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with Dr MacLagan's Essay

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CASE OF SUDDEN DEATH,

FROM

RUPTURE OF THE SUPERFICIAL FIBRES OF THE HEART.

BY DAVID MACLAGAN, M.D., F.R.S.E.

Extracted from the London and Edinburgh Monthly Journal of Medical Science.—June 1845.

A LADY, 75 years of age, while seated with her family at about half-past two P.M., on Monday, February 10th, was observed to become suddenly pale, and, (after feebly expressing that she was sick,) before assistance could be given, fell from her chair on the floor in a fit or faint, described to have been of a slightly convulsive character. She was with some difficulty conveyed to bed, in her clothes, by the females of the family. I saw her there in about a quarter of an hour from the period of seizure; and found her with pale sharpened features, and cold pulseless extremities. She was now, however, quite collected, and spoke with a low, but quite articulate, and even tolerably hale voice. She stated in answer to my inquiries, that she had no pain, but a sense of weight, tightness, and uneasiness over the chest. External appliances of heat, and internal stimuli, were immediately and assiduously administered. She swallowed without difficulty, though latterly with disinclination, and there was no restoration of the pulse, or of the natural temperature of the extremities. She continued apparently without pain, but in a state of restlessness and occasional jactitation, and expired in about an hour from the time of seizure. The breathing throughout, with the exception of fitful intervals of hurried respiration, though feeble, was, until towards the close of life, nearly natural. About half an hour previous to her death, her clothes had been so far loosened and removed as to enable me to ascertain a considerable extent of dulness over the precordial region,

but not its exact limits, and though on applying my ear I thought I heard and felt a slight impulse of the heart, it was so obscure as not to be depended on.

Though watching with much interest the symptoms of the case, and strongly impressed with its probable affinity to that of our lamented friend, Dr Abercrombie, I need hardly apologize for the scantiness and imperfection of my observations. The Society can appreciate the circumstances in which a medical practitioner is placed, in the midst of an anxious family, constant in inquiry, watching his every movement and expression, and hoping even against hope, that something may be done to save the object of their affections.

This lady had throughout life enjoyed a remarkable share of good health, was active to the last in the discharge of domestic duties, and in taking regular exercise in the open air. With the exception of occasional derangement of the digestive functions, which demanded only the mildest remedies, she had rarely required medical aid. She had never complained of difficulty of breathing or inability for exertion, except that limitation of power and of facility in ascending heights or steeps common even to healthy persons of a less advanced age, particularly where, as in her case, increased corpulence accompanies it.

The body was examined forty-six hours after death, by my son, Dr Douglas Maclagan, in my presence, and that of one of his pupils. The general appearance was that of a healthy person suddenly deprived of life, and of an apparently less advanced age than that which the individual had actually attained.

Previously to opening the cavities of the chest and abdomen, it was ascertained, that precordial dulness extended from the centre of the sternum to the left mamma, as far upwards as the fourth rib, and as low as the xyphoid cartilage.

On opening the cavities of the chest and abdomen, the tegumentary coverings were found loaded with fat. The contained viscera exhibited a very healthy appearance. On exposing the pericardium,—the state of which, and of the contained heart, was the first and main object of inquiry,—the pericardium was immediately seen and felt to be much distended, and that apparently with fluid; on opening it, about eight ounces of fluid blood, and four of coagulated, were removed.

On further examination, the source of the blood was found to be two small lacerations of the substance of the heart itself. One of these was about four lines in length, in a direction nearly corresponding with the greatest length of the organ. It was situated on the anterior aspect of the left ventricle, close to the septum cordis, and about an inch and a half above the apex of the heart. The smaller laceration was situated a little higher up on the heart,—was very shallow, and seemed little more than a rent or fissure of the investing serous membrane. Close to the septum there were also one or

two ecchymotic spots on the surface of the heart, apparently as if blood were effused under the serous covering, without any laceration of the textures. On examining more minutely the larger rent, it was found by Mr Henry Goodsir, Conservator of the Museum of the College of Surgeons of Edinburgh, that a bristle inserted into it, passed into one of the coronary veins, and there seems no reason to doubt that the rupture of this vessel, and probably of some of the smaller arteries, was the cause of the hemorrhage. The bristle was not found ever to pass into the interior of the ventricle, but no farther attempt was then made to ascertain this with the probe, from fear of making an artificial opening. When, however, the heart had been hardened by being kept for some time in spirits, its cavity was opened and carefully inspected by Mr John Goodsir, Demonstrator of Anatomy in the University. Some coagulated blood and fibrinous matter were found adhering to the interior of the ventricle, but on removing these carefully by washing and other gentle means, the endocardiac membrane was exposed, and not the least appearance of laceration could be detected. It was clear, therefore, that this was not a case of rupture of the heart, in the ordinary acceptance of the term, but merely a laceration of some of its superficial fibres. Though the symptoms in this case were such as usually accompany hemorrhage, it is obvious, from the quantity found, that death was not owing to the mere loss of blood, but rather to the mechanical obstruction which the effused blood opposed to the heart's action. The chief differences between this case and that of the late Dr Abercrombie seem to have been the less rapid escape of blood into the pericardium, and the rupture being on the anterior surface of the ventricle.

The heart in this case was above the normal size, but was proportionally large in all its parts, and though more than naturally loaded with fat, there was no appearance of hypertrophy or other organic disease; unless there may have been some degree of softening of the heart's substance, from chronic inflammation, which not unfrequently occurs in old age, and with which the adhesion of the fibrinous mass to the interior of the ventricle may have had some connexion.

Cases of fatal lesion confined to the external parietes of the heart, and where effusion of blood took place into the pericardium,—such as that now described, and as occurred in the case of the late Dr Abercrombie, and in that examined by Mr Melvin, and reported at a late meeting of this Society, by Mr John Goodsir, though alluded to in a general manner, seem to have been rarely, if at all observed or recorded by pathologists. The most analogous cases are those referred to at the same meeting, by Dr Cormack, as described by Cruveilhier, under the head of apoplexy of the heart.¹

Cruveilhier calls this a spontaneous hemorrhage, which has its

¹ Vide Reports of Med.-Chir. Society of Edinburgh, p. 159 of MONTHLY JOURNAL for February 1845.

seat in the substance of the parietes of the heart, independent of all rupture of the internal fibres, and of all communication with the cavity of the ventricles; and which he considers to be the result of what he calls "*phlébite hémorrhagique*." It would appear, however, that under this head he chiefly refers to effusion of blood into the substance of the heart itself, and not into the pericardium, or to a very limited extent.

Dr Baillie, in his *Morbid Anatomy*, alludes to cases having occurred, although rarely, in which a large quantity of blood has been accumulated in the cavity of the pericardium, but where no rupture could be discovered, after the most diligent search, either in the heart itself, or in any of its vessels. He refers to two cases,¹ but none of those were cases of sudden death, but had been attended with long-continued symptoms of disease of the heart, and of other affections, and in one the extravasation of blood into the pericardium seems, from the symptoms described, to have been slow and gradual. Upon the supposition of there being no rupture, these were probably cases of capillary hemorrhage, or hemorrhage by exhalation, from the free or serous surface of the pericardium, an opinion which, as Dr Craigie remarks, the analogy of other serous membranes shows to be well founded.

Cases of sudden death from laceration of the entire substance of the heart, are frequently described by writers on morbid anatomy, particularly by Morgagni, who himself, it is said, fell a victim to this disease. It may save some time and trouble to those making inquiries on the subject to mention, that there is an excellent table of these cases given by Dr Townsend of Dublin, in the article *Rupture of the Heart*, in the Appendix to the 4th volume of the *Cyclopædia of Practical Medicine*. From this table, comprising twenty-five cases, it would appear, says Dr Townsend, "that the occurrence of this formidable lesion, is almost exclusively confined to extreme old age; that the proportion of males to females is sixteen to nine, or nearly as two to one. As regards the situation of the rupture, of twenty-five cases, the lesion occurred nineteen times in the anterior surface of the left ventricle near the apex."²

In regard to the nature of the structural derangement or disease, which has been precursory of this lesion, various opinions have been expressed by pathological writers. Morgagni ascribed it to general and topical obesity and ulceration, or erosion. M. Blaud³ regards the softening of the heart's substance resulting from its

¹ Medical Observations and Inquiries, vol. iv. p. 330. Memoirs of the Medical Society of London, vol. i. p. 238. Dr Craigie in his valuable work on the Practice of Physic, adds a third, from the "Medical Observation and Inquiries," vol. vi. p. 1, and a fourth from Mérat "Mémoires de la Société Médicale d'Emulation," tom. vii. p. 63.

² There is a valuable article on the "abnormal conditions of the heart," in the 2d volume of the Cyclopædia of Anatomy and Physiology, in which numerous references are given to writers on this subject. An abstract of two recent cases of rupture of the heart, from the Provincial Medical Journal of Nov. 18, 1843, is given in the Edinburgh Medical and Surgical Journal of Jan. 1845.

³ Bibliothèque Médicale, an. 1820.

prolonged action, and which is a frequent, if not necessary, consequence of old age, to be the essential cause of the ruptures which take place in extreme old age, and proposes to designate it by the term *déchirement sénile*.¹ Rostan considers partial or general hypertrophy of the heart, to be the precursory state, and Bertin and Laennec ascribe the lesion chiefly to perforating ulcers; while Cruveilhier, from eight cases of rupture of the heart which he had occasion to observe, and which he studied with the greatest attention, says, that the real cause is fragility of the tissue of the heart, either limited or general. The probability is, that these degenerations, either singly or combined, have operated in different cases both of total and partial rupture; while in some of the cases recorded, no immediate cause of rupture could be detected. Whatever the nature of the degeneration may be, if it disturb the uniformity of the heart's action, or its equilibrium, as Cruveilhier expresses it, we can easily understand that total or partial rupture may take place in its weaker parts, from even a slightly abnormal action of the organ itself, or pressure upon the circulation, and still more readily from violent contraction excited by over physical exertion, or strong mental emotion.

This may perhaps, to some extent, explain the more frequent occurrence of total and partial lesion in the left ventricle near the apex of the heart, for "although," as Dr Townsend says, "the parietes of the right ventricle, and of the auricles, are considerably thinner than those of the left ventricle, and, consequently, are the parts which would *à priori* be supposed most liable to rupture, yet, as they are nearly of the same uniform thickness throughout, the force of their contractions, as also their power of resistance, is equally divided, and operates equally on every point of their surface." Whereas, besides that the contractile force of the left ventricle is probably greater than that of the right, and, at all events, the force to be overcome in propelling the blood is considerably greater; the walls of the left ventricle are naturally thinner towards the apex than towards the basis, and this inequality is occasionally rendered still greater by disease, especially by that form of hypertrophy, by no means uncommon in advanced life, in which the walls of the left ventricle are more or less thickened towards the basis, while they retain their ordinary thinness near the apex, or are even rendered thinner than natural. According to Rostan, the disproportion is, in some cases, so great, that the muscular walls of the left ventricle measure fifteen or even eighteen lines in thickness towards the basis, while near the apex they are scarcely two lines thick. Whenever, therefore, the disproportion which naturally exists between the thickness of the walls of the left ventricle near the apex, and towards the basis, is rendered still greater, as in some forms of hypertrophy, or when, their relative proportions remaining unchanged, the firmness of texture and

¹ TOWNSEND.—Cyclopædia of Practical Medicine, vol. iv. p. 633.

force of contraction are generally diminished throughout their muscular structure, as in the case of general softening, described by M. Bland—the apex of the left ventricle becomes the point which sustains the greatest shock in proportion to its powers of resistance, and yields to the distending power. Accordingly it is found that aneurismal pouches, as well as ruptures, occur most frequently at this very point, namely, towards the apex of the left ventricle.

The cause of the seat of rupture being at a little distance from the apex, and on the anterior surface of the ventricle, may be more difficult to explain, as that part does not appear thinner than the rest, possibly it may be connected with the peculiar spiral direction which the great mass of the fibres of the heart take near the apex, a weaker portion being left in the situation specified.

These remarks afford some explanation of the cause of rupture when complete. In order to appreciate how far they are applicable to cases of partial rupture like the present, it would be necessary to determine whether the immediate cause of rupture is distention from within, or some lesion of the coronary blood-vessels. As there was no appearance of disease in them, it is probable, that unequal action or incomplete contraction of the fibres of different parts of the heart, may be the cause of rupture of the more contracted fibres. The explanation now given, though not applicable to all cases, seems to me to be generally well-founded, and though, from the nature of the cases referred to, we can hardly expect that much information can be derived, in reference either to their diagnosis or treatment, the subject, in a physiological and pathological point of view, is not undeserving of farther attention.

It was justly remarked by my friend Professor Allen Thomson, that the case under consideration suggests two reflections, bearing upon the explanation of the phenomena and causes of sudden death in general, which appear deserving of notice in this place. The one relates to the cause of the interruption of consciousness and nervous power; the other to the cessation of the heart's action, which precedes the invasion of complete death.

In the first place, it is interesting to observe that in the case before us, consciousness and voluntary power remained, when the circulation of blood through the brain was almost if not wholly interrupted; for it was observed, that although the usual loss of consciousness which attends syncope occurred at the time when the rupture of the heart appears to have taken place, this state was only temporary, and the power of motion as well as the mental faculties returned, and remained active for a considerable time, during the whole of which there were no signs of the heart recovering from the state into which it had been suddenly thrown: when, in fact, no pulse was perceptible at the wrist, nor in any of the arteries, and when the heart's action had either ceased, or was so weak as not to be distinctly felt or heard.

This observation, then, together with considerations derived from other sources which become every day stronger, seems to give

support to the view, that loss of consciousness, when not of the nature of coma from increased pressure on the brain, is more immediately due to the sudden diminution in the force and rapidity of the flow of blood through the brain, and more especially to the sudden removal of the usual pressure to which that organ is subjected, rather than to the mere cessation of the renewal of blood within the capillary vessels of the brain, or the consequent interruption of the supposed nutritive changes in its substance.

In the second place, the case before us seems to illustrate, in a striking manner, the extent to which a merely mechanical impediment to the heart's motion may so interfere with its action as to bring it speedily to a stop. For it may be supposed, that in this case, after the patient's recovery from the first syncope depending upon the rupture, the oozing of blood from the torn coronary vessels, gradually filling more and more the cavity of the pericardium, prevented the dilatation of the heart's cavities, and the entrance of blood into them. It may still, however, be a debateable question, whether the loss of the heart's irritability, and the ultimate cessation of its action ought to be attributed more immediately to the first injury of its substance, to the absence of the renewed stimulus of blood within its cavities, or to the impossibility of distention occasioned by the pressure from without.

REFERENCES TO THE PLATE.

- a.* Site of the rupture, with bristle or probe introduced.
- b.* Ecchymotic spot.

129 GEORGE STREET, EDINBURGH,
March 1, 1845.

Dr. Bennett, Ed. Dr. Renaud,
22.
THE HUMAN FEMALE OVARY, *Comp.*

WITH REFERENCE TO

CORPORA LUTEA, BOTH TRUE AND FALSE. (23)

BY

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Extracted from the Monthly Journal of Medical Science.—Aug. 1845.

IN this paper it is proposed to submit the result of four years' research, pursued independently of the writings of others, and developing facts, simply as they appeared; in order that any novelties may, by repetition, be refuted or confirmed, and that the writings of those already in print may be strengthened by corroborative testimony.

The ovary is definable as the "germ-preparing gland—its functions consisting in secreting, developing, and maturing the ovum or follicle."

Glands, when ultimately considered, are blind canals, or cul-de-sacs, within the cavities of which the proper secretions are eliminated. The secretion of the ovary is a germinal vesicle, or compound cell, which is formed within its stroma, as in a nidus, and which, when cast off, is endowed with properties enabling it to assume ultimately all the complicated mechanism of the parent animal. Some discrepancy seems to exist between the mammalian ovary and other secretory glands, in that the former has no excretory duct directly attached to it. This duct or tube of Fallopius is always contiguous, and is periodically continuous with it, the same nerves supplying both ovary, oviduct, and uterus, —viz. the hypogastric plexus, which is made up of bundles, partly sensory, and partly motory, the sensory and motory fibrillæ subdividing in the ganglia, and receiving different distributions.

Four cæcal tubes, terminating in a common vestibule, constitute at once gland and duct in the *bombyx rubi*, of the class Insecta. In the *leech*, the ovary is enclosed in the common sheath of the oviduct. Thus it appears, that in some orders of animated beings,

not only is the ovary and its duct continuous, but the reproduction of the species is completed without any uterine appendage. In the *ornithoryncus paradoxus*, the ovaries are completely embraced by the oviducts. This fact may be expressed by saying, the fimbriæ of the oviduct are so modified, that they form one common calyx, which, at all times, and under all circumstances, grasps the ovary, and constitutes, along with the tube, an outlet for the secretions of the gland. The *ornithoryncus* has no distinct uterus, but merely a rudimentary one, formed by a slight hypertrophy of each oviduct on their common junction.

In many quadruped mammalia, the oviducts, at their fimbriated extremities, exhibit no line of demarcation between their commencement and their termination in the uterus proper. Each cornu commences at a common body, and tapers away gradually, until it terminates abruptly in a fringed margin, or morsus diaboli. In the human female, the line of demarcation is too palpable to be misunderstood. Thus it appears, that the human female uterus may be viewed as the crown and epitome of all antecedent types; whilst the uterus being the only part wanting in the reproductive economy of some animals, it seems preferable to consider it, as found in the various classes of the animal kingdom, rather as an enlarged portion of the oviduct, than to understand the oviducts as uterine appendages.

As respects the yellow bodies found in the human female ovaries, the old terms, "true" and "false" corpora lutea, are adhered to, in order that unnecessary confusion may be avoided, through the introduction of a new phraseology.¹

Each menstrual period may be considered an abortive attempt on the part of nature to reproduce the species. In like manner, the sequelæ, or catamenial secretion, may be viewed as the perversion of an action destined for other ends, and failing in the accomplishment of them. Such an action under the stimulus of impregnation would be so far altered, as to minister towards the production of a deciduary membrane.

The periodicity of the ovaries in the different classes and orders of the vertebrate mammalians varies considerably; but is always persistent in the same animal, when its functions, general and specific, suffer no declination from the standard of health.

The excitement originated in the ovaries is naturally followed by vascular congestion, during the continuance of which the Graafian follicles progress rapidly towards maturity, and protrude from the free walls of the ovary. Thus, rupture of the tunics of the ovary, with escape of the ovum, often ensues in a manner quite independently of the menstrua, as flowing previously, although probably

¹ Dr Ritchie has recently called false corpora lutea "Corpora menstrualia," which designation is objectionable, even according to Dr Ritchie's own showing, as he observes, "the presence of the catamenia is no indispensable pre-requisite to the rupture of a Graafian vesicle."

putting a sudden period to their flow, by a cessation of the cause originally exciting them.

A study of the comparative anatomy and physiology of this subject shows, that the lower the class of animals, the greater the facility with which ova effect an escape into the ducts; whilst the reverse rule obtains in the human subject. Hence it is, that anatomists and physiologists appear to err so much, in conducting experiments upon lower animals, and thence educing hypotheses by which to account for identical phenomena in organized beings, wherein the structures no less than the functions are dissimilar.

There does not appear to exist any near sympathy between laws regulating the uterine and ovarian functions in ruminating animals and man,—the sequences common to lower mammals in respect to the generative system being only partial in their influence over the human female.

