and it is well to mark these days by a red dot within a circle.

If the morning urine alone is recorded the results will be more constant, more flattering, and less useful. The night specimen is best for a patient who does not always urinate at home. A twenty-four hours specimen is not much better; it is a nuisance to warm, and is only available for the home-keeping patient.

Ketone Test.—Every morning the patient watches two drops of liquor ferri perchlor. trickle down the near side of the urine glass. If it changes from yellow to dark brown the doctor must be informed that day.

THE SCHICK TEST AND ACTIVE IMMUNIZATION AGAINST DIPHTHERIA.

BY

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The burgh of Fraserburgh has, according to the Registrar-General's estimate for 1923, a population of 10,367. The births in that year numbered 257, and the average for the preceding five years was 287.

Incidence of Diphtheria in the Burgh.

Since 1900 there has been in Fraserburgh, as in other towns in the kingdom, an increasing incidence of diphtheria, as the following total notifications indicate:

1900-04	...	...	...	...	...	48
1905-09	...	...	...	...	...	127
1910-14	...	...	...	...	...	164
1915-19	...	...	...	...	...	61
1920-23	...	...	...	...	...	401

In view of this increased incidence and the cost of hospital isolation, the Public Health Committee, on my recommendation, decided to try the newer measures of prevention by toxin-antitoxin inoculation, and accordingly, on March 25th, 1924, decided to open a series of clinics, free of charge, for the inoculation of children under 5. The clinics were to be held once a week in the Town House, and to be conducted by the local medical practitioners in rotation, who had cordially agreed to give their assistance.

In recommending that children under 5 should be dealt with first, I was influenced by the fact that at this age reactions either do not occur or, as Dr. Park says, are "slight or negligible." The susceptibility at this age to diphtheria (70 to 80 per cent.), and the fact that half of the diphtheria deaths are among children under 5, were also reasons for trying to get as many of them as possible inoculated. It seemed likely also that the absence or slight nature of the reactions in young children would lead parents more readily to give their consent for the inoculation of the older children when the schools were dealt with, and this proved to be the case.

The first step in the way of propaganda was the distribution through the schools of a leaflet to all parents or guardians having children attending school, explaining the purpose of the clinic and the value of toxin-antitoxin inoculation, while the same leaflet was shown in large posters in shop windows and other places throughout the town.

The following is a copy of the leaflet.

DIPHTHERIA PREVENTION.

To Parents or Guardians:

Diphtheria is a most dangerous disease, and is particularly fatal to young children. Of a hundred deaths from diphtheria, 80 are under 10 years of age, the larger proportion being under 5.

Your children need not have diphtheria. It can be prevented.

Some people are able to resist the germs of diphtheria, others are not.

A simple method—painless and harmless—has been discovered to find this out. It is called the Schick test.

If this shows that your child does not resist diphtheria germs, it can be inoculated and protected against diphtheria.

As almost all children over 6 months and under 5 years of age are liable to contract the disease, it is not necessary to apply the Schick test to them. They should all be inoculated and protected. The inoculations are followed by no constitutional reactions and very little local irritation.

This method has been used for several years, and so far almost no one who has been so protected has got diphtheria.

Diphtheria can be stamped out and many lives saved every year if mothers will have this done and protect their children.

The Town Council of Fraserburgh have resolved as a first step to give parents an opportunity of having all children under 5 years of age and over 6 months protected free of charge. They have accordingly arranged to open a clinic in the Town House to which children under 5 may be brought. The clinic will commence on Wednesday, the 11th June, and will continue for six weeks, a meeting being held each Wednesday at 2.30 in the Town House. This clinic will be conducted by Dr. Beddie.

Subsequent clinics will be conducted by the other doctors in rotation.

To obtain complete protection each child will have to be brought to the clinic three times, at a week apart.

Articles giving a more complete explanation of the Schick test and toxin-antitoxin inoculation were published in the Aberdeen and Fraserburgh newspapers, and we were greatly indebted to the press for the strong support they gave us in the work. I carried out also, as far as time permitted, a personal visitation of the homes, more especially in the poorer parts of the town where diphtheria had been most prevalent.

