

## SOME COMMENTS UPON THE PROBABLE DIRECTION OF FUTURE PROGRESS IN TREATMENT OF CHRONIC JOINT DISEASES.

BY H. W. MARSHALL, M.D., BOSTON.

PROGRESS in treatment began long ago, originating possibly at the time of the Ptolemies and Rameses of Egypt, for old Egyptian mummies show evidence of deforming arthritis and pathological changes in their bones; but the history of progress and fluctuations in knowledge through the centuries must be summarized in the present paper in the abbreviated statement that there have been handed down from the past an incredible number of cures embracing drugs, mineral waters, baths, lotions, various physical therapeutic methods, quaint superstitions and mystical talismans and charms that are worn to ward off "rheumatisms," for by no means have these latter disappeared from use.

Notwithstanding the abundant supply of remedies that may be drawn from, chronic joint diseases still prevail and not infrequently run their course in spite of diversified, persistent treatments; and while it seems true that many of these remedies possess virtues under certain conditions, yet there are none that can be confidently expected to benefit all cases; moreover, because of difficulties in telling whether given procedures will prove helpful or not in individual instances, there has been, and continues to be, constant search for new cures of wider applicability and more pronounced usefulness.

At the present time new drugs, vaccines, therapeutic sera, organ extracts, surgery, new modifications of physical therapy and preventive measures are being added to the long list of remedial agents and methods by which arthritis is combated, and it does not seem likely that this multiplication of remedies will cease in the future; furthermore, it must be expected that treatment of chronic joint diseases will continue in an unsatisfactory state as long as physicians are contented to search for new or more simple cures only, and fail to comprehend clearly the essential principles that always are necessary for success in all cases.

The cure of chronic arthritis is dependent upon three important complicated factors: firstly, upon correct diagnosis of underlying causes; secondly, upon proper selection and application of remedies; and thirdly, upon having patients carry out the instructions given them; also it is true that defects in any of these three factors generally mean unsatisfactory results.

These statements are so obviously true that it seems at first sight to be almost unnecessary to mention them, but when consideration is given to the fact that a large percentage of failures are due to careless, defective diagnoses and treatments rather than to lack of efficient therapeutic measures, then the reasons become apparent why these important commonplace considerations as well as the latest medical novelties must be kept in mind. It seems at present that progress in treatment will be accelerated most rapidly by

more skillful application of the facts and ideas that are already known than by accumulation of new remedies that must have a restricted field of usefulness, as will be shown later; therefore the effect upon progress in treatment, of greater skill in diagnosis and more thoughtful application of remedies first will be discussed.

## PROGRESS INFLUENCED BY SKILL IN DIAGNOSIS.

Correct diagnosis depends upon a proper conception of arthritis; upon familiarity with all causes of joint diseases, and upon recognition that common infections, common defects in various organs which contribute joint irritants to the blood, and common errors in personal hygiene are the usual causes of joint affections. Another peculiarity of diagnosis is that substances in the blood which act as joint irritants very frequently cannot be identified by clinical tests in the laboratory, so that dependence has to be placed upon the presence of gross pathological changes in organs that may be demonstrated upon physical examination; or simply by the history of such troubles.

This combination of circumstances makes errors very easy in the interpretation of existing conditions, and commonplace mistakes that are equally as disastrous to successful cures as the lack of interesting new methods of treatment are become very important on account of the frequency of their occurrence, and, therefore, much greater care should be taken to have definite, clearly defined ideas of the nature and causes of arthritis.

When the nature of joint disease is thought of, there ought to come to mind immediately the picture of joint tissues, synovial membranes, blood vessels and nerves, cartilage, bone and fibrous tissues; each with its variable vital resistance and its properties common to all living tissues reacting to external stimuli of various sorts. The stimuli may be harmful, beneficial, chemical, mechanical, nervous, thermal, electrical or of other physical nature, and they always are found acting in combinations. A convenient device for remembering the balance of health that is maintained by the joints towards their environment is given below in an algebraic equation.

This concisely summarizes the main groups of contributing etiological elements and clearly shows that disease is always dependent upon a number of factors and not solely upon the immediate cause found associated with the onset of the trouble. The immediate cause, however, is the one that is usually remembered; and while it is correct to speak of gonorrheal arthritis or arthritis with a tonsillar etiology or joint disease of intestinal origin, yet these illustrations present only one side of the story, and emphasis also should be laid especially when treating patients upon other etiological elements which are partly responsible for the general state of health and which permit such infections to upset the normal healthy joint balance.

