the study of the normal and abnormal structures and constructions of the human mechanism, leaving the question of treatment entirely out of consideration; thus medicine was threatened with the loss of its essential object. Since it was generally admitted that many ailments and diseases terminate in recovery, it was evident that the animal organism must possess means and methods by which it accomplishes these recoveries. Here, then, a competent school exists where therapy could be learned legitimately and efficiently. With this object in mind, the methods of self-repair of the animal body became the object of profound scientific studies, and immunity became the third method of therapeutics. This statement deserves to be especially emphasized. The study of immunity means the study of the natural therapeutics of the body with a view of employing it also artificially and, when possible, improve upon it. From this point of view immunity is the most rational and most promising method of therapeutics. I am afraid that this aspect of the studies of immunity is not yet appreciated even by some leading pharmacologists.

The difficulty with which these new studies were confronted was to discover and discern during the process of a disease the phenomena which were manifestations of repair. All recognizable phenomena had already their assigned places; they were pathological if they were not physiological; all deviations from the normal were parts of the disease. It was a good fortune that the antitoxins were discovered; here was something which physiology could not claim as its own, and pathology had not yet laid hands upon. Here was something which the body in its effort of defence and repair evidently manufactured anew. And I may add that here the new therapeutics was quick enough to learn to improve upon the body's method: to provide with passive immunity when active immunity failed. The new field is rapidly growing larger. Besides the discoveries of new substances and processes, many old phenomena are now reclaimed from pathology in behalf of the domain of self-repair. To quote a few trivial instances: pains of joints or muscles are looked upon as a means of insuring immobility of the diseased parts; cough is a means to remove irritating, infecting, or obstructing agencies from the air passages; the production of mucus in gastric ulcer is a means of protection for the denuded tissues from digestion by the gastric juice; vomiting or diarrhoea is a means of relieving the gastro-intestinal canal from corroding or intoxicating substances.

The present conception of the pathology of inflammation is an instructive and interesting illustration of the point under discussion. Tumor, rubor, calor, and dolor were the old insignia of inflammation. The modern pathological studies distinguish local and general symptoms. The local symptoms consist of hyperemia with

stasis, emigration of leukocytes, exudation of lymph, increase of glandular secretion, proliferation of tissue cells, and formation of granulation tissue. Of the general symptoms, we should mention only fever and leukocytosis. All of these symptoms were considered as manifestations of the disease. The present tendency in pathology is to consider every symptom as a manifestation of the efforts of the organism for defence and self-repair. The profusion of blood and lymph, with their natural bacteriolytic, antitoxic, and anti-fermentative properties; the leukocytes, with their phagocytic and digesting activities, and the lymphoid and granulation tissues, with their mechanical and vital powers, attempt to destroy and remove, or at least to wall off, the primary causes of the disease, to neutralize the secondary intoxications, to separate, dissolve, and remove necrotic tissue, and to start regenerative processes. Of the general effects, leukocytosis is now generally acknowledged as being a strong means of defence. Fever, so far as the elevation of temperature is concerned, was considered at various epochs of the history of medicine as a sign of the body asserting itself against the disease. It is now assumed by some writers that it assists in some way or other in the termination of the infection. In short, all the signs of inflammation are now considered as factors in self-repair.

It is interesting to observe how, on the basis of this newest conception, some of the very same signs which were previously considered as essential manifestations of the disease are now artificially produced for therapeutic purposes. There is to be mentioned, in the first place, the production of venous hyperemia in the treatment of various acute and chronic diseases of the body, the so-called Bier's method. The results seem to be excellent indeed. Here we see a brilliant surgeon developing a practical medical method of treatment on the very basis we have been discussing here: the therapeutics of self-repair. I call it a medical method, because it requires no knife and no anesthetics, and should be learned and employed by every practitioner.

The various attempts to influence favorably the course of infectious diseases by the artificial production of leukocytosis is another venture to utilize therapeutically one of the methods of defence and self-repair employed by the body against the cause of inflammation. As examples, may be mentioned Landereker's method of treating tuberculosis by intravenous injections of hetol; Löwy and Richter's experiments upon the production of leukocytosis by pilocarpin, spermin, and albumose-like bodies; Mikulicz's attempts to increase the peritoneal resistance to postoperative infections by the injections of nucleinic acid, as a leukotactic substance.

Fever is another means of repair which is now being tried by various investigators as a curative agent. Here may be mentioned Buchner's experiments to cure anthrax by fever brought on by injections of sterilized emulsions of Friedlander's pneumobacillus;

Dehio's method of treatment of lupus by fever produced by albumoses; and Bier's attempts to produce curative fever by the intravenous injection of alien blood.