The theory that would indicate each menstrual period to be co-existent with the secretion of a small yellow body in the ovaries, requires facts much more imperative than any as yet advanced. To assert that a recent yellow body, with or without an internal coagulum of blood or fibrine, is never seen except menstrual œstrum or conception can be traced, is not proof adequate to establish as a physiological law, that menstruation never happens without its presence. If dates taken during the life-time of an individual, and pathological examinations made subsequent to death, be of any value, then all who have made special search for the appearances in question, must have remarked how small the number of them frequently is, and how very irregular they are in appearance—the presence of spurious corpora lutea being discernible longer than two months, at the lowest calculation. Rather, therefore, than be forced into the opinion, that the menstrual periods in women are of much less regularity than is generally supposed, it seems preferable to receive with caution a theory that requires so much show of ingenuity for its establishment, and which, by this very fact, demonstrates a weakness in some of its connecting parts.

Very few ovaria found after death in women of the child-bearing period, fail to develope within their substance appearances referrible to vascular excitation; *e.g.* yellow bodies, with or without coagula, abortive of true conceptive corpora lutea; or yellow bodies, more diminutive in size, lined internally by a very thin black membrane; or jet black bodies, triangular or oval in shape, placed near to, and close up to the surface, with or without corresponding cicatrices; or more solid black bodies, resembling shot corns, occasionally found nearer the centre of the ovary, and without any connection with its periphery.

As respects the first of these appearances, viz. the yellow bodies, with or without coagula, there is evidence enough collected to prove, that towards each menstrual epoch a perceptible and rapid develop-

ment of the Graafian follicles occurs; and to this may be added, that they sometimes burst—the rupture or the retrocession being guided by the duration and intensity of the action within the secretory gland.

False corpora lutea differ from true corpora lutea: or, in other words, these bodies differ from each other, accordingly as they precede or follow impregnation, in the following particulars:—*1st*, In size; *2d*, In colour; *3d*, In the relative thickness of their parietes; *4th*, In the rapidity with which they arrive at perfection; *5th*, In the smaller amount of time they occupy in disappearing; *6th*, In structural peculiarities.

1. *Of size*.—After the lucid descriptions given of false corpora lutea by Dr Montgomery, M. Raciborski, Dr Lee, Dr Paterson, Dr Ritchie, and others, any further delineation of these general appearances seems unnecessary; and the more especially so, since, after all, it appears the evidence thus furnished is unsatisfactory in its result, as well as liable to error and misinterpretation. The size of spurious corpora lutea is perhaps the most uncertain of the criteria named; nevertheless, the average dimensions of these bodies are less than those of true ones at a very early period of formation. At a later date, the comparative difference is most clear, as they rapidly decrease to one-third, or to more than one-third of their pristine magnitude, prior even to losing their proper yellow colour. In true corpora lutea, the specific secretion goes on progressively increasing, until, occasionally, one-half or more of the ovary is occupied with it.

2. *Of colour*.—False corpora lutea appear always of a sulphur or chrome-yellow colour on first being secreted, depending upon the presence of an oil of a bright yellow tint. As degeneration advances, the brightness of the yellow matter fades into a paler hue. The colour of true corpora lutea is more variable, ranging from yellow-ochre to reddish-brown.

3. *Of relative thickness of parietes*.—This is no mean evidence of a difference existing between the true and false bodies. In false corpora lutea, the parietes are characteristically thin; in the true ones, they are always of relative thickness, but always more so than the spurious ones—the absolute density being in accordance with the internal arrangement of parts. The average thickness of a spurious corpus luteum of recent date is from one-third to one-half of a line.

4. *The rapidity with which they arrive at perfection*.—It is an important fact to notice, that, whereas a spurious corpus luteum comes to maturity in two or three days, the true corpus luteum goes on progressively increasing for some weeks. This assertion is based on the fact, that the walls of a false corpus luteum are thickest immediately after the cessation of the menstrua; whereas true corpora lutea, examined a month after the foetal development has commenced, are found increasing.

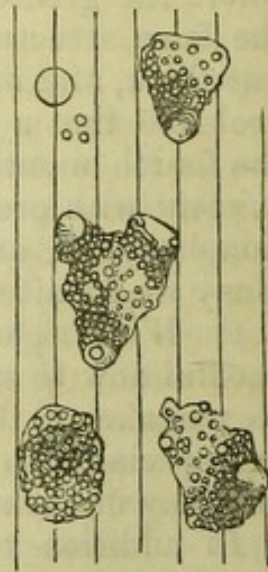
5. *The more rapid degeneration* undergone by the spurious bodies, is another circumstance, affecting any parallel, that may be attempted to be drawn between them and the true bodies. In ovaria where the greatest regularity of action may be inferred to persist, the false structures of prior monthly periods are always smaller, less thick, and more pale, according to their respective ages. It is probable that a spurious corpus luteum can be detected as late as the fourth month, but not long afterwards. In corpora lutea co-existent with pregnancy, it is well known that no such rapid declension happens, and that evidences of their presence may be seen many weeks after parturition.

6. *With reference to structural peculiarities*—it will be only needful now to state, that spurious bodies have never been known to partake of that fleshy character so well understood as belonging specially to the true conceptive bodies. The microscopical anatomy of each will be found elsewhere.

In addition to the foregoing diagnostic differences, Dr Montgomery has given one, which is no less clear in fact than universal in application, viz.:—that, whereas injections pass freely into the substance of the true corpora lutea, they invariably fail to penetrate the false ones. Having now detailed what appear to be the most striking differences between these two secretions, they must stand as apologies for the name “false corpus luteum” being retained, although in contra-distinction to the statements of some recent writers who desire a total abolition of the term. Dr Bischoff, in a letter to M. Breschet, states, that both Dr Montgomery and Dr Paterson are in error, in maintaining as they do, that there are two sets of these bodies, the true and the false, and that such views are based upon mistaken notions of the manner of their formation. M. Raciborski, in the *Comptes Rendus de l'Académie*, &c., for 1843, asserts that the anatomical characters of a lacerated Graafian follicle, at the menstrual periods, resemble altogether those that have been described by physiologists under the name of “corpora lutea after fecundation.” Latterly, Dr Knox, in a paper published in the *Medical Gazette* for 1843, has adopted similar opinions, and argues on the impropriety of tolerating the term. When the yellow secretion of the spurious corpus luteum is placed under the microscope, immediately after the cessation of the catamenia, it is seen to be made up of cells, enclosing 1, 2, 3, or more nuclei, which are of a bright and clear colour, surrounded by granules or molecular particles. The cell walls are so very tender and delicate, that on the slightest pressure, the nuclei escape on all sides, and meeting with each other, quickly coalesce, a large and shapeless mass of oil resulting. The moment these nuclei come in contact with each other, so soon do they amalgamate, an act which goes far to prove them to be fatty matter. Boiled in ether, the nuclei disappear, and the oil granules become shrivelled and empty. In shape, the cells are irregularly rounded, oblong, or oval. In most of them, the nuclei can be detect-

ed, whilst in others they either do not exist, or are obscured by the aggregation of the granules surrounding them.¹ This demonstration puts a period

Fig. 1



to speculations as to the yellow matter being altered blood, or intumescence of the vascular membrane of the Graafian follicle. Furthermore, as the body is distinctly formed of cells, it follows, that it is a substance *sui generis*—a consequence of some action or actions excited in the ovary in order to its production. To investigate the mode of production of these cells, it appears most consonant with the physiology of generation to consider the changes wrought in the ovum, prior to the advent of those actions which first cause the corpus luteum to be developed. The yolk globule is originally produced from granular matters secreted by the vascular ovisac. In some instances, as in the umbilical vesicle of the embryo lizard, the most accustomed eye can detect little or no difference between it and the cells of false yellow bodies. If a fully developed ovum be placed in the field of a good microscope, the granular matter is found to be mixed up with cells, perhaps more regular in form, and much smaller, yet not essentially differing from either of the foregoing. If, then, these appearances be traceable in the unruptured follicle, it seems to follow, that, as the entire follicle is comparable to a compound cell, the fluids within it must directly or indirectly emanate from actions taking place on the inner surface of the cell wall, *i. e.* the vascular membrane of the Graafian follicle. Hence, it appears a legitimate conclusion, that the yellow matter of the false corpus luteum has its origin here also. This mode of stating the case has been observed by reason of contradictory statements having recently been published regarding the exact locality of this yellow matter—Bischoff espousing Baer's doctrine as to the secretion being found on the inner surface of the *inner* membrane of the follicle, whilst Dr Montgomery and others have asserted it to be found on the inner surface of the *external* membrane, and between the two. The following case is cited at full, to show that the yellow matter may be found lying free in the cavity of the spurious body,—an instance of departure from a general rule, rather than an illustration of the rule itself.

Isabella Smith, aged 36, took a poisonous dose of opium on the 25th May 1844. She partially recovered, but relapsed, and died on the 28th, at which time the catamenia were upon her. The os uteri is dilated and elongated laterally—the walls are hypertrophied

¹ Much similarity of form and constituent principles will be observable between these cells, and the exudation corpuscle, characteristic of inflammation:—for some good illustrations of which, *vide* "Inflammation of Nervous Centres," by Dr John Hughes Bennett, in the *Edinburgh Med. and Surg. Journ.* for 1843.

ed—a sanguineous secretion covers the mucous membrane of the uterine cavity. The right oviduct is occluded at its free extremity, and is dropsical, the pavilion being distended with nearly an ounce of straw-coloured fluid. The corresponding ovary contains a Graafian vesicle at its superior and uterine extremity, small in size, and but slightly vascular. There is also a degenerating false corpus luteum. The left oviduct is contracted in length, and twice curved on itself, the consequence of adhesive bands stretching between it and the uterus. The free extremity is tightly bound down to the broad ligaments, and with the exception of two pointing and fleshy-looking points, the fimbriæ are obliterated. The whole interior of the duct is filled and distended with coagulated blood, of a deep carmine colour, approaching to modena. The corresponding ovary is so covered with false membranes, that it requires dissecting out. Its outer portion is distended with a dropsical vesicle as large as a walnut. The portion nearest the uterus contains a spurious corpus luteum, bearing on the *inner* surface of the *internal ovisac* the characteristic yellow secretion, which, when submitted to the microscope, presents the appearance of these bodies in a perfectly recent state. The inner membrane presents traces of vascularity. There is no yellow matter between the two membranes. The substance is semi-fluid, and can be rubbed partially away with the finger. No cicatrix was observed, the ovary being much involved in false membranes.¹

A certain criterion whereby the dates of corpora lutea, both true and false, may be determined with moderate accuracy, is a desideratum in medico-legal investigations that has long been felt. The very lax manner in which the descriptions of these bodies have been detailed, and the difficulties encountered by the most cautious in making their meanings understood, as well as the incertitude surrounding the bodies themselves—all combine to call for some additional definition, whereby doubt may be replaced by certainty, and the “ipse dixit” of third parties, who may be non-professional, corroborated, or else received “cum grano salis.”

Without seeking to exalt any aid the microscope may yield in this dilemma, it certainly appears, that, by its use, certain fixed appearances are made manifest, both as to the nature of the corpora lutea themselves, as also to the same appearances in their development, persistence, and decay. The cell structure of an early corpus luteum of the false type is already figured. By having several times compared these bodies of the same date with each other, they can be referred to with some degree of confidence. One case will merely be cited from out the number, in order that others

¹ This case serves to prove, that one oviduct may be obliterated, and yet the uterine functions remain entire. Also, that to the development of a spurious body, the grasping of the ovary by the fimbriæ of the oviduct is not imperative. Furthermore, that the ovary may be partially diseased, and yet maintain a certain superficial power to perform its periodical functions.

may form an opinion as to the bodies in question, and the circumstances under which they were found.

A young woman, aged 25, who had not conceived, commenced menstruating on Monday the 31st of July 1843. The catamenia flowed regularly during the day. On Tuesday August 1, they ceased suddenly, without any apparent reason. Early on Wednesday, August 1, acute peritoneal inflammation set in, which terminated fatally within twenty-four hours.

Her death took place precisely on the third day. On post-mortem section, perforation, the consequence of chronic ulceration of the stomach, was found to have been the cause of the fatal seizure.

The right ovary measures one inch four lines in length. The average breadth is seven lines. The surface is partially corrugated. A slight prominence exists at the anterior and lower edge. On division, the ovary is found deep red and almost livid in colour. Corresponding with the external prominence is a body, in colour chrome-yellow, having the parietes, which are convoluted, and which enclose within their walls the specific yellow secretion. Within the external cavity lies a well-defined clot, lying free at all points, except at that corresponding to the external cicatrix. Microscopically viewed, the yellow substance is just what is seen represented at Fig. 1. The micrometer on which the cells lie is one thousand to an inch. In the same ovary are five Graafian vesicles, four of the size of peas, and one much larger. The left ovary measures one inch four lines long, and is six and a-half lines across. A longitudinal section displays three of the false corpora lutea in different stages of retrogression.

The next illustration is of a spurious yellow body, dating one month. It was taken from a young woman who died of pneumonia. The uterus and ovaries gave evidence of approaching menstruation. The mucous membrane of the uterus was reddened. The oviduct corresponding to the enlarged Graafian vesicle contained bloody mucus, and was congested. The spurious body of last month was contracted to one-half the dimensions usually observed in these bodies at the third or fourth day of their appearance. The internal ovisac was studded over with pigmentary molecules. The cells will be seen smaller in size. The nuclei are yet very distinct, but smaller than in Fig. 1; as are also the molecular granules. They lie on the same micrometer.

Fig. 2.



The next figure is the microscopical anatomy of a false body, fast becoming extinct. The size altogether is not more than two lines long, by half a line broad. It preserves the yellow colour in a modified degree. The date is probably three months, or even more,

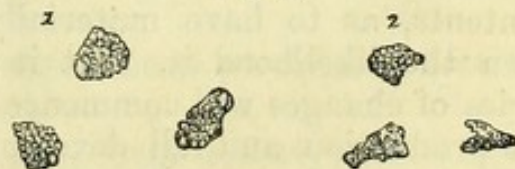
calculated from circumstances connected with the woman's history. At this period it seems next to impossible to date with perfect accuracy. Every thing connected with this wood-cut bespeaks a state of decline. The cells are more shrivelled—the nuclei and granules are less. The appearance becomes the more striking by comparison with Fig. 1.

Fig. 3.



Independently of these yellow bodies, there are dark spots in the ovaries, which in most cases partake of a true inky blackness. This dense colour entitles it to rank as a variety of spurious melanosis, distinct from the true melanosis, inasmuch as it has neither a tendency to cause irritation, ulceration, or disorganization of surrounding tissues. The ovaries being glandular bodies, and far removed from the centre of circulation, yet periodically, under the influence of physiological excitement, are liable to have in their proper sacs or follicles, an increase of vascularity, which is essentially capillary. Dr Carsewell, in his article "Melanosis," written for the *Cyclopædia of Practical Medicine*, says;—"black discoloration of the blood has been long known to follow as a consequence of retarded or interrupted circulation. This change is never so conspicuous as when it takes place in the extreme venous circulation, or in the capillaries. Under some circumstances, as in chronic inflammation, &c., the blood accumulates in the capillaries, and finally ceases to circulate. After a certain length of time, it coagulates, and the serum is forced out along with the salts which are absorbed. That which remains is an almost black substance, of the consistence of firm fibrine, which is probably hematosine." The black matter in the ovaries so much resembles the same, in other parts of the body, when not malignant, that it seems difficult to separate the appearances of the one from the other; whilst, if viewed conjointly or separately under the microscope, the size of the cells, the aggregation of the granular contents, the small nuclei, &c., render any diagnostic difference difficult, if not impossible, of detection. The black pigmentary matter within the ovaries is a cellular growth. If it be viewed some length of time subsequent to secretion, it may appear difficult of detection,—the exact appearances of the individual cells having undergone so much alteration, as to give them something of the appearance of a structureless mass, following the ramifications of blood-vessels. When recent, the case is markedly different, as appears from consulting the following wood-cut,

Fig. 4.



where the cells are too clearly defined, to leave any question as to their nature. They are rounded or oval, having plump walls, which are distended with

a dark, oily, and granular matter, having here and there larger spherules or nuclei, which are indefinite in numbers, (vide 1, Fig. 4.) As they grow older, the shapes of the cells have a tendency to become more and more triangular, so much so, as in many cases to be distinctly pointed at the apex, (vide 2, Fig. 4.) According to the duration of these cells, so is their increase of consistency, and by so much is the diminution in the size of the globular nucleus or nuclei determinable. They all follow out a definite direction, being arranged in semicircular or linear strata—a course not pursued by the proper secretion either of true or false corpora lutea. This appearance is as distinctly discernible in the small bodies of like nature found in the ovaries of cows—the most striking difference being, that, whereas in the human ovary, the colour is black, in the ovary of the cow it is of a dull brick-red. Not only are the cells in many instances triangulated, but the whole black body partakes of the same shape, especially when near the surface of the ovary.

So far as my observation extends, this black secretion lies within, and between the cell-walls of the ovule, and, as a general rule, does not exceed tissue-paper in thickness. The minute anatomy of this black matter differs so remarkably from any ordinary appearances of blood, that it is clearly indicative of some fresh arrangement of molecular particles, consequent on local vascular excitement, progressing to a certain extent, yet in the end abortive. Where a Graafian vesicle has attained to a considerable size, and suffered disruption, with escape of its contents, then a series of changes commence within and between the cell-walls, in many respects similar to the foregoing, but more extensive, as also colorifically different, resulting in what is commonly termed a “false corpus luteum.”

Nor is the presence of one action, causing the secretion of the black matter, incompatible with another action, terminating in the formation of the yellow matter.

When ovaria are examined frequently, it occasionally appears, that both yellow and black matter are found together, the black being internal to the yellow. The rationale of this appears to be somewhat as follows:—If a vesicle be small in size, and but slightly protruded beyond the walls of the ovary at the time of menstruation, or, if the ovarian walls be much covered over with false membranes, the vascular ovisac may become congested, (the menstrual act being dependant upon changes taking place in one or both ovaries.) The ovisac being loaded with blood, may secrete the black pigmentary granular cell peculiar to it in that condition. Should the vesicle have so far advanced in size, and in its granular contents, as to have materially thinned the dense ovarian walls, then the likelihood is, that it will burst, and in rupturing, that series of changes will commence within its walls, which will end in the production and full development of a spurious corpus luteum. If, however, the time of menstruation pass away, and this vesicle do

not burst, it will, or may, have the same characteristics as appear in the smaller follicle herein before mentioned. Moreover, as the ovary is a gland liable only to periodical excitement, so it is reasonable to infer, that the follicle, having failed to rupture the walls of the ovary and peritoneum, remains stationary, or nearly so, for the next three weeks, when, the same series of changes recurring, the act of rupture may receive completion; and hence, again, the compound aspect (black and yellow colour) of the corpus luteum—the thin lamina of black secretion of the previous month, having been pushed towards the centre of the cell, and surrounded subsequently with the yellow secretion from the vascular ovisac.¹

In only one instance, have I discovered this black pigmentary matter in the oviducts. It occurred in a woman who died of chronic disease, nine months and nine days subsequent to conception. It was found near to the pavilions, had a striated appearance, and, when microscopically examined, exhibited the usual appearance of granular cells, which, on pressure, exuded a considerable portion of dark-coloured oil. It yet remains to be observed, that this melanotic matter may be secreted in the ovaries, independently of any external signs of menstruation, it being found where the catamenia can be distinctly traced as absent. The following is a well-marked case in point.

