The inconvenience produced by this "dragging" upon the intestine is altogether obviated by the operation now under consideration. The hæmorrhoid may be removed, if necessary, without even being protruded through the external opening. The pain and irritation caused by leaving the ligature upon the part to be removed is also dispensed with.

2. Although the ordinary operation for hæmorrhoidal tumours is reckoned safe, yet instances every now and then occur in which very severe and even fatal effects follow. Sir B. Brodie mentions having, in his own very large experience, had three fatal cases. I have myself had the opportunity of dissecting the parts after a fatal result in three other instances where the operation had been performed by the most able and cautious surgeons of the day. In two of these instances, secondary deposits had occurred in internal organs, and in the third there were symptoms of blood poisoning during life, and an open vein of some size was found after death, leading directly from the wound caused by the operation. When the base of a hæmorrhoidal tumour is transfixed with a needle, any large vein which it may happen to contain is necessarily liable to be wounded; and if, after this is done, each half of the tumour is included in a separate ligature, it is extremely likely that the sides of such a vessel would be held open. This circumstance, in the subsequent stages of the complaint, would, as far as it goes, directly favour the absorption into the circulation of the inflammatory products of the part. If, on the other hand, the whole of a hæmorrhoidal tumour is included in a ligature, there is a possibility that it may not be completely strangulated. The outer parts of the tumour may slough, while a languid and partial circulation is continued in a conical portion in its centre. The blood which there circulates through tissues on the verge of mortification, but which have not entirely lost their vitality, may become infected by the products of decomposition with which it comes in contact, and may thus, being again received into the circulation, become the source of general disorder in the system. This point is well illustrated by cases in which a ligature has been applied to portions of the tongue. It has been found that, as ulceration occurred in those parts directly subjected to pressure, the ligature has gradually become loosened. The circulation has then again in some measure been restored in the centre of the ligatured part, and this has been followed by symptoms of general constitutional disturbance.

After the application of a ligature to a large tumour in any part of the body, such a partial restoration of circulation may take place. There is no distinct and immediate line of demarcation drawn between the living parts and the dead; and it may be left to accidental causes to determine how much of the tumour will recover its vitality, and how much of it will perish.

That a general contamination of the blood, from some cause or other, occurred in the three cases above referred to, that I had myself an opportunity of examining, I cannot doubt; and I believe that this source of danger would be entirely prevented by performing the operation in the manner which has now been described. The application of the actual cautery, while it prevents any blood flowing from the divided vessels, also prevents any vitiated fluids passing through them into the general circulation.

3. After the application of a ligature to a portion of mucous membrane, a process of ulceration is commenced, and continues until the ligature separates. During this period, no process of repair can be commenced. No two actions, as Hunter has so well said, can go on in the same part at the same time. While the part is undergoing ulceration produced by the presence of the ligature, no attempt at reparation can take place. At the time the ligature falls off, the surgeon will often be surprised, if he happens to see the part, at the size of the wound which is left. By the process of ulceration, it is rendered much larger than it would have been by the simple removal of the hæmorrhoidal tumour.

After excision of the tumour, and the application of the actual cautery, no cause of irritation remains. The opera-

tion is complete, and the process of repair at once commences. The wounds, when seen on the following days, always appear smaller than the portions of mucous membrane which have been removed. The object of the application of the cautery, it is to be remembered, is not to destroy any depth of structure, which would be in itself a somewhat prolonged and painful operation, but simply to seal the divided vessels, which, in this operation, afford the only cause for anxiety. The superficial slough, which is made for this purpose, is very soon thrown off; a clear and definite line is at once drawn between the parts destroyed or removed, and those which it is intended to leave; and there is nothing to prevent the process of cicatrisation from commencing immediately.

It is not necessary in the operation now described to include all the diseased or protruded membrane. The removal of some portions exerts its beneficial influence on that which is left. The same observations apply in this respect to the removal of a portion of mucous membrane by excision, as to its destruction by the application of the strong nitric acid. In both cases, the permanent benefit is produced during the process of cicatrisation.

I have only, in conclusion, to remark that, as the subject of piles generally is far too extensive to be considered in a single paper, I have purposely confined my observations at present to the surgical treatment of these affections.

Dover Street, Piccadilly, February 1854.

CLINICAL NOTES ON CHOLERA.

By W. LAUDER LINDSAY, M.D., late Resident Physician of the Surgeons' Square Cholera Hospital, Edinburgh.

In the following rough "Clinical Notes", I do not propose to present a series of elaborate articles on the etiology, symptomatology, or pathology of cholera, but merely a few random and crude thoughts on various points, especially regarding the pathology of the disease, which fell more particularly under my own observation, while resident physician of the Surgeons' Square Cholera Hospital of Edinburgh, during the past winter, and which appeared to me of sufficient importance to be worthy of reconsideration by medical observers. The epidemic in Edinburgh and Leith this season has been very limited in extent, consisting, however, of a due proportion of isolated and grouped cases: the absolute number of seizures has been small, but the relative mortality has been as high as in former years, varying from one-half to two-thirds of the cases which came under my own charge. The paucity of the cases was, however, exceedingly favourable to the calm and deliberate study of the disease: hence, for a period of three months, I was wholly and constantly engrossed in the hospital above mentioned, in a series of histological and chemical examinations of the cholera evacuations, and in investigating other points connected with the natural history of the disease. The cases admitted into hospital were, as usually happens, the most severe and advanced, occurring among the poorest class of the inhabitants, and from the filthiest and worst ventilated parts of the town. They were chiefly in the stage of collapse, and generally beyond the power of curative treatment. One case died within three hours after admission; and others within periods varying from twelve hours to three days. About an equal number died in collapse, and in the "consecutive" fever.* Of all the fatal cases careful *post mortem* examinations were made; so that I had full opportunity of studying the symptomatology and pathology of the disease connectedly. I shall not here enter on the subject of the type or character of the disease, as it occurred in Edinburgh: this, and other similar questions, will fall to be considered hereafter. Throwing aside any systematic arrangement of my subject as fettersome and

* I use the term "consecutive fever", not because I believe in the existence of a separate febrile state, which follows the collapse of cholera, but only as the usual name for the most frequent termination of the disease.

unnecessary, I shall consider briefly the following points, *inter alia*, in the order of their importance:—

I. THE PRESENCE OF BILE IN THE CHOLERA EVACUATIONS.
II. THE HISTOLOGY AND CHEMISTRY OF THE CHOLERA EVACUATIONS.

III. THE PATHOLOGY OF CHOLERA.

IV. THE TYPE OF THE DISEASE IN EDINBURGH AND LEITH, AS ILLUSTRATED BY ITS SYMPTOMS AND TREATMENT.

V. ITS ETIOLOGY, AND SANITARY DEDUCTIONS THEREFROM.

Be it always kept in view that, throughout my remarks, I speak (unless when it is otherwise stated) from personal experience of the disease, as it occurred in Edinburgh in the winter of 1853.

