positive action of the soda, but simply to its tending to displace a certain proportion of potassium from the body.

Our experiments upon the action of calcium, magnesium, and aluminium are now in progress, and we hope shortly to communicate the results of them.

THE ACTION OF SOME RECENT HYPNOTICS ON DIGESTION.

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HAVING observed that certain gastric disturbances such as distaste for food, flatulence, vomiting, and diarrhoea occasionally followed the exhibition of chloralamide, paraldehyde, urethane, and sulphonal, the following investigations were undertaken to elicit their action on digestion. For example, when sulphonal was given, and when vomiting occurred, it appeared that though the food had been in the stomach for several hours little digestion had taken place. Again, after the exhibition of paraldehyde there frequently followed diarrhoea.

These investigations, which, it must be observed, attempt to deal only with one of the phases of digestion, may help to throw some light on the action of the drugs on the ferment. It has to be remembered that they may have a further action on gastric secretion, and that the whole of the muscular and nervous mechanism of the stomach may be influenced directly or indirectly by them. At any rate, paraldehyde does not seem to interfere with digestion, because of its influence on the peptone-forming power of pepsin; for when employed both in large and small quantities, it distinctly accelerated the digestion of the fibrin.

To ascertain this, the method employed was that of Grützner, and consisted in preparing fresh fibrin from blood, which was carefully washed with cold water until the washings were free from blood colour; the washed fibrin was then allowed to stain in a weak ammoniated solution of carmine for twenty-four or thirty-six hours; the stained fibrin was again washed in a slowly-running stream of cold water till the washings were colourless. The rate and amount of digestion were estimated by the liberation of colour from the stained fibrin, and by its diminished bulk. Four test tubes of equal size and shape were selected; No. 1, which was the control test tube, as a rule contained $\frac{1}{2}$ gramme stained fibrin, 2 decigrammes pepsin porci, 2 cubic centimetres 2 per cent. hydrochloric acid, and 15 cubic centimetres of water. The other three test tubes contained, in addition to the preceding ingredients, varied and graduated quantities of the drug under observation. The fibrin was suspended in the test tubes either loosely tied by silk threads, or enclosed in small muslin bags. The set of test tubes were then placed in an incubator, the temperature of which was kept as nearly as possible to that of normal body heat. The liberation of colour and the bulk of fibrin were recorded from time to time. Morson's pepsin porci was used throughout. An acid solution of pepsin supplied by Barron, Harveys, and Co., London, was also employed to control the results obtained by Morson's pepsine.

Many series of experiments were made with each of the drugs, both in strong and weak solutions. To avoid repetition one experiment illustrative of the action of drug in a strong and in a weak solution is given.

Chloralamide: Strong Solution.

Test Tubes. Temperature of Incubator 36° C.

1.	2.	3.	4.
Control as already indicated.	Control plus 0.075 gramme chloralamide.	Control plus 0.15 gramme chloralamide.	Control plus 0.3 gramme chloralamide.

Experiment was set going at 11.30 A.M.; at 1.30, two hours after, the following was noticed:

1.	2.	3.	4.
Slight liberation of colour.	Less liberation than 1.	No liberation.	No liberation.

At 3.30 P.M., four hours after, the following was observed:

1.	2.	3.	4.
Free liberation of colour and considerable digestion of fibrin.	Marked liberation of colour and active digestion of fibrin.	Less liberation of colour and digestion retarded.	Less liberation than 3, and digestion more retarded.

At 6 P.M., six hours and a half after, the following was observed:

1.	2.	3.	4.
Fibrin quite digested.	Fibrin quite digested.	Fibrin two-thirds digested.	Fibrin about half digested.

At 11.30 A.M., twenty-four hours after, the following was observed:

1.	2.	3.	4.
—	—	Fibrin nearly digested.	Fibrin two-thirds digested.

It being evident from experiments with strong solutions of chloralamide that digestion was retarded, it was then desired to ascertain what might be the results with weak solutions.

Chloralamide: Weak Solutions.

Test Tubes. Temperature of Incubator 36° C. to 40° C.

1.	2.	3.	4.
Control as already indicated.	Control plus 0.01 gramme chloralamide.	Control plus 0.02 gramme chloralamide.	Control plus 0.03 gramme chloralamide.

In this and similar control experiments, it was found that up to 0.02 gramme there was not any evident change in the rate of digestion by the presence of chloralamide, but that when the strength of 0.03 gramme was used, retardation in the rate of digestion began. It was noticed that this retardation was in direct ratio with the strength of the solution of the drug.

The result of the experiments showed that:—

1. Large quantities retarded the digestion of fibrin in the ratio of the quantity employed.
2. Small quantities, for example, up to 0.02 gramme, did not have any marked influence either in accelerating or in delaying the digestion of fibrin.
3. Putrefaction was not retarded by either large or small quantities.