Finally, we have to mention the recent interesting experiments of Opie, in which tuberculosis of the pleura and lungs of dogs was cured or greatly mitigated by the intrapleural injection of sterile pus obtained from another animal. It is again the therapeutic employment of a phenomenon of self-repair occurring in the local process of inflammation, namely, the phagocytic and proteolytic cell activity of the emigrating leukocytes.

I have dwelt upon the phenomena of inflammation at greater length because they illustrate the modern tendency in pathology to look upon some of the pathological manifestations as Nature's efforts for self-repair, and at the same time show the tendencies of our day to learn in therapeutics from the methods employed in Nature.

With regard to the latter, I wish, however, to append here a few qualifying remarks. In the first place, learning the methods of Nature should not imply that we have to follow them blindly; on the contrary, we ought to try to improve upon them. Nature's methods of repair often lead to disastrous results; I need only refer to strictures of canals following the natural repairs; or to the formation of abscesses in important organs without the possibility of a spontaneous innocent outlet. In studying self-repair, we need only to get the hint as to Nature's methods; but he is a bad pupil who does not try to do better than the master.

Furthermore, even if we acknowledge that certain phenomena of disease are Nature's methods of repair, it does not follow that we are bound to tolerate their continuation in all cases. In some instances we are at liberty to assume that the method is wrong and that the treatment might be even worse than the disease. For instance, even admitting that pain in articular rheumatism is a part of repair by thus insuring the immobility of the joint, we need not and should not accept this method of treatment. Immobility can be better attained by a splint, and we should, therefore, relieve the pain by an opiate or by a salicylate. Or, to take another instance, even if it be true that fever may be beneficial in some cases, it is wrong to permit its excess when it obviously makes the patient feel miserable. Besides, we should not be orthodox, and should not sacrifice the patient's comforts to mere theories. I am not willing to accept Nature's advice to treat the disease by fever to the great discomfort of my patient, as I am not willing to treat the fever with the cold bath, when, to use Osler's description, the patient is in dread of it, and pitifully begs to be left in the warm bed. We ought also to bear in mind that our duties differ from the self-imposed task of Nature. Nature strives only to avoid death; the physician has an additional duty, and that is to make life bearable. Furthermore, we should not lose sight of the fact that relieving from suffering may mean much more than symptomatic treatment; in some cases it may mean saving life. I

need only refer to one well-known fact, that general or local anesthesia may save life by avoiding shock. The recent statements that the fatal effect of anaphylaxis can be obviated by ether or chloral anesthesia contain, to my mind, a very significant principle, which should not be lost sight of in therapeutics.

Without dwelling on the subject further, I wish to emphasize my view, that phenomena of disease, when they cause serious discomfort, ought to be treated, even if they belong to the group of self-repair, provided, of course, the treatment is not endangering life.

Returning to the methods of repair of the animal body, we may say in general that the living organism responds with a reaction to any change in its normal condition; the reaction may be local or general, or both, and it may be in the nature of an increase of the normal forces, or a change in the distribution of forces; or a call upon the reserve or the latent forces; or, finally, the reaction may consist in the creation of entirely new forces.

The phenomena of inflammation illustrate the several varieties of the first-mentioned reactions. New creations are the antitoxins, bacteriolysins, anti-endotoxins, agglutinins, precipitins, and coagulins. These phenomena have been recognized only within recent years, and it is entirely premature to assume that the above list represents all the new substances which the organism is capable of producing in its struggle against disease.

The therapeutics which is based upon this new lesson from Nature has already attained great success. I need not speak of diphtheria antitoxin; its usefulness is beyond doubt. Last year's experimentation established the practical efficiency also of an anti-endotoxin. I mean the serum for meningitis. It is my impression that its practical efficiency is as good as that of the diphtheria antitoxin, if not better. The other methods of treatment by passive and active immunizations I need not dwell upon, as they will be treated by another speaker.

The enumerated instances will suffice to prove my contention that the fact of spontaneous recovery of the organism from disease can be, and has already been, utilized with great profit in favor of scientific and practical therapeutics.

The fact of spontaneous recovery has frequently, as stated above, been utilized as an argument against the use of any artificial treatment; and if the usefulness of any treatment was admitted, it was that of physiological therapeutics; that is, to improve during disease the conditions which the body requires during health. In the foregoing we have learned that there are methods of treatment which, in contradistinction to the term physiological therapeutics, may be designated as pathological therapeutics; that is, the employment of methods of treatment along the lines which the organism institutes during disease in its efforts of defence and self-repair. Pathological therapeutics promises to be the most efficient method of studying therapy.