I. PRESENCE OF BILE IN THE CHOLERA EVACUATIONS.

If there is one fact regarding the pathology of cholera which can be said to have been generally accepted by the profession, and by the world, as fixed and true, it is the absence of bile from the so-called "rice water" or "serous" evacuations, which characterise the disease. This appears universally, throughout the literature of cholera, to have been admitted as a truth: for, having been originally laid down as such in the earlier works on cholera, which, in consequence of the very slow progress of our knowledge of this disease, still maintain a distinguished place in medical literature,—the statement that there is a total deficiency of bile in the "rice water" stools has been blindly handed down as fact in all subsequent writings on the subject. Notwithstanding the vast extent of cholera literature, and notwithstanding that cholera, since 1832, has formed a fertile subject for the *cacoëthes scribendi* of professional and non-professional writers in all parts of the civilised world,—a subject which has demanded and exhausted all our known means of research,—our knowledge of its essence is still almost *nil*. The literature of cholera is a painful instance of the fact that medical authors of late years have been in the habit of writing more for the love of fame, than for the love of truth; they have been more prone to theorise on erroneous and supposititious data, than dispassionately to sift the accuracy of those data, and apply themselves patiently and unostentatiously to the mere observation of facts. By the latter means alone can we ever hope to arrive at scientifically true and practically useful views of cholera, or of any similar subject. The result of this unfortunate tendency among authors is, that many statements regarding the history of cholera, which have been generally hitherto received by the profession as correct and trustworthy, are erroneous; and one of these I believe to be the supposed fact that the "rice water" evacuations are destitute of bile.

The evidence on which I am led to believe, not only that bile is present in *all* the choleraic dejections; but that it is peculiarly *healthy* in cholera, is both direct [*i.e.*, chemical] and indirect [corroborative], founded on the results of a series of experiments conducted with the special object of investigating the accuracy of a fact which I doubted. This conclusion may *a priori* appear startling; but it will cease to be so, when we consider that the seizure of cholera is generally very sudden; that it frequently supervenes more or less immediately after a meal, when the digestive functions are in a state of high activity, and when therefore we should expect a copious secretion and expulsion of bile, proportionate to the stimulus of the food; and that the persons attacked may often be said to be in the full enjoyment of health, and to be comparatively free from acute or chronic disease of any kind. These two statements, however, first, with regard to the presence of bile, and secondly, with regard to its comparatively healthy character, may not be fully borne out by the experience of others, though I consider them strongly supported by my own. Still, I shall sufficiently gain the object of this communication, if, instead of proving them to be beyond doubt true, I can merely awaken attention to the necessity of investigating this subject more thoroughly than has been hitherto done.

Those who have been accustomed to make chemical examinations of cholera evacuations, are sufficiently aware of

the fact that the fluid part of the "rice water"* stools, especially of those first passed after the superintention of collapse, exhibits on the addition of nitric acid after the application of heat, in the majority of cases, more or less of a pinkish-red colour. It has long been doubted whether this reaction is indicative of the presence of bile in any morbid state, in which we know it, or do not know it, to exist, many denying *in toto* the possibility of its being biliary under any circumstances. I shall immediately attempt to prove that it is *undoubtedly biliary*. Latterly, Simon and others have declared that this reaction depends on the presence of *modified bile*; but the fact is yet so far from being generally recognised by medical men, that I think it demands greater publicity. Dr. W. T. Gairdner, of Edinburgh, with whose views on the pathology of cholera I more nearly coincide than with those of any author whose writings I have seen, threw out a hint in a paper on the "Pathology of Cholera", in the *Edinburgh Monthly Medical Journal* for 1848-9—judging from the distended condition of the gall-bladder, and the colour and consistence of the bile, in deaths from cholera—that this substance did not appear to be in any way vitiated or diminished in quantity. I quite agree with him in considering "the assertion that the bile is *suppressed* is obviously incorrect; and it is only wonderful that this idea has not met with more positive discouragement by pathological writers." Professor Parkes of London, as if following out this hint, soon after published, in the same periodical, a short note on the subject, and attempted to prove the presence of bile in the cholera stools and urine, on what I am compelled to consider insufficient and partly erroneous grounds; at least, my experiments lead to different conclusions, and oblige me to consider the subject in a different point of view. He mentions as the chief grounds which formerly led him and others to doubt the biliary nature of the reaction in question, that—

"1. The usual green reaction of nitric acid with bile—depending on the presence of *biliphæin*—is *always absent* in the 'rice water' stools.

"2. We have no evidence that bile, either in its pure state, as taken from the gall-bladder, or as it occurs in stools, healthy or diseased, can give a *pink* reaction with heat and nitric acid, similar to that yielded by the 'rice water' stools; and

"3. This reaction (the pink) exactly resembles that given by some kinds of urine under similar circumstances, depending on its colouring matter, which is not usually supposed derived from the bile."