The factors that influence joints and whose

algebraic sum represents the health and resistance of articular structures are as follows:

(a) External conditions + (b) blood conditions + (c) mechanical conditions + (d) nervous conditions + (e) inherent resistances of joint tissues = (x) degrees of healthy joint resistance.

Each of these factors may be amplified and explained individually, and each can thus be shown to be a variable quantity, which sometimes has a positive favorable value and at other times a negative, unfavorable one, according to different circumstances, therefore this makes (x) very variable and fluctuating.

(a) *External conditions* include —

1. Variations in temperature of the air, moisture, barometric pressure, storms, winds and other meteorological conditions; also abnormal exposures to heat or cold in special occupations.

2. Traumata of the joints.

3. Local thermal, electrical, mechanical and chemical therapeutic agents, hot and cold applications, massage, liniments, radiant heat and various forms of electricity.

(b) *Blood conditions* include —

1. Food substances of the blood and oxygen required by the joint tissues.

2. Metabolic substances from tissue cells, such as sodium bi-urate, waste products, antitoxins, internal secretions, hormones.

3. Bacterial toxins and other products of bacterial metabolism, the latter being represented by indican and ethereal sulphates of the urine.

4. Drugs used for therapeutic purposes, as, for example, salicylates, urotropin and others.

5. Metallic poisons, as, for example, lead, which occasionally produces joint symptoms.

(c) *Mechanical conditions* include —

1. The amount of exercise taken, and whether mechanical stimulation of the joints resulting from it is excessive, normal or insufficient.

2. Mechanical pressure due to body weight, especially when pressure effects are increased by exercise.

3. Abnormalities from defective development, or pathological changes in joints from injuries such as displaced cartilages, or previously existing arthritic disease which may make a normal amount of exercise abnormally irritating under such special conditions.

4. Forcible manipulations which sometimes prove to be beneficial and at other times are harmful.

(d) *Nervous conditions* include —

1. States of the blood and other factors which influence nerve cells controlling the joints.

2. Inherent resistances and health of such controlling nerve centers.

(e) *Inherent resistances of joints* depend upon —

1. A definite resistance and degree of health contributed by parents of the individual.

2. Slow modifications brought about throughout life by the response of the joint tissues to their environment; namely, the external, vascular, mechanical and nervous conditions just enumerated.

These devices, if they keep the correct conception of the nature of arthritis in mind, permit the first step towards successful treatment to be taken; but correct diagnosis also includes correct estimation of the relative importance of the etiological factors that are acting in each case, and consequently for accurate judgment there is demanded familiarity with all possible causes of arthritis.

The causes of arthritis are many, at least joint symptoms have been recorded in medical literature as occurring during the course of or following after a great many diseases including bacterial, constitutional and nervous affections; and some pathological conditions of all important organs of the body as well as many acute infectious fevers are represented in the list, but it is necessary to recognize that common infections, common disturbances of digestive functions, common irregularities associated with menstruation and pregnancies, and defects in personal hygiene are the usual causes of joint troubles rather than rare disorders.

Some diseases in which joint symptoms are observed probably simply lower the individual's vital resistance, and by altering the metabolic balance of the tissues and proportions of blood constituents allow latent infective foci to become active and an unusual amount of their products to get into the circulation, thus temporarily causing arthritic symptoms. The intestine with its countless bacteria must be considered such a focus, and while the integrity of the intestinal mucosa and the protective powers of the individual keep intestinal toxemias in abeyance in robust health, yet the intestine seems a constant menace to health in depleted states, as well as in intestinal disorders, when it probably assumes pathological significance; and this idea is further substantiated by the facts that intestinal bacteria are known to rapidly invade the body in moribund conditions, and they also are not infrequently recovered in bacterial cultures taken from the joints. If the truth could be definitely shown, probably there would be found several different joint irritants, namely, the different toxins and metabolic products of different species of bacteria, some ordinary products of tissue metabolism like the urates which act as irritants when they are present in unusually large amounts; other metabolic products, internal secretions, occasionally metallic poisons like lead, and abnormal nervous stimulations of articular structures.

The relative importance of different etiological factors and correct diagnosis, therefore, depends upon thoughtful consideration of all facts which have been stated, and upon the following additional ones.

Clinical tests frequently are inconclusive, and physical examinations occasionally fail to reveal concealed lesions, and in such instances personal histories showing sequence of events very often afford the only clue by which correct interpretations can be made. Personal histories as told by patients themselves, therefore, should receive careful attention, and it should be recollected that one cause may initiate arthritis and another

one complicate or perpetuate it; also that what seem to be causes sometimes can as well be considered accompaniments of arthritic conditions, and that both may be cured by attention to a third element, the latter often being correction of unhygienic habits.