Mary Bates, aged 29, has borne nine children, and is now a widow. The youngest child is three years of age, and the mother has not menstruated for two years. She has suffered from partial imbecility, consequent on two attacks of palsy, a condition that, by rendering her sister's attendance necessary, has placed her in full possession of all the facts of the case. She died from a third attack, and her sister clearly testifies as to the absence of the catamenia. The uterus is neither large nor vascular. The tubes are pervious. The ovaries are more than usually smooth on their surfaces, although, on close inspection, several old and half-obliterated cicatrices can be seen. One ovary contains six vesicles of the size of peas, which are vascular. In the opposite ovary, there are four pigmentary bodies, none of which communicate with the surface. There is also a well-developed vesicle in this ovary, with a very thin lamina of black matter between its walls. The pigmentary cells are quite recent. The conclusions are threefold. 1st, That menstruation has been a long time absent. 2d, That to the presence of melanotic bodies, menstruation is not a *sine qua non*. 3d, That, judging from the development of the vesicles, &c., the catamenia would soon have returned, had life been prolonged.

Reasoning from analogy, I once entertained an opinion that *true*

¹ Dr Ritchie believes the dyeing of the coats of the follicle of an inky black colour, to be merely mechanical, proceeding from their contact with the contained decomposed blood.

corpora lutea were only equivocal indications of pregnancy, or conception. The lower animals present facts which render such an opinion tenable with respect to them; and, at some other time, I hope to demonstrate it as incontrovertible.

In the human female, the more closely the ovarian functions are viewed, the more conclusive does the verdict seem, that true corpora lutea are never found, except as the products or sequences of conception.

It is very necessary that those characteristics by which a true corpus luteum may be distinguished, should be defined, as well as the means by which it may be known from other substances within the ovary,—substances that, to a certain extent, bear a resemblance, and which, being found by parties unable to draw a line of demarcation, have led to interminable differences of opinion and scepticism.

As regards structural peculiarities, or the exact mode of arrangement of the solid ingredients of the true corpus luteum, the greatest latitude must be allowed. The endeavour to narrow this law has, or appears to have, ever been a failing amongst those who have attempted a definition. From a great number of illustrations taken indiscriminately, it would be difficult perhaps to state which form or general outline predominated, or whether any two bodies, when examined comparatively, presented the same appearances. Nevertheless, an approximation sufficiently near does exist, whereby a decision may be guided, which can hardly fail of being correct, if taken in conjunction with other auxiliaries.

True corpora lutea are always to be found located between the proper tunics of the Graafian follicle, or, in other words, between the two ovisacs. I have seen a specimen in the human subject where there appeared to be a third membrane; and there is in my collection a similar appearance in the ovary of a cow. Each of these tertiary membranes is extremely thin, and in texture more or less reticulated. They give the idea, of being some portion of the granular matter of the ovum, in a low state of organisation. Furthermore, they do not wholly line the cavity of the corpus luteum, nor do they exist independently of its proper tunics.

True corpora lutea are always vascular in the early months of pregnancy. Numerous vessels branch forth into the solid substance, which originate in trunks ramifying over the vascular ovisac. By reason of this vascularity, the corpus luteum has a deep reddish-yellow colour, approaching sometimes to brown. This appearance is most plain on first dividing the ovary, but it rapidly fades on being immersed in water or spirits—the whole colouring matter derived from the blood oozing out—when the body assumes a dingy-yellow, or flesh colour.

In form, the true corpus luteum is round, oval, falciform, pyri-form, or reniform. These may be regarded as the standard types, from each of which there are many deviations, referrible ultimately

to the one or the other. The periphery of a corpus luteum is mostly, but not always, scalloped.

A central cicatrix has always been associated with these bodies. This criterion is most just, and if always attended to, would obviate many erroneous descriptions, having reference not only to tubercle, but also to malignant deposits, which, to a certain extent, simulate them, but which are devoid of these central cicatrices. These cicatrices may be divided into groups. In some corpora lutea, the cicatrix does not present until a late period, and then results from the apposition of the sides of the contracted ovisac. In others, it is present from a very early period, and depends upon the specific secretion obliterating the internal cavity. Some have the cicatrix so diffuse, as to be at first difficult of detection, and capable of being traced only under a lens. A large cavity is not unfrequently found in the centre of the body, the inner walls being so moulded as to accord with the external shape. This, however, is not an invariable rule, as it has been known in more instances than one to push the solid matter to one side more than to the other, or even exclusively to one side. The proper substance is sometimes found both external to, and within the internal ovisac. This is readily explicable, on recollecting that the internal ovisac may recede from the outer one, whilst the secreted matter may find ingress through the aperture caused by escape of the ovum. These cicatrized bands partly depend on the puckering in of the ovisacs, and partly on the cellular tissue accompanying the blood-vessels throughout the substance of the body.

These points of difference may be inferred to depend on the greater or less size of the follicle originally; or the greater or less thickness of the internal ovisac; or the greater or smaller quantity of the matter secreted between the two ovisacs; or the amount of blood-vessels running into the yellow body.

Four types with their accompanying variations, may perhaps express the whole of the foregoing remarks.

1st. When the inner wall of the corpus luteum originates a cavity, the sides of which may be smooth, or scalloped, or lobulated.

Fig. 5.



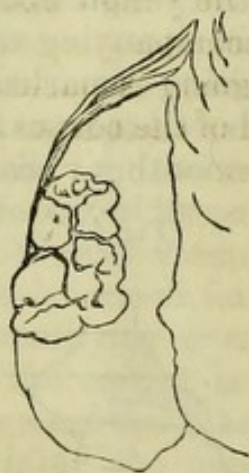
2*d.* When the whole substance is solid throughout, but where also, the internal ovisac is visible as a minor circle, the space within it being occupied with the proper substance of the corpus luteum, instead of containing serous or granular fluid.

Fig. 6.



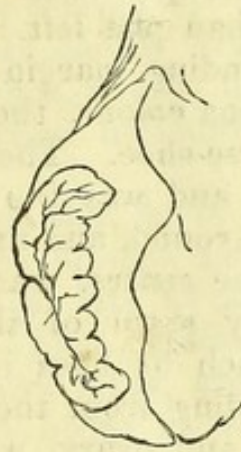
3*d.* When the centre of the corpus luteum is the seat of a stillate or radiate cicatrix, branching off on all sides towards the circumference. These stellæ may be both regular and irregular in form, and as a variety, more than one nucleus or centre of a ray may exist.

Fig. 7.



4*th.* The interior may be generally and irregularly striated; or, in other words, the septa of the two ovisacs may permeate the yellow body without having any one point of meeting in preference to another.

Fig. 8.



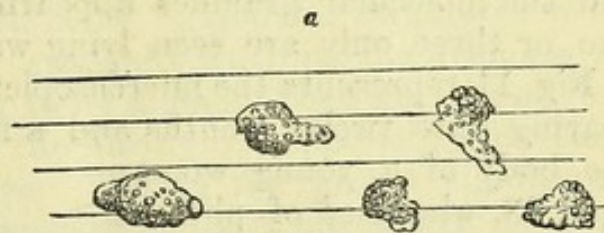
In each of these divisions, one law is persistent, viz., that one ray of the cicatrix extends to that point of the surface of the ovary, that has undergone rupture in consequence of the escape of the ovum or germ. This ruptured point is seldom found patulous,—few opportunities offering themselves for making an examination sufficiently early. Sir Everard Home found the orifice pervious in his “Case.” I have twice seen the same thing in the ovaria of cows, the opening being large enough to admit the end of a blow-pipe. Dr William Hunter remarked, “that in the cases he had seen, no bristles would pass; it appeared to be an obliterated duct or passage grown together;” and Montgomery’s extensive experience is the same.

The microscopical appearances of true corpora lutea are somewhat different from those of the false,—sufficiently so probably to establish a diagnosis. The cells of a true body examined at the various periods have not presented the large nuclei or oil spherules, so constantly observed in the false corpora lutea. They are nucleolated, but the nuclei are much smaller.

The figure represents the cell growths of a corpus luteum, found in connection with an ovum of one month’s date. The case is as follows:—A woman, of irregular habits, presented all the symptoms of delirium tremens, — remained incoherent, — and

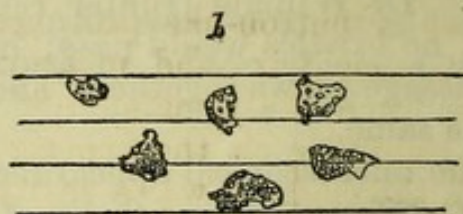
died on the third day. On opening the body, the uterus was found enlarged, and fluctuated beneath the fingers; it measured 3 inches and 3 lines from the os to the summit;—was 3 inches across;—the neck was 8 lines long;—and the os, which was flaccid, measured $6\frac{1}{2}$ lines across, and contained a thin mucus. A deep and red injection of the superficial vessels was seen for the

Fig. 9.



breadth of an inch, running from cervix to summit. The same appearance was observed around the uterine orifice of the left oviduct. The oviducts were neither large nor injected. The right one was slightly more so than the left. The surface of the right ovary presented at its depending margin in front, a discoidal protuberance, of a dingy modena colour, the centre of which was yellow, and shaped like a horse-shoe. The yellow portion measured two-thirds of a line across, and was the protruding surface of the corpus luteum beneath. Around, and upon the yellow substance, were minute vessels. In the centre, was an elongated and bluish substance, being the early state of the superficial cicatrix.—The ovary measured 1 inch $6\frac{1}{2}$ lines in length, and 9 lines in extreme breadth. Proceeding from the fold of broad ligament, found between the oviduct and ovary, were a number of tortuous arteries and veins, converging to pierce the gland. A section through the centre of the cicatrix developed an orange coloured corpus luteum, of a reniform shape, (vide Fig. 8,) the convexity corresponding with that of the ovary. The ovary was very vascular. Ether dissolved the yellow substance, by disintegrating the oily cells. The embryo was semiflexed, and in this position did not measure more than $2\frac{1}{2}$ lines in length. The extremities appeared as leaflets; the divisions of the vertebræ were perceptible; and the chorion was just beginning to branch out and subdivide. The annexed

Fig. 10.

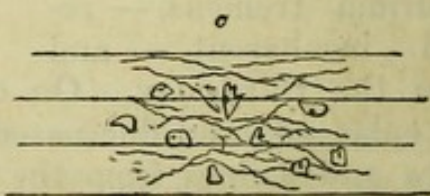


cut represents the microscopical anatomy of a corpus luteum, dating between the 4th and 5th month. It was obtained from the body of a woman who aborted whilst suffering from fever. She died a few days afterwards. The cells are somewhat smaller than those of the corpus luteum bearing date one month,

So far as my observation extends, corpora lutea do not begin to retrograde, much before the 4th month; after which period, they slowly and gradually decrease in size, the cells becoming smaller. and the molecular granules appearing less and less distinct, until two or three only are seen lying within the shrivelled cell-walls.

Fig. 11 represents the microscopical anatomy of a corpus luteum, bearing date twelve months and a few days. It was taken from

Fig. 11.



the body of a young woman, aged 23, who died of phthisis, three months and fifteen days after delivery at the full period. This and several other preparations came into my possession through the courtesy of Dr Francis. The corpus luteum has a lobulated circumference, and is as large as a small horse bean. The colour approximates

closely to that of the ovary. The granulated corpuscles will be seen to measure very little more than the 1-2000th of an inch in diameter. They are greatly shrivelled. Some contain the remains of nuclei, whilst others are simply granular. The ovary measures 1 inch 8 lines in length, and $5\frac{1}{2}$ lines in breadth, thus, not exceeding much the average measurements of ovaria without corpora lutea.

Dr Montgomery observes, that he is unable to state the exact period at which the corpus luteum disappears, but that he has found it distinctly visible, so late as the fifth month after delivery at the full period. The appearances, as regards average size of degenerating corpora lutea, are variable in the extreme, some of the ninth month being as small as others of a date three or four months later.

But notwithstanding the discrepancy with regard to common appearances, the cell structure appears to preserve a fixed standard of decrease.

I think I have seen a true corpus luteum existing as a dense capsule, as late as the seventh month after delivery. This occurred to a soldier's wife, who became a patient in hospital in September 1843. She was mother of four children. After recovering from an acute febrile attack, dropsy set in from granular disease of the kidney, of which she died on January 2, 1844. On the upper and depending surface of the right ovary, there existed a button-like protuberance, bearing in the centre a triangular cicatrix, and measuring $3\frac{1}{2}$ lines in diameter. It was whiter than the remainder of the ovary. Blood-vessels were yet seen ramifying on the upper surface of the prominent body. Beneath the cicatrix was a cavity, capable of holding a pea, bounded by a dense, white, and corrugated capsule, about one-third of a line in thickness.

The microscope seems especially valuable in deciding those dubious cases, where spurious bodies resemble somewhat degenerated true ones; and *vice versa*.

Corpora lutea are frequently styled glandular bodies. By Hunter they are said to be "tender and friable, like glandular flesh." Sir Everard Home states them to be "glandular structures which form the ovum, disappearing gradually when it (the ovum) is expelled." Premising the ovary to be a gland, then its proper function is secretion; and a gland can hardly be supposed to produce a gland within its own substance. Taking the proper signification of the word "gland," the corpus luteum does not appear to be at all glandular, but merely a collection of cells secreted by a gland, sometimes nucleated, and sometimes filled with molecular oily particles.

The only plausible hypothesis that seems adducible, to account for the difference in structure, &c., of true and false corpora lutea, rests in the changes effected in the impregnated ovum prior to its

escape from the ovary. These changes, together with the appearances put on by the ovisac, are fully detailed by Dr Martin Barry, in the *Philosophical Transactions*.

Tubercle, and cerebriiform cancer, are perhaps the structures most readily mistaken for corpora lutea. In the former, however, the matter is seen located *within* the proper tunics of the Graafian vesicle, and *not between* them. Added to this, the structure of the specific substance is homogeneous, and not separated into lobuli by cicatrices. There is also an absence of the external cicatrix, which is ever present in true corpora lutea.

The appearance of these bodies in the ovaries, after a successful intercourse, is so remarkable, that it is impossible to contemplate their structure and nature without being led to ask the question, *Cui bono?* The disruption of the ovarian stroma, caused by escape of the germ, might simply terminate in a cicatrization, and the cavity might easily be obliterated without the formation of this post-product. The idea that it is present to facilitate the passage of the ovum through the ovary, by contracting upon the fluid posteriorly, is an opinion too hypothetical, and too little substantiated by facts, to be received as a solution. The testis brings to perfection its spermatozoon, which is evacuated: the ovary is its analogue in the female, and secretes the ovum. Both are glands, and the function of the one is no more remarkable than that of the other; yet on the casting off of the vital germ, other phenomena arise terminating in the production of a new substance. A series of well-conducted observations, on any sympathy that might exist between premature abortions, and the accelerated decline of the corresponding corpus luteum, would be a valuable addition to the facts already collected. The bodies are too evanescent to leave any permanent impression on the surface of the ovaries; and as yet, observations are wanting whereby they can be shown to have any direct association with the healthy development of the intra-uterine foetus. Their simple presence in the ovary, when considered intrinsically, or as unassociated with ulterior purposes or functions to the economy, appears so unnecessary, so little connected with the integrity of the gland in which they are found, and so remote from any presiding action that can be inferred to occur during the months of child-bearing,—that physiologists have neither attempted an explanation of their presence, nor ventured upon any hypothesis concerning them.

The human female ovaria are large in comparison with the ovaria of other animals. Thus I have found the average size of the ovary in the cow, when quite free from corpora lutea, to be 1 inch $4\frac{1}{2}$ lines long, and 8 lines broad. In the human female, taking the same calculations, they average 1 inch 4 lines in length, and from $6\frac{2}{3}$ to 7 lines in breadth. The following is a table of the measurements of forty-three ovaria, chosen when the persons were all above pu-

berty, and in the child-bearing period of life. No ovary is measured containing corpora lutea of the true type.

No.	Condition of Ovaria.	Length.		Breadth.	
		Inches.	Lines.	Inches.	Lines.
1	Woman of middle age who had borne children, .	1	3	...	4
2	.....	1	4	...	4
3	Woman had borne four children, and was aged 27	1	3	...	7
4	years,	1	4	...	7½
5	Woman, aged 20, who was unmarried, and died of	1	5	...	6
6	phthisis,	1	6	...	6½
7	Young person dying of pneumonia, and unmarried,	1	2	...	8
8	.....	1	6½	...	8
9	Woman dying of fever, after abortion—opposite	1	6	...	6½
10	ovary contains the corpus luteum,				
11	Young person, aged between 20 and 30,	1	4½	...	6
12	.....	1	8	...	7
13	.....	1	8	...	6½
14	.....	1	7	...	7
15	Woman, age averaging between 20 and 30,	1	3	...	6½
16	Woman, borne three children, and dying of phthisis,	1	4	...	7
17	.....	1	2	...	5
18	.....	1	3	...	7
19	Woman who had borne children,	1	3	...	7
20	.....	1	2	...	8
21	Woman unmarried, and aged 25 years,	1	4	...	7
22	.....	1	4	...	6½
23	Young unmarried woman,	1	8	...	8½
24	.....	1	6	...	6½
25	Middle aged person, whose pregnancies are doubtful,	1	9	...	9
26	.....	2	0	...	8
27	Woman, aged 33, dying during pregnancy ; opposite	1	2	...	7
28	ovary has corpus luteum,				
29	.....	1	3	...	7
30	Woman who has borne four children,	1	4	...	7½
31	.....	1	2	...	5½
32	Woman, aged 33; opposite ovary has corpus luteum,	1	2½	...	7
33	Woman, aged 34, who had borne seven children,	1	7	...	8½
34	and died of phthisis,	1	7	...	9½
35	.....	1	1	...	6
36	.....	1	8	...	5½
37	Woman, aged 23, dying of phthisis,	1	2¾	...	5½
38	Woman, aged 23, dying of phthisis,	1	7	...	6¾
39	.....	1	5½	...	6½
40	A girl, aged 19, dying of phthisis,	1	0	...	5½
41	.....	1	0	...	5
42	Woman aged 35,	0	9½	...	6½
43	.....	1	1	...	6
44	Woman aged 29, who had not menstruated for 2 years,	1	2½	...	6½
45	.....	1	3	...	8

As the child-bearing period passes away, and the procreative powers decline, so in proportion is the glandular system, appropriated to these purposes, seen to decline also. The ovaries shrivel, but the shrinking is nearly all lateral. Cicatrices are seen, but longitudinal striæ or depressions are mixed up with them, giving

the ovary an appearance as if gashed with a knife. This is caused by the lateral contractions of the gland, which go on for some time, until an ovary once measuring seven lines across, will frequently be no more than two lines.

The aptitude for child-bearing at puberty is associated with a rapid increase and development of the ovary and its specific secretion. The first design in the animal economy appears to be a retardation of the generative or super-system of parts, so that time may be allowed for all the organic functions immediately affecting life, to be either fully constituted, or to be rapidly advancing towards completion, in order that collision of action, with consequent blight to both, may be avoided:—for, as Dr Walker expresses the fact, in his work on intermarriage, “a premature development diminishes both strength of body and vigour of mind—deteriorates all moral qualities, and is extensively fatal to life, and its permanent enjoyment.”

In like manner, the ovaria preside over the decline of the reproductive functions. This may be a part only of a general system of decay, manifested more particularly in the glandular system; or, it may be urged that the powers of absorption, at this exact period, predominate over those of secretion, and therefore, as the development of Graafian vesicles pre-supposes an action diametrically the reverse, they can no longer be protruded—whilst those already advanced will undergo gradual degeneration. Hence the small puckered cysts or ovisacs, of a white colour, so commonly found about this period.