Let me analyse shortly these several statements. It does not accord with my experience that the green reaction with nitric acid, aided or not by heat, previously or subsequently applied, and indicative of the presence of biliphæin, is *always absent* in the *rice* stools. Far from it: I have frequently noticed it, and in *every stage* of the disease. The action of nitric acid on the serous stools is to a certain extent variable:† if the specimen under examination is comparatively fresh and the collapse recent, the most frequent reaction is certainly pink; but it sometimes also presents various shades of orange, red, brown, or greenish-yellow.‡ In the later stools of the collapse stage, and in those passed during the reaction and consecutive fever, the latter tints are more common, while the pink is comparatively rare. But I believe all these colours to be to a certain extent transmutable, and dependent on the presence of the same substance, *viz.*, bile. The pink and red tints I found convertible in most instances, by excess of acid and prolongation of heat, into

* I do not employ the words "rice water" or "serous" as implying any resemblance which I can trace, or any theory in which I believe, but merely as the terms in common use to designate the dejections so characteristic of cholera.

† In applying the heat and nitric acid test to the detection of bile in the cholera stools, I have been in the habit first of using a moderate heat, as in testing for albumen, and subsequently adding the acid cautiously and *guttatim*.

‡ The denomination of this colour is perhaps too arbitrary. In many cases, it ought more properly to be called "yellowish-green", or "green". But, as in the majority of instances, the blue and yellow tints are so blended, that the latter predominates, I have, for convenience sake, designated the compound colour so resulting "greenish-yellow".

green, or more properly greenish yellow, but never *vice versa*. So that a green colour seems to be the natural and ultimate result of the action of nitric acid on cholera stools, while the other tints are mere temporary modifications, depending on circumstances with which we are not yet fully acquainted. I frequently found that, while the serous stools gave a pink reaction when fresh, if laid aside for a few days and again tested, they gave an orange, and perhaps subsequently a greenish-yellow; and the same variability of reaction was noticed in the stools of the same patient on different days, and even sometimes at different periods of the same day. Occasionally heat and nitric acid failed to produce any change of colour at first; but, on allowing the fluid to stand for several hours or days, there was always, sooner or later, developed either a greenish or reddish tint. Sometimes an orange, red, or brown colour was converted by the further addition of acid and application of heat, into a deep pink, which again speedily passed through purple into greenish yellow; indeed the orange, red, and pink colours were always readily and mutually convertible. The depth and stability of this pink colour is proportionate to the freshness of the specimen of the rice watery matter examined, and the early period of the collapse at which it has been evacuated by the patient: it has also probably some relation to the severity of the disease, the previous state of the patient's constitution, etc. The condition of the bile, or of the serous contents of the intestines, on which this reaction depends, must be temporary, remaining only a few days, and gradually disappearing from the moment that the fluid is ejected; for, on allowing the "rice water" stools to stand a few days, we find less and less of a pinkish tint produced on the application of heat and addition of nitric acid, but, instead of it, various shades and combinations of red, brown, yellow, and green. This property of giving a pink colour is also destroyed, as I have already stated, by excess of acid, prolongation of heat, or by both combined. When no distinct reaction of any kind was produced by heat and nitric acid, I found sometimes a faint pink developed by sulphuric acid and sugar, [Pettenkoffer's test] or by muriatic acid. The presence of bile has also been doubted on the ground of the non-exhibition of the usual reaction of bile with Pettenkoffer's test. This objection I cannot consider valid; for, so far as my experience goes, this test is very variable and unsatisfactory. I have found it fail to give any reaction with pure diluted bile itself.

I cannot at all enter on the question, what peculiar condition of the bile, or of the fluid in which it is diffused, causes the variety of reactions just mentioned: this is a subject on which the chemist alone is competent to decide. Various theories certainly have been adduced in explanation, but what amount of credence we ought to place in them must be a mere matter of opinion. Simon supposes that the bile-pigment exists in these collapse stools in an oxidised condition, or that some other constituent of the bile is present in excess, while there is a deficit in the proportion of the bile-pigment proper. This is obviously, however, mere theory.

In the course of examinations of the matters vomited in cholera, I have seen the same pink colour produced by similar means, where the ejecta had an undoubtedly biliary tinge, i.e. a distinct grass-green colour. The colour of the ejected matter varied greatly in different individuals, and even in the same individual, at different periods of the same day. During the course of twenty-four hours, it was no unusual thing for one patient to vomit fluids of different shades of green, brown, red, pink, and blackish gray. A pinkish red was the commonest tint; the next, in point of frequency, being grass green. A green coloured vomit frequently gave a pinkish reaction with heat and nitric acid; while a brown, red, or pinkish, gave a green. The case was sometimes, however, reversed: and I could observe no fixed relation between the tint developed by heat and acid, and the colour or other character of the fluid vomited. A greenish, brownish, reddish, or pinkish tint, was often indiscriminately produced, whether the colour of the matter tested was green, red, brown, or gray. I believe all these

colours of the fluids vomited to be *biliary* in their origin, because:—

1. The matters vomited, even by the same patient, were differently coloured at different times. These colours appeared to be substituted indiscriminately one for another: they passed insensibly into each other; they were vomited at periods when the stomach contained neither medicines nor food to affect their colour. One of the commonest tints was a grass green, which is well known to be the usual colour of unaltered bile.

2. In many instances, these matters gave, with heat and nitric acid, or the latter alone, a grass-green colour, which is universally admitted by chemists to be indicative of the presence of healthy bile. Where this reaction was not produced, a pink, red, or brown colour was substituted; capable of conversion, however, into the green, by allowing the fluid to stand for various periods, by re-applying or prolonging heat, or by adding an excess of acid. These reactions were thus transmutable, and graduated into each other.

3. We should *a priori* expect bile to be present—and in large quantity, too—in the matters vomited in cholera, when we consider the extreme probability that the duodenum and bile-ducts participate in the inverted spasmodic action of the stomach during the violent retching, which is so common a concomitant of the collapse stage of the disease.

Granting these facts to be true, it follows that what I have said of, and deduced from, the reaction of the cholera vomit, applies equally to the cholera stools, both in collapse and in fever; and that the presence of bile in absolute abundance in the vomit, and in relative or comparative abundance in the stools, is easily and satisfactorily proved. In future experiments on this subject, it appears to me important that the vomit should be carefully examined contemporaneously with the stools, being convinced that the investigation of the chemico-pathology of the former will greatly elucidate that of the latter.

