TABLE V.—*Prophylactic Action of Immune Serum.* (Serum given intravenously in right ear; toxin (K8) given intravenously in left ear half an hour later.)

No. of Rabbit.	Weight.	Serum.	Toxin (K8).	Result.
	grams.			
No. 1 ...	1,345	4.0 c.cm.; immune	0.5 c.cm.	Lived; no symptoms.
" 2 ...	1,655	" "	1.0 "	Lived; no symptoms.
" 3 ...	1,705	" "	2.0 "	Lived; no symptoms.
" 4 ...	1,710	" "	2.0 "	Lived; no symptoms.
" 5 ...	1,705	" "	2.0 "	Lived; no symptoms.
" 6 ...	1,715	" "	4.0 "	Lived; no symptoms.
<i>Control.</i>				
" 7 ...	1,670	4.0 c.cm. normal	0.5 "	Dead (20 hours).

TABLE VI.—*Prophylactic Action of Immune Serum.* (Serum given intravenously in right ear; toxin (K8) given intravenously in left ear 24 hours later.)

No. of Rabbit.	Weight.	Serum.	Toxin.	Result.
	grams.			
No. 1 ...	1,635	4.0 c.cm.; immune	2.0 c.cm.	Lived; transient paralysis in forelegs.
" 2 ...	1,370	" "	2.0 "	Dead (4 days) after paralysis and diarrhoea.
" 3 ...	1,555	" "	2.0 "	Lived; transient paralysis in forelegs.
" 4 ...	1,650	" "	4.0 "	Dead (2 days).
<i>Controls.</i>				
" 5 ...	1,970	4.0 c.cm.; normal	0.5 c.cm.	Dead (40 hours).
" 6 ...	1,695	" "	0.5 "	Dead (20 hours).
" 7 ...	1,470	" "	0.5 "	Dead (20 hours).
" 8 ...	1,740	" "	1.0 "	Dead (40 hours).

TABLE VII.—*Table showing that Toxin and Antitoxin do not Combine at Once.* (Injections intravenous in rabbits.)

No. of Rabbit.	Weight in Grams.	Serum.	Toxin (K8).	Serum and Toxin Mixed and Injected.	Result.
1	1,570	1 c.cm. immune	3.0 c.cm.	Immediately	Dead (4 days) after paralysis and diarrhoea.
2	1,425	1 c.cm. immune	3.0 c.cm.	After 1 hour at 37° C.	Lived; no symptoms.

TABLE VIII.—*Table showing Effect of Temperature on the Combination of the Toxin and Antitoxin.* (Injections intravenous in rabbits.)

No. of Rabbit.	Weight in Grams.	Immune Serum.	Toxin (K8).	Serum and Toxin Mixed and Injected After.	Result.
1	1,725	0.5 c.cm.	3.0 c.cm.	5 min. at 37° C.	Lived; no symptoms.
2	1,550	0.5 c.cm.	3.0 c.cm.	4 min. at 0° C.	Dead (32 hours).
3	1,675	0.5 c.cm.	3.0 c.cm.	30 min. at 0° C.	Dead (42 hours).

The antitoxin appears to be stable, and shows no marked change after exposure to a temperature of 65° C. for an hour. Tested both on rabbits and guinea-pigs, the immune serum showed no more protection, either against living or dead cultures of the dysentery bacillus, than did normal serum.

The question naturally arises as to whether the toxin described must be regarded as an intrabacillary toxin which has been extracted from the bodies of the bacilli by the prolonged action of the alkaline broth, or whether it is a true extrabacillary toxin secreted as such by the bacillus. This point is not easily decided, but the fact that the antitoxin does not protect against either the living or dead bacilli would appear to favour the latter view.

From the above results we are forced to the conclusion that by immunization with the toxin it is possible to obtain a purely antitoxic serum which is quite distinct from the antibacterial sera which have been described by Shiga⁷ and Kruse,⁸ and with which excellent clinical results are said to have been obtained.

CONCLUSIONS.

1. By growing the dysentery bacillus in a somewhat highly alkaline broth a soluble toxin is obtained.
2. Certain animals, notably the horse and rabbit, are highly susceptible to this toxin.
3. The toxin is fairly stable, and though destroyed by an exposure to a temperature of 80° C. for an hour, is not destroyed by exposure to a temperature of 70° C. for the same period.
4. When injected into suitable animals, for example, the horse, the toxin gives rise to a powerful antitoxin.
5. The combination of the toxin and antitoxin *in vitro* does not take place immediately, but requires a certain time, and the rate of combination varies with the temperature.

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ON TOTAL EXTIRPATION OF THE STOMACH;
WITH A RECORD OF AN UNSUCCESSFUL
CASE.

By B. G. A. MOYNIHAN, M.S., F.R.C.S.,
Assistant Surgeon, Leeds General Infirmary.