Correct diagnosis of underlying causes and estimation of their relative importance obviously will be generally conceded to be a rather difficult matter; and practitioners, therefore, welcome each new simple remedy which promises relief and helps to keep patients' interests. The writer wishes to point out, however, that such promised relief in very many cases is not obtained, nor should any one single remedy be expected to fit and relieve all causes of such diverse origins. Physicians must recognize that thoughtful consideration of each case and careful attempts at correct diagnoses are indeed worth while, and cannot be replaced by any makeshift or routine methods that seem desirable because they are less laborious. The subject is naturally a complex one and its simplification beyond a certain degree is an impossibility; and although successes sometimes do occur from routine treatments, even when no attempts are made to understand the causes involved, yet such thoughtless methods are to be deprecated.

The first way to be emphasized, therefore, in which progress may be made and future efforts profitably directed is toward more accurate diagnosis.

#### PROGRESS INFLUENCED BY SKILL IN APPLYING REMEDIES.

In the treatment of arthritis, as in all diseases, it is essential to keep in mind the fact that living tissues are being dealt with, and to apply remedies in a manner which harmonizes with biological laws known to govern health of all living things.

Living protoplasm possesses peculiar properties in its power of growth, waste and repair, reproduction and irritability in response to stimuli, which distinguish it from all other organic and inorganic substances. It also possesses many other peculiarities that are exhibited in the great variety of cell types, for these latter owe their individual form and function to minor properties of protoplasm which differ with and are peculiar to each particular kind of cell; so that more universal knowledge and application of these general as well as individual peculiarities of protoplasm is desirable for future progress in treatment.

Around the two main groups of general and individual characteristics of cell protoplasms are clustered many of the important medical problems of the present day, as, for example, researches upon cancer, studies in special bacterial diseases, immunity and anaphylaxis; and the action of special drugs. It is noteworthy that these are mainly studies into individual reactions and biological characteristics of single types of cells which possess unusual importance, and that general properties of living protoplasm receive comparatively little attention at the hands of medical investigators at present.

Joint tissues, like all others, have their own individual peculiarities as well as characteristics in common with all, and these will next be discussed.

*Biological characteristics of joint tissues* are rather difficult to study, and their peculiarities may be pointed out best by comparison with the biological characteristics of another kind of tissue, muscle tissue, whose contractility can be easily and accurately measured as it shortens in response to variable easily measured electrical stimuli, when the latter are applied to the motor nerves enervating the selected muscles.

From the familiar laboratory experiments of stimulating the isolated gastrocnemius muscle of the frog through its sciatic nerve the following peculiarities can be distinguished.

(1) There is a definite fixed *strength* of stimulus in response to which muscle makes its greatest contraction, and if the stimulus is weak the muscle contracts to a less degree, or not at all in case the irritation is too slight.

(2) Individual muscles vary considerably in their response, and the strength of stimulus needed to provoke maximal contractions is found experimentally to differ with each muscle-nerve preparation.

(3) The *rate* of stimulation, when the exciting stimulus remains constant in strength, exerts an influence upon the muscle response. A slow rate permits equal simple contractions with a period of rest between each; while a rapid rate does away with the rest period, and the succeeding stimulus coming before the preceding relaxation has been completed produces a new contraction in the already contracted muscle. The result of such rapidly repeated stimuli is seen in greatly increased muscular contractions known as compound or tetanic contractions. The rate required for complete tetanus is a variable quantity depending upon temperature, fatigue and individual protoplasmic differences.

4. *Temperature* exerts an influence upon muscle contraction, and when the exciting stimulus remains constant, the exact degree at which optimum activity occurs can be easily found by experiment.

(5) *Chemicals* affect muscle contraction, as, for example, the alkaloid, veratrin, produces a peculiar, characteristic prolongation of the phase of relaxation.

(6) *Fatigue* of muscle is noticed after too prolonged stimulation, and has been studied in the voluntary contractions of human muscles by means of the ergograph. The results of these experiments, therefore, will be mentioned; and Howell<sup>1</sup> summarizes some of the more important results as follows:

"If a sufficient interval is allowed between contractions, no fatigue is apparent."

"After complete fatigue, a very long interval is necessary for the muscle to make a complete recovery and give a second record as extensive as the first."

"The power of a muscle to do work is diminished by conditions that depress the general

<sup>1</sup>W. H. Howell: *Textbook of Physiology*.

nutritive state of the body or the local nutrition of the muscle used; for instance, by loss of sleep, hunger, mental activity, anemia of the muscle, etc."