I shall illustrate the facts which I have just narrated, by abstracts of the history of several cases that fell under my charge.

CASE I. Mary Robertson, aged 37;—admitted in deep collapse;—passed through all the phases of the disease, and completely recovered in a fortnight. The fluid portion of the "rice water" stools, passed in the collapse stage,—which was alkaline, odourless, whey-like in colour and consistence, and of specific gravity 1010,—gave, with heat and nitric acid, a pale pink colour.

CASE II. Hutchison Hodge, aged 44;—died about eight hours after admission, in collapse. The rice water stools were of a light greenish-yellow colour, alkaline, of specific gravity 1008. With heat and acid, no pink or reddish tint was produced; but the greenish-yellow was very slightly increased.

CASE III. Isabella Monteith, aged 55. Premonitory symptoms very insidious: collapse mild: consecutive fever very typhoid. Died three days after seizure, in the fever stage. The reaction and fever stools resembled thin pea soup in colour and consistence, were alkaline, foetid, and of specific gravity 1011. When filtered, they gave, with heat and acid, a deep orange-red colour. Here the stools had a distinct biliary tinge.

CASE IV. John Williamson, aged 34. Premonitory diarrhoea of a week's standing: collapse mild: consecutive fever protracted, but comparatively mild. Discharged, able for work, about three weeks after admission. Three children and his wife were seized immediately after himself. One child died; the others recovered. The reaction and fever stools were likewise of a pea-soup character, alkaline, foetid, and of specific gravity varying from 1005 to 1012. With heat and acid, after filtration, they gave a reddish orange colour.

CASE V. Alison Williamson, aged 7½. Seizure sudden: collapse very severe: reaction rapid and well marked: fever severe and protracted. During the course of the latter, there was a secondary but sthenic fever, accompanying the evolution of an urticario-rubeoloid eruption. Discharged,

well, a fortnight after admission. The collapse stools had the usual characters of the "rice water" evacuations, and gave a *pinkish-orange* tint with heat and acid. With acid alone, the *pink* colour was very slowly developed. The reaction and fever stools had a distinctly biliary tinge, resembling pea soup. With heat and acid, they gave a deep *orange-red* tint.

CASE VI. Alexander Fraser, aged 48. Premonitory diarrhoea of several days' duration: collapse not producing complete prostration, patient having, in this stage, walked to hospital, with some assistance: reaction ill-marked: fever very typhoid in character, chiefly marked by constant but slight hiccough. Died, in the fever stage, seven days after admission. The reaction and fever stools were of pea-soup character, albuminous, alkaline, foetid, and of specific gravity 1012: they gave, with heat and acid, no pinkish tint, but an *orange-red*. The reaction vomit was of a deep chocolate colour, acid, of low specific gravity, and devoid of odour: contained a quantity of epithelium scales, entire or atrophied in various degrees, and *sarcina ventriculi*. With acid and heat, it gave a *greenish-yellow* colour. The contents of the stomach, removed after death, were of a brownish-green colour. With acid, aided or not by heat, a fine chocolate colour was produced. After being boiled and filtered, with heat and acid, they still gave a reddish-brown tint, which rapidly passed into a greenish-brownish-yellow on agitation. Heat and muriatic acid developed a *pinkish* tinge. The contents of the intestines,—also removed at the *post mortem* examination,—which were mixed with a considerable quantity of mucus and mucous membrane, more or less disintegrated, gave, with heat and acid, an *orange red*.

CASE VII. Isabella Williamson, aged 28. Premonitory symptoms slight: collapse intense, marked by incessant vomiting for nearly two days: fever severe and tedious, marked by considerable delirium and semi-coma. Discharged, well, in a fortnight after admission. The collapse stools [rice watery] were alkaline, albuminous, odourless, and of specific gravity about 1010-1015: they uniformly gave a *greenish-yellow* colour with heat and acid, without any trace of a pink. With acid alone, however, the earlier stools particularly, on standing, slowly developed a pinkish tint, which, on the application of a very slight degree of heat, was immediately converted into a greenish-yellow. Here the biliary nature of both reactions seems to be easily proved. Heat and muriatic acid caused the development of the same pink colour; which, however, was not convertible into greenish-yellow by the re-application of heat, or the further addition of acid. The earlier fever stools were semifluid, of a dark brown colour, foetid, and alkaline. With heat and acid, they gave a deep *orange-red* tint; with acid alone, a pinkish-red was slowly developed. The later fever stools had a still more distinct and deep biliary tinge, being loam-coloured, and having the consistence of gruel. They were very foetid. When filtered, they gave an intense *blood-red* colour with heat and acid; and, with acid alone, a dull *brownish-red*. The collapse vomit was chiefly of a light brownish tint, frequently resembling *café au lait*, acid, odourless, and of low specific gravity. With heat and acid, it gave a *greenish-yellow* tint.

CASE VIII. Ann Simpson, aged 40. Seizure sudden: collapse very severe, marked by constant cramps of the lower extremities. Died, in the collapse stage, about nineteen hours after admission. The collapse stools, which had the ordinary appearance of "rice water" evacuations, were alkaline, albuminous, and of low specific gravity: gave merely a trace of *pink* with heat and acid. In the later stools, no appreciable change of colour was at first detectable. The matters vomited were all acid, albuminous, and of low density, having various shades of light brown, light yellow, light brownish-yellow, pinkish, lead-gray, and whey colour. All of them gave a faintish *pink* with heat and acid. The contents of the intestines, removed after death, had a purplish colour, from intermixture with blood, were alkaline, albuminous, and of specific gravity 1015. With heat and acid, they gave a *pink* colour, which speedily passed into a brownish-yellow.