Paraldehyde: Strong Solution.

This being a volatile body, the test tubes, besides being plugged with cotton-wool, were capped with india-rubber to prevent evaporation.

Test Tubes. Temperature of Incubator 36° C.

1.	2.	3.	4.
Control as already indicated.	Control plus 0.3 cc. paraldehyde.	Control plus 0.75 cc. paraldehyde.	Control plus 1.25 cc. paraldehyde.

Experiment was set going at 11.30 A.M.

At 1.30 P.M., two hours after, the following had taken place:—

1.	2.	3.	4.
Least liberation of colour and digestion.	Next advanced to No. 1.	More advanced than No. 2.	Distinctly more advanced than No. 3.

At 3.30 P.M., four hours after, the following was observed:

1.	2.	3.	4.
Still least action.	More active than No. 1.	More active than No. 2.	Still distinctly the most active.

At 5.30 P.M., nine hours after, the following was noticed:

1.	2.	3.	4.
Action distinctly delayed.	Action well advanced.	Digestion completed.	Digestion completed.

The result of numerous experiments showing that large quantities accelerated the digestion of fibrin, investigations to elicit the action of small quantities were undertaken.

Paraldehyde: Weak Solution.

Test Tubes. Temperature of Incubator 36° C.

1.	2.	3.	4.
Control as already indicated.	Control plus 0.00075 cc. paraldehyde.	Control plus 0.0015 cc. paraldehyde.	Control plus 0.003 cc. paraldehyde.

The conclusion drawn from a number of experiments made with paraldehyde of similar strengths to the above was that its presence, even in minute doses, accelerated the digestion of the fibrin, and that the greater the amount of the paraldehyde present so much the quicker was the digestion of the fibrin.

The result of the experiments showed that:

- a. Large quantities considerably accelerated the digestion of fibrin, and that the rate of this acceleration was distinctly in ratio with the quantity used.
- b. Small quantities also increased, but to a less degree the digestion of fibrin.
- c. Putrefaction was presented by the larger quantities of paraldehyde, and was delayed by the smaller quantities.

Urethane.

The result of experiments which were conducted in similar manner showed that:

- a. Strong solutions, that is, 0.5 gramme, 0.25 gramme, 0.175 gramme delayed digestion; that the stronger the solution the greater was the delay.
- b. Weak solutions, that is, 1, 2, and 3 milligrammes, neither delayed nor accelerated digestion.
- c. Neither strong nor weak solutions retarded decomposition.

Sulphonal.

Similar conducted experiments showed that:

- a. Strong solutions, saturated or half saturated, consider-

ably delayed digestion, and that the stronger the solution the greater was the retardation.

b. Weak solutions, such as $\frac{1}{8}$ or $\frac{1}{4}$ of a saturated solution had little effect either in accelerating or delaying digestion, but when a solution of $\frac{1}{4}$ of a saturated solution was employed delay in digestion took place.

c. Strong or weak solutions had no marked effect in retarding putrefaction.

ON THE IMPORTANCE OF PERFORMING THE RADICAL CURE AFTER OPERATIONS FOR STRANGULATED HERNIA.¹

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It is now the established custom amongst surgeons to complete the operation for strangulated hernia by ligaturing and removing the hernial sac. Others go further, and in addition to removing the sac, endeavour to repair the abdominal wall, and thus effect a cure. There is little doubt but that the mere removal of the sac has had a favourable influence upon the mortality of the operation, whilst the further proceeding of repairing the abdominal wall has effected many cures. In what follows I merely propose to bring together the kind of evidence which has induced surgeons to supplement kelotomy with removal of the sac or with a curative operation.

Of course patients with strangulated hernia are sometimes so critically ill that the idea of performing a prolonged operation, such as that of repairing the abdominal wall, cannot be entertained, or it may be forbidden by the condition of the intestine. But in the absence of such contra-indications it will be allowed that the ligature and removal of the sac is imperative, and the repair of the abdominal wall most expedient. The correctness of this proposition is very clearly borne out by the records of cases which were operated upon many years ago, and before removal of the sac was practised. Whilst working at another branch of this subject, I collected a number of such cases from the surgical records of St. Bartholomew's Hospital, to illustrate the accidents which used to happen. It is to be remembered, however, that these cases have been chosen from the records of a very large number of cases of strangulated hernia, because of their unusual character; and further, it is to be remembered that nearly all of them occurred before the operation of radical cure had taken its present position, and before antiseptic surgery had attained its present degree of perfection. And here I wish to thank the surgeons who have most kindly allowed me to mention the cases under their care, and my friend Mr. Bowlby for the assistance he has given me in obtaining the notes.