Moreover, as during the entire child-bearing period, the vital energies and functions of the female may be counted as in the ascendant, and indeed excessive, so, at the critical period it is that the balance is struck, and an equilibrium constituted, which shortly gives place to a gradual decline, the vital powers becoming more and more taxed to maintain the integrity of the organism. Thus, as the reproduction of the species is a function altogether superimposed on the physiological organisation of the parent, when the parent organism shows signs of decreased vitality, the reproductive system may be inferred to be that most likely first to become inoperative, and to suffer decay.

JUNE 30, 1845.

10, PICCADILLY, MANCHESTER.

LIII. *On the Proportion of Nitrogen contained in Alimentary Substances taken from both the Organic Kingdoms as a comparative measure of their Nutritive Power.* By Dr. J. SCHLOSSBERGER and ALEXANDER KEMP, Assistant Chemical Teachers in the University of Edinburgh*.

THE distinction between the elements of the reproductive and those of the respiratory functions, is probably one of the most fertile ideas for which physiology is indebted to modern chemistry; even if we do not admit that division in its full extent, nevertheless we must allow it to be a beautifully conceived idea, and one founded on a great amount of observation. It may be assumed with safety that no other classification of the substances comprised under the vague designation of alimentary bodies, has in an equal degree represented the essential differences in their chemical composition and their physiological effects, or has presented to the eye of the mind the important part which these substances perform, as the above-mentioned distinction, which is also identical with that of *azotised* and *non-azotised* bodies.

In order to give some indication of the state of confusion which existed, even in this most elementary proposition of dietetics, previous to that distinction being made, it may not be more than necessary to mention the idea of that classical author, Dr. Prout†, that the nutritive power is in direct proportion to the quantity of carbon. At the present day not a single fact is known which can support the idea of the animal body being able to form azotised from non-azotised substances, —possibly, under the influence of ammonia or of nitrogen from the atmosphere; on the contrary, all experiments, as well as daily observation, seem to prove the absolute necessity of azotised food for the preservation of the individual. Chemistry has likewise demonstrated the presence of a more or less high, but constant proportion of nitrogen in all the tissues and fluids of the animal body, while in all those substances which, according to our modern ideas, are the most nutritive, namely, the *proteine* compounds, the carbon is present in medium quantity. Those substances esteemed by Prout the most nourishing, because richest in carbon, as the fats and oils, must be altogether excluded from the list of reproductive bodies, except in so far as fatty matter is necessary to the formation of animal cells. The chemical physiologist could make use of the theory of Prout, in measuring the fitness of the bodies necessary to respiration, if along with

* Communicated by the Authors.

† See Mayo's *Outlines of Human Physiology*, p. 206, second edition, London, 1829.

the carbon could be taken into account the quantity of combustible or unoxidized hydrogen contained in them; but for those substances, which in the strict sense of the word are capable of being transformed into blood and animal tissue, according to our present knowledge, the capability for these purposes may be estimated relatively by the amount of nitrogen. This has been already done to a certain extent by the researches of several chemists and physiologists, but, so far as we are aware, it has been confined to vegetables; and it therefore appeared to us not to be without interest to make use of the same principle in extending the investigation to the various alimentary substances taken from the animal kingdom, and so to give to the physiologist a basis founded on facts in a department which has hitherto been so defective in the mysterious doctrine of nutrition.

Already Boussingault and Liebig have demonstrated, that in general the amount of proteine compound, and therefore that of nitrogen, is in a direct ratio to the phosphates; this proposition has as yet been extended only to vegetable matters, but will most probably preserve its value when applied likewise to those derived from animals. In so far as the nitrogen may be taken as an indication of the quantity of these salts, we could not find any observations as to how far it might be also applied to the gelatigenous compounds; and we have alluded to this as a very interesting field for future research, particularly with regard to the phosphate of lime, which seems so universal and so necessary to the whole animal œconomy.

It seems to be at present a proper time to overcome an objection, which, if not alluded to, might have been made against our attempt to determine the nutritive power of animal aliments; it is with regard to the delicate question of the use of animal gelatine, which seemed to Mulder, and likewise to us, as not at all decided by the experiments lately made at Paris. It is a fact sufficiently proved by the experiments of Magendie, Tiedemann and Gmelin, that any substance, even the most nourishing, if very simple and used without admixture, cannot sustain animal life for any length of time; and if it was proved at Paris that dogs fed exclusively on gelatine perish, it is far from being just to conclude that the substance is not nutritive, as we should be compelled to apply the same rule to albumen and fibrine, by the exclusive use of which an animal would no less speedily perish. At all events gelatine has a high value as nutriment, if even that value arises alone from its being useful in the formation of gelatigenous tissues; in addition, the gelatigenous tissues, as well as those containing

proteine, in regard to their formation and chemical constitution, seem to lie in close relation, although that relation is at present not perfectly understood*. The experience of our best physicians at the bedside of the patient tends to prove that during convalescence a well-prepared gelatinous diet, but not exclusively gelatinous, is highly nutritious.

All organic alimentary substances, as presented to us by nature, are mixtures, but seem to be pretty constant in their composition, although variously modified by our different modes of cooking them. Of such natural mixtures, the greater part taken from vegetable bodies have already had the proportion of nitrogen contained in them determined by previous observers; and we believe we shall best introduce the subject by a concise representation of that which has been done in regard to the vegetable part of our aliments, which will likewise afford the best means of comparing the results of our experiments on animal substances.

The following table shows the amount of nitrogen contained in 100 parts of the dry vegetable bodies named in it:—

Rice	1.39	} Boussingault, <i>Economie Rurale</i> . Paris, 1844, tome 2 ^{me} , p. 438.
Potatoes	1.5	
Turnips	1.7	
Rye	1.7	
Oats	2.2	
Wheat	2.0 to 2.3	
Carrots	2.4	
Barley	2.0	
Maize	2.0	
Peas	3.8	
Lentils	4.4	
Haricots	4.5	
Beans	5.1	} R. D. Thomson, in the London and Edinburgh Philosophical Magazine for November 1843.
White bread	2.27	
Brown bread	2.63	
Glasgow unfermented bread	2.14	
Essex flour	2.17	
Canada flour	2.21	
Lothian flour	1.96	
United States flour	1.82	} Schlossberger and Dæpping, Liebig's <i>Annalen</i> for October 1844, Chemical Gazette, July 15, 1845.
Agaricus deliciosus	4.6	
... russula	4.2	
... cantharellus	3.2	

Boussingault has calculated from the results of his experi-

* See Mulder's Chemistry of Animal and Vegetable Physiology, translated by Fromberg, 319 and following pages.

ments, that which he calls the equivalent nutritive powers of these substances for the domestic herbivorous animals, and Thomson has also given one for those bodies which he examined. We omit these tables, as we have the intention of constructing a table of our own for all the substances which are used as food by man, and which have been hitherto examined in this respect.

We may now proceed to the relation of our experiments. All the substances made the subject of observation were first carefully dried at 212° F., and then analysed according to the method of Varrentrapp and Will, slightly modified to overcome some practical difficulties.

Intermediate between animal and vegetable aliment, as daily observation teaches and chemical analysis confirms, is to be found the most general food of the young of the class Mammalia, namely, milk.

I. Cow's milk. 0.404 gramme* of the dried residue, obtained by evaporating the fresh-drawn milk in the water-bath and subsequent desiccation at 212° F., yielded 0.241 gm. of the ammonio-chloride of platinum, corresponding to 3.78 per cent. of nitrogen.

II. 0.438 gm. human milk, treated as in the first experiment, gave 0.11 gm. ammonio-chloride of platinum, equal to 1.59 per cent. of nitrogen.

Human milk is, according to most analyses, one of the poorest in caseine, and in this respect is very far inferior to that of the cow, but in consequence of this may probably be more easily digested. The amount of nitrogen in milk, which corresponds to that of caseine, comes much nearer to the proportion contained in vegetables than any other kind of aliment from the animal kingdom.

Of the substances obtained from milk and used as food, we have examined only that of cheese, selecting four of the kinds most commonly used in Britain.

III. 0.485 gm. of Dunlop cheese gave 0.461 gm. of ammonio-chloride of platinum, equal to 6.03 per cent. of nitrogen.

IV. 0.475 gm. of Gouda cheese gave 0.532 gm. of ammonio-chloride of platinum, equal to 7.11 per cent. of nitrogen.

V. 0.444 gm. of Cheshire cheese gave 0.471 gm. of ammonio-chloride of platinum, equal to 6.75 per cent. of nitrogen.

* The balance used in these analyses having been made by Deleuil of Paris, and being only furnished with French weights, will account for the introduction of the word here, and in the other analyses throughout the paper. The French gramme is equal to 15.444 English grains.

VI. 0.477 grm. of double Gloucester cheese gave 0.525 grm. of ammonio-chloride of platinum, equal to 6.98 per cent. of nitrogen.

VII. 0.557 grm. of a very old double Gloucester cheese, abounding in mites and mould, in the condition in which it is sought after to gratify the depraved taste of the epicure, gave 0.463 grm. of ammonio-chloride of platinum, equal to 5.27 per cent. of nitrogen.

We add here, as being similar in composition, the yolk of the egg of the common fowl.

VIII. 0.526 grm. of well-dried yolk gave 0.387 grm. of ammonio-chloride of platinum, equal to 4.86 per cent. of nitrogen.

Somewhat more nutritive than milk, and more nearly allied to cheese, is a series of bodies obtained from the lower orders of the animal kingdom. We give here, as examples, the oyster and one or two others.

IX. 0.418 grm. of the oyster, *Ostrea edulis*, gave 0.346 grm. of ammonio-chloride of platinum, equal to 5.25 per cent. of nitrogen.

As this seemed to us a very low result, we repeated our analysis, which, however, confirmed our first experiment; in this case 0.354 grm. giving 0.283 grm. of ammonio-chloride of platinum, equal to 5.07 per cent. of nitrogen.

X. 0.354 grm. of the yellow matter (liver and bile) from the crabfish, *Cancer communis*, gave 0.418 grm. of ammonio-chloride of platinum, equal to 7.52 per cent. of nitrogen.

XI. 0.377 grm. of the common mussel, *Mytilus edulis*, gave 0.498 grm. of ammonio-chloride of platinum, equal to 8.41 per cent. of nitrogen.

XII. 0.308 grm. of the above animal, previously boiled, gave 0.510 grm. of ammonio-chloride of platinum, equal to 10.51 per cent. of nitrogen.

We find that many of the organs of the higher animals, for example, the liver of the ox, nearly agree in the amount of nitrogen with those substances we have just treated of.

XIII. 0.432 grm. of ox liver gave 0.726 grm. of ammonio-chloride of platinum, equal to 10.66 per cent. of nitrogen.

XIV. 0.419 grm. of the liver of the pigeon gave 0.778 grm. of ammonio-chloride of platinum, equal to 11.80 per cent. of nitrogen.

For the reason just mentioned, we here likewise notice the analysis of the muscles of some kinds of fish, which, from being quite saturated with oil, give a low amount of nitrogen; for instance, that of the eel containing 6.91 per cent., and pork ham, from the large quantity of salt, giving only 8.57 per cent.; but we shall return to these more in detail. The

connecting link between the two extremities of the nutritive scale of animal aliments we have formed, appears to be the dried extract of meat, which is sold under the name of portable soup, or *bouillon*.

XV. 0.441 grm. of portable soup, of an excellent quality, gave 0.845 grm. of ammonio-chloride of platinum, equal to 12.16 per cent. of nitrogen. Osmazome is therefore a body rich in nitrogen, probably from containing oxide of proteine, and perhaps also kreatine.

We shall give our results on the different kinds of flesh, including that of the fishes also, with which we begin.

Common eel, *Anguilla vulgaris*.—The flesh of this fish is poorer in nitrogen than any of the others which we have examined, in consequence of the large quantity of fat or oil it contains; indeed, during the whole desiccation it was floating in a liquid fat.

XVI. 0.345 grm. of raw eel's flesh gave 0.379 grm. of ammonio-chloride of platinum, equal to 6.91 per cent. of nitrogen.

XVII. 0.306 grm. of boiled eel's flesh gave 0.329 grm. of ammonio-chloride of platinum, equal to 6.82 per cent. of nitrogen.

XVIII. 0.293 grm. of eel's flesh, which had been previously washed with distilled water and afterwards boiled in alcohol as long as any matter separated, yielded 0.667 grm. of ammonio-chloride of platinum, equal to 14.45 per cent. of nitrogen, a quantity as great as that from the higher animals.

XIX. 0.274 grm. of the flesh of the salmon, *Salmo Fario*, gave 0.533 grm. of ammonio-chloride of platinum, equal to 12.35 per cent. of nitrogen.

XX. 0.286 grm. of boiled salmon gave 0.437 grm. of ammonio-chloride of platinum, equal to 9.70 per cent. of nitrogen.

XXI. 0.319 grm. of the purified muscular fibre of the salmon gave 0.785 grm. of ammonio-chloride of platinum, equal to 15.62 per cent. of nitrogen.

XXII. 0.271 grm. of the raw herring, *Clupea Harengus*, gave 0.590 grm. of ammonio-chloride of platinum, equal to 14.48 per cent. of nitrogen.

XXIII. 0.314 grm. of boiled herring gave 0.636 grm. of ammonio-chloride of platinum, equal to 12.85 per cent. of nitrogen.

XXIV. 0.350 grm. of purified muscle of the herring gave 0.802 grm. of ammonio-chloride of platinum, equal to 14.54 per cent. of nitrogen.

XXV. 0.4065 grm. of the milt of the herring gave 0.940

gram. of ammonio-chloride of platinum, equal to 14.69 per cent. of nitrogen. This substance is therefore as nutritive as the muscular parts of the fish, containing the same amount of nitrogen.

XXVI. 0.316 gram. of the flesh of the haddock, *Æglefinus communis*, gave 0.729 gram. of ammonio-chloride of platinum, equal to 14.64 per cent. of nitrogen.

XXVII. 0.331 gram. of boiled haddock gave 0.677 gram. of ammonio-chloride of platinum, equal to 12.98 per cent. of nitrogen. Whereas in the case of the herring, salmon, haddock, and eel, the proportion of nitrogen was considerably diminished by boiling the flesh for about half an hour, the reverse of this occurred in some of the other cases; for example, in the mussel, the flesh of the ox and calf. These are mere observations of facts, arising probably from accidental causes; the modification which meat undergoes by boiling not being sufficiently understood by chemists at present, although Mulder has proved the formation of oxide of proteine by it; from the observations just made, no general conclusion can be drawn, because they do not seem to coincide, at least at first sight.

XXVIII. 0.271 gram. of the purified muscle of the haddock gave 0.671 gram. of ammonio-chloride of platinum, equal to 15.72 per cent. of nitrogen.

XXIX. 0.348 gram. of the flesh of the flounder, *Platessa Flessus*, gave 0.783 gram. of ammonio-chloride of platinum, equal to 14.28 per cent. of nitrogen.

XXX. 0.342 gram. of boiled flounder gave 0.818 gram. of ammonio-chloride of platinum, equal to 15.18 per cent. of nitrogen.

XXXI. 0.301 gram. of purified muscle of the flounder gave 0.745 gram. of ammonio-chloride of platinum, equal to 15.71 per cent. of nitrogen.

We have selected the skate, *Raia Batis*, as a fair example of the cartilaginous order of fishes.

XXXII. 0.415 gram. of the flesh of the skate gave 1.066 gram. of ammonio-chloride of platinum, equal to 15.39 per cent. of nitrogen.

XXXIII. 0.402 gram. of boiled skate gave 0.964 gram. of ammonio-chloride of platinum, equal to 15.22 per cent. of nitrogen.

XXXIV. 0.407 gram. of the boiled muscle taken from the claw of the crabfish gave 0.877 gram. of ammonio-chloride of platinum, equal to 13.66 per cent. of nitrogen. From this analysis we are led to believe that the muscles of the *Crustacea* are as rich in nitrogen as those of much more highly organised animals.

XXXV. 0.299 gm. of the flesh of the pigeon gave 0.570 gm. of ammonio-chloride of platinum, equal to 12.10 per cent. of nitrogen. This is a surprisingly low number, more especially as the muscle of this bird was nearly free of fat.

XXXVI. 0.334 gm. of boiled pigeon gave 0.649 gm. of ammonio-chloride of platinum, equal to 12.33 per cent. of nitrogen.

XXXVII. 0.166 gm. of the purified muscle of the pigeon gave 0.344 gm. of ammonio-chloride of platinum, equal to 13.15 per cent. of nitrogen. The fibre used in this experiment most tenaciously retained a small quantity of the colouring matter of the blood. We have already given the analysis of the liver of this bird (experiment XIV.).

XXXVIII. 0.347 gm. of lamb gave 0.725 gm. of ammonio-chloride of platinum, equal to 13.26 per cent. of nitrogen.

XXXIX. 0.320 gm. of the purified fibre of lamb gave 0.734 gm. of ammonio-chloride of platinum, equal to 14.56 per cent. of nitrogen.

XL. 0.336 gm. of mutton gave 0.651 gm. of ammonio-chloride of platinum, equal to 12.30 per cent. of nitrogen. In this case it was found extremely difficult to separate mechanically the whole of the fat: it is necessary to notice this, as the numbers are somewhat lower than might have been expected.

XLI. 0.341 gm. of boiled mutton gave 0.728 gm. of ammonio-chloride of platinum, equal to 13.55 per cent. of nitrogen.

XLII. 0.335 gm. of the purified fibre from mutton gave 0.779 gm. of ammonio-chloride of platinum, equal to 14.76 per cent. of nitrogen.

XLIII. 0.318 gm. of veal gave 0.696 gm. of ammonio-chloride of platinum, equal to 13.89 per cent. of nitrogen.

XLIV. 0.379 gm. of boiled veal gave 0.866 gm. of ammonio-chloride of platinum, equal to 14.50 per cent. of nitrogen.

XLV. 0.214 gm. of purified fibre from veal gave 0.532 gm. of ammonio-chloride of platinum, equal to 15.78 per cent. of nitrogen.

XLVI. 0.306 gm. of ox-beef gave 0.675 gm. of ammonio-chloride of platinum, equal to 14.00 per cent. of nitrogen.

XLVII. Last experiment repeated. 0.292 gm. gave 0.633 gm. of ammonio-chloride of platinum, equal to 13.73 per cent. of nitrogen.

XLVIII. 0.331 gm. of boiled beef gave 0.781 gm. of ammonio-chloride of platinum, equal to 14.98 per cent. of nitrogen.

XLIX. 0.392 gm. of purified fibre of beef gave 0.919

gram. of ammonio-chloride of platinum, equal to 14.88 per cent. of nitrogen. The liver of the ox gave 10.66 per cent. of nitrogen (see XIII.).

L. 0.216 gram. of the lungs of the ox gave 0.504 gram. of ammonio-chloride of platinum, equal to 14.81 per cent. of nitrogen.

LI. 0.359 gram. of pork-ham gave 0.485 gram. of ammonio-chloride of platinum, equal to 8.57 per cent. of nitrogen.

LII. 0.395 gram. of the boiled pork-ham gave 0.777 gram. of ammonio-chloride of platinum, equal to 12.48 per cent. of nitrogen.

LIII. 0.384 gram. of the purified fibre of pork-ham gave 0.860 gram. of ammonio-chloride of platinum, equal to 14.21 per cent. of nitrogen.