CASE IX. Margaret Feeny, aged 40. Seizure sudden: collapse severe: reaction well marked and promising: fever of a low typhoid type. Died, two days after admission, in the fever stage. The collapse stools [rice watery] were alkaline, albuminous, and of specific gravity 1010. With heat and acid, they gave no reaction at first: on standing some time, a greenish-yellow was slowly developed. The same stools, filtered and tested a day after being evacuated by the patient, gave a deep *greenish-yellow*. The reaction stools, characterised by the sediment being brown and "branny", or "linseed-meal" like in appearance, and the supernatant fluid more of a brown tint, gave a *pinkish-red* with acid, whether aided or not by heat. Subsequently, when the stools were beginning to acquire a more distinctly biliary tinge, they gave an *orange-red* colour, quickly passing into greenish-yellow. The collapse vomit had a brownish tint, was alkaline and albuminous, and of low density: with heat and acid, it gave a greenish-yellow. The stools and vomit were again tested, five days after the *post mortem* examination: they both gave a pinkish-red, which became greenish-yellow on increasing, prolonging, or re-applying heat, and adding excess of acid. The bile—removed after death from the gall-bladder—appeared quite healthy, and exhibited its ordinary reactions with nitric acid. Portions of the duodenum and jejunum were deeply stained with bile, especially the *valvula conniventes* and Peyer's patches. The contents of the large and small intestines were alkaline, albuminous, foetid, and of specific gravity 1010-1015. They gave a fugitive *orange-red*, convertible into greenish-yellow.

CASE X. James M'Gunnigill, aged 45. Premonitory diarrhoea of a week's duration; collapse severe, marked by considerable lividity, and by constant cramps and vomiting. Died about nine hours after admission, in the collapse stage. The collapse stools (rice-watery) were alkaline, albuminous, and of specific gravity 1010. They gave a fugitive and faint *pinkish red*, convertible into greenish-yellow. The collapse vomits were all acid, odourless, of specific gravity 1005-1010, and of various shades of pink and flesh colour. With heat and acid, they gave a deep *pink*, easily convertible into greenish-yellow. With muriatic acid, they also gave a deep flesh colour. On evaporating them to dryness, nitric acid produced a beautiful deep crimson, gradually becoming dirty-orange and brownish-red. The stools and vomit were filtered, set aside, and again tested a week after death. They all gave more or less of a faint pink, easily transmutable into a greenish-yellow. The bile, removed after death, showed its usual reactions with nitric acid. The contents of the small intestines, also removed subsequent to death, were like the "rice-water" stools passed during life, with the exception of their having a pinkish tint, from admixture with blood. They were alkaline, albuminous, of specific gravity 1010, and almost devoid of odour. They gave a greenish-yellow.

CASE XI. Caroline Macaulay, aged 34. Was about four months pregnant. Seizure sudden; collapse comparatively mild; reaction strong; fever violent, marked by high delirium and restlessness. Died in the acmé of the fever, three days after admission. The reaction stools were of pea-soup character, foetid, alkaline, and of specific gravity 1015; they gave a *reddish-orange*, convertible into *greenish-yellow*; the sediment resembled bran or linseed meal. The reaction vomit first ejected was of a grass-green colour, acid, and of specific gravity 1005. By heat and acid, it was decolorised. The second and third ejected were of a grayish-brown colour, and of specific gravity 1010. They gave a brownish-red, convertible into greenish-yellow. The fourth was of a deep steel or lead-gray colour, also acid. It gave a brownish-red, transmutable into greenish-yellow; but, with acid alone, the colour produced was a faint pink. The fever stools were of a much darker brown than those of the reaction stage: they gave a brownish-red, having a transient purplish tint. The fever vomit first ejected was of an ale colour, of specific gravity 1010, acid, and odourless: it gave a greenish-yellow. The second ejected was of a much darker ale colour, also acid. With heat and nitric acid, it gave a reaction

precisely similar to that produced by bile with the same acid, viz., in the test tube, from below upwards, a series of zones or belts of pink, purple, blue, and green. The bile, removed after death, appeared healthy, and exhibited its usual reaction with nitric acid.

CASE XII. William Lumsden, aged 42. Premonitory diarrhoea of two days' duration; collapse comparatively mild; reaction ill marked; fever insidious, at first almost æthenic, but soon passing into a low typhoid state. Died in the fever stage, six days after admission. The collapse stools (rice-watery) were alkaline, albuminous, of specific gravity 1010, devoid of odour: they gave a pink, convertible into greenish-yellow. If one or two drops of acid were cautiously added, and the heat was moderate, a greenish-yellow zone was seen below, and a pink above; but if both heat and acid were even slightly in excess, the pink tinge was exceedingly transient, so that the green appeared almost at once to be developed. The collapse vomits were acid, of low specific gravity, and of various shades of brown, red, pink, and grey: they all gave a greenish-yellow colour (the pink and red fluids immediately), attended by considerable effervescence. The reaction stools were of the colour and consistence of very thin pea-soup, alkaline, albuminous, and ammoniacal: they gave a very fugitive pink, which almost at once passed into greenish-yellow. The earlier fever stools were loam-coloured, alkaline, fœtid; when filtered, they yielded a fluid of a sherry colour, which gave a greenish-yellow. The later stools were more fœtid, and thicker in consistence: they gave an orange-red with heat and acid. The fever vomit was grass-green, acid, devoid of odour, of specific gravity 1010: it gave a blue tint, passing through purple and red into brownish-yellow on increasing the heat and acid. The same fluid, filtered and tested next day, gave brownish-red, convertible into greenish-yellow. The bile, removed after death, seemed quite healthy, and exhibited its usual reaction with nitric acid.

CASE XIII. Archibald Brodie, aged 49. Premonitory diarrhoea slight; collapse and reaction mild; fever gradually assumed a typhoid character; died four days after admission, in the fever stage. The reaction stools were of a pea-soup character; when filtered, they yielded a pale straw-coloured fluid: they gave a pink colour, with a slight greenish-yellow zone at the bottom of the test-tube. The reaction vomit was of various colours, acid, non-albuminous, and of specific gravity 1010: it gave a yellowish-green. The fever stools were of a much darker brown colour: they gave a reddish-orange tint. The bile was very fluid, and of a dull brownish-orange colour. Heat produced considerable opacity, and nitric acid no further change than decolorisation. The gall-bladder was only half-filled, and very flaccid: its walls were very thin and pale in colour; its interior was very nude of epithelium. The duodenum and jejunum were deeply stained with bile.