Additional observations will not be given as enough have been cited to show that fatigue influences the muscle response to a very important degree.

(7) Other important biological peculiarities of muscle tissues are their atrophy from disuse, and atrophy when their controlling motor nerve centers are destroyed; also their hypertrophy when exercise is taken regularly in normal physiological manner.

Considerable trouble has been taken to review these different reactions because these same general reactions occur in joint tissues, although they cannot be demonstrated as simply; yet the existence of such biological characteristics in joints are of vital importance to recognize when prescribing appropriate remedies. For example, joint tissues may be fatigued, and they have a definite strength and rate of stimulation to which they respond best; and these facts most assuredly ought to be considered in treatment as well as the nature and combinations of influences acting upon them, — the mechanical, vascular, nervous, thermal, chemical, electrical and other physical kinds that already have been described under discussion of diagnosis.

It is the writer's opinion that the most serious obstacle to future progress is lack of appreciation by many physicians of the physiological needs of the tissues; and in consequence frequent use of excellent remedies in a faulty manner. Illustrations will make clear the defects which it is desired to point out.

Arthritic patients go to sanatoria and health resorts for "courses" of special treatments, particularly hydrotherapy; and as a result some are benefited while others are made worse. The explanation of the different effects observed upon different individuals seem to be that patients who derive benefit happen by chance to have physiological needs which the particular "cure" fits, while those who are made worse exhibit physiological wants that the special forms of treatment do not supply.

Other examples not infrequently observed are ineffective bakings of special joints, like the knees, at regular intervals until the patient tires of the treatment; also in other instances the use of inflexible courses of drug, dietetic, electrical or other physical treatments. Failures to cure should not be ascribed to particular methods, as the latter always prove their value when they are appropriately given, but rather to difficulties in making correct diagnoses and in estimating suitable strengths, rates, varieties and combinations of remedies to be used; moreover, it seems possible that there may already exist a superabundance of excellent remedies with which cases may be treated successfully as soon as requisite skill in diagnosis and skill in administration of remedies are acquired; therefore multiplication of remedies can do comparatively little good under these condi-

tions when failures in treatment can be traced mainly to such causes. The following ideas are offered for improvement of this existing state of affairs.

(1) That inflexible, fixed routines will always prove disastrous in a certain proportion of cases when they are used in treatment of conditions which always differ more or less in different individuals, and instead of such routine treatments the substitution of variable methods adapted to the physiological needs of each patient is advocated.

(2) That such physiological needs can be determined only by applying different remedies experimentally and noting their effect exactly as the strengths and rates of stimulation required for maximum effects are determined in laboratory experiments.

(3) That the best strengths, rates, varieties and combinations can be easily ascertained experimentally by systematic trial of a series of different therapeutic agents; and that failures at the present time often are due to the helpless way with which some single method is arbitrarily selected and persevered in, without regard to its physiological effect, being perhaps of entirely unsuitable nature, or administered too cautiously, or at other times being effective at first but prolonged until the tissues become overstimulated and so fatigued that first benefits are neutralized.

(4) That much harm as well as good may be done by treatments according as they are, or are not, thoughtfully prescribed and their effects carefully watched.

(5) That the course that should be pursued in treatment is frequently suggested by the sequence of events in the history of the case, and by the manner in which pathological joint conditions have developed through slight irritations acting continuously or by recurrences of brief acute attacks of arthritis, each of which have left the joints in slightly weaker condition after their subsidence. In the decisions which have to be made whether strong or mild, continuous or interrupted treatments should be employed, mild measures usually should be tried first and afterwards followed by variations that may be suggested by the history until the precise strength, frequency and combinations that are best are experimentally discovered.

It is a common occurrence to have patients say that they have tried many remedies and that each was beneficial for a short time, but that after a while there always were relapses into a chronic state again. Such patients often are difficult or impossible to permanently cure, and the principal hope lies in experimentally finding a series of measures whose combined effect, when they are tried in rotation, is sufficient to overcome the chronicity and re-establish health. In applying remedies one should be contented if slight improvements follow the use of each new therapeutic agent, and the latter should be changed while they are still acting in a beneficial manner just before fatigue effects appear.

Theoretically at least it seems possible, with sufficient skill in application of remedies after

correct diagnosis has been made, to occasionally retrace the course which has been traversed in development of such pathological states. Improvements upon present conditions certainly may be hoped for anyway, and complete dependence in the future at least need not be placed, as is so often the case now, upon some fixed routine administration of a single drug, vaccine, serum or other remedy without definite knowledge of its proper dosage, or the frequency and length of time that it should be given, not to mention consideration whether its nature fits the causes of the trouble or whether the tissues already are exhausted and should not receive additional therapeutic stimulation.