We regret that at the time when these experiments were made, we were unable to procure fresh pork, but we thought that an examination of the salted and smoked substance would not be devoid of interest.

From these results we see that there is no appreciable change produced in the composition of the fibre by the preparation and length of time it had been kept; if however we take equal weights of the prepared ham and of the fresh flesh of the sow, we shall of course find a considerable difference in the amount of nitrogen from the large quantity of salt which is present in the prepared ham. We conclude this account of our experiments by giving the analysis of the white of the egg of the barn-door fowl.

LIV. 0.369 gram. of the white of the egg gave 0.781 gram. of ammonio-chloride of platinum, equal to 13.44 per cent. of nitrogen. The quantity of nitrogen in pure albumen, as determined by Mulder, is 15.8 per cent.

We take the liberty to add to these experiments the following remarks:—The proportion of nitrogen in purified muscular fibre seems to be identical, from whatever part of the animal kingdom it may be obtained; and the differences given by the results of analysis may be fully explained by the difficulty, or even impossibility, of analysing it in an equally pure or impure condition, as obtained from different animals, in which it is always mixed with cellular tissue, minute vessels and nerves. Moreover, it is extremely difficult to get rid of traces of fat and hematine.

That the chemical properties of muscular fibre in the whole animal kingdom are identical, one of us endeavoured to prove in a former research (Schlossberger, *Vergleichende Untersuchungen über das Fleisch verschiedener Thiere*. Stuttgart, 1840). In contradiction to a very generally-received opi-

nion, it appears to us that the muscles of fish are as rich in nitrogen as those of higher animals; at first sight, however, owing to the presence of a greater quantity of water, and in some fishes, as the eel, to a difficultly separable fat, its amount appears very much lower. Further, as the proximate principles are essentially the same in both classes of animals, it seems to us that they should be equally nutritive, although this proposition is also directly opposed to another very general prejudice. According to our scale, the oyster does not seem nearly so nourishing as it is generally reputed to be by common opinion, although it is possible that the proteine compounds in the lower classes of animals may be found to be much richer in phosphorus, in sulphur, and in phosphates than in the higher. Should this prove to be the case, we can see, that although the proportion of nitrogen may not be so great, nevertheless that they might act more powerfully as *stimulants*, which, as regards the oyster, is believed by some of our best physicians. We intend in a future series of experiments to direct our attention to this part of the subject.

In order that our views on this subject should not be misunderstood, it is necessary for us to state, that we do not consider the proportion of nitrogen, taken alone, to be an absolute measure of the nutritive power of our aliments; but as there is a total want of any positive data in regard to this subject, and as so many different and contradictory opinions are given in the works on dietetics*, it must be granted that any attempt to fix a standard for comparison is not without interest.

With respect to the capability for nutrition, we are far from denying that the physical condition, the state of admixture, the peculiar kind of proteine compound, the amount of water and other inorganic matters, of fat, and lastly, the effects of cookery, must necessarily have a very great influence on the physiological effects of our aliments.

There is one consideration in particular which requires to be noticed, namely the distinction between the absolute amount of nutritive matter and that portion of it which is in such a state as to be easily digested and assimilated by the system, in the same way as a soil produced from minerals abounding in alkaline salts is not always the most fertile as regards plants with a predominance of alkaline bases, but the fertility of which depends on the amount of these bodies contained in a state in which they can be taken up and made use of by the plant. Thus an aliment abounding in nutritive matter may

* See all works from Plenck's *Bromatologia* to the latest, as Paris's *Treatise on Diet*, as well as our standard works on *Materia Medica*, and we think it will be allowed that we have not asserted too much.

be inferior to one with a much smaller quantity as regards the nourishing effects produced by it; if in the first of these cases only a part, in the second the whole may be easily absorbed and assimilated. Here we must rely upon the experiments of the physiologist as to the degree of digestibility of different substances; and there already exists an excellent basis in the researches of Beaumont and of Blondlot. This is one of the questions, in which, by the co-operation alone of the physiologist and chemist, any progress can be expected to be made in the elucidation of this point. If the work were once fairly begun by the physiologist, chemistry would not be long in rendering that assistance which would then be found necessary; for example, in the various experiments which might be made in artificial digestion, from the results of which as one element in the calculation taken along with the proportion of nitrogen as the other, it would at once be possible to determine scientifically the real nutritive value of the different kinds of aliment; the importance to our dietetics of this method of determination, which at present exists only in idea, would then not only be felt by the patient, but by the whole human race.

Table of the comparative proportion of nutriment in our organic aliments. If we assume the amount of nitrogen in human milk, perfectly dried at 212° F., to be represented by 100, we can then express the degree of nutritive power of the other alimentary substances by the following numbers:—

<i>Vegetable.</i>			
Rice	81	Agaricus deliciosus . . .	289
Potatoes	84	Beans	320
Turnips	106	<i>Animal.</i>	
Rye	106	Human milk	100
Maize	190 to 125	Cow's milk	237
Barley	125	Oyster	305
Unfermented bread of		Yolk of egg	305
Glasgow	134	Cheese	331 to 447
Oats	138	Eel, raw	434
White bread	142	... boiled	428
Wheat	119 to 144	Liver of crabfish . . .	471
Carrots	150	Mussel, raw	528
Brown bread	166	... boiled	660
Agaricus cantharellus .	201	Ox-liver, raw	570
Peas	239	Pork-ham, raw	539
Agaricus russula . . .	264	... boiled	807
Lentils	276	Salmon, raw	776
Haricot beans	283	... boiled	610

<i>Animal (continued).</i>		<i>Purified muscular fibre from various animals.</i>	
Liver of pigeon	742	Fibre of eel	908
Portable soup	764	... salmon	982
White of egg	845	... herring	914
Crabfish, boiled	859	... haddock	988
Skate, raw	859	... flounder	988
... boiled	956	... pigeon	775
Herring, raw	910	... lamb	916
... boiled	808	... sheep	928
... milt of	924	... calf	993
Haddock, raw	920	... ox	935
... boiled	816	... sow	893
Flounder, raw	898		
... boiled	954		
Pigeon, raw	756	<i>Proximate principles of animals, calculated from the quantity of nitrogen as determined by Mulder.</i>	
... boiled	827	Pure proteine	1006
Lamb, raw	833	... albumen	996
Mutton, raw	773	... fibrine	999
... boiled	852	... caseine	1003
Veal, raw	873	... gelatine	1128
... boiled	911	... chondrine	910
Beef, raw	880		
... boiled	942		
Ox-lung	931		

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Dr Bennett from his
the Author

(25)

ON THE
MEDICINAL PROPERTIES OF BEBEERINE.

By DOUGLAS MACLAGAN, M. D., F. R. S. E., &c.

(From the Edin. Med. and Surg. Journal, No. 163.)

IN April 1843, I communicated to the Royal Society of Edinburgh some chemical and pharmaceutical remarks on the Bebeeru, or Greenheart Tree of British Guiana, in which Dr Rodie of that colony had pointed out the existence of a vegetable alkali which he called Bebeerine, and which he considered to be possessed of antiperiodic virtues. This paper has appeared in the Transactions of the Royal Society, Vol. xv. In August of the same year I published in Cormack's Monthly Journal a few observations on the medicinal qualities of Bebeerine, in which I narrated a series of cases furnished me by others, or observed by myself, which served to show that bebeerine is possessed of considerable antiperiodic and general tonic qualities, resembling quinine in its general effects, but without its liability to excite the circulation or produce the constitutional irritation to which the cinchona alkalies are too apt to give rise.

My present object is to lay before the profession further evidence as to its powers, with a view to its being employed, if it stand the test of experience, as a substitute for quinine.

Before, however, narrating cases illustrative of its medicinal action, I may be allowed to mention one or two points of informa-

tion which I have gained regarding its natural history and pharmacy, since the date of the above papers.

In my communication to the Royal Society I stated that the plant was unknown to me, and that although it had been referred to the natural order *Lauraceae* by Hooker, Lindley, and Schomburgk, nothing precise was known regarding it. Since that time flowering specimens of the plant, which were sent to me by Dr Watt of Demerara, and especially the examination of the plant by M. Schomburgk, have confirmed its lauraceous origin, and Schomburgk finds it to be a species of the genus *Nectandra*, to which he has given the specific name of *N. Rodiei*, in honour of Dr Rodie, the original discoverer of its medicinal powers. (Hooker's London Journal of Botany, December 1844.)

With regard to the chemical history of the active principle, I may state that subsequent trials have led me to believe that what I described as a second alkali, under the name of Sipeerine, is only a product of the oxidation of bebeerine, and that there is really only one alkali in the bark. My other avocations have prevented me from completing an inquiry into its ultimate chemical constitution, in which I have been engaged along with Professor Tilley of Birmingham. This investigation is now in progress, and, as I have put a portion of the sulphate into the hands of Professor Liebig, I hope also soon to learn that it has been examined in the Giessen laboratory.

A more important fact in relation to our present object is, that a very great improvement has been effected in the manufacture of bebeerine intended for medicinal use. I cannot refrain from noticing the spirited exertions made by Mr J. F. Macfarlane of this city, and the continued perseverance of Mr Brown, the superintendent of his laboratory, to improve the quality and appearance of the salt; and I am glad to have this opportunity of saying, that the latest manufactures bear ample testimony to the success of their endeavours. The principal point in which the more recently made sulphate seems to have the advantage over former manufactures is, in the salt being kept a little basic, in which condition it is not so liable to be affected during drying as the completely neutral salt is. The only difference resulting from this is, that, like disulphate of quina, it requires the addition of a few drops of sulphuric acid to form a perfect solution. On comparing this salt with perfectly neutral sulphate, analyzed by myself in the course of my former experiments, I find that the comparative constitution of the two salts, when carefully dried, is the following:—

Neutral sulphate, Maclagan, Trans. Royal Soc. of Ed. Loc. cit.		Mr Macfarlane's basic, Commercial sulphate.	
Bebeerine,	36.39		90.83
Sulphuric acid,	13.61		9.17
	<hr/> 100.00		<hr/> 100.00

The salts are anhydrous. Mr Macfarlane's preparation (after being carried to my class-room in a paper instead of a bottle) contained only 0.11 per cent. of hygrometric moisture.

I may further add, that Mr Macfarlane finds that he will probably be able to sell the sulphate at 6s. per oz. This is less than one-half the price of sulphate of quinine, which now costs 12s. 6d. per oz.

In adducing further evidence of the medicinal virtues of Bebeerine, which is my object at present, I shall confine myself to those testimonies to its value which I have received from other quarters, contenting myself on my own part with the general statement, that I have not met with any circumstances tending to shake the opinion expressed in the following sentence, which I quote from my paper in *Cormack's Journal* for August 1843.

"As regards the features, which are characteristic of Bebeerine as a therapeutic agent generally, I think that the above cases entitle us to consider that it is a marked antiperiodic and tonic, and consequently that there is good reason to believe that it may be applied to the same purposes for which the more expensive quinine is employed."

I shall first give the more recent reports which I have got, regarding its action in remittent and intermittent fevers, along with a tabular view of all the cases treated by it with which I am acquainted, and then notice its employment in periodic headach, neuralgia, &c.

Intermittent and Remittent Fever.—My friend Dr Watt of Georgetown, Demerara, whose first series of cases were published by me in 1843, has made farther trial of the Bebeerine, and has favoured me with the following additional reports.

CASE I.—(*Quotidian.*) Josephina Pereira, native of Madeira, age about 38; has been four years in Demerara, and has had frequent attacks of intermittent fever since her arrival. She labours in the cane fields, and has an infant of four months at the breast.

27th November 1843. Was seized with ague and fever on the 24th, between the hours of nine and ten A. M., and it has returned at the same hour every day since. To-day is the fourth paroxysm, and she is now (noon) in the hot stage, and vomiting. Has had calomel and jalap. No bile in the matters vomited to day; tongue clean; pulse 116. To have twelve grains bebeerine evening, and same dose at six A. M. to-morrow.

28th. Took bebeerine last evening, but did not get the dose this morning till ague was coming on, and she did not take it. Ague and fever came on at usual hour to-day. To have twelve grains bebeerine evening and twelve grains early to-morrow morning.

29th. Took the two doses of bebeerine as directed. The ague

did not return at the usual hour this forenoon, and she went out to wash some clothes for her baby. Just now (noon) she has been seized with ague, and has returned to her chamber. To confine herself to her chamber entirely, and continue the bebeerine, twelve grains evenings and mornings.

1st December. No return of fever yesterday or to-day; has had one drachm bebeerine altogether; and has had no deafness or ringing of the ears or any affection of the head.

1st June. Has had no return of fever since.

CASE II.—(*Tertian.*) Maria de Jesus, from Madeira, four years in the colony, and occasionally subject to intermittent fever, which generally comes on every second day.

29th December 1843. Had a paroxysm of intermittent fever the day before yesterday and again to-day. Is now (noon) in the hot stage, during the cold stage vomited bile; pulse 120; skin hot and dry. To have ten grains calomel and twenty-five grains jalap now, and twelve grains bebeerine at bed-time. To-morrow to have twelve grains bebeerine morning and noon.

31st. Taken the medicines as ordered. The thirty-six grains bebeerine have had no effect upon her head. As this is her fever day let her have twelve grains bebeerine immediately.

1st January 1844.—Fever has not returned.

3d. Convalescent.

1st June. This woman soon after left the estate, and I saw nothing of her since.

CASE III.—(*Enlarged Spleen and Fever.*) José da Brio, from Madeira, about three or four years in the colony; very subject to intermittent fever; has a pale emaciated appearance, with great enlargement of the spleen, which extends to near the right ilium.

3d January 1844. was seized at 5 P. M. on the 1st with intermittent fever, which continued all night, but went off yesterday morning and returned again at 5 in the afternoon and continued the whole night. Skin is now (10 A. M.) moist, and pulse 90, small and soft; tongue much furred; stomach irritable. To have an emetic now, ten grains calomel at bed-time, and twenty-five grains of jalap to-morrow morning.

5th January. Took the emetic; but as the fever had only remitted, and returned with increased violence towards evening of the 3d, he refused the calomel in the evening and the jalap yesterday. Yesterday there was merely a remission in the forenoon with increase of fever towards the evening. To-day he has likewise had remission of fever in the morning; but now (1 P. M.) his skin is hot and dry, and pulse 116. Take of opium six grains; tartar-emetic one grain; calomel ten grains. Mix and divide into four pills. One to be given every six hours while the fever continues.

6th January. Fever still continues with remissions; skin sometimes moist, sometimes dry, always hot; complains of pain on pres-

sure in the spleen. To have a blister over the spleen ; the remaining pill now, and half a drachm of jalap two hours after it. Twelve grains of bebeerine at bed-time.

7th. Fever left him last evening. Refused the blister, but took the other medicines, and has passed much bile. Twelve grains of bebeerine twice to day.

8th. No return of fever. Took two doses only of the bebeerine yesterday and the third early this morning. Slept some during the night, and feels better, but very weak. To have twelve grains of bebeerine at noon, and to be allowed a little wine, soup, &c.

10th. Has had no return of fever ; tongue cleaning ; spleen softer and smaller, and says he has no pain in it. To have thirty-five grains of jalap and one drachm of cream of tartar.

12th. Continues convalescent. Bebeerine had no effect on his head.

1st June. I believe he has had once or twice slight attacks of fever and ague since, but so slight that he has not again put himself under medical treatment.

CASE. IV.—Julio de — from Madeira, aged 12, had an attack of congestive remittent fever in August last, and was insensible for two days.

January 1844. Has had tertian fever latterly. I gave him bebeerine in the same way that I usually give quinine, and the fever was completely checked. My notes of this case are lost or mislaid.

CASE V.—(*Bilious Intermittent*.) Mr William C., native of Scotland, aged 20, has been about three or four years in the colony as a field overseer, where he is constantly exposed to the sun and weather. Says that about two years ago he had yellow fever, and was very ill, since which, however, he has enjoyed very good health.

April 15th. Between ten and eleven o'clock to-day he was suddenly seized in the field with bilious vomiting and fever ; but without any perceptible cold stage. He is now (3 P. M.) sweating very profusely ; pulse 120 and full ; severe pain across the forehead ; urine deeply tinged with bile ; tongue covered with fur. To have four pills containing sixteen grains of the compound colocyath mass, with twelve grains of calomel, and a full dose of Epsom salts to-morrow morning.

16th. Free of fever and headach this morning ; pills and salts have acted freely ; stools dark green at first, and now yellow ; urine very high coloured ; medicines still acting.

17th. Three o'clock yesterday afternoon the fever returned without any perceptible cold stage. Took salts again this morning, which have acted freely ; stools still very bilious and urine the same. Was seized at 11 A. M. with smart ague, which lasted nearly an hour, during which time he vomited copiously of thick yellow bile. 1 P. M., his skin is now hot and dry ; pulse 120 and full ; severe frontal

pain. The head to be frequently bathed with vinegar and water, and wet cloths applied to the brow.

R *Sulph. Bebeer.* ℥ij. et gr. viii. ; *Calomelanos*, gr. xxiv. ;
Mucilag. Ac. Arab. q. s. *M. ft. massa in pil.* xii. *divi-*
denda.

Three of the pills to be taken in two hours, three again at bed-time, and three early to-morrow morning.

18th. Yesterday the sweating commenced about four, and the fever left him about seven P. M. Has had a good night, and taken nine of the pills as directed. No pain nor fulness in the head, and is quite certain he has had no ringing in the ears ; tongue still much furred ; pills have acted thrice on his bowels ; urine scarcely so high in colour. To have forty-five grains of jalap with some cream of tartar.

19th. 7 A. M. No return of fever. The jalap acted scantily, having vomited about an hour and a half after it was taken. Had a good night, and this morning feels inclined to eat ; pulse 80, and natural ; tongue still covered with a greenish fur ; urine deeper in colour ; eyes slightly yellow. To have three of the pills of bebeerine and calomel now.

1 P. M. Called on my return up the coast, and find he has had two eggs with tea and toast, since which he feels very full and uncomfortable about the stomach, with nausea and restlessness.

5 P. M. Have just been called to him. Soon after I left he vomited the eggs, &c. and about two o'clock was seized with fever, which was soon followed by copious perspiration. His pulse is now 84, and full, and he is still perspiring freely. He feels very full and uncomfortable about the hypogastrium ; urine and eyes more tinged with bile since the fever returned. To have a purgative glyster now ; three of the pills of bebeerine with calomel at bed-time, and three again to-morrow morning.

20th. Took the pills as directed, (thirty-six grains of bebeerine last twenty-four hours.) No ringing of ears nor deafness, nor any peculiar feeling about the head ; pulse 80, and soft ; skin moist ; passed a tolerable night, but the enema did not act, and he still complains of the fulness in the hypogastrium. To have Epsom salts now, as he prefers that purgative. Three pills of bebeerine with calomel in the evening, and three to-morrow morning.

22d. Took the medicines as directed, and another dose of Epsom salts this morning ; eyes and urine less tinged with bile ; pulse and skin natural ; gums slightly affected by the calomel ; feels hungry ; and has had no return of fever since the 17th, with exception of the slight attack after the error in diet on afternoon of 19th.

23d. Continues convalescent.

29th. Resumed his duties in the sugar works, where he is not exposed to the sun or weather.

May 9th. Mr C. returned to his duties in the field a few days ago, and got well drenched with rain, which, he says, gave him a cold in the head. At noon on the 7th he was seized with ague and

fever, and again at the same hours yesterday and to-day. The fever did not last more than from two to three hours on each occasion. Tongue is slightly furred.