CASE XIV. Janet Brodie, aged 53. Seizure sudden; collapse very severe, marked by intense cramps. Died in the collapse stage, three and a half hours after admission. The intestinal contents (rice-watery), which were removed after death, were cream-coloured, slightly stained with blood, alkaline, and fœtid; when filtered, they yielded a pale straw-coloured fluid, which gave a reddish-orange with heat and nitric acid. The bile appeared healthy, and showed its usual reaction with nitric acid.

Dr. Parkes mentions this pink reaction as being exhibited only in the earlier stools and mild cases; never being noticed "during the acmé of the intense disease". With none of these statements do my observations correspond, for I have seen it in the reaction and fever, as well as in the collapse stools and vomits, and in the most intense, — i.e., most rapidly fatal, cases. So far as my experience goes, it is far from being constant, or to be relied upon; it cannot be said to bear any definite or fixed relation to the symptoms, and it is liable to great modification by the most insignificant circumstances. He mentions also his having latterly found a pinkish or reddish reaction with nitric acid in healthy human fæces, and in the alvine evacuations of typhus and dothineritis. To this list, I

may add, that I have found it in several cases of the chronic diarrhoea of phthisis, simple chronic diarrhoea, and chronic dysentery, and I doubt not I should have found it comparatively common in the stools of many other diseases, had opportunity been afforded me of examining them.

I shall introduce here a few of the instances in question by way of illustration; the stools examined were those of patients in the Royal Infirmary of Edinburgh.

CASE I. Simple chronic diarrhoea. Dr. Keiller's ward, (male). The stools resembled thin pea-soup in colour and consistence; they were fœtid, alkaline, albuminous, and mixed with a considerable quantity of mucus. The biliary tinge (brown) was well marked. With heat and nitric acid, they gave a transient, but deep, blood-red, which gradually passed through orange into greenish-yellow. With the acid alone, a deep grass-green colour was produced, slowly becoming, on exposure and standing, orange.

CASE II. Simple chronic diarrhoea. Dr. Andrew's ward, (male). The stools were also of a pea-soup character; they were very fœtid, alkaline, albuminous, and of sp. gr. 1010. With heat and acid, they gave a fugitive, but beautiful, orange-red; with acid alone, a fine pinkish-red. The addition of a slight excess of acid, with the application of heat in the case of the latter, converted both into a dirty greenish-yellow.

CASE III. Simple chronic diarrhoea, accompanying chronic utero-vaginal disease. Dr. Keiller's ward, (female). Stools also of pea-soup character, having a "branny" or "linseed-meal" sediment; they were alkaline, albuminous, non-fœtid, and of low specific gravity; they exactly resembled in appearance the reaction stools of cholera. With heat and acid, they gave a deep greenish-yellow.

CASE IV. Chronic diarrhoea of phthisis. Dr. Keiller's ward, (male). Last stool passed [in bed] before death. It had precisely the appearance of the reaction or fever stools of cholera, being of a light pea-soup colour, with an "oat-meal"-looking sediment, alkaline, albuminous, of low density, and scarcely fœtid. With heat and acid, it gave a transient brownish-red, which rapidly became yellowish-green; with acid alone, it gave a pinkish-red.

CASE V. Chronic diarrhoea of phthisis. Dr. Andrew's ward, (male). The stools were of a light stone colour, fœtid and alkaline. When filtered, with heat and acid, they gave a deep blood-red colour; with acid alone, no reaction was produced, but, immediately on the application of heat, a blood-red colour was developed; in both cases, this colour passed into greenish-yellow, on the further application of heat and addition of acid.

CASE VI. Chronic dysentery. Dr. Andrew's ward, (male). The stools were very fluid, but contained a considerable admixture of fæculent matter, pus and blood. They were highly albuminous, alkaline and fœtid. When filtered, with acid alone, a fugitive pink was developed, which slowly became a faint greenish-yellow; on the application of heat, the latter colour was at once deepened.

CASE VII. Hypochondriasis. Dr. Andrew's ward, (male). No ascertained disease of the stomach or intestines. The stools were a jelly-like mass, apparently consisting of almost pure mucus, of an apple-green colour; they were very albuminous, but not at all fœtid. With acid alone, the greenish colour was merely deepened.

I have thus sufficient grounds for holding that bile, as it occurs in healthy, as well as diseased stools, is capable of exhibiting this pink reaction; and I am also convinced, from a series of further experiments on bile taken from the gall-bladder after deaths from cholera, and other diseases, that pure bile, diluted to various degrees, can also, under certain circumstances, show this reaction with nitric acid. I found that the usual play of colours produced by the action of nitric acid on bile, could be modified to a considerable extent according to the degree of heat, cold and dilution, and according to various states of the bile and the system of the patient, etc., some one tint, generally either the green or purple, predominating. These modifying causes would form interesting subjects of chemical re-

smell, but with regard to their nature, and *modus operandi*, we are yet in the dark. Experimenting in most instances on bile contained in the gall-bladder after deaths in the collapse stage, I found that, if moderately diluted, and a few drops of nitric acid were cautiously added, the fluid gradually assumed a bluish tint and passed thereafter into a deep grass-green colour, which was permanent. If the liquid was moderately heated, before the addition of the acid, a zone of pink or purple was formed at the bottom of the test tube, and immediately above it, successive belts of bluish-purple, bluish-green and grass-green; on slight agitation, the whole mass acquired a deep green colour; by agitating more strongly, and especially if a slight degree of heat were superadded, it became first bluish-green, then bluish-purple, purple, pink, brownish-red, orange, and brownish-yellow, which was permanent. The rapidity of these changes, and the nature of the predominant tint, was in proportion chiefly to the degree of heat and dilution, and the amount of acid added. If the fluid was boiled, and several drops of acid at once added, the change of colour was often so rapid that the pink or purple tint alone was distinctly seen, and rapidly passed into a dull orange or brownish-yellow.