The exercise of greater skill in applying remedies according to the physiological needs of the joints and according to the physiological requirements of other contributing defective organs, therefore, is the second important way to be emphasized in which future progress in treatment of chronic arthritis may be profitably directed.

#### PROGRESS INFLUENCED BY DISCOVERIES OF NEW THERAPEUTIC METHODS.

The universal fascination to physicians and patients of new remedies, with their unknown possibilities, guarantees beyond question the continuation of discoveries of many novelties in the future, and some undoubtedly will be beneficial enough to be retained in use, although the majority probably will be found of comparatively little value and will be soon forgotten again.

The records of the past repeatedly show methods of one period superseding the ideas of the preceding one, and it is reasonable to expect as continual changes in the future; also to realize that, while interesting new methods and ideas are being discovered, at the same time some meritorious ones are falling into disuse, from which a few occasionally are reclaimed and brought again into prominence after a lapse of years.

Real progress, therefore, is fluctuating and dependent upon continual additions to and simultaneous subtractions from the total sum of medical knowledge that is available at any given time; and the present state of affairs with regard to chronic joint disease is now one in which many additions may be expected in the near future from medical researches of the most varied kind.

Contributions to the knowledge of joint affections seem especially likely to come through —

(1) Advancement in knowledge of the special reactions and biological peculiarities of different species of pathogenic bacteria.

(2) Increased knowledge of the responses which the body tissues make to such bacteria and their products as are being elucidated by studies in immunity and anaphylaxis.

(3) New facts concerning normal metabolism of the body and its organs which physiological research laboratories now are making possible.

(4) Progress in treatment of diseases of various individual organs which contribute joint irritants to the blood stream.

(5) Better understanding of the chemical, physical and biological peculiarities of living joint tissues themselves.

Numerous species of bacteria have been discovered in the joints and synovial fluids, notably tubercle bacilli, streptococci, staphylococci, gonococci, pneumococci and bacillus coli as well as others like the diplococcus rheumaticus of Poynton and Paine; but it is impossible to tell which of the numberless, apparently trivial facts and reactions relating to each of these micro-organisms may be found in the future to have an important bearing upon the eradication of such bacteria from the joint tissues or from other organs where they may have found lodgment. Paul Ehrlich's fascinating experiments in producing a chemical substance, his "606" compound, which shows a special affinity for and a special poisonous reaction against spirochetes in the tissues, leads to the hope that it may be the first of a series of such experimental substances that can be used in combating inoperable bacterial disease of various kinds, yet it seems foolish to speculate now upon what such discoveries will be.

Bacterial vaccines and therapeutic sera have been tried sufficiently to demonstrate some of the difficulties which are experienced when they are used to overcome bacteria living in the tissues in chronic affections. It has been found that micro-organisms in such conditions, which are often the survivors of many repeated protracted battles with their host, have intrenched themselves so strongly through their relatively high powers of resistance that vaccine and serum treatments very frequently cause only temporary improvements in such conditions.

Along other lines of work, the great value of physiological experiments which are being made to determine more precisely the nature and variations in normal metabolic functions of the body and its organs, especially the remarkably complete, accurate observations that institutions like the Carnegie Nutrition Laboratory in Boston make possible, need no comment, because establishment of normal standards obviously will be of immense use in many pathological states.

Improvements in treatment of various diseased organs should favorably influence treatment of associated joint lesions, if normal contributions of such organs' secretions and metabolic products to the blood stream which have been interfered with are restored to their healthy balance again, and if abnormal products are diminished by such improvements. An illustration may be cited in the use of desiccated thymus gland for the cure of arthritis as proposed recently by Nathan.<sup>2</sup>

He was led to give thymus gland to a certain class of arthritic patients who presented changes in their bones that suggested to him a similarity to the effects observed by Basch upon the growth of the skeleton after removal of the thymus gland, and Nathan found that a metabolic osteo-arthritic type of arthritis is sometimes strikingly improved

<sup>2</sup> P. W. Nathan: A New and Apparently Successful Method of Treating Metabolic Osteo-Arthritis, So-Called Arthritis Deformans. Jour Am. Med. Asso., June 17, 1911.

by prolonged administration of dried thymus gland over a period of many months, provided other means, such as rest and proper diets, are simultaneously instituted. Nathan's results seem worthy of a digression in order to comment briefly upon their interpretation.