R *Mass. pil. Coloc. comp.* gr. xvi.; *Calomel.* gr. x. *M. ft. pil. No. iv. h. s. s.*, and Epsom salts to-morrow morning.

10th. The pills and salts have acted well, and brought away dark-coloured stools. The fever returned at noon as usual, being the fourth daily paroxysm.

R *Sulph. Bebeer.* ℥ii.; *Muc. Ac. Ar. q. s.* *M. ft. mass. in pil. No. xii. dividenda.* Three to be taken at bed-time, three at six, and three at ten A. M. to-morrow.

11th. Took the nine pills as directed; still the fever returned at noon as usual, being the fifth daily paroxysm. To have the three remaining pills of bebeerine early to-morrow morning.

13th. Has had no fever yesterday or to-day.

June 1st. Continues well.

CASE VI.—Doctor F. in December last had symptomatic fever from abscess, for which he was advised to take full doses of quinine during the remissions. This he did on three several days, but on each occasion, in two hours after taking the quinine, his whole body became covered with nettle-rash, which generally lasted for six hours at a time, and caused great irritation and annoyance. In January he was again recommended to take full doses of quinine, (ten grain doses,) and thinking that on the former occasion the nettle-rash might have arisen from some impurity in the quinine, which bore to have been made at Philadelphia, he had recourse to French quinine by different makers, but the nettle-rash invariably appeared after each dose, though one of them was as low as six grains. Altogether this occurred six or seven several times.

On the 4th of February, having again occasion for a similar remedy, he determined to substitute the sulphate of bebeerine, of which he took ten grains rubbed up with brown sugar. The bebeerine was not followed by urticaria, though it was followed by the same remedial effects as he had usually experienced from the quinine on former occasions. Since then he has had occasion to take the bebeerine, at intervals, three several times, making four times altogether, and it has always been followed by the same remedial effects, without the slightest tendency to produce the urticaria. On one occasion he took fourteen grains at a single dose, without any perceptible effects on the ears or head, or any of that nervous feeling which commonly follows full doses of quinine.

Remarks.—Quinine in full doses is occasionally followed by rather unpleasant symptoms. When under its influence, the head becomes confused and feels larger than usual, with ringing of the ears and deafness. The whole nervous system appears to become affected, and sometimes the hands are so unsteady that the patient can scarcely write. These symptoms, in a greater or less degree, generally follow the exhibition in twenty-four hours of from twenty

to thirty grains of the quinine, and it is seldom that a smaller quantity will suffice to check an intermittent when once it is fully formed. Quinine likewise acts powerfully on the skin and gall-ducts, causing an increased flow of perspiration and bile, and a very small overdose will now and then produce alarming cold sweats, sinking of the pulse, and great irritability of stomach. In all the cases of this kind which I have seen, the patient had taken the quinine by guess, instead of weighing the doses, so that it is impossible to say exactly how many grains had been taken to cause these symptoms, but I should think in each case probably not more than forty to forty-five grains in the twenty-four hours. On the other hand, in the yellow fever of this country, the late Dr Smith, Physician to the Seaman's Hospital, and several other practitioners, have been in the habit of giving, and with great success, twenty to twenty-four grain doses of quinine combined with calomel every four hours until the symptoms abated, without such doses having been followed by any alarming symptoms, and even the ears did not become affected until the fever had yielded. The fact is, quinine appears to act much after a law similar to that pointed out by Marshall Hall with regard to blood-letting ;—the more in need the patient is of quinine, the greater quantity will he bear without affecting his nervous system, and the less he requires it, the smaller quantity affects him. Six or eight grains, taken to prevent an accession of fever, before a regular paroxysm has appeared, will generally cause ringing of the ears ; while three times that quantity will be required to produce a similar effect after a paroxysm has once taken place. This, however, by the way.

Should the bebeerine be found equally efficacious with the quinine, in checking fever, and as an antidote to malarious diseases in general, which, I think, we already have good reason to anticipate, how far superior will it prove, in that it leaves the head and nervous system comparatively free and unaffected, while in no case within my knowledge has it ever caused irritation of stomach or cold sweat. In Mr C.'s case, No. V., where ninety-six grains of the bebeerine were taken in three days and a half, I should not have ventured to give the same quantity of quinine in the same period for fear of cold sweats, sinking pulse, and irritability of stomach, more especially, as, when the system is charged with bile, those untoward symptoms are more apt to follow the free exhibition of the quinine.

I have a suspicion that the bebeerine is somewhat tardier, however, in developing its febrifuge effects, as witness case No. I. where the fever returned once after the system, with quinine, would have been under its effect ; and again, in Case V. the fever likewise returned once after the system should have been under its influence, though both of these might certainly have arisen from the indiscretion of the patients, the first by exposing himself prematurely, and the other from an error in diet. This, however, does not apply to a similar recurrence of the quotidian in No. V.'s case in May.

Should further experience confirm this suspicion of a somewhat tardier action, may it not be accounted for by the quinine acting more immediately on the nervous system, and the bebeerine through the blood; and may the bebeerine, therefore, not be likely to produce a more permanent febrifuge effect? Arsenic, we know, takes eight to ten or twelve days to arrest an ague, but it is far more permanent in its effects than the bark, and may we not hope something similar from the bebeerine? Time and further experience will show.—I am, &c.

P. F. WATT, M. D.

Georgetown, Demerara,
June 4, 1844.*

In August 1843, I forwarded to Dr Nicolson, Deputy-Inspector of Hospitals at Madras, a few ounces of the sulphate, which he at my request placed at the disposal, partly of the medical officers of H. M.'s troops, and partly in the hands of those of the Company's service. I gladly embrace this opportunity of thanking Dr Nicolson and the other officers whose names are mentioned below, for their prompt attention to my requests regarding this matter.

"Her Majesty's 21st Fusiliers.—Fevers. Six cases treated with Sulphate of Bebeerine."

Febris Intermittens Quot. James Templeton, private, aged 25; temperament sanguineous; line of life cotton-spinner; resident in India four years and three months. 20th November 1843.—Admitted at noon, having had a paroxysm of fever on the two preceding days at ten o'clock. The rigor was of short duration, followed

* Whilst this paper was going through the press I received, by the West India mail of February, a letter from Dr Watt, containing the following additional remarks.

"Thinking it would be better to have cases from other medical men, than always from the same, who might be supposed to be prepossessed in its favour, I gave away most of the sulphate in my possession to other medical practitioners for trial, retaining merely a portion for my personal use, as I frequently require a full dose, and I cannot take the quinine without its giving me eight to ten hours nettle-rash all over my body. Owing to this I have no new cases myself, and none of my medical friends, with the exception of Dr M'Farlane, (son of the Principal), have, I believe, yet tried it. Dr M'Farlane gave it to several children, in whom he thought it did good as a tonic. He afterwards took the remainder of it himself in an attack of intermittent; but the fever returned notwithstanding. He is not certain, however, that the quantity he took was sufficient. So this case tells neither way. It did not affect his head in any way, and acted gently on his bowels as a laxative. This effect it likewise invariably has with me. If I take twelve or fifteen grains at bed-time, I am certain to have one copious bulky evacuation the following morning.

When quinine is given in sufficient quantity in the interval, a paroxysm seldom follows. This is not, however, always the case with the bebeerine,—one paroxysm does sometimes come on after its full exhibition,—but, so far as my experience yet goes, no second paroxysm. It is important that this should be fully known, otherwise disappointment is sure to ensue.

The bebeerine is tardier in cutting short an intermittent, but its effects seem more permanent. This, I think, I mentioned in my note accompanying the cases sent you on 4th June last."

by headach and great heat of skin, and with but little perspiration. *Habt. haust. Emeticum more solito; Pulv. Jalap Co. ʒi. c. Infus. Sennæ ʒij.; Vesp. pediluvium et Mist. Diaphor. ʒi. 2dis horis.* Spoon diet.

21st. The emetic and purgative acted freely; slept badly; is at present free from fever; pulse calm; skin soft; tongue clean; anorexia. *Capt. q. p. Sulph. Beberinæ. gr. v. in Extr. Gentian. et rept. hor. decima.*

Vesp. Very slight pyrexia at nine o'clock; no regular paroxysm; bowels are loose; tongue clean. *Habt. pilul. purg. ij. H. S.*

22d. Slept well; no fever; tongue clean; pulse regular. *Repr. pil. (ut heri) ter die.* Low diet.

Vesp. Is free from fever.

23d. No return of the paroxysm. *Cont. Med. ter die.*

24th Convalescent; bowels free. *Infus. Gentian. ʒiij. ter. die Omitt. S. Beberinæ.*

25th. Is quite well. Discharged.

Febris Remittens. James Barber, private, aged 21; temperament robust; line of life labourer; resident in India one year and two months. 24th November 1843.—Complained of febrile symptoms and soreness all over him, and says he felt suddenly unwell at the barracks; pulse of ordinary strength and frequency; skin harsh; tongue slightly furred; anorexia and thirst.

Habt. Haust. Emeticum q. p.; postea, Calomel. gr. vi.; Pulv. Jalap. Co. ʒi; Mist. Diaphor. ʒi. 2dis horis. Utatur balneo calido, et capt. pil. Calomelanos et P. Antimon. H. S. Spoon diet.

25th. Was freely purged; perspired after the bath, and slept well last night; apyrexia; pulse calm; skin soft; tongue whitish.

Capt. Sulph. Beberinæ gr. v. in Extr. Gentian. et repr. 3tis horis. Cont. Mist Diaphor. si opus sit.

26th. No return of fever yesterday; slept well; bowels free; appetite returned; pulse calm; tongue clean. *Cont. pil. ut supra ter die.* Low diet.

27th. No return of fever; bowels loose; tongue clean; slept well. *Pergat ut heri.*

28th. Convalescent; bowels free. *Infus. Gentian. more solito.* Half diet.

29th. Bowels open.

30th. Is quite well. Discharged.

Febris Remittens. James Axford, private, aged 23; temperament plethoric; line of life labourer; resident in India four years. 27th November 1843.—Complains of febrile symptoms, which attacked him the evening before last; says he slept in a current of air in the barracks; general health good; last admission in July 1842 with diarrhœa; pulse full and frequent; headach; heat of the skin, and furred tongue; bowels confined.

Fiat venesection ad ʒxxiv. Habt. haust. emeticum q. p.; postea Cal. gr. vi.; Pulv. Jalap Co. ʒi. Spoon diet.

Vesp. Apyrexia. *Capt. Sol. Tart. Antimon.* ζi . *horâ quâque secundâ et pil. Calomel. et. P. Antimon.* *H.S.*

28th. V. S. removed the headach; the emetic operated freely; the purgative only acted twice. Slept well, and feels greatly better; pulse 78; skin soft; tongue white, is thirsty. *Capt. Mist. Sennæ* ζiv . *q. p. et habt. Pil ex Sulph. Beberinæ gr. v. in Extr. Gentian.* *Atis horæ, et cont. Sol. Tartar. Antimon. si opus sit.*

29th. Continues free from fever; bowels are loose; pulse calm; skin soft; tongue clean; appetite improved. *Cont. Med. ut heri.* Low diet.

30th. Is quite well. *Cont. med.* Discharged.

Febris Intermitt. John Jerrold, private, aged 23; temperament sanguineous; line of life labourer; resident in India three years and three months.

Vesp. 29th November 1843.—Complains of having been seized at 3 P. M. with alternate fits of cold (with shivering) and heat, lasting for nearly three hours. Cannot assign any cause for the attack. Pulse regular; skin soft; tongue white; had a similar attack last month.

Habt. Haust. Emeticum q. p.; post., Calomel. gr. vi. c. Pulv. Jalap. Co. ζi *Utatur pediluvio et Pil. Calomel. c. P. Antimon. H. S.*

30th. The emetic and purgative operated freely; slept well, and is at present free from fever; pulse 76; skin soft; tongue cleaning. *Sumat q. p. Sulph. Beberinæ gr. v. et repr. Atis horis.* *Capt. Mist. Diaphor. si opus sit.* Spoon diet.

December 1st. No paroxysm yesterday. Bowels free; slept well. *Cont. Med. ut heri.*

2d. No return of the paroxysm. Bowels acted freely; slept well; tongue clean; pulse regular; skin moist; appetite returned. *Cont. Sulph. Beberinæ ut heri.* Low diet.

3d. Continues free from fever. Bowels loose; tongue clean; appetite good.

Omitt. Sulph. Beberinæ et capt. Infus. Gentian. ζiij . *ter die.*

4th. Continues to improve. No fever; bowels free; tongue clean; appetite good. *Cont. remedia ut supra.*

5th. Improving. No fever; bowels free. *Idem.*

6th. *Idem.* Half diet.

7th. Discharged.

Febris Intermittens Quot. James M'Chrink, private, aged 28; temperament phlegmatic; line of life, ship smith; resident in India three years and three months. 22d November 1843.—Admitted at 6 P. M., of a pale cachectic appearance, having had severe rigors, followed by acute febrile symptoms, about 10 A. M. the same day. He stated that he had been subject to severe attacks of ague during the previous sixteen months. The febrile symptoms were reduced by an emetic, purgative, and leeches to the temples. Subsequently fifteen grains of the sulphate of bebeerine were given

daily in pill until the 25th November, when the occurrence of hepatitis prevented its employment for three days. On the 28th November the fever returned, but without the cold stage, and again on the 29th. His mouth was affected by the remedies employed in the hepatitis, and the bebeerine was continued until the 8th December, when he was discharged to duty. Fever has not since recurred.

Febris Con. Com. Joshua Richards, private, aged 24; temperament sanguineous; line of life shoemaker; resident in India four years. 29th November 1843.—Admitted at 6 A. M.; stated that he had been seized with rigors the preceding evening, succeeded by headach, much heat of skin, and thirst. On the subsidence of these symptoms 10 grains of the sulphate of bebeerine were given daily for a week. The disease having returned with severity on the evening of the 11th December, attended with much determination to the head and relaxed bowels, and again on the following day, fifteen grains were now given daily during the apyrexia, and he continued free from fever for upwards of ten days. On his return to his duty he was again attacked with the disease, and as all the bebeerine had been expended, quinine was employed.

In the above cases the medicine did not produce *tinnitus aurium* or deafness.

Kamptee, 19th January 1844.

J. DEMPSTER, M.D. Surgeon,
H. M. 21st Fusiliers.

The following are the reports from the medical officers of the H. E. I. C.'s Service.

To the Superintending Surgeon Ceded Districts.

Sir,—In reference to memorandum No. 389, dated Medical Board Office, 2d May 1844, I have the honour to inform you, that, from not having had any well-marked cases of periodic fevers in hospital during the time alluded to, I was unable to make fair trial of the effects of the sulphate of bebeerine,

On two or three out-patients, however, its febrifuge power did not appear satisfactory, whilst its unpleasant taste and astringency were complained of.—I have, &c., &c.

(Signed) J. GODFREY, Garrison Surgeon,
Bellary, 9th May 1844.

To the Secretary to the Medical Board Madras.

Sir,—Having expended the small supply of sulphate of bebeerine sent to me for trial in fever of miasmatic origin, I have much satisfaction in forwarding a brief statement of the various cases in which it was employed.

It will be observed that, though given when fever was present, it only in one instance affected the brain, and that transiently; that it has a decided tendency to induce perspiration, allaying fever and

checking exacerbations ; and that it seems to exert a peculiar power over the alvine secretions, changing them to a brick-red colour. This appearance of the evacuations, however, being far from uncommon in remittent fevers, cannot be regarded as solely owing to the influence of bebeerine, if indeed at all.

Notwithstanding my limited experience, I cannot but believe that bebeerine is a medicine of the highest efficacy in checking fever, and that it will prove a valuable substitute for quinine.—I have, &c., &c.

(Signed) J. DORWARD, Assist. Surgeon 13 Reg. N. I.
Chicacole, 13th May 1844.

Febris Remittens. Veerasaamy, aged 24, Sepoy, C. Company, thin spare habit. 12th December 1843. Admitted at 6 A. M. ; complains of having had fever for two days, with frequent chills, giddiness, and prostration of strength ; skin hot ; pulse quick ; eyes suffuse ; tongue red.

Habt. stat. pulv. Ipecac. ʒj. ; *Ant. Potass-tart.* gr. i. *M. ft. pulv. ; postea Pulv. jalap. Co.* ʒj.

R. Calomelanos, Pulv. antimon. co. āā. gr. iiss. *M. ft. pil. qq. horā tertiā.*

13th, 7 A. M. Slight remission of fever was experienced yesterday after the action of the medicine, but an exacerbation came on at night with delirium preceded by rigors ; skin warm and dry ; pulse quick ; great thirst ; no pain ; head at present clear.

Pulv. jalap. et. Pil. Calomelanos rept. ut heri.

R. Liqr. Ammon. acet. ʒj. ; *Ant. potassio-tartrat.* gr. ij. ; *Misturæ camphoræ* ʒiij. *ft. mist. Capiat* ʒj. *quāque horā tertiā.*

14th, 7 A. M. Occasional chills ; fever and low delirium all night. Was violently purged yesterday by the medicine ; head symptoms and fever now remitting partially.

R. Quininæ Disulph gr. ij. *omni horā sumend.*

16th, 7 A. M. A better night ; no delirium ; dry warm skin continues, with occasional rigors ; considerable debility. *Cont. Quinæ disulph.*

16th, 7 A. M. Had a severe accession of fever last night with delirium, and still mutters when left alone. Complains of chilliness. Skin dry and warm ; lips parched ; tongue dry ; bowels free.

Emplast. vesicat. occipit appl. ; habt. Stat. Bebeerinæ grs. x. et merid. rept.

17th, 7 A. M. Fever less. Three hours after taking the first dose of bebeerine, which seemed to affect his head a good deal, an accession of fever took place, and the second dose was not given. The blister rose well, he passed a better night, and looks more lively. *Habt. st. Bebeerinæ grs. x. et merid. rept.*

18th. No accession of fever since last report. Skin continues warm and dry with a feeling of chilliness ; took both doses of be-

beerine yesterday, which induced perspiration. No delirium. *Cont. Bebeerina ut heri.*

19th, 7 A. M. Skin for the first time soft and cool. Had a copious brick-red feculent motion in the night. *Cont. Bebeerina ut heri.*

20th. Free from fever. *Cont. Bebeerina dos. grs. v. bis die.*

21st. Complains only of debility. *Omitt. Bebeerina.*

27th. Well. Discharged.

Febris Remittens.—Soobroyah, aged 34, Sepoy, F₄ Company, No 322, weak and emaciated. Admitted 29th December 1843, at 7 A. M., complaining of fever for the last two days, with exacerbations about noon, and constant giddiness. Skin warm and dry; pulse frequent; tongue foul. Was in hospital from the 16th November to the 19th instant, labouring under *febris continua*, and has never properly regained his strength. *Hab. stat. Pulv. Ipecac. ʒj. ; Pulv. Jalap. co. ʒj.*

Vesp. Had an accession of fever with rigors at 1 P. M. Complains of chilliness; skin hot and dry; bowels freely opened; stools dark-brown. *Hab. Calomelanos, Pulv. Antim. Co. āā.gr. iij. ft. pil. h.s.*

30th. Passed a restless night, the feeling of chilliness continues, and the skin dry and warmer than natural. *Hab. stat. Bebeerinæ, grs. v. et merid. rept.*

31st. Perspired profusely after the bebeerine; an exacerbation of fever with considerable giddiness came on at 2 P. M.; passed a better night, however; fever still present. Bebeerine continued *ut heri.*

Jan. 1st. Fever left him in the night; skin cool, feels chilly; has had several brick-red looking stools. Bebeerine continued.