Clinics.—The first clinic was opened on June 11th, but there was no attendance on the first three occasions. To the fourth clinic, however (July 2nd), 5 children were brought, and to the fifth 10. To the next three clinics 4, 3, and 0 came forward—the total attendances being 19, 17, and 6. To the eight clinics, therefore (June 11th to July 30th), only 22 children had been brought. This was largely due to the fact that, owing to absence on holiday in July, I was unable to continue the visitation of the homes which I had begun in June. On my return this visitation was energetically resumed, and the numbers coming to the clinics began to increase. On August 6th, 15 fresh children, and on August 13th 41, came, making the total at this latter clinic 57. With the consent of the Public Health Committee a second weekly clinic was opened on August 18th, and as the numbers continued to grow a third clinic was commenced on September 5th. These three clinics were carried on throughout September, October, and November, while one of them was continued into December. Apart from school children, there was a total attendance of 596 children under 5, 92 per cent. of whom were inoculated thrice, while of the remaining 47, 25 had two inoculations and 22 had one; 780 children from the schools were also inoculated at these clinics.

Schools.—On September 4th, by which date 183 children had attended the clinic, the town council resolved unanimously to take measures to deal with the schools, and authorized me, with the assent of the education authority, to ask for the consent of parents to inoculate those under 7 without Schick testing, to use the Schick test for those over 7 and inoculate those found Schick-positive, and to obtain such assistance as might be necessary. I did not think it desirable to apply the Schick test to children under 7, and the experience of applying the Schick test in the schools has confirmed me in this view. The head masters and mistresses of the schools were approached, and they most kindly promised their hearty co-operation. With their assistance consent forms were distributed to all parents and guardians; the forms were of two kinds, according as the children were under or over 7. Class sheets were provided, and these were very kindly filled in by the teachers of each class from the consent forms returned. No propaganda was employed further in connexion with the schools, other than had already been carried out for the children under 5. There are five schools in Fraserburgh, of which three are attended by children under 7—namely, the Infant, the North, and St. Peter's Episcopal. St. Peter's and the North School have children also up to 14, and the Infant School to 11. The Central is attended by children from 8½ to 14 years; the Academy pupils are over 12 years.

Children under 7.—For children under 7 consent was obtained for the inoculation of 324—namely:

St. Peter's Episcopal ...	29=93% of children under 7
Infant ...	222=87% " "
North ...	73=61% " "
	<hr/> 324=80% <hr/>

Children over 7.—For children from 7 to 14 consent was obtained for 1,239. These belonged to the following schools:

Central ...	608=90% of children over 7
Academy ...	202=88% " "
St. Peter's ...	100=86% " "
Infant ...	143=85% " "
North ...	184=61.5% " "
	<hr/> 1,237=82.2% <hr/>

The percentages of consents are very high. Dr. Park, speaking of the New York schools, says that these varied "from one-fourth to three-fourths, depending upon whether the teachers were enthusiastic or not in their co-operation," while the average for sixteen Edinburgh schools, as given by Dr. Benson,¹ was 42.3 per cent.

Schick Testing and Results.

The testing was carried out by a medical staff of seven, under the able supervision of Dr. Anderson, superintendent of the City Hospital, Aberdeen, who had been kindly allowed to assist in the work. In all cases a control test was carried out on the right arm. The Schick testing occupied two and a half days (October 13th to 15th), and the results were read on October 17th and 24th.

Of the 1,239 children, 456 were found to be Schick-positive and 783 Schick-negative. The following table gives the results:

Total Schick-positive (including 43 pseudo-positive) ...	456=36.8%
Total Schick-negative (including 130 pseudo-negative) ...	783=63.2%

The percentage of Schick-positives for each school was as follows: Infant, 49.6; Central, 48; Academy, 43; North, 39; and St. Peter's, 24. It is interesting to note that the average of Schick-positives among 83,000 children in the New York schools, as given by Dr. Park in 1922, was 35.7.

The inoculation of the school children was carried out at the clinics in the Town House along with the children under 5; the total number of inoculations done at these from June 11th to December 24th was 4,039. The highest numbers attending a clinic were 198, 188, 186, and 175.