In order to ascertain how far the pink and greenish-yellow reactions of the collapse stools depended on mere diffusion of healthy bile in a whey-coloured or whitish-opaque fluid, I made various mixtures of milk and water, and of similar fluids, tinging them with different proportions of cholera bile, so as to imitate as closely as possible the colour and appearance of the "rice-water" fluid. I found, however, that in such a mixture, the pink colour was developed in a much less degree than in a simple mixture of pure bile and water. The green and bluish-green tints were always well exhibited, but the pinks and purples were obscured or modified in degree or tint. If the admixture of bile was so small as merely to communicate to the liquid a very faint greenish tinge, this colour was at once bleached by heat and acid, or by the latter alone, in many cases; if, again, the bile was present in comparatively large quantity, green was the colour most frequently developed. By using the bile of a patient, who died of peritonitis, in the same way, a faint pink was produced by heat and acid, exactly resembling the reaction given by the "rice-water" stools of cholera with heat and nitric acid; a small quantity of the bile, removed from the gall-bladder of McGunnigill, mixed with the fluid portion of the rice-water stools passed by him during life, did not increase the pink reaction produced by heat and acid. As a general result, I found that bile mixed with various whitish, opaque liquids, produced the same results with heat and acid, differing, however, in degree, as a simple mixture of the same bile with water. It therefore appears to me evident that the greater comparative frequency of the pink biliary reaction in the rice-water stools of cholera, depends on certain chemical conditions or changes, either in the bile or the fluid in which it is diffused. Not being yet acquainted with these chemical differences, we cannot imitate them in experimental investigations.

If we study the pathology of the liver and bile in cholera, we shall find that both are essentially healthy. The texture of the liver is usually normal in colour and consistence, though it is generally congested to various degrees, the seat of engorgement being more the large veins than the minute venules of the organ; its epithelium is sometimes found more or less loaded with oleo-albuminous granules, occasionally to such an extent as to constitute that condition of the liver denominated "fatty." But with this exception, it is seldom that any other lesion, chronic or acute, of this gland, is met with in cholera.

The gall-bladder is usually much distended with bile, protruding considerably beyond the free edge of the liver, so as almost to be felt during life as a pyriform tumour in or about the right hypochondriac region. It has generally a deep grass-green colour; its walls are thick; its interior wall coated with inspissated mucus, which is found abounding in cylindrical epithelium of an intensely bright green-

ish-yellow colour. The whole of the bile ducts are uniformly found quite pervious. Some authors* have described them as "greatly enlarged and gorged with thickish bile, which was also infiltrated into the surrounding parenchyma of the liver".

The bile itself is generally of an intensely dark green colour, with a slightly brownish tinge, and its consistence is comparatively viscid and ropy from abundant mucous admixture and inspissation. When diluted with water, in various degrees, it gives, with heat and nitric acid, the reactions which have been already mentioned.

This being the condition of the liver and its secretion, we can therefrom have no evidence to support the opinion, which has been so long and so blindly advocated by medical writers on cholera, that the bile is suppressed in that disease: were the deficiency of bile in the collapse stools a reality, which I hold it is not, it could not therefore depend on non-secretion. That there is not, however, a temporary retention of bile in the gall-bladder during the collapse stage, we have not the same means of proving; indeed, it is reasonable to expect, *a priori*, that during the intense shock, this should exist to a certain extent. But the presence of bile in the stools at every stage of the disease, in my opinion, proves that, if this exist at all, it cannot be of long duration. Parkes, however, believes that "during the acmé of the intense disease" there is sufficient evidence of complete retention; or, in other words, evidence is wanting to prove any passage of bile into the canal during this stage. I am not prepared, nor even inclined to attribute any particular value to the presence or absence of bile in the cholera evacuations as having any causal relation to the disease; whether even the retention of urine or urea in the system is capable of producing certain symptoms of the consecutive fever, as is generally supposed, I take the liberty of doubting. The existence of spasm of the neck of the gall-bladder, and other theories, have been adduced to account for the temporary retention of bile; the excreting, if not the secreting apparatus of the liver, it is thought, may, or does, participate in the effects of the general systemic shock or collapse, which appears so to react on all the glands and glandular reservoirs in the body as to prevent, for a time, the elimination or expulsion of their various secretions or contents. What is the *modus operandi* of this systemic shock on the liver or gall-bladder? whether has the bile found in the gall-bladder in collapse been secreted and accumulated prior to the cholera seizure?—and similar questions I cannot here enter upon. I would eschew all theory, my sole object being to call attention to facts, and especially to the circumstance of the invariable presence of a certain amount of bile in all the cholera stools.

In judging of the amount of bile, which we should expect by chemical tests to find in these evacuations, we must remember:—

I. Its extreme dilution. The intestines, instead of excreting a semi-solid mass of limited extent, are constantly throwing off perhaps 50 or 100-fold as much in the form of a fluid nearly as thin as water.

II. There is virtually an absence of the natural stimulus to the expulsion of the bile; no food is passing through the intestinal canal; and, in fact, to a certain extent, death in the collapse of cholera may be compared to death from starvation.

III. The quantity of bile expelled from its reservoir into the duodenum in health, during abstinence from food, is very small; and there is every reason to suspect, though I have not had an opportunity of putting it to the test, that the amount of bile contained in healthy human fæces, if diffused among fluid equal in amount and similar in colour to the serous discharges of cholera, would not give it a more distinctly greenish-yellow tinge than these evacuations naturally possess.

In order to estimate the comparative healthiness of the

* Schmidt, on the Cholera in Leyden.—Edin. Monthly Medical Journal for 1848-49.

bile in cholera and other diseases, I examined the contents of the gall-bladder in deaths during every stage of cholera, and in a number of miscellaneous cases of various affections which fell under my notice, while pathological assistant in the Royal Infirmary of Edinburgh,—viz.: phthisis, various lesions of the heart and brain, delirium tremens, etc. In the former case, the condition of the liver, gall-bladder, and bile, was such as I have already described,—i.e., essentially healthy; in the latter, the liver was frequently itself affected, chiefly with chronic lesions; the gall-bladder was much more empty and flaccid, paler in colour, being less of a deep green, and the bile was frequently more fluid, its colour more of a brown, sometimes of a deep brownish-red, and gave abnormal reactions with nitric acid. To cite a few instances of the condition of the bile in other diseases than cholera:—

CASE I. *Peritonitis*, general, chronic, tubercular. Dr. Keiller's ward, (male). Gall-bladder very small and flaccid; contained about 3i of bile, which was very turbid, and of a bright reddish-orange tint; when diluted with water, exhibited the ordinary reaction, with nitric acid, modified in degree.