The most important data submitted by him in his very interesting valuable paper seem to be as follows: Among eighty-three patients who exhibited severe grades of metabolic osteo-arthritis, eight of eighteen bedridden patients after treatment are walking without cane or crutch; three of fourteen wheel-chair cases are walking without assistance of any kind; and all the remainder, namely, fifty-one of eighty-three severe cases, have improved under treatment with thymus gland.

He also states that some patients had their symptoms reappear when thymus capsules were discontinued.

Thymus treatment alone, he states, is not sufficient to effect a cure, and emphasis is very properly laid by him upon accompaniments of rest, suitable diet, upon avoidance of forcible manipulations, etc. These clinical observations, namely, slow restoration of general health and joint function, together with results of animal experiments which show the influence of thymus secretions upon normal bony development, harmonize well with Nathan's supposition that small amounts of the gland given over a long period of time may somehow supply the deficiencies in secretion due to slightly defective glands presumably existing in such arthritic individuals. Certainly Nathan's results cannot be ignored, for his observations have been carefully drawn from a large number of cases, and objections cannot be raised of lack of accurate, comprehensive understanding of arthritic processes and their causes; and, therefore, it seems very probable that he has found another origin and cure of this small group of cases.

However, opinions are bound to occur which are opposed to the ideas that thymus capsules are the therapeutic agents which are responsible for the improvements noticed.

Any series of eighty-three cases will show some favorable and unfavorable variations with other treatments, and by careful attention to rest, diet and other general hygienic measures such as Nathan has observed it is possible to gradually restore health without the use of thymus gland in many individuals who are suffering with the same type of metabolic osteo-arthritis apparently; moreover, no very marked abnormalities of the thymus have been recorded in autopsies of such patients, and the gland is generally considered to play a relatively unimportant rôle in adult life; also the active element of thymus gland is not well understood, nor is its fate in normal digestive processes known; moreover, the fact has yet to be proved that the active element of sheep's thymus gland enters the circulation through the patient's intestine in the same form as normally occurs when products from the individual's own thymus gland enter the circulation in the usual physiological way.

These facts, however, should not invalidate the theory that thymus gland is beneficial to certain patients; but instead, recognition should be given of the probable benefit of hygienic measures combined with gland administration in producing the best results. Although careful hygienic treatments alone may sometimes yield good results, yet this circumstance does not disprove that combinations of the two act still more efficiently, as Nathan's results seem to demonstrate.

Objections on pathological grounds and on account of the supposed small importance of thymus gland ought not to carry much weight, as poorly understood conditions are generally inaccurately judged, and there may exist slight abnormalities which have escaped notice of pathologists, and functions exist which are unknown and unappreciated. Accordingly, under these circumstances data obtained by animal experiments should be remembered, that thymus products do exert an influence upon bony development and may influence blood pressures, etc.

Attention is called to the fact, however, that routine use of thymus in treatment of all types of arthritis deformans will undoubtedly show only a very small proportion of improvements because this type of metabolic osteo-arthritic cases are comparatively rare, as Nathan states; and while he has accumulated many examples showing the benefit of thymus treatment, yet it should be remembered these were culled from a very large number, and the statement which was made earlier in this paper that new remedies must have a restricted field of usefulness is seen to be substantiated in this instance.

In conclusion, it must be pointed out that other sources of origin for metabolic osteo-arthritis are not disproved, and indistinguishable bony changes sometimes occur in arthritis whose onset is intimately associated with pregnancy and its accompanying metabolic disturbances.

#### PROGRESS INFLUENCED BY ADVANCES IN SURGICAL KNOWLEDGE.

Surgical operations upon joints themselves at times become necessary, and many other organs that stand in casual relationship to arthritic conditions also demand operative interference not infrequently.

The larger joints are now opened much more fearlessly and successfully than formerly, and complete excisions of diseased tubercular joints, removal of loose bodies, joint mice and loose cartilages are universally recognized as very valuable, useful procedures, while the advantages and disadvantages of arthrotomies for lipomatous, villous and mild infectious conditions are becoming more clearly defined.

There still remains much to be known about merits and faults of immobilizing joints with impaired function in the most favorable position for use; also about attempting to restore function in defective joints by arthroplasties, insertion of animal membranes, etc., but these can be mentioned only and not satisfactorily discussed in this short paper.



Organs which have received surgical treatment with benefit to arthritic lesions are as follows: Tonsils, nasal sinuses, mastoid processes, teeth, stomach, gall bladder, appendix, intestines, rectum, prostate, urethra, kidneys, urinary bladder, Fallopian tubes, uterus, lungs and pleura, bones, lymph glands, breasts and skin.