SINCE the publication of Schlatter's case there have been many reported as examples of complete gastrectomy. On reading carefully through the description of the operation it is found that in the majority of these some portion of the stomach—generally at the cardiac end—has been left. Thus, in one report it is said that "the stomach was excised at about 2 in. anteriorly and 3 in. posteriorly from the cardiac end"; and similar statements can be found in many other reports.

HISTORICAL.

The first complete extirpation of the stomach was performed in 1883 by Connor. The patient died on the table. Cases of "extirpation of the stomach" were recorded by Schuchardt (1884), Maydl (1902), and Langenbuch (1894), but in all these a portion of the stomach was not removed. The next "total extirpation"—the first to be successful—was the memorable case of Schlatter's. In this the whole stomach was removed; the microscopical examination of the specimen showed duodenum at the one end and oesophagus at the other. The cut end of the duodenum was closed by suture, and the oesophagus united to the jejunum. The patient, a woman of 56, lived fourteen months, and died of local recurrence. Her health after the operation improved greatly. She was able to take food in good quantity, and she gained in weight. The third operation was performed by Brooks-Brigham in 1898.¹ The patient was a woman aged 66. The duodenum was united to the oesophagus by means of a Murphy button. Recovery ensued, and the patient was alive and well two years after the operation.

The fourth operation was by Maurice Richardson of Boston.² The patient recovered, but died eleven months later of recurrence.

The next case is recorded by Macdonald. The patient was a man aged 38. The duodenum and oesophagus were united by a Murphy button. The patient was alive and well eighteen months after the operation. Kocher removed the whole stomach and a portion of the transverse colon from a woman aged 44. The duodenum and oesophagus were united by suture. The patient died of peritonitis.

Bernays removed the stomach and a portion of the pancreas from a man aged 42. Death occurred in thirty-six hours.

Chavasse operated upon a man aged 64. As it was impossible to unite the oesophagus to the intestine its end was closed by suture and duodenostomy performed. The patient died in a few hours.

Bardeleben removed the entire stomach from a woman

aged 52. The cut ends of the oesophagus and duodenum were closed by suture, and a lateral anastomosis made between the oesophagus and a loop of small intestine. The patient was alive nine months later. [This case is, perhaps, open to question. A lateral anastomosis with a normal oesophagus would be difficult or impossible.]

Harvie removed the stomach and 3 cm. of the duodenum from a woman aged 46. The oesophagus was united directly to the duodenum. Recovery followed.

Dollinger.—The whole stomach was removed from a man aged 37. A loop of small intestine was sutured to the oesophagus. The patient recovered, but a few days after the operation a biliary fistula formed, owing, it was presumed, to imperfect closure of the duodenum.

Herczel.—Complete removal of the stomach from a woman aged 42. The oesophagus and duodenum were closed, and a lateral anastomosis made between the former and a loop of small intestine. Sutures were passed between the diaphragm and the anastomosing loop to avoid traction on the sutured line. The patient a year and ten months after the operation had gained 18½ kilo. in weight.

Rivera removed the whole stomach from a woman aged 36. The patient recovered and remained under observation for fifteen months.

Gurrea y Hurtado removed the stomach from a woman aged 41. The oesophagus and duodenum were united by suture. Recovery followed.

Fedoroff performed total extirpation upon a man aged 35. The oesophagus was united to the duodenum by suture. The patient died on the fifth day of peritonitis.

Vander Veer removed the whole stomach from a woman aged 42. The duodenum and oesophagus were united by a Murphy button. The patient died the following day, and at the necropsy it was found that the attachment between the oesophagus and the duodenum had given way.

There are thus 16 cases in all. The ages range between 35 and 66. There were 6 deaths; 10 recoveries.

On reading through the records it will be seen that the junction between the oesophagus and intestine has been made in the following ways:

Oesophagus to duodenum	{ By simple suture.
	{ By the Murphy button
Oesophagus to jejunum	{ By simple suture.
	{ By the Murphy button.

Oesophagus and duodenum both closed by suture and a later anastomosis made.

Oesophagus closed by suture, the open end of the duodenum stitched to the skin = duodenostomy.

CASE.

The case upon which I operated was the following:

Mrs. R., aged 49, seen with Dr. Oldfield, had been ailing for four to five months. Pain after food was the symptom first noticed, this quickly became so severe that solid foods were abandoned. Gradually it was found that liquid foods began to cause distress, and eventually these could be taken in only very small quantities. If a teacupful of milk were taken a portion of it was rejected almost at once. There had gradually been a loss of weight, but altogether only about 1 st. had been lost. On examining the abdomen a hard ovoid mass was found lying transversely across the lower part of the epigastrium. When an attempt was made to inflate the stomach by administering portions of the two halves of a scidlitz powder separately, a considerable part of the fluid swallowed was almost instantly ejected as foam from the mouth. There was no perceptible stomach resonance either before or after inflation, and a diagnosis of carcinoma giving rise to a "leather-bottle stomach" was made. The condition and the risks of operation were fully explained to the patient, who elected to submit to operation, and hoped that an attempt would be made to remove the whole growth. Her condition was poor, but no evidence of other disease could be found.