CASE II. *Phthisis*, advanced; fatal, four hours after admission. Dr. Keiller's ward, (male). Liver normal; gall-bladder half empty, flaccid, pale; bile of a reddish-brown tinge; when diluted, showed ordinary reaction with acid.

CASE III. *Delirium Tremens*. Dr. Andrew's ward, (male). Gall-bladder small, flaccid. Bile of a brownish-red colour, with a mere tinge of greenish-yellow; in consistence thick and treacly; gave the usual reaction with acid.

CASE IV. *Cardiac disease*; lesion of aortic and mitral valves; dilatation of right side of heart; general anasarca; ascites. Dr. Keiller's ward, (male). Liver enlarged, but healthy; gall-bladder contained about 3ii of bile, which had a considerable admixture of stringy mucus, and a deep reddish-orange tint; with acid, it exhibited a beautiful play of very rich colours.

CASE V. *Cardiac and pulmonary disease*; hypertrophy and dilatation of the heart; lesion of the mitral valve; ossification of the aorta; pleuro-pneumonia; "nutmeg" liver; gall-bladder greatly dilated, as if the arch of the ascending colon were adherent to the under surface of the liver; its capacity was increased to five or six times the normal state; from the complete loss of shape and change of colour, it was quite unrecognizable as the gall-bladder, the bile resembled in appearance pea-soup, or the stools of dothinerteritis, or the fever stage of cholera; it had a very disagreeable odour, similar to that of putrid cabbage; with heat and acid, it gave a very faint greenish-yellow tint.

CASE VI. *Cardiac disease*; lesion of mitral valve; dilatation, with hypertrophy of the heart. Dr. Bennett's ward, (male). Liver normal in structure and appearance; gall-bladder three-fourths full; was of its usual pyriform shape, pale, somewhat thickened in its walls. Bile had a reddish-brown tinge, and gave the usual reaction with heat and acid in a modified degree.

The objection urged by some that this pink reaction of the cholera stools with nitric acid resembles very closely that produced, under similar circumstances, by the urine-pigment, is not even a strong presumptive evidence against such reaction being biliary; since, though we have not yet exactly arrived at this point in animal chemistry, there are strong reasons, from the results of recent researches on the bile and urine pigments, for believing that these colouring matters will be found greatly to resemble each other, if they are not identical in physical characters, or perhaps derivable from a common source.

In conclusion, I would beg to recapitulate my opinion that bile, and comparatively healthy bile, though, in many cases, perhaps, chemically modified to a slight extent, exists in *all* the cholera stools, or in other words, in the alvine discharges passed during every stage of the disease; because

I. I found a pink, red, brown or greenish colour produced

by the action of heat and nitric acid in *all* cases; these several reactions I consider *biliary*, on the grounds that,—

a. They appear to be indiscriminately substituted one for the other, according as the bile or fluid in which it is diffused is chemically or otherwise modified.

b. To a certain extent, they are convertible into each other,—that is to say, the pinks, reds, and browns are transmutable into a green tint as an ultimate and permanent result, and this is well known and recognised as the normal reaction of bile with nitric acid.

II. I found the same variety of reaction in the vomit of cholera, where there could be no doubt of the presence of biliary colouring matter, and in considerable quantity.

III. I found similar reactions in healthy human faeces, and in the evacuations of typhus, chronic diarrhoea, and dysentery, and other diseases, when there was equally little doubt of the existence of a large quantity of bile.

IV. Analogy would not lead us *a priori* to expect in cholera a large amount of bile to be present in the intestines, or their contents, chiefly for the following reasons:—

a. Its extreme dilution.
b. The absence of the natural stimulus to its expulsion,—i.e., the food.

c. The small quantity expelled in health during fasting.
d. The small quantity naturally present in healthy faeces.

v. The pathology of the liver and bile in cholera, leads us to the belief that,—

a. The secretory structure of the liver is comparatively healthy.

b. The biliary reservoir and ducts are also healthy and quite pervious.

c. The bile, as compared with its condition in other diseases, is both healthy in quality and large in quantity.

Crichton Royal Institution, Dumfries, Feb. 1, 1854.

[To be continued.]

COEXISTENCE OF TUBERCULOSIS WITH CYANOSIS; PRODUCTION OF HEMIPLEGIA BY DETACHMENT OF FIBRINOUS DEPOSIT FROM THE HEART.

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THE case, of which an outline is given below, supplies an important correction, and also confirmation, of opinions which have been recently promulgated.

It is now generally taught by pathologists, that a venous condition of the blood is eminently antagonistic to tubercular development and deposit. The doctrine is thus broadly laid down by Rokitsansky:—"All cyanoses, or rather all forms of disease of the heart, vessels, or lungs, inducing cyanosis of various kinds and degrees, are incompatible with tuberculosis, against which cyanosis offers a complete protection; and herein we find a key for the solution of the immunity against tuberculosis afforded by many conditions which at first sight appear to differ so widely from one another."

A similar statement is made by Mr. Simon in his excellent *Lectures on General Pathology*:—"There is one signal peculiarity which attends this chronic venous condition of the blood, which I must not leave unmentioned. Not only in extreme cases of cyanosis, but in all chronic diseases where, from any cause whatever, there is defective arterialization of the blood, the patient enjoys one privilege. He is exempt (perhaps absolutely, but at least all but absolutely, exempt) from tubercular diseases."

In the subject of the following report, cyanosis of the most perfect description was associated with equally well-marked tuberculosis.

* *Pathological Anatomy*, vol. iv, p. 251. (Sydenham Society's Translation.)

† *Lancet*, 1850-1, p. 712.