As far as possible the cases have been arranged so as to illustrate the accidents which used to happen, and which may reasonably be put down to non-removal of the sac, in the order in which they occur. Of course I am aware that the inferences which I have drawn from the facts are not always the only ones which could have been arrived at; but I trust that, even if the inferences be not accepted, the facts themselves may not prove uninteresting.

Taken thus in what may be called chronological order, we find that, when the hernial sac is not ligatured and removed, the intestine not infrequently comes down again. When this happens a few hours after the operation, there is no doubt but that the *recurrence* has taken place into the original sac. For instance, a man aged 59 was operated upon for a strangulated femoral hernia,² the sac having been opened but not removed. Soon afterwards the bowel descended again, and a finger had to be introduced into the sac to push the bowel back into the abdomen. This patient afterwards died of general peritonitis, and it seems reasonable to suppose that, had the neck of the sac been ligatured and fixed in the manner described later on, the "recurrence" at least might have been prevented.

¹ Read before the North London Branch of the British Medical Association.

² I regret that I have not always been able to ascertain the names of the surgeons who performed the operations.

In another case an accident similar to the last happened. A woman aged 63 had been operated upon for a strangulated femoral hernia of the right side, and reduction was effected without opening the sac. The obstruction seems to have been relieved, but next day the hernia recurred; the patient afterwards died, and, although the return of the hernia was not the actual cause of her death, yet it was a source of anxiety, and might have been prevented by a curative operation.

This case opens the question whether, when reduction can be effected without opening the sac, a curative operation would not be an unjustifiable addition to the risks. In the first place, we must not begin by assuming that reduction without opening the sac is in itself free from risk. The condition of the returned bowel or omentum is an uncertain factor, and they may have suffered so much from strangulation as to be in a dangerous state. Next it has been ascertained³ that the fluid which is effused into the sac of a strangulated enterocele becomes after awhile septic and capable of causing peritonitis, and ought not, when it can be avoided, to be squeezed into the abdomen. My own experience is that aseptic surgery has made the risks of opening and dealing with the hernial sac so trivial that they need hardly be taken into account; at all events, they are less than those of prolonged taxis. But, to continue with the question of recurrence, we find that when the neck of the sac is not ligatured the tendency of the hernia to recur may be very persistent. For example, a woman, aged 53, was operated upon for an inguinal hernia of the right side. The sac was opened and the bowel replaced, but next day the bowel came down again and was again replaced, only to return on the following day. The sac also became highly inflamed and full of purulent fluid, and there was general peritonitis. Sometimes it is the omentum and not the bowel which comes down again into the unobliterated sac. For instance, the sac of an oblique inguinal hernia of the left side was opened for the reduction of its contents, which consisted of bowel and omentum. These were replaced, but the omentum returned and protruded from the wound. There was also suppuration in the sac, but the man recovered. As might be expected when the hernia recurs, the loop of intestine which comes down into the unobliterated sac is not always that which was originally strangulated. A woman, aged 56, was operated upon for a right femoral entero-epiplocele which had been strangulated for four days. The strangulated bowel was deeply congested and covered with lymph. It was returned into the abdomen, but the patient sank, and it was afterwards ascertained that a fresh loop of ileum had entered the hernial sac, where it lay free from strangulation; whilst the damaged loop was within the abdomen, close to the femoral ring. In reading the notes of the examination of similar cases it is by no means an infrequent thing to find it noted that the sac contained a fresh loop of intestine.

The above extracts are, I trust, sufficient to show that when no attempt has been made to obliterate the hernial sac, or to perform a curative operation, a recurrence of the hernia is not a very improbable event. But, inasmuch as the hernial aperture has usually been enlarged, this accident is not of necessity followed by a return of the obstruction. Nevertheless, it is not devoid of immediate risk and anxiety, and may be the source of future dangers.

Another very rare complication may supervene when the sac is not removed. Mr. Marrant Baker operated upon a woman aged 20 for a right femoral epiplocele. Next day the sac protruded from the wound, but it shortly afterwards granulated over, and the patient recovered. It is to be expected that this accident, when it does occur, will usually happen in cases of femoral hernia, because in them the sac lies loosely in its bed, and has no firm connections.

I will now proceed with another accident which has already been incidentally mentioned, namely, *suppuration* within the sac. But first it is to be remembered that this accident is not always attributable to the operation. For instance, a woman aged 58 came in with an inflamed femoral hernia of the right side. The tumour gradually increased in size, and the skin over it became red and oedematous, with clear signs of fluctuation. The sac was opened, and found to be full of pus,

³ Bönneken : Ueber Bakterien des Bruchwassers eingeklemmter Hernien und deren Beziehung zur peritonealen Sepsis, *Virchow's Archiv*, Band cxx, Heft 1; also *Centralblatt für Bakteriologie und Parasitenkunde*, Band viii, No. 5, p. 147. See also Clado, note in *BRITISH MEDICAL JOURNAL*, October 26th, 1889, p. 938.