The total number of children from 6 months to 14 years of age inoculated was 1,376. Of these, 1,290 (94 per cent.) completed the three inoculations. In addition, 12 teachers were inoculated (2 male and 10 female).

The numbers inoculated at the age of 7 and under were: from 6 months to 1 year, 61; second year, 142; third year, 141; fourth year, 150; fifth year, 166; sixth year, 153; and seventh year, 123.

One of the most gratifying features of the work was the entire absence or the comparatively slight character of the reactions following the inoculations of the children under 5. In the case of children over 5 also we were fortunate in having no reactions of a serious character.

Effect on School Attendance.

That the reactions in those over 5 were either absent or not serious is shown by the reports as to the amount of absenteeism in the schools following upon the inoculations, with which the headmasters and headmistresses very kindly supplied me, and which show that the inoculations had no noticeable effect on the school attendance. One may be given as an example:

In the Central School the percentage attendances from October 17th, the week of the Schick test, to December 5th, a week after the third inoculation, were as follows: 93.4; 91.3; 88.1; 92.1; 90.3; 90.4; 90; and 90.5. The inoculations were done in the three weeks from November 14th to November 28th. "The change

in percentage attendance," the headmaster points out, "is not noticeable."

The reports for the other schools were in similar terms.

Incidence of Diphtheria amongst those Inoculated.

Amongst the children who were inoculated, three cases of diphtheria occurred down to February 14th. The first was a boy, aged 6, inoculated on October 12th, 20th, and 29th, who developed diphtheria on November 30th. His attack was so slight that he recovered without the administration of antitoxin. The second was a girl, aged 4½ years, who developed diphtheria on December 13th, forty-five days after the date of the third inoculation, which was on October 28th. There was hardly time, therefore, for her to have developed protection. The third case was a child, aged 2½ years, who was notified on January 21st, 1925. She had been inoculated on August 13th, 20th, and 27th, 1924, so that there was time for protection to have developed. Two points, however, have to be kept in view: first, that protection may not be complete for a year; and secondly, that a certain percentage of cases are not protected by the first series of inoculations. All three cases made a good recovery. I may add that during 1924 43 cases of diphtheria were notified in Fraserburgh, 19 being under 14 years of age. This year (1925) 5 cases in all have been notified, all under 14. One of these was the third case referred to above as occurring amongst those who had been inoculated. The other 4 cases had not been inoculated. One of them had had diphtheria four years ago. Last year two girls, 9 and 12 years of age respectively, who had been tested and found Schick-positive, developed diphtheria before the inoculations could be carried out.

Suggestions.

As the result of my experience in Fraserburgh, I have formed the opinion:

1. That, for the reasons mentioned in the earlier part of the paper, it is better to commence the work with children under 5, and that even in an area where antivaccinators are numerous (and in Fraserburgh the percentage of unvaccinated children is from 30 to 40) the work may be successful if carried out with energy and perseverance.

2. That the most successful form of propaganda is the visitation of the homes, and in this latter work the fathers as well as the mothers must be approached and persuaded. I frequently found that the rather sharp reactions which had sometimes followed inoculations, such as those against typhoid, paratyphoid A, and paratyphoid B, in the late war, had made many of the men who had experienced them averse to inoculations generally, and they had to be convinced that the inoculations of the children with toxin-antitoxin would not be followed by similar reactions.

3. That if prejudice against it amongst the working class is to be avoided, the work should be carried out simultaneously among the better class.

4. That it is very important that medical practitioners be asked to co-operate to the utmost extent. In the support I received from the medical men in Fraserburgh I was singularly fortunate, and to their help the success of the work was largely due. I should like to add also that the district nurse rendered me the greatest assistance, and that she was present at all the clinics and helped most effectively in the propaganda work.

I think there can be no doubt that if toxin-antitoxin inoculation against diphtheria were adopted generally it would lead to a great diminution in the incidence of the disease and to a still greater diminution in the case mortality. Sir George Newman admits that diphtheria remains "one of the most baffling diseases from the point of view of the public health administrator, and that the mortality from it has not shown any decline during the past ten years." It was the failure of the usual administrative measures accompanied by a high case mortality that led Dr. Park and his coadjutors to introduce these measures in New York. They found that the number of "carriers" in times of epidemic made the control of diphtheria by the ordinary methods of little or no avail.

The Town Council of Fraserburgh and its Public Health Committee have supported wholeheartedly the various measures recommended, and faced the rather heavy expenditure involved without hesitation and in a highly public-spirited manner, seeing that they were about the first authority in this country to adopt these new measures on a large scale.

REFERENCE.

¹ *Lancet*, November 8th, 1924.

JEJUNO-COLOSTOMY IN THE TREATMENT OF ACUTE SPREADING PERITONITIS.

BY

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THE prognosis of acute spreading peritonitis has improved very greatly since the universal recognition of the importance of removal of the focus of the infection (commonly the appendix), drainage, rectal salines, and Fowler's position. Unfortunately cases occasionally occur in which the application of these methods fails, and hitherto the outlook in such circumstances has been almost hopeless.

Mr. Sampson Handley's work on this subject cannot be too widely known. It is of great value, and his line of treatment offers a hope in truly desperate cases. He embodied his views in a Hunterian Lecture, which is published in a finely illustrated article in the *British Journal of Surgery* (January, 1925). The chief points in this lecture may be summarized as follows:

1. The importance of intestinal paralysis in severe forms of peritonitis.
2. In some cases the infection itself, and the toxæmia resulting, are so intense that no treatment is of avail.
3. In others, less severe, but progressing more slowly to a fatal issue (in spite of removal of the septic focus, drainage, Fowler's position, etc.), the main feature is failure to produce an action of the bowels. Death in these cases is due not so much to absorption from the peritoneum as to paralysis of the bowel wall.
4. This paralysis does not usually affect the whole of the bowel, as is often thought to be the case.
5. The paralysis affects, at first, the pelvic coils of the ileum and the pelvic colon (hence the name of "ileus duplex" given some years ago to this condition by Mr. Handley). Later, the peritonitis spreads upwards to the hypogastric region, and a large amount of small intestine becomes involved, but the inflammation does not often reach the upper abdomen. "General" peritonitis is rare.
6. The signs of spreading "hypogastric peritonitis" are tenderness, rigidity, distension, and immobility of the abdomen below the umbilicus; rising pulse and falling temperature; anxiety and extreme discomfort; vomiting which is vigorous and in considerable amount at not frequent intervals (and not yet effortless, frequent, and in small quantities—which is a final hopeless stage), and failure of turpentine enemata, combined with hypodermic injections of pituitrin and eserine, to emit flatus.
7. Treatment is designed to overcome the obstruction which exists in the small bowel and also in the pelvic colon. If the obstruction is relieved, the peritonitis tends to subside. Jejunostomy has obvious disadvantages. The procedure advocated is short-circuiting combined with a temporary caecostomy; in the pelvic stage an ileo-caecostomy with caecostomy; in the hypogastric stage a jejuno-colostomy with caecostomy.

Mr. Handley reports four cases with spreading hypogastric peritonitis, in which he performed jejuno-colostomy and caecostomy. Three of these completely recovered. He informs me that none of these patients have suffered any disability from the short-circuiting, such as diarrhoea or loss of weight. Presumably the anastomotic opening tends to close—or ceases to function—when the peritonitis sub-

sides and the obstruction disappears. In the fourth case, although the infection was so severe as to cause pyæmic abscesses, from which the patient died on the twenty-seventh day, yet the peritonitis entirely subsided.

A similar case that I have treated recently furnishes another proof of the correctness of Mr. Handley's views and the hopefulness of the treatment that he recommends.

In my case the patient had acute spreading peritonitis, and was very obviously going downhill. A jejuno-colostomy was performed with immediate beneficial result, and the peritonitis completely subsided in two weeks' time. A sloughing ischio-rectal abscess unfortunately developed, and the patient died from its effects on the twenty-sixth day after the operation.

It will be noticed that caecostomy was not done in this case. The pelvic colon is not necessarily involved in the inflammatory paralysis, though this would presumably be so when it has a long loop which lies in the pelvis. Three days before the short-