The determining factor in surgical interference very commonly has been the arthritic condition itself in treatment of tonsils, nasal sinuses, teeth and urethra, while very defective local conditions have decided the course in severe operations upon important internal organs, and improvements in arthritic conditions have simply been considered interesting coincidences. The future has to decide to what degree surgical interference is beneficial and justifiable on account of the joints themselves, when they exhibit lesions that are due to indefinite defects in important internal organs. At present, much interest is centered about chronic inflammations, atrophies, stenoses, atonies and ptoses of the stomach and intestines, but discussion of advantages and disadvantages of abdominal operations for arthritis must await further accumulation of surgical and medical data, as the solutions of such arthritic problems become the complicated ones of surgery and internal medicine.

Without attempting to collect statistics from medical literature, the writer has personal knowledge of two severe cases of arthritis which were cured by removal of the uterus; one case in which the removal of a chronically inflamed appendix adherent from repeated attacks of appendicitis was followed by complete relief of severe arthritic symptoms; several instances where abdominal operations for septic conditions, appendicitis and salpingitis requiring subsequent drainage have been the starting points for chronic joint disease; a few colostomies performed for ulceration of the colon that have been followed by marked relief of arthritic symptoms, and one case of cholecystotomy which caused subsidence of accompanying joint disease.

Usually greatest improvements in joints follow radical operations that entirely remove foci which contribute joint irritants to the blood; and when it is impossible to eradicate these foci, as is often the case in chronic diseases of vital organs, then accompanying arthritis is incurable unless such chronic states can be overcome by other means. The greatest hope for the future in this direction lies in the discovery of specific chemical compounds that will select and destroy micro-organisms in the tissues without seriously injuring the latter, as is the case with quinine in malaria and Ehrlich's salvarsan ("606") in syphilis.

Digestive irregularities, although chronic, present more hopeful prognosis than diseases of other internal organs, because the alimentary tract is more accessible for treatment with medicinal agents; and its normal physiological activities may be modified to greater extent by variations in diets; yet satisfactory treatment of its various diseases has still to be clearly understood in many

instances; consequently, relative merits of surgery as compared with other means cannot be stated completely and certainly at the present time. However, enthusiasm which exists over operative procedures upon the stomach and intestine seems likely to furnish data for future deductions as to merits and demerits of operations, and, moreover, in justification of such treatments, it may be said that they often furnish the only hope, although slight, that exists now of curing certain intractable cases of joint disease.

Extended discussion of surgical treatments for different individual organs cannot be made satisfactorily in the present paper.

#### PROGRESS INFLUENCED BY ADVANCES IN PREVENTIVE MEASURES.

Treatments for chronic joint disease may be influenced similarly as treatments for many other maladies may be, namely, through understanding the nature and origin of the one in question and by preventing causes from acting; also by treating early symptoms as soon as they develop before the physiological limits have been passed from which restoration of function of the tissues is impossible.

There must be familiarity with all possibilities that may be encountered. Consideration must be given to variations in joint resistance and to variation in causes. Combinations theoretically occur as follows, and must be mentioned with tiresome precision in order to give an idea of the different possibilities.

(1) With weak joint resistances and transitory causes acting upon the joints, there are produced brief attacks of arthritis and liability to recurrences. The acuteness of symptoms depends upon the strength of the underlying cause. Examples are seen in acute articular rheumatism and acute polyarthritis associated with infectious fevers.

(2) With weak joint resistances and causes acting for a prolonged period there are produced progressive joint changes. The rate of destruction is regulated by the strength and nature of the cause and frequently is rapid.

(3) With moderately strong joint resistances and transitory causes acting there are produced no arthritic changes unless the cause is greater than joint resistance; that is, slightly more than moderately strong, then there will be brief attacks, the severity of which increases with the strength of the irritant. Typically such cases are of moderate or slight degree.

(4) With moderately strong joint resistances and causes acting for a prolonged period there also are produced no arthritic changes unless the cause is stronger than the joint resistance; and if the difference is slight, there are transitory premonitory symptoms at the onset, as well as brief improvements and relapses during the course of the disease corresponding to fluctuations in the physiological balance and unstable equilibrium which results from the struggle between the two nearly equally matched influences. Examples are seen in "low-grade" infections which pursue a very chronic course, and these, as the cause increases, grow moderately in severity and rate of progress. Obviously the disparity in strength between joint resistances and unfavorable external influences determines the degree of the symptoms, regardless whether weak, moderately strong or

very strong joints are being acted upon by moderately strong, very strong or the strongest influences respectively.