2d. Had a paroxysm of fever ushered in by rigors from three to six A. M. this morning. Bebeerine continued.

3d No fever nor chilliness. Bebeerine continued.

4th. Continues free from fever, feels stronger and better. Bebeerine continued.

6th. Convalescent. Omit bebeerine.

11th. Well. Discharged.

Febris Intermit. Quotid.—Rammanah, aged 50, Sepoy, B Company, No. 284, 41st regiment Native Infantry.

23d March 1844. Admitted at 7 A. M., complaining of attacks of fever, preceded by rigors yesterday and the day before, from noon until night; pulse quick; skin dry; tongue furred. *Hab. st. Pulv. Ipecac, ʒj. ; Antimon. Potass-tart gr.j. ; postea, Pulv Jalap. Co. ʒj.*

24th. Medicine acted well; fever returned in the evening, took a pill containing *Calomel. grs. iiss. ; Pulv. Antimon. Co. grs. iiss.* Passed a feverish, restless night; skin moist, but warmer than natural; thirst.

Hab. Pulv. Jalap Co. ʒj. ; St. Mist. Salin. Co. ʒj. q. q. 2dā horā.

25th. Exacerbation of fever last night; no rigors; complains of a burning sensation all over his body; pulse frequent; skin dry.

Rept. Pulv. Jalap. Co. Cont. Mist Salina.

26th. Has had fever all night ; slight remission ; bowels free.
Habt. Bebeerinæ grs. v ; quâque horâ tertiâ.

27th. Free from fever ; took twenty grains of bebeerine yesterday.

28th. No fever. Continue bebeerine.

29th. No fever, weak. Omit bebeerine.

April 5th. Discharged.

Chicacole, (Signed) J. DORWARD, Assist - Surgeon,
13th May 1844. 13th Regiment, Native Infantry.

Five cases of intermittent fever treated by the sulphate of bebeerine, in the hospital, 3d Battalion of Artillery at Kamptee.

Febris Inter. Quotid.—T. G. Doyle, gunner, aged 30, ten years resident in India ; nervous temperament. Admitted at six o'clock A. M. on the 26th November 1843, a man of spare habit, temperate. Returned this morning from Nagpore, where he has been on duty during the last fourteen days. By his account he has had daily paroxysms of fever for the last nine days. They began at nine in the morning, and terminated at three or four o'clock in the afternoon. There was no cold stage ; the symptoms are said to have been headach, heat of skin, thirst, nausea, &c., followed by profuse perspiration, bowels lax, tongue furred. At present skin is cool and pulse natural, but he complains of headach, which does not leave him during the intermission.

Has taken no medicine since he was first attacked. *Olei Ricini* \mathfrak{z} i. *Aquæ*, \mathfrak{z} iss. *M. ft. haust. statim sumend.* Spoon diet.

Five o'clock P. M.—Fever returned at nine o'clock, and is still present ; complains of the headach being severe, of nausea and thirst ; skin hot and dry ; pulse 104, full and soft ; four stools, consisting of orange-coloured mucus and some loose feculent matter. Owing to the return of the fever, the leeches, although they operated well, did not relieve the pain of head. Has taken an ounce of the following mixture, at intervals, since the return of the fever.

R Antimon. potassio-tart., gr. i. ; Magnesiæ Sulphatis \mathfrak{z} ss. ; *Aquæ Acet. Ammon.* \mathfrak{z} ij. ; *Misturæ camphoræ*, \mathfrak{z} viiij. *M. fiat mistura.*

R Calomelanos ; Pulv. Ipecac. comp. aa gr. vi. ; Confect. aromat. q. s. ft. pil. horâ somni sumend.

27th. At ten o'clock P. M. the paroxysm terminated in profuse perspiration, and since that time the headach has been gradually diminishing in severity. Skin is now cool ; pulse 76 ; three stools, they consist of brownish mucus and slime ; has no abdominal uneasiness.

Had three grains of the sulphate of bebeerine dissolved in an ounce of water at four o'clock, and the same was repeated at five, six, seven, eight, and nine o'clock.

Vespere. Took all the bebeerine ordered, (eighteen grains,) and the fever has not returned ; skin has been cool, and pulse natural ; headach has not entirely left. The only sensible effect from the bebeerine was its impression on the palate. He describes its taste as a mixture of sweet and bitter. Four stools, a greenish mucus.

R *Massæ pil. Hydrarg.* gr. vj.; *Pil. Rhei comp.* gr. x. *M. ft. pilulæ*, iij. *h. s. s.*

28th. Continues free from fever; one stool, a small quantity of natural fæces; headach is now very slight; tongue furred in the centre. Nil.

Vesp. No return of fever, still has slight headach. Three loose natural stools. *Rept. pilulæ h. s. ut heri.*

29th. No headach; tongue clean; two feculent stools; appetite returns. Four ounces of bread extra.

30th. Continues well.

1st December. Chicken diet.

2d. Discharged from hospital.

Febris Inter. Tertianæ. Patrick Fitzpatrick, gunner, aged 30, thirteen years resident in India; sanguine temperament; a muscular man of the ordinary height; temperate. Admitted at eleven o'clock A. M., on the 28th November 1843, in the cold stage of an intermittent, which he says attacked him on the 26th instant at same hour. Soon after admission his skin became hot and pulse frequent. He complained of headach, nausea, and loss of appetite, aching pain in the legs, thirst, giddiness, and prostration of strength; was ordered on admission one grain of tartar emetic and a scruple of ipecacuan, which caused a free emetic effect; and he afterwards took, as his bowels were confined, six grains of calomel and two scruples of compound jalap powder, by which he has been moved four times; stools are loose but not otherwise unnatural; fever is leaving him; he begins to perspire. Nil. Spoon diet.

29th. Complains only of headach, and it is not severe; tongue is very little furred, moist; pulse and skin natural; two stools. Nil.

30th. Since last report free from fever, but he expects its return to-day; no stool during the last twenty-four hours. *Haust. purgant.* ζ iv.

6 P. M. At half-past nine o'clock this morning felt cold and chilly; nails blue. After ten o'clock the skin became hot and dry; he was restless; complained of thirst, nausea, and giddiness; pulse frequent. As the draught taken in the morning purged him repeatedly, no other medicine was ordered. At two o'clock he perspired copiously, and he now complains only of giddiness and debility; skin cool, and pulse of natural frequency.

R *Massæ pil. Hydrarg.*; *Pulv. Antimon. comp.* a a. grs. v. *M. fiat pilulæ* ij. *h. s. s.*

1st December. Remains without fever; no stool during the night.

R *Antim. Polassio-tartrat.* gr. j.; *Magnes. Sulphat.* ζ ss.; *Mist. Camphoræ* ζ vj. *M. ft. Mist.* ζ iss. *ter in die.*

2d. Took at four o'clock A. M. three grains of sulphate of bebeerine dissolved in an ounce of water. The same was repeated at five, six, seven, eight, and nine o'clock.

Vespere. Fever has not returned. Nil.

3d. Continues free from fever, but bowels have not been moved since the first. *Pulv. Jalap. C. ʒj. stat. sumend.*

4th. No fever ; appetite improves ; two stools. Chicken diet.

5th. Continues well ; discharged to duty.

Febris Inter. Tertianæ. Charles Lowther, bombardier, aged 29, six years and three months resident in India ; sanguine temperament ; muscular ; of sober habits. Admitted into hospital on the 31st March 1844, at four o'clock P. M. in the hot stage of a paroxysm of intermittent fever ; complains of headach, thirst, loss of appetite, and debility ; pulse 108, full ; tongue white ; bowels confined. By account had on the 27th and 29th of the present month attacks of fever ; each began at two in the afternoon with rigor, and terminated in profuse perspiration at five o'clock in the evening. Took on admission one grain of tartar emetic and a scruple of powdered ipecacuan, and soon after four grains of calomel and fifty of compound jalap powder.

1st April. After the operation of the emetic there was profuse perspiration, followed by relief of all the symptoms ; two stools after the purgative ; is cool this morning and free from uneasiness ; pulse natural. Nil.

2d. Since last report no fever ; but this morning complains of headach ; no stool since the evening of admission. *Haust. purgant. ʒiv.*

5 P. M. Immediately after the morning visit the fever returned, commencing with rigor ; headach is very severe ; several copious but not unnatural stools.

R Antimon. pot-tart. gr. j. ; Aquæ ʒvj., solve ; sumat ʒiss, om. horâ ad 3tiam vicem ; Temporib. admov. hirud xvj.

3d. At half past six o'clock the fever terminated in profuse perspiration ; headach removed by the leeching. He passed a very good night, and this morning is cool and without uneasiness ; tongue clean ; bowels open. Nil.

Vesp. This afternoon headach, without heat of surface or other marked febrile symptoms ; bowels not moved to-day.

R Calomelanos, gr. iv. ; Extr. Colocynth. C. gr. vj. M. ft. pilulæ ij. h. s. s. ; Temporibus admovr. hirud. xij.

4th. Continues without fever ; no headach since the operation of the leeches ; one natural stool ; took three grains of sulphate of bebeerine dissolved in an ounce of water at five, six, seven, eight, nine, and ten o'clock.

6 P. M. After the bebeerine (eighteen grains) fever returned at eleven o'clock. The rigor was slight, and he began to perspire at three o'clock ; skin now cool and moist, and he complains only of headach ; bowels not moved. The fever was less than on any previous occasion. *Rept. hirud. xij. temporib. applic. ; rept. pilulæ h. s. s.*

5th. Headach again removed by the leeches ; complains only of debility ; tongue a little furred ; several stools containing a little slime. Nil.

6th. No fever yesterday ; one stool, a small quantity of slime ; pulse 84. The bebeerine was repeated as on the 4th at four, five, six, seven, eight, nine, ten, and eleven o'clock.

Olei Ricini ℥j. *meridie*.

7th. Escaped fever yesterday after taking twenty-four grains of the bebeerine, which neither affected the head nor the pulse ; pulse 80, soft : bowels open. Nil.

8th. Remains without fever. Nil.

9th. Feels well and wishes to return to duty ; appetite keen ; bowels open.

11th. Well. Discharged.

Febris Inter. Quotidian.—Daniel Murphy, gunner, aged 30 ; five years resident in India ; sanguine temperament ; sober ; of robust health. Admitted at six o'clock A. M. on the 13th May 1844, when he complained of loss of appetite, slight headach, giddiness, thirst and debility, tongue furred, moist, skin cool, pulse natural, bowels by account regular.

States that he had on the 10th, 11th, and 12th paroxysms of intermittent fever, commencing each day at three o'clock in the afternoon, with rigor followed by heat of skin and headach, and terminating in perspiration about six o'clock in the evening ; can assign no cause for the attack.

℞ *Antimon. Potassio-tart.* gr. i. ; *Pulv. Ipecac. rad. contrit.* ℥i. *M. fiat pulv. statim sumend.*

Vespere. Emetic acted well ; paroxysm returned to-day at ten o'clock. There was no rigor, but his face became flushed ; headach increased in severity, and he complains of pain in the back and lower extremities, of thirst, nausea, and great prostration of strength ; skin hot and dry ; pulse 104, full ; took frequently one ounce and a half of the following mixture ; it nauseated him, but has not moved his bowels.

℞ *Mist. camphor.* ℥ix. ; *Antimon. Potassio-tart.* gr. iss. ; *Magnes. Sulph.* ℥vi. *M. ft. Mist.*

℞ *Calomelanos*, gr. vj. ; *Pulv. Jalapæ Co.* ℥ij. *M. ft. pulv. statim sumend.*

14th. The sweating stage commenced at six o'clock P. M. He is this morning cool, feels very little headach ; pulse 78, soft ; bowels were freely moved with the assistance of a purgative enema. Took three grains of sulphate of bebeerine dissolved in an ounce of water at four, five, six, seven, eight, nine, and ten o'clock.

Vesp. Took the twenty-one grains of bebeerine ; it produced no sensible effect either on the pulse or head. Fever returned at three o'clock P. M., but was slight. He is now perspiring ; bowels again moved ; stools feculent. He perspired freely while taking the bebeerine, but that is attributable to the weather, which is intensely warm.

℞ *Massæ pil. Hydrarg.* gr. vj. ; *Ipecac. rad. contrit.* gr. ii. *M. ft. pilulæ ij. h s. s.*

15th. An excellent night ; pulse 78 ; skin cool and moist. Bebeerine repeated as yesterday.

6 P. M. The fever returned at noon. There was more headach than during the previous paroxysms in the hot stage; his pulse was 100; face flushed; conjunctiva injected; perspiration commences; one not unnatural stool. *Rept. pilulæ h. s. ut heri.*

16th. Fever terminated as before in copious perspiration; pulse 84; tongue coated with a white fur, moist; one stool.

Three grains of sulphate of quinine were dissolved in an ounce of water, and given at the same hours as the bebeerine.

6 P. M. Took twenty-one grains of the quinine. There has been no return of fever; weak, but has no particular uneasiness; two natural stools. Nil.

17th. A good night; pulse 80; no symptom of fever.

18th. Convalescence; regains his appetite; bowels open. Four ounces of bread extra.

20th. Continues well; has an excellent appetite; bowels regular. Chicken diet.

23d. Half diet.

24th. Well. Discharged.

Febris Inter. Tertiana.—Mrs Ann Dogherty, aged 28, five years resident in India; of spare habit. Admitted into hospital at 6 o'clock P. M. on the 10th May 1844 in the hot stage of a paroxysm of intermittent fever, which she states commenced with rigor about an hour before admission. She complains of severe headach, pain in the back and lower extremities, of thirst, nausea, and loss of appetite. Skin is hot and dry; pulse 106, full, but compressible; tongue coated with a thick fur, but moist; bowels confined.

By her account had attacks of fever on the 6th and 8th. They commenced at 4 o'clock P. M. and continued for several hours. No cause for the seizure can be assigned.

R. Antim. Potassio-tart. gr. i.; Ipecac. rad. contrit. ʒi. M. ft. pulv. statim sumend.

R. Calomelanos gr. v.; Pulv. Jalapæ comp. ʒi. M. fiat pulv. post horas tres sumendus.

11th. Emetic brought on the sweating stage, she ejected a quantity of greenish fluid; purge has acted several times; headach, thirst, and debility are what she now complains of; skin cool; pulse 84, soft; tongue clean.

R. Antimon. Potassio-tartrat. gr. i; Magnes. Sulph. ʒi; Aqua ʒviij. M. ft. mistura cujus sumat ʒiss. ter in die.

12th. Had no fever yesterday; feels weak and giddy in the erect posture, but in other respects is well; bowels open. 6 P. M. Paroxysm returned at one o'clock, rigor followed by heat and sweating, the latter commencing about half an hour ago. The attack was attended by severe headach and acceleration of the pulse, flushing of the face and urgent thirst; the headach remains. Has taken several doses of the saline mixture, which has produced both an emetic and purgative effect. Stools watery, but contain some healthy feculent matter. *Temporibus admovr. hirud. xvj.*

13th. Headach relieved by leeches; it is not complained of this morning; is weak and scarcely able to stand from giddiness.

14th. Fever expected to-day; one stool yesterday; pulse 64; three grains of sulphate of bebeerine dissolved in an ounce of water were given at 5, 6, 7, 8, 9, 10, and 11 o'clock. 6 P. M. Took twenty-one grains of the bebeerine, the last dose at 11 o'clock, but fever returned at noon. There was no cold stage, the skin suddenly became hot and dry. She complained of headach and thirst, and was restless, bowels not having been moved in the morning, she took during the attack an ounce of castor-oil. Thinks the present attack the mildest; the headach remains. Began to perspire at 5 o'clock; pulse 98; oil has not yet acted.

Rept. hirudines xiv. tempor. applic.

R. Massæ pil. Hydrarg. gr. vi. ; Pulv. Ipecac. gr. ij. M. fiat pilulæ ij. h. s. s.

15th. Headach removed by the leeches; complains only of debility; several brown feculent stools.

Rept. pilulæ h. s. ut heri.

16th. This is the fever day; weak, and does not regain her appetite; bowels open; three grains of the sulphate of quinine were dissolved in an ounce of water and given at the same hours as the bebeerine. 6 P. M. Had a slight attack of fever; it commenced at four and left at five o'clock; tongue still furred but moist; slight deafness from the quinine, but no headach; pulse 96.

Rept. pilulæ c. Pulv. Antimon. c. gr. iv.

17th. Tongue remains furred; thirst; skin cool; no stool since yesterday morning. *Olei. Ricini ʒj.*

18th. Oil operated several times; tongue cleans; quinine repeated as before.

19th. Not the slightest symptom of fever yesterday; weak, but appetite returns. Bowels open.

20th. No return of fever; gains strength.

21st. Chicken diet.

24th. Well. Discharged.

Remarks.—These five cases being ascertained by observation in hospital to be regular uncomplicated intermittent fevers, they were considered favourable for testing the antiperiodic virtue of the sulphate of bebeerine. After the functions of the stomach and bowels had been regulated by an emetic, mild mercurial and aperient medicine, the time of the paroxysm being known, the sulphate of bebeerine was ordered in three grain doses hourly, till from eighteen to twenty-four grains were taken. It was managed so that the last dose was taken immediately before the expected return of the fever. In the two cases that the bebeerine did not prevent the paroxysm, the sulphate of quinine was substituted for the bebeerine, for the purpose of contrasting the effects of the two remedies.

In the cases of Doyle and Fitzpatrick eighteen grains of the sulphate of bebeerine prevented the return of the fever. In that of Lowther, although the same quantity did not have a similar effect, the paroxysm that followed was later in appearing and milder than those that preceded it, and on the next expected recurrence of the fever twenty-four grains were given with perfect success. In these

three cases the antiperiodic power of the bebeerine was fully equal to what I should have expected from the sulphate of quinine similarly administered.

In the case of Murphy twenty-one grains of the bebeerine were insufficient to prevent the coming paroxysm, which, however, was slight and postponed. The same quantity of bebeerine was repeated before the next paroxysm, but contrary to expectation it returned at an earlier hour, and was more severe than the previous one. Quinine was then substituted for the bebeerine, and twenty-one grains similarly administered were followed by recovery.

To the woman Dogherty twenty-one grains of the sulphate of bebeerine were given, without any marked influence on the fever, while the same quantity of quinine, subsequently given, had to be repeated before it prevented the return of the fever.

From these cases I infer that the sulphate of bebeerine possesses considerable antiperiodic power, and although inferior to, it is likely to be a valuable substitute for the sulphate of quinine. The bebeerine neither excited the circulation nor affected the head.

(Signed) J. ANDERSON, M. D. Assist. Surgeon.

(Signed) D. FALCONER, Actg. Supg. Surgeon.
N. S. Force.

Kamptee, 24th May 1844.

The following case, in which bebeerine was tried in a case where the constitution had long suffered from intermittent, was kindly furnished me by my friend Dr Bennett.

Bronchitis ; intermittent fever of thirty-two years' duration ; regular quartan ; enlargement and induration of spleen ; treated by sulphate of Bebeerine.—Alexander Murray, aged 56, admitted November 21st, complaining of dyspnœa and cough, attended with expectoration. On percussion the chest is resonant on both sides. The respiratory murmurs are indistinctly heard over anterior part of chest. Over the sides and back a slight sonorous râle may be heard at the termination of the expiration. The expectoration is copious, composed of muco-purulent matter, loosely connected together in masses. Complains of dyspnœa, which sometimes amounts to orthopnœa. Can only sleep with his shoulders elevated. The dyspnœa comes on in paroxysms, and is induced by exertion, and by an east wind.