On June 26th, 1902, the abdomen was opened. The whole stomach was seen to be invaded by growth, and the glands along both curvatures were enlarged. The stomach was free from any but the lightest adhesions, and no secondary nodules could be seen in the liver. The whole stomach was therefore removed. The steps of the operation in the early stages were similar to those I described in the BRITISH MEDICAL JOURNAL on April 25th, 1903. The cut end of the duodenum was closed by suture. On the lower end of the oesophagus a small clamp was temporarily applied. An anastomosis was now made between the oesophagus and a loop of the jejunum pulled upwards through a rent in the transverse mesocolon. After the posterior layer of a continuous suture of fine Pagenstecher thread had been passed the jejunum was opened. A rubber stomach tube was now passed down the oesophagus and onwards into the distal portion of the jejunum, and kept in this position while the anterior suture was applied. After the completion of the circular suture a second line of continuous suture was passed. At intervals this was interrupted, and at each interruption a stitch was taken through the diaphragm, so as to fix the jejunum up to its under surface. The suturing was not so difficult as I had anticipated. The oesophageal tube certainly made the hold on the parts

more secure. At the completion of the stitching half a pint of peptonized milk was passed through the tube and "milked" downwards in the jejunum. The patient was very much collapsed after the operation, and despite all our endeavours died of shock in six hours.

COMMENTARY.

In addition to the cases recorded above, numbering 17, including my own, there are 3 cases operated upon by Professor von Mikulicz, the details of which have not yet been published.

It was at one time considered doubtful whether a complete extirpation of the stomach, even if possible, could be a legitimate procedure. It was argued that by the time so much of the stomach was involved as to make desirable its complete removal, other growths in the liver or elsewhere would be found which would effectively preclude any possibility of a radical operation. But an examination of many records, specimens, and cases has shown me that in some cases, very exceptional it is true, the whole stomach may be infiltrated when, even on minute *post-mortem* examination, no secondary deposits could be seen. Two cases of my own have satisfied me of this fact, in one I had performed jejunostomy, in the other no operation had been done. In both so much of the stomach was involved as to make a complete removal necessary if extirpation of the growth were attempted. In neither case were there complex adhesions, distant lymphatic enlargements, or secondary growths of such a character as to forbid resection, to be found after the most careful examination. In a certain very small proportion of cases, therefore, a complete removal of the whole stomach may be demanded if resection of the growth is considered desirable. So far as the difficulties in the operation are concerned, it may safely be said that they are less than would be anticipated. The stump of the oesophagus and its peritoneal investment might certainly be planned upon a more generous scale, but there is nevertheless enough for the purpose. The oesophagus can be freed from its opening in the diaphragm by stripping with the finger, though this is probably not desirable. There is the risk of pleural infection. In my case it seemed that the oesophagus was looser when the patient's neck was fully flexed, the chin being pressed down on to the sternum. The use of the oesophageal tube was certainly a great help, and I would urge its employment upon any who may be called upon to do the operation. Complete extirpation of the stomach is, therefore, not merely a piece of brilliant surgical gymnastics. The operation has its place in surgery.

It may not be inadvisable to enter a protest against the description of any operation as a "complete" or "total gastrectomy," when a larger or small portion of the dome of the stomach is left. It is inaccurate and untruthful.

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A CASE OF DOUBLE PERFORATING GASTRIC ULCER.*

By L. LOVELL KEAYS, M.R.C.S., L.R.C.P. LOND.,

Late Assistant Surgeon, Royal Herbert and Auxiliary Hospital, Woolwich, and House-Physician, Middlesex Hospital.

On being summoned to see a girl taken suddenly ill I found the patient was quite dead. The following facts were elicited from her parents and friends.

Previous History.—E. M., female, aged 16, single, a general servant at a country inn. The family history was remarkably good; her mother and father were both alive and well, and of nine other children all were healthy except one sister who was slightly anaemic. She had had no previous illnesses of any importance apart from what will be described below. The patient had always enjoyed good health until about twelve months before when she complained of "indigestion," evidenced by pain after food and heartburn. This increased to actual vomiting immediately after food, followed by immediate relief from the pain. The vomit was described as being frothy, abundant, fairly clear and containing particles of food more or less unchanged. It tasted "nasty and acid." There had never been an attack of haematemesis nor had any signs of melaena been noticed. There was a definite history of acute epigastric pain in January, 1902, which in view of the subsequent necropsy it is interesting to note. The patient took nothing but liquids for some days and rapidly recovered from this attack. Again in September, 1902, she was ill and

* Extracts from a paper read before the East Sussex Branch of the British Medical Association.