(5) With very strong resistances and transitory causes acting there are rarely produced arthritic lesions except during the course of extremely severe infectious fevers. Joint symptoms, then, are mild and of brief duration.

(6) With very strong resistances and causes acting for a prolonged period there are no arthritic changes until the health of such patients is broken down and the joints succumb as the individual's general resistance diminishes and invading micro-organisms gain mastery in terminal infections.

(7) Bacteria lodging in joints develop, or fail to do so, according as joint resistance and the resistance due to protective properties of the blood combined are less, or greater than, the vitality of the parasitic micro-organisms. Three factors enter into the combination, namely, joint tissue resistances which may be strong or weak; protective reactions of the blood which may be strong or weak; and invading bacteria which may have heightened or weakened resistance. Tabulation of all possibilities is complicated and too confusing to be attempted, yet all bear upon the understanding of arthritis and indirectly upon preventive measures.

It can be seen from what has just been pointed out so tediously that first symptoms of arthritic trouble may be slight and transitory, yet possibilities for curing the joint disease may have already passed, owing to origin of the joint lesions being in chronic diseases of other organs that already are beyond hope of cure.

On the other hand, the onset of a very severe arthritis may be followed by speedy, complete permanent recovery, and between these two extremes lie a great many possibilities. Some types are remediable if prompt attention is given to them, and on account of the prolonged course joint diseases may take with years of crippled existence, there should be more stress laid upon the advantages of early diagnosis and treatment.

Obstinate incurable diseases in other organs occasionally may be modified sufficiently to alter blood conditions enough to restore healthy joint balance for a considerable time and to give the individual very appreciable relief; and in other instances underlying causes may be just at the limits from which restoration of health is possible. Prompt attention, then, will turn the course towards recovery instead of incurability. The advantages of preventing disorganization of joint structures with their scanty powers of repair, by quick interference, are obvious even though it may be possible to remove underlying causes later completely.

Prognosis before onset of joint symptoms sometimes can be roughly estimated from personal histories. Those persons who have suffered from various diseases known to cause arthritis and who have escaped entirely from having joint symptoms in severe illness presumably have relatively resistant joints, while those who have had arthritic symptoms coming on during the course of fevers, or have had acute articular rheumatism, should be considered to have relatively susceptible ones and should be advised how to avoid conditions known to precipitate attacks of arthritis.

## RÉSUMÉ.

Reasons and data have been given to show how greater accuracy in diagnosis; greater skill in applying remedies accurately according to physiological needs of the tissues; discoveries of new methods of treatment through development of many medical researches; improvements in surgical knowledge and skill; and more keen appreciation of the advantages of preventive measures will all favorably influence progress in treatment of chronic arthritis. Simultaneously with increase in efficiency of such treatments there will develop greater confidence among patients with regard to medical understanding of joint diseases, and this of itself will be an additional advantage, if existing practices that are so fatal to satisfactory results can be minimized, namely, the habit which patients have of wandering from one physician to another trying indiscriminately many cures until hope of recovery has passed and their joints are worn out and damaged beyond repair while attempting to restore their normal function.

## HUMIDITY AND HEALTH.

BY P. W. GOLDSBURY, M.D., WARWICK, MASS.

As a boy I used to enjoy "staying round" the kitchen after studying in my own room. Often since then have I tried to analyze this boyish liking. Was it due merely to the change of surroundings, the simple companionship, or to the pleasant excitement of what was going on? To be sure, my eyes were rested from their books, my ears were entertained and my mind relaxed by the homely discussions of that part of the house; moreover the "smells" aroused other sensations common to growing youth. Even now I experience like refreshment in going to the kitchen, and I have come to the conclusion that this partiality for the kitchen, rather than the study, was largely due to the contrast in the air of the two rooms. The study was probably dry, whereas in the kitchen the steam from the tea-kettle and the water evaporating from the cooking softened the air and gave an agreeable feeling to the skin.

I was annoyed by drying and cracking of the lips, and remembered especially how sore they often were on cold winter days in a country church. Evidently this was due to the variety of atmospheric conditions through which I passed. Before leaving home I would have spent most of the morning in the kitchen. The change was very marked from the warm moist air there, and the cold moist outside air immediately following, to the air of the church, where moisture was all sucked out by the *rapid heating* of the cold building. The contrast of moisture and dryness following close upon that of heat and cold was so sharp as to irritate the lips which are highly sensitive, and left them cracked and sore.

Later, on moving from the Central West to a dry northern state, I found the atmosphere trying. The skin often had a parched feeling, and the