The cardiac dulness measures two and a-half inches across. The sounds of the heart are heard most distinctly about two inches below the left nipple. In this situation he complains of pain, which is increased on exertion. A slight rough murmur accompanies the second sound of the heart. Pulse 52, and of good strength.

While percussing in the cardiac region, an intense degree of dulness and sense of resistance were perceptible immediately under the false ribs, external and inferior to the cardiac region. This extended for about four and a-half inches from above downwards, and about three inches from before backwards. On inquiring whether he has ever suffered from ague, it appears that he laboured under that dis-

ease thirty-two years ago, when a soldier in the Peninsula. It attacked him in Madrid, when it was present seven months continuously. Since then he has scarcely ever been free from it.

Complains of pain in the head, *muscæ volitantes*, occasional vertigo, and pains between the shoulders. Tongue furred; appetite good; thirst; bowels have been opened five times yesterday by medicine. His countenance and general aspect present the peculiar dull and haggard character indicative of long suffering from ague. There is no œdema of the lips.

R. *Antim. Tart.* gr. j.; *Spt. Eth. Nitr.* ℥iss.; *Mist. Scillæ* ℥vss.; *Sol. Mur. Morph.* ℥ij. *M. Sumat* ℥j. *quartâ quâque horâ.*

Nov. 22d. Passed a sleepless night, owing to frequent paroxysms of dyspnœa and cough; sputa slightly tinged with blood; mucous râles heard all over chest; complains of great pain of head and vertigo. *Appl. cuc. cruent. et extrahatur sanguis ad ℥xii. pectore dextro.*

25th. Has been much relieved since cupping; the respiration has been more easy; sputa still tinged with blood.

Dec. 3d. Bronchitic symptoms have now nearly disappeared. Last night had an attack of intermittent fever. Says it returns every third night.

Dec. 5th. R. *Sulph. Quinæ* ℥j.; *Pulv. Capsici*, gr. ix. *M. dividantur in chart. iij.*; *cujus capiat unam statim, et repetatur quâque quartâ horâ.*

6th. Took the three powders yesterday before the attack, which was less severe than on former occasions.

8th. Repeat the powders.

9th. The attack last night, notwithstanding the powders of quinine, was much more severe than that of the 6th. There is considerable pain of head and suffusion of the eyes induced by the powders.

12th. Last night had another attack, which was very severe. The quinine powders were purposely omitted, in order that the duration and severity of the attack might be observed. The cold stage and shivering continued three-quarters of an hour, and the sweating was very profuse, and continued for two or three hours.

R. *Bebeerin. Sulph.* gr. v.; *Pulv. Capsici*, gr. iij. *M. ft. pulv. Mitte tales vj.*; *Sumat unum ter in die.*

15th. The attack came on last night, and was of the same length as that noticed at last report. The shivering was not so severe, nor was the sweating so profuse.

23d. R. *Bebeerin. Sulph.* ℥j.; *Pulv. Capsici*, gr. ix. *M. ft. pulv. tales iiii. Capiat unum quâque quartâ horâ.*

24th. In the attack of last night the cold stage was of twenty-five minutes' duration.

27th. Is ordered to take the bebeerine powders, containing five grains each, three times a-day during the interval, and three powders, each containing a scruple, on the day previous to the attack. Last night the cold stage was of twenty minutes' duration, and was much less severe. Considerable cephalalgia.

30th. Last night the cold stage was of sixteen minutes' duration, and the sweating stage was very slight. Still cephalalgia.

Jan. 2d. Last night the cold stage lasted fifteen minutes, and was of much less severity than formerly; cephalalgia more severe; considerable suffusion of the eyes and vertigo.

R *Pil. Col. co. ij. h. s. sumend.*

R *Haust. Cath. ℥iv. cras. mane sumendum.*

5th. Last night the cold stage lasted for thirteen minutes; cephalalgia much diminished. The dose of bebeerine on the day of attack to be diminished to ten grains in each powder.

8th. The cold stage last night was of ten minutes' duration and very slight.

He was permitted to leave the hospital to obtain his pension at Glasgow. He returned on the evening of the 12th in a state of intoxication, and was so disorderly in the porter's lodge that he was sent to the police office, and has not since been heard of.

Copied from Journal of Ward No 2., commencing Nov. 7. 1844.

M. YOUNG, Clerk.

Remarks.—This man entered the hospital complaining of asthma and bronchitis. The pulmonary symptoms were successfully combated by expectorants combined with an antispasmodic, and by local depletion. It is singular that, although he laboured under a very intense form of intermittent fever, he did not complain of it. The enlargement and induration of the spleen, as determined by percussion, led to its discovery. When the bronchitis and dyspnoea had subsided, I treated the ague first by large doses of quinine, which, although they had a slight effect upon the intensity and duration of the attack on one occasion, produced none whatever on being tried a second time. On each of these occasions ℥j. of the sulphate, with nine grains of *Pulv. Capsici*, were given during the twelve hours preceding the attack. I then determined to try the sulphate of bebeerine, but previously watched an attack of the fever, when no drug whatever had been given. On this occasion the shivering was very violent, and the cold stage continued three-quarters of an hour; the hot and sweating stages were prolonged to between two and three hours. Fifteen grains of the bebeerine were given daily during the interval, in three doses, and ℥j. every third day, when the attack was expected. The first attack experienced after this treatment was adopted was of the same duration, but much diminished in severity. In the second attack, the cold stage, instead of lasting 45 minutes, continued only 25 minutes. In the third attack it continued 20; in the fourth, 16; in the fifth, 15; in the sixth, 13; and in the seventh, 8. At this time he left the hospital, and has never returned. I much regret that the spleen was not again percussed before his departure.

The action of the medicine appeared to me in every respect similar to that of quinine. The relative power of each, of course, is only to be ascertained by more extended trial. But so far as their actions as an antiperiodic and as a stimulant are concerned, they appear to me to be identical. The same congestion of the brain

was experienced in the above case after taking ʒj. doses of both drugs. Indeed, from what I have observed of its therapeutic effects in this instance, I have no doubt that bebeerine possesses all the valuable properties of quinine in an equal if not a superior degree.

J. H. BENNETT, M. D.

The cases of fevers treated with bebeerine with which I am acquainted, amount to about 40, and they are all collected in the subjoined tabular statement. It will be seen on inspecting the table, (p. 383,) that bebeerine has been tried in various climates, including Edinburgh, Canada, the West and East Indies, in all the various forms of remittent and intermittent, and at all ages from twelve to seventy-four. In all of them it appears to have manifested more or less of antiperiodic action. In 6 cases, or nearly 1 in 7, it does not seem to have acted satisfactorily. Of 26 cases, the details of which are given, 5 only suffered from any unpleasant effect, and this seems not to have gone beyond a little *tinnitus aurium*. It appears therefore to be entitled to a fair trial, especially in the public services, where alone such cases can be found and properly observed, and where its cheapness, contrasted with the price of quinine, might be matter of importance.

Periodic headach and neuralgias.—Professor Simpson having made pretty extensive trial of bebeerine in Edinburgh, I begged of him to let me know what results he had obtained. These he has embodied in the following letter to me.

22, Albany Street, 30th January 1845.

My Dear Sir,—You must allow me to give you the general impressions which I have derived from observations made upon the use of the bebeerine, as I have little time to enter into particulars. You know that Piorry and others have somewhat frightened us accoucheurs from employing quinine during pregnancy, alleging, as they do, that it is apt to produce abortion or premature labour. Nor is arsenic a medicine which one would choose to exhibit to a pregnant female. Though thus deprived of the advantages to be derived from the use of these two potent remedies in periodic neuralgias, still, as you well know, such neuralgias are far from being uncommon during utero-gestation.

Latterly I have used your sulphate of bebeerine in some instances of this kind, and, as it has appeared both to me and to my patients, with the most perfect and satisfactory success. I prescribed it about a couple of months ago to a lady who had one of the most severe attacks of forehead and face neuralgia that I remember to have seen. It came on towards noon, and kept her in blindness and agony for some time. The ordinary medical attendant on the family had leeches her, &c. without relief. I advised the bebeerine to be given in two grain pills repeatedly during the interval between the paroxysms. As the medicine seemed to have no effect I gradually in-

TABULAR VIEW OF INTERMITTENT AND REMITTENT FEVERS TREATED WITH BEBEERINE.

No.	Case.	Sex.	Age.	By whom Treated.	Where.	Form of Disease.	Duration in days.	Quant. Bebeerine.	Remarks.
1	Mr C.	M.	27	Dr Douglas MacLagan	Edin.	Tertian	5	...	First dose vomited when bowels loaded.
2	...	M.	25	Do.	Do.	Do.	...	40	No unpleasant effects.
3	J. P.	M.	74	Do.	Do.	Do.?	7	45	Do.
4	J. M.	F.	...	Dr Watt	Demerara	...	...	...	Quinine and arsenic had failed.
5	M. de J.	F.	38	Do.	Do.	Tertian	No recur.	20	Caused tinnitus aurium.
6	G. J.	F.	21	Do.	Do.	Do.	4	80	Caused some tinnitus.
7	D. F.	M.	25	Do.	Do.	Do.	4	40	Affected ears much.
8	J. G.	M.	20	Do.	Do.	Do.	3	45	No unpleasant effects.
9	J. F.	M.	22	Dr P. W. MacLagan	Canada	Yellow Fever	13	10 gr. dos.	Disliked from nauseous taste.
10-14	...	...	...	Dr Blair	Demerara	...	...	...	Quinine had failed.
15	J. P.	F.	38	Dr Rodie	Do.	...	...	...	No unpleasant effects.
16	M. de J.	F.	40	Dr Watt	Do.	Quotidian	4	60	No unpleasant effects.
17	J. da B.	M.	...	Do.	Do.	Tertian	3	48	No affection of head.
18	Julio	M.	12	Do.	Do.	Quotidian	9	60	Complicated with affection of spleen; no bad effects.
19	W. C.	M.	20	Do.	Do.	Tertian	...	...	Notes of the case lost by Dr Watt.
20	W. C.	M.	20	Do.	Do.	Bilious Remit.	14	84	Relapse from error in diet; no bad effects.
21	A. M.	M.	56	Do.	Do.	Quotidian	4	40	No unpleasant effects.
22	J. T.	M.	25	Dr Bennett,	Ed. Infr.	Tertian	30	240	Head seemed affected by large doses.
23	J. B.	M.	21	Dr Dempster, 21st Regt.	India	Quotidian	5	25	No unpleasant effects.
24	J. A.	M.	23	Do.	Do.	Remittent	6	45	Do.
25	J. J.	M.	23	Do.	Do.	Do.	3	90	Do.
26	J. M.	M.	26	Do.	Do.	Quotidian	9	120	Do.
27	J. R.	M.	24	Do.	Do.	Do.	16	120	Complicated with hepatitis; no bad effects.
28	V.	M.	24	Do.	Do.	Feb. cont. com.	23	240?	No bad effects. Quinine substit. when bebeerine exhausted.
29	S.	M.	34	Dr Dorward 13th N. I.	Do.	Remittent	15	80	Head appeared affected; patient delirious at the time.
30	R.	M.	50	Do.	Do.	Do.	13	70	No unpleasant effects.
31	T. G. D.	M.	30	Do.	Do.	Quotidian	6	40	Do.
32	P. F.	M.	30	Dr Anderson, 3 Batt. A.	Do.	Do.	6	18	Do.
33	C. L.	M.	29	Do.	Do.	Tertian	7	18	Do.
34	D. M.	M.	30	Do.	Do.	Do.	12	42	Do.
35	A. D.	F.	28	Do.	Do.	Quotidian	11	42	Not effectual; quinine substituted with success.
36-40	4 cases?	...	...	Dr Godfrey, Bellary	Do.	Tertian	14	21	Do.
					Do.	...	...	...	Not satisfactory.

creased it, till on the third day she took about half a drachm of the sulphate during the fourteen or sixteen hours' intermission. To tell you the truth I was beginning to despair of seeing the sufferings of my patient in any way relieved by it, and would have changed it for some other remedy next day, but such change was not required, as, after the large dose I have mentioned, the usual fit was greatly less in severity, and in a day or two entirely disappeared. Of her own accord my patient fell back upon the bebeerine pills some time afterwards, when the neuralgia was again threatened, and it again speedily disappeared.

Last year I saw a similar case of periodic tic in the face in a lady far advanced in pregnancy. The disease was by no means so severe as in the instance I have already mentioned, but still it was sufficiently annoying. It yielded rapidly when the patient was using the sulphate of bebeerine alone.

I have a lady at present under my care, who, after miscarrying twice in the country, has been suffering from distressing pains in the face, shoulder, and other parts of the body. Before I saw her she had been put on the use of guaiacum, colchicum, &c. under the supposition that the pains were rheumatic. They occur with a kind of irregular periodicity. The patient at the same time suffers from menorrhagia. Quinine, arsenic, &c. have failed to relieve her. Latterly, I placed her upon the use of the sulphate of bebeerine, and at my last visit she stoutly declared that she had derived far more benefit from this medicine than from any others that I had previously prescribed for her. The pains have returned as usual, but are much less severe in their character, and manifestly diminishing in intensity.

During the last year I have seen two or three cases in which ladies, during their puerperal convalescence, have suffered from slight periodic attacks of chilliness, heat, &c., resembling fits of imperfect ague. In one of them the attacks were of a tertian type, and yielded at last to the use of bark. In another, in which the fits of rigor have been more irregular, after in vain trying quinine, arsenic, zinc, &c., the patient has appeared to get more relief, and the disease to be more checked by the bebeerine than by any other form of drug I had used. Both of the two ladies I allude to had, within the last two years, lived abroad in climates where they might have been exposed to marsh miasma.

I have a patient from India, where she had suffered from ague, and whose stomach seems always to rebel against quinine. Since coming to Edinburgh she has had repeatedly a recurrence of aguish symptoms, and has taken the sulphate of bebeerine for them without feeling those symptoms of gastric irritation and headach which the quinine seems to inflict upon her.

In other cases where I have employed the bebeerine, either as antiperiodic or as a tonic, it has appeared to me to have caused far less of those irritating and stimulant effects which we see in some constitutions to be produced by the use of quinine.

If these remarks can be of any use to you they are very heartily at your service.—Yours very truly,

J. Y. SIMPSON.

For the following case I am indebted to my friend, Dr Macfarlan of Charlotte Square, who requested me to see the patient along with him, in consequence of my having in casual conversation with him suggested a trial of the bebeerine.

Case of Intermittent Neuralgia.—A lady, now in her 48th year, was first attacked with supra-orbital tic about sixteen years ago while nursing her fifth child. The attack came on in November and during the prevalent cold north-easterly winds. The suffering was most intense and lasted generally about two hours, coming on about four or five in the afternoon, and on this occasion continuing only for a fortnight, and seeming to yield to Huxham's tincture of bark and generous diet. The disease returned next May, but not in a very severe form. The following spring, however, the powers of the constitution having been much exhausted by anxiety, and the long-continued nursing of a sixth child, whose system had been drained by the depletion necessary to remove a violent bronchitic attack, it came on in a very aggravated form; the pain of forehead agonizing in the extreme; the paroxysm lasting for many hours, and generally ushered in with a chilly fit, and gradually declining under the use of quinine, large quantities of wine, brandy, and animal food during the intermission: the powers of the digestive organs seeming to suffer no diminution by the derangement in the nerves of sensation. These attacks continued to recur with pretty much the same train of symptoms every spring for several years during the prevalence of our easterly winds. Change of air, generally to a sheltered nook in Stirlingshire, proved decidedly beneficial when it could be had recourse to. In 1842, however, the system was considerably enfeebled by her attendance on several members of her family, who required her care on account of scarlatina, &c. In the month of March of that year; and on the approach of east wind in April, the disease set in with great severity and continued longer than usual. Quinine was given to the extent of twenty grains a-day, but not without producing the many unpleasant feelings which generally accompany its use in large and long-continued doses, such as ringing in the ears, derangement of the digestive functions, and a severe febrile state of system. A removal to Stirlingshire, as usual, was followed by a very decided improvement, although the debility on setting out was so great as to make her medical attendant almost dread the risk of removal. 1843 also had its spring of suffering from the disease, and from its antidote. In 1844, by the kind advice of Dr D. MacLagan, she substituted the sulphate of bebeerine for that of quinine, and for weeks took the former in the shape of pill, commencing early in the morning, so as to anticipate the attack, with a dose of gr. iij. repeated every hour or two till she

had taken daily for four or five days as much as gr. xv. ; and at an average for a fortnight gr. xi. a-day. Under this plan the symptoms gradually subsided, or rather never attained to the same degree of severity as in former seasons. I am quite aware that we are not entitled, from a single instance, to infer the superiority of bebeerine to quinine as an antiperiodic in all cases ; but I am very certain that the same quantity of quinine taken by the same individual would have produced very disagreeable effects on the general state and feelings of the patient ; and consequently that in her case the new drug proved a very valuable addition to our *materia medica*.

The following is an extract from a letter to me from Dr Johnston of Berwick-on-Tweed in reply to some inquiries which I addressed to him regarding a case where I understood the bebeerine had been employed. "Mrs D. is not a patient of mine, but I know her well enough. She has suffered of late from several attacks of tic in the face, which have lasted for two or three weeks at a time. She cannot take quinine, for it makes her feverish and nervously irritable, and this always whenever she has tried the remedy. In her last attack, which was about three weeks since, her husband gave her the bebeerine in the same doses that he would have given quinine, and it soon relieved the pain, nor has she had any return of it. She continued the bebeerine for some time, and it produced no inconvenience."

The above cases convey to my mind very good evidence of the powers of bebeerine as a remedial agent. I have confined myself to the testimony in favour of its antiperiodic virtues as communicated to me by others whose ideas cannot be supposed in any way to be biased in its favour, and I have given the cases at full length, that the grounds on which my opinion is founded may be patent to the profession. Of its qualities as a general tonic I am satisfied from repeated trials ; but this is a point of view in which it is not capable of being so precisely observed as in its use in periodic diseases.

The success attending a secret preparation called Warburg's drops, which I regarded as a preparation of bebeerine, cannot, as I formerly thought, be adduced as evidence in its favour ; for I find from a note appended to an abstract of my paper in Buchner's *Repertorium*, (New Series, vol. xxxv. part 3d,) that Buchner and Winckler have detected quinine in this nostrum. I find however, that Winckler agrees with me in believing that bebeerine enters into its composition.

I formerly expressed my opinion that bebeerine differs from quinine in not being so liable to excite the circulation, or affect the nervous system ; and this seems to be borne out by the above

reports, especially those of the neuralgic cases; and it has been found useful by others as well as by myself in other cases where excitant action would be hurtful, as in cases of phthisis accompanied by atonic dyspepsia.

With regard to the mode of administration of bebeerine, I have commonly given it in pill with conserve of roses, in the same way and the same doses as quinine. It can also be readily given in the liquid form, the addition of a few drops of diluted sulphuric acid sufficing to form with it a perfect solution.

129, *George Street, Edinburgh,*
February 14th 1845.

It is important to note that the reaction between the two substances is not a simple one, but involves a complex series of steps. The first step is the formation of a complex between the two substances, which is then followed by a series of rearrangements and eliminations. The final product is a complex molecule which is stable under the conditions of the reaction.

120. George S. Smith, Baltimore.
February 14, 1895.