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AND THEIR RELATIONS TO HEALTH AND TO LIFE ASSURANCE

BY

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ON ALBUMINA MINIMA.

WITHIN a few years the fact has been very generally recognized that the existence of serum albumin in the urine is not always accompanied by perceptible changes in health, whence a conclusion has been adopted by many that albuminuria may occur, and even exist persistently, without any organic changes in the kidneys. When albumin is found in apparent health, the difficulty, and often, indeed, the impossibility, of discovering, except where an autopsy is made, any pathological conditions of the kidney to account for it, has tended to establish a theory, as I hope to show, untenable, that albuminuria may exist as a physiological or normal condition. The numerous discussions and papers upon the subject of harmless albuminuria, and the opinions of many prominent writers—among others Senator, Posner, Kinnicutt, Semmola, Saundby, and Johnson—that albuminuria may occur without any pathological conditions of the kidneys, have tended to confirm the belief in the so-called physiological or normal albuminuria. A summary title does not, however, constitute a facile and legitimate method of disposing of a phenomenon not so easily explicable. That albumin may exist as a transient condition, or even persistently for a long time without impairment of the health, has often been observed, sometimes

definite causes for its occurrence being easily recognized, while in many cases the ætiology remains obscure or unknown. Albuminuria occurring without a recognizable cause and without apparent derangement of the health, either persistent or occurring irregularly or at intervals, has been variously styled physiological or normal, temporary, intermittent, transient, paroxysmal, cyclic, and dietetic albuminuria, the variety of designations itself indicating inexactitude, and one of them, at least, being inaccurate. In the first edition of my work on *Bright's Disease*, which appeared in 1883, I stated my belief that albumin might occur in the urine as a physiological event. Chateaubourg and Capitan had just published their interesting and extensive experiments for the purpose of demonstrating the occurrence of albumin in healthy subjects under a great variety of circumstances, made under such favorable and varied conditions and on such an extensive scale that, although their *conclusions* were irrefutable, I now consider that they were often based upon inaccurate premises. But numerous experiments made by myself and others since then, with the greatest precautions as regards the accuracy of the tests, show that in an absolutely healthful condition of the genito-urinary tract albumin is not present in anything like the proportion stated by them in the paragraphs on Albuminuria in Healthy Children,* Rest and Fatigue as influencing Albuminuria in the Healthy, Albuminuria in Health and after Food, etc.†

Capitan, in the urine of ninety-seven healthy children from one and a half to eighteen years of age, found albumin in eighty-one specimens; and Chateaubourg found albumin in one hundred and eleven in one hundred and

* Capitan. *Albuminuries transitoires.* Paris, 1883, p. 80.

† Chateaubourg. *Albuminurie physiologique.* Paris, 1883, pp. 53, 61, 86.

forty-two specimens of the urine of healthy children from six to fifteen years of age. In some cases there was only a trace of albumin, in others it was strongly marked. They found albumin in 82 per cent. of cases of urine passed in healthy soldiers five hours after meals, and in ninety-two specimens out of one hundred and twenty (76 per cent.) of the urine of perfectly healthy soldiers who had exercised less than usual the previous day, the urine being collected at 5.30 A. M. The urine of two hundred and thirty-one soldiers who had undergone severe and prolonged exercise, part on foot and part on horse, showed albumin in two hundred and one cases.

Extremely careful and accurate experiments made by Lecorché and Talamon among others, to which I shall refer more fully, show that albumin when secreted by the kidneys can never be surely predicated to exist in health; in a word, that it is never physiological, but always pathological and dependent upon histological changes in the kidneys. I stated, however, in my work, referring especially to Chateaubourg and Capitan, Vogel, Johnson, Gubler, Ultzmann, and Saundby, that their method of testing in each case is not given; and as they do not state whether microscopic examinations were made, it is impossible to determine that some of the cases at least might have been shown to be cases of slight nephritis. Even though the accuracy and methods of the above-named observers were beyond question, their experiments would not prove albuminuria to be physiological. *Thus far albuminuria has not been shown to exist physiologically.*

Senator* believes that albumin could always be found in the urine, except that there are no reagents sufficiently sensitive always to show it, and that the variations of albumin in the urine are due to oscillations of a physical

* Senator, *Albuminurie*, Author's edition, Paris, 1891, p. 49.

function and not to a disorder of the function. Posner, indeed, goes so far as to state that he *can* find albumin in all healthy urine. His methods of procedure are, however, faulty. In regard to Senator's opinion, "as to the sensibility of reagents," say Lecorché and Talamon,* "we have seen that with Tanret's and Millard's test albumin can be detected in solutions of 1 part to 200,000 or 300,000—that is, five to three milligrammes to the litre. Urine, supposing that it contains albumin, which gives no reaction with these tests, must then contain less than three milligrammes to the litre. If, then, the renal filtration is such that it will not allow five milligrammes ($\frac{1}{11}$ grain) to pass in twenty-four hours, we may admit that it will not allow the slightest trace to filter through."

As to the opinion entertained by so many writers that albumin may occur physiologically, I believe that these opinions are due often, first, to a want of absolute capacity on the part of the experimenters to make examinations for albumina minima, to their not always employing the best tests and methods, and to their mistaking other substances for albumin; and, second, that when albumin is found in apparent health, there is too great readiness to assume that no pathological condition exists. In a paper read by me before the Academy of Medicine, in April, 1887, I endeavored to show some of the errors that were likely to occur even in careful testing for albumin, stating that:

Among the most difficult things to distinguish from albumin are mucin and certain elements always found in urine where there is leucorrhœa, even mild cystitis, cervico-metritis, gleet, etc. Such urine is commonly thought to contain mucus, but, according to Méhu, mucus is seldom, if ever, found in the urine. Epithelia from the various regions, with their detritus, some

* Lecorché and Talamon. *Traité de l'albuminurie et du mal de Bright.* Paris, 1888.

partially and some wholly disintegrated or dissolved, leucocytes, pus-corpuscles, pyin, and, where there is much inflammation, the serum of the liquor puris, are contained in the urine where there is cystitis, vaginitis, etc. The broken-down and dissolved epithelia contain many protein elements, and these, with the other substances I have just mentioned, give many of the reactions of albumin.

I have myself examined the urine of a large number of patients unaffected by any renal difficulty, making in many cases repeated examinations of the urine of the same patient, the examinations being made with the greatest precautions, without finding a trace of albumin. The urine of many of these patients was examined under a great variety of circumstances, and I should state that the urine was in most cases that of people who consulted me for some derangement of health, some of the patients suffering from cancer of the stomach, ulceration of the stomach, cirrhosis of the liver, gout, dyspepsia, glycosuria, and a great variety of ailments.

In doubtful cases, or where there is only albumina minima, in examining the urine for albumin, I first filter the urine through a double thickness of Swedish filtering paper; the cellulose or vegetable albumin of the gray French paper gives a reaction of albumin with my own test of potash and phenic and acetic acids. If this does not perfectly clarify it, though this is rare, I boil with liquor potassæ or magnesian fluid, and filter again. Then I employ Heller's test by nitric acid, using a test-tube about seven eighths of an inch in diameter. Numerous experiments that I have made with this test have shown me that it will not detect more than $\frac{1}{100}$ of 1 per cent. of albumin, or 1 part in 100,000. If the albuminous line be absent, I resort at once to Tanret's or to my own test. It is quite possible to exclude my own personality when I say that Lecorché and

Talamon, after numerous and extensive experiments with the principal tests for albumin in which they devote a good deal of space to my own, sum up by saying that they consider it incontestably superior even to Tanret's in testing for minute quantities of albumin, giving their reasons for their conclusions. They prefer it not only on the score of delicacy, but of accuracy and clearness. My own experience is that this test will show 1 part of albumin in 300,000, Tanret's showing only 1 in 250,000, and that with less certainty.* As to the usefulness of such tests, their *necessity* even is demonstrated in the very class of cases I am now treating of. If Tanret gives a reaction, I consider that the acetic acid contained in this test will produce a reaction with mucin, and confirm it by other tests, as my own. The presence of mucin in slight amount is very misleading. In very mild catarrh of the bladder Tanret's test always produces a reaction which does not disappear by heat.

In the instance where Chateaubourg found albumin in two hundred and one out of two hundred and thirty samples of urine of soldiers, after several hours' exercise on horseback or after eleven miles' marching in the sun, the reaction was produced by Tanret's test. In the words of Lecorché: "This proportion is evidently exaggerated, and the author has arrived at false conclusions by the process he employed in not considering the mucin precipitated by Tanret's test. The cause of error is here pronounced. Muscular fatigue, riding, and marching greatly augment the

* The following is the composition of my test; it is used in the same manner as Tanret's:

℞ Acid. phenic. glacial. (95 per cent.) ..... ʒ ij;
Acid. acet. puri..... ʒ vij;
M. Add liquor potassæ ..... ℥ ij ʒ vj.

It is important that the glacial carbolic acid should be used, or the mixture, which should be quite clear, will be turbid.

quantity of mucus contained in the urine. Should there exist slight irritation of the urethra, of the prostate, or bladder, the remains of a clap, or old cystitis, the excitement of marching provokes an abnormal secretion of mucus from the lower urinary passages. This augmentation of mucus is appreciable after exercise even in perfectly well persons, and can readily be shown by citric acid." This mucinuria consecutive to a march explains a large number of so-called cases of albuminuria from muscular fatigue. It accounts for the exaggerated figures given by Chateaubourg and Noorden.

Griswold* found that the urine of twenty-four subjects in good health, examined repeatedly, showed no albumin after walks of three or four miles, vigorous exercise with perspiration, followed by cold baths, showing that, in perfect health, fatigue, even aided by the action of cold water upon the skin, can not or does not always produce albuminuria.

Noorden, however, considers that he found albumin in twenty-three out of fifty-three specimens of urine passed by soldiers after exercise—that is, in 43 per cent. But, if albumin exists as a physiological condition, why is it *so often* absent, and why was it not present in the remaining 53 per cent. of Noorden's cases, and why is it usually absent after exercise and cold baths, as I maintain it to be?

I have made many experiments which have shown this fact. In numerous mild affections of the genito-urinary system the microscope will disclose the presence of blood or pus-corpuscles, which are certain to be accompanied by albumin. Perhaps the most common aberrations from health that we meet with are affections of the digestive system and catarrhal symptoms, yet we never think of

* Griswold. Phila. *Med. News*, June, 1884.

pronouncing any of these phenomena physiological or normal.

It is true that serum albumin may exist in the urine transiently or permanently in moderate amount without perceptible derangement of the health. But how numerous are the cases of organic affections of the heart and brain, terminating with sudden fatality, in subjects in whom the existence of ill health was not even suspected! Health can not be predicated to exist simply from the fact that people seem well. In a paper contributed by me to the *New York Medical Journal and Obstetrical Review* for November, 1882, I gave an account of a lady, fifty-nine years of age, whose general health, with the exception of rheumatic symptoms and gouty tendencies, was perfectly good. In this case the urine was always free from albumin, but I invariably found, on examining the urine, epithelia from the convoluted tubules, and hyaline or granular casts. Oxalate of lime and uric acid were usually found. This lady was under constant observation from June, 1881, to June, 1882. About four years after, Bright's disease declared itself, and she died from this a year or two later. A large proportion of chronic lesions may exist for a long time without recognizable disturbances to the health. Sir Andrew Clark stated that he had seen personally within thirteen years six hundred and eighty-one persons affected by valvular lesions of the heart without grave subjective symptoms, and, taking also into consideration the number thus affected who considered themselves in such excellent health as to make medical advice unnecessary, the result was astonishing.*

It is well known, too, that Bright's disease may exist

* Sir Andrew Clark. Valvular Lesions of the Heart without Grave Subjective Symptoms. (British Medical Association, Fifty-fourth Congress, 1886.)

for years, especially what may be designated *primitive chronic interstitial nephritis*, affecting the health not at all, or so little that no examination of the urine is thought of until, perhaps, advanced cirrhosis is attained.

In old men albumin is more frequently intermittent and slight in degree. Lecorché found in the Hôpital Broussais, in the urine of patients above sixty, albumin in fifty-one cases, or 66 per cent. In only one of these cases were there symptoms of Bright's disease, there being in this case œdema, polyuria, and two grammes of albumin to the litre. The reagents used were heat, nitric and picric acids, and Millard's test. In another series of tests made at the hospice of Ivry, in one hundred and fifty-seven cases of patients whose ages ranged from sixty to ninety years, albumin was found in ninety, or 57 per cent., ten of the cases being intermittent. The tests used were heat and nitric and acetic acids. Lecorché believes that had the sensitive tests now known been in use then, a larger proportion of cases of albuminous urine would have been found. Seventy-three of the one hundred and fifty-seven patients died; fifty-six of these had had albuminuria and seventeen had not. In forty-four of these fifty-six, alterations of the kidney were visible to the naked eye; in the remaining twelve the kidneys were congested. In six cases of the seventeen non-albuminuric six presented lesions to the naked eye. The microscope would probably have revealed changes in all the albuminuric cases.

Dr. Goodheart, of Guy's Hospital, recently found albumin in two hundred and seventy-two out of fifteen hundred cases that he examined. In the great majority albumin was found to be dependent on renal disease, but in thirty-nine cases no organic alteration could be found. These thirty-nine cases Goodheart calls cyclic, functional, or physiological albuminuria, though he thinks these two last terms

had better be discarded. To explain these thirty-nine cases he states that it is necessary to admit that there is from time to time an exaggeration of arterial tension which produces albuminuria, but that if the tension remain constantly elevated it might bring about definite lesions of the kidney, and the albuminuria then having become constant, being united to a renal lesion, is no longer functional. But, according to his own showing, all his two hundred and seventy-two cases are organic, inasmuch as the observations of the late Dr. Mahomed, Dr. C. W. Purdy, and others have clearly shown that this high arterial tension almost always precedes the appearance of albuminuria, and that in interstitial nephritis it becomes permanent.

In a paper presented to the Academy of Sciences, Paris, in September, 1889, by Dr. Arthaud and Dr. Butte, upon Neuropathic Albuminuria, these authors based the title of their paper upon experimental researches relative to the pathological physiology of the pneumogastric nerve and upon clinical facts. These refer more especially to nephritis of a special type characterized by the pre-existence and coexistence of symptoms of the viscera innervated by the pneumogastric nerve. There is first observed a period in which predominate gastric-pulmonary-cardiac troubles, albumin as yet being absent from the urine. In the second period these premonitory symptoms are persistent and more accentuated, and albumin, ordinarily in small quantities and transient, is found. If the evolution of the malady continue, the albuminuria becomes permanent, and finally the classic Bright's disease dominates the situation. They believe that, in consequence of irritation of the vagus, vasomotor disturbances of the visceral organs innervated by this nerve are produced, and little by little, if the causes remain constant, the nervous lesion becomes chronic and finishes by producing in the kidneys alterations which become

definite. This is the same common history—namely, that causes for a long time latent and at first producing no albuminuria at length produce intermittent or persistent albuminuria, and finally recognizable nephritis.

Semmola believes that a considerable degree of albuminuria can be realized simply from dyscrasic conditions of the elements of the blood and independent of any renal lesion; that the continued dyscrasia of the albuminoids of the blood, with the elimination of a non-assimilable albumin which circulates in the blood like a foreign or toxic body, may in time produce a nephritis well marked histologically. Hayem, however, in the discussion that followed the reading of Semmola's paper (before the Academy of Medicine, Paris, July 29, 1890), and in his correspondence afterward with Semmola relative thereto in the *Bulletin médical*, states that, admitting the well-known fact that albumin is eliminated like a foreign body, the nephritis which Semmola produced by the subcutaneous injection of the white of the egg was only a common toxic nephritis. Hayem himself injected normal albuminoids in large proportion—the serum of the peritoneal cavity, the liquid of hydrocele, and even blood serum—without provoking albuminuria. In another experiment he replaced, as far as possible, the blood of a healthy dog by the blood of a dog affected with Bright's disease without producing albuminuria, showing that the blood serum of a dog affected by Bright's disease presents no alterations in its albuminoids capable of producing albuminuria in a healthy animal, and that the albuminuria has no normal or abnormal relations with the products of the blood. Semmola maintains, too, that subjects of Bright's disease eliminate more albumin in the urine when they subsist upon a nitrogenous than upon a lacteal diet. This, according to Hayem, involves several pure hypotheses: 1. That the nitrogenous diet introduces

abnormal albuminous principles. 2. That the albuminous principles from a nitrogenous diet arouse albuminuria. 3. He assumes that the albuminoids from milk are different from the albuminoids from other food. Formerly Semmola endeavored to attribute the supposed alteration of the albuminoids of the blood in Bright's disease to a greater diffusibility of them. At present he admits that he does not know the modifications and alterations which the albuminoids of the blood plasma may undergo. He nevertheless continues to maintain the theory of the existence of a chemico-molecular change of an indeterminable nature, but, as he says himself, "non-demonstrable." In Semmola's own words (see letter to the *Bull. méd.*, Aug. 2, 1890), though denying his views to be hypothetical, he says the laboratory is impotent to afford experimental demonstration of the chemico-molecular alteration in the blood of Bright's disease, which does not prevent the recognition of the fact that these alterations are a fact and not a hypothesis. And he says also (*Bull. méd.*, July 30, 1890) that Hayem's experiments can not be invoked against the alteration of the albuminoids of the blood in Bright's disease, because there is a large number, a crowd, of differences in the albuminoids (or hétero-albuminoids, as he calls them) which are entirely unknown to us.

To sum up, however, Semmola fails to show that the albuminuria produced in his experiments was due to any other cause than glomerulitis and to inflammation of the tube system of the kidneys. The dogs were killed after the experiments and these lesions invariably found, and were undoubtedly due to the egg albumin acting as a toxic irritant. Semmola therefore furnishes no basis for belief that albuminuria may occur without changes in the kidneys. *Albuminuria, independent of renal changes, has yet to be demonstrated to have an existence.*

Claude Bernard, Brown-Séquard, Hammond, Germain Sée, Ferret, Christison, Tégart, Noorden, among others, give instances of albuminuria after highly albuminous food; Christison, especially after cheese in excess; the others, after eggs were eaten freely. Noorden narrates three cases; in one case casts and albumin were produced, in another simple albuminuria, in the third no albumin.

On the contrary, however, it is important to consider that raw eggs do not, as a rule, produce albumin in the urine. Stokvis and two others each took, fasting, eight to ten raw eggs without the appearance of albumin in the urine, and at another time the same author added to his diet eight to ten raw eggs daily for seven consecutive days without a trace of albumin being found, and Griswold never found albumin after eating raw eggs. A student of Lecorché swallowed, fasting, at 6 A. M., six raw eggs. The urine was examined after each urination during a period of forty-eight hours by the most sensitive tests, without finding a trace of albumin. Four tuberculous patients under the observation of Lecorché and Talamon took for eight, ten, and fifteen days the whites of six eggs. In three of these not a trace of albumin was produced; in the fourth, who suffered from hectic fever, a trace was found four times in three weeks. Another patient, free from albuminuria when admitted to the hospital, suffering from alcoholic gastritis and ulceration of the stomach, with hæmatemesis, was fed exclusively for eight days on hot bouillon and eight raw eggs a day. No albumin could be found while under this diet.

In the cases where albumin was voided after taking eggs, it is therefore probable that some disorder of the digestive system prevented the peptonization of the egg albumin, or that the kidneys were diseased. The excretion of albumin after partaking largely of cheese or eggs may

be attributed in some instances to individual idiosyncrasy. In the case reported by Christison the patient died of Bright's disease; the patient reported by Dr. Sée had all the symptoms of Bright's disease. Claude Bernard found albumin in his urine after taking (fasting) six raw eggs, disappearing entirely in five or six hours. This author afterward died with all the symptoms of morbus Brightii. After feeding dogs on egg albumin, diarrhœa and jaundice are usually established. Lecorché surmises that the albuminuria is simply a reflex of the intestinal irritation, because, as he states, "it has never been shown that egg albumin is absorbed unchanged into the blood," though peptonization may be so impaired that enough may be taken up in a changed condition into the blood as to produce toxic glomerulo-nephritis. Ferret is the only one who has detected the reaction of egg albumin in the urine, and to show this, the urine must contain a large quantity—at least $\frac{1}{10}$ of 1 per cent., or one gramme to the litre.

Turn therefore which way we may, we can not satisfy ourselves that albuminuria, either natural or artificial, ever occurs except as a result of pathological changes in the kidney, and is consequently never normal or physiological, and never, therefore, to be regarded without distrust.

It is rare in making autopsies that the kidneys do not present changes even macroscopically, the most common being depressions and retractions in the cortex, and in the numerous studies of kidneys that I have made I have found but very few where the microscope did not show some pathological changes, the most frequent being slight cirrhosis; after that, cloudy swelling of some of the epithelia of the tubules and glomerulitis being the most common. In many cases some of the epithelia would be lost and replaced by endothelia. Fig. 6, my book on Bright's disease, shows this, the patient being a woman who had died of gin-drink-

er's liver. I had never found albumin in the urine, but frequently found renal epithelia. These changes are found not only in the human kidney, where renal disease has not been suspected, but I have found them in the kidneys of dogs, pigs, and rabbits. The lesion necessary to produce slight albuminuria may not be great; it may be confined to one kidney or affect only a few clusters of glomeruli and tubules proceeding from them, constituting what Lecorché and Talamon call *néphrite parcellaire*, and which they regard as the true anatomical substratum of latent albuminuria; there may be cloudy swelling only of the epithelia of a few of the *tubuli contorti*, with slight proliferation of the connective tissue or slight glomerulitis.

There is no doubt but that rest and fatigue may greatly influence the appearance, or the contrary, of albumin in the urine; but in advanced stages of cirrhosis of the kidneys I have in very rare cases found at intervals the urine free from albumin, and albuminuria is undoubtedly increased, as a rule, by exercise and diminished by rest. But I do not think that proofs are numerous that severe exercise even will of itself produce albuminuria in a perfectly healthy person, though it would be more likely to in a delicate subject. When this occurs, I believe it to be by the system of the vena cava producing passive engorgement of the kidney with slowness of the blood-current, this being most favorable to the exudation of albumin through animal membrane, if long-continued, modifying the nutrition of the glomerular epithelia and bringing about anoxæmia or a deoxygenated state of the blood. If this continues beyond a certain length of time, structural changes of the glomerular epithelia are soon engendered and albumin exudes into the glomerulus. That albuminuria indicates glomerulitis I believe is clearly enough shown by the experiments of Nussbaum and Overbeck, an abstract of which is given by Charcot in

his treatise on Albuminuria. Sometimes the glomerular lesion is rapidly recovered from, but it sometimes becomes permanent, and, although no derangement of the health may be observed, there can be no certainty that the glomeruli and tubuli contorti may not in time become gravely affected.

Next as regards albuminuria from a prognostic point of view. If the albumin is found beyond question to be true serum albumin and not caused by cystitis, elytritis, trachelitis, etc., whether it be cyclic, permanent, transient, or intermittent, whether only traces are found or it exists in a measurable percentage, it never can be safely assumed that harm can never come of it. I speak of chronic conditions. Great vigilance should be exercised in the observation of these cases. The urinary secretion should be measured, the amount of solids estimated, and the nutrition of the system as regards growth or waste, etc., ascertained, the arterial tension and cardiac condition noted, and these data not once simply but oftener if necessary, and in many cases for a continued period. "Renal inadequacy," a very suitable term, first employed, I believe, by the late Sir William Gull —that is, incapacity of the kidneys to form and excrete the proper amount of solids and a deficient formative capacity which usually accompanies marked albuminuria—is an important factor in the prognosis. If the amount of solids fall much below what should be voided according to the diet and weight of the patient, and that persistently, there is ground for believing that serious pathological changes are being or have been developed. The average amount of solids voided by a man in health being placed at fifty-eight grammes, any great diminution for a continued length of time of solids excreted is significant. A very close approximation to the amount of solids (in grammes) voided can be obtained by Trabb's well-known simple rule—that is,

reducing the number of ounces voided in twenty-four hours to cubic centimetres by multiplying by thirty, then multiplying this again by the last two figures of the specific gravity multiplied by two. Of course the diet, stature, weight of the subject, amount of exercise, perspirations, etc., must be considered. Forty-eight ounces being taken as the amount of urine voided in twenty-four hours and the specific gravity being 20, we would have about fifty-eight grammes of solids excreted. The aid of the microscope should always be enlisted. In slight albuminuria and in albumina minima the microscope rarely shows any of the elements of renal inflammation. Proliferation of the connective tissue, mild catarrhal nephritis, and glomerulitis may exist for a long time unaccompanied by changes in the tubules. These in time are, however, likely to become involved, and then renal epithelia casts, blood-corpuscles and pus-corpuscles, variously, may be found. It has been a not infrequent experience with me, however, that cases have been pronounced albuminuric when the albumin has been simply an accompaniment of slight catarrh of the bladder or of the prostatic portion of the urethra. I have never seen these cases, no matter how slight, where I could not recognize albumin, sometimes not more than one two hundredth or one two hundred and fiftieth of one per cent., either by Tanret's or by my own test. If the cystitis is sufficiently marked for numerous pus-corpuscles to be found under the microscope, Heller's test will probably show a sharp line at least one ninth of a line in thickness, which indicates about one ninetieth of one per cent. of albumin. The urates, too, may show this same sharp line. But if we have renal albuminuria to deal with, if persistent, no matter how favorable all physical conditions may seem, we can not assert with perfect confidence that serious lesions may not in time become manifest, and every precaution as regards dress,

diet, and care in living should be observed. I should not class as intermittent albuminuria those cases produced by hard study, taking cold, etc.

After albuminuria has existed for a long time, I have known it only in a small proportion of cases to disappear permanently, and then after a long and rigid course of treatment. Nevertheless, I have had under my observation patients in whose urine I could always find $\frac{1}{50}$ to $\frac{1}{40}$ or $\frac{1}{30}$ per cent. of albumin for several years consecutively without the occurrence of what could be considered renal symptoms. At the same time I should, however, state that the health of these patients was seldom perfectly good. Common symptoms would be a depressed condition of the strength, loss of appetite, the uric or oxalate-of-calcium diathesis. The cases without renal symptoms of some sort at some period were, however, quite exceptional.

Permanent albuminuria, even if intermittent, according to my experience, usually implies in some way impaired health or some latent pathological condition.

As to when albuminuria may be considered cured: Not until at least a long time has passed, the urine being examined from time to time in the most careful manner without albumin being found. Then, if no organic changes of the kidney are found, arterial tension is absent, the heart is normal, and the health is good, we may hope that the albumin will not return.

Should all cases of chronic albuminuria, simply from the fact of albumin being found, be rejected by life-assurance examiners? I believe they should not. I have known some albuminuric patients who enjoyed practically good health and lived to a good age. Albuminuria is not always a more threatening symptom than *other* symptoms. An albuminuric patient may occasionally be in every respect a good risk. There are cases where repeated and comprehensive

examinations must be made before the examiner can decide as to the interests of his company. There can be no unvarying rule as to this point. I have known albuminuric subjects rejected whose health was good, and applicants with other affections more serious than some of these cases accepted.

What Lecorché and Talamon say is pertinent to this subject: "It is impossible to attach any prognostic value, direct and immediate, to the presence of albumin in the urine. Albuminuria indicates an alteration of the glomerular filtering membrane; transient or permanent, abundant or minimal, it indicates nothing else; it affords us no information as to the profundity and extent, and consequently none as to the gravity, of the lesion. To form an opinion of this, other elements of appreciation and other phenomena, general or local, must be considered conjointly with the albuminuria."

Of course, if even albumina minima or intermittent albuminuria are accompanied by arterial tension and the significant signs of cirrhosis—such as headaches, disturbances of vision and debility, and insufficient excretion of solids by the kidneys—the case is perhaps more than doubtful, and the dread *sequelæ* of advanced morbus Brightii—such as atheroma of the arteries, miliary aneurysms, loss of the renal functions—are to be expected.

Finally, all persistent albumina, *maxima* or *minima*, are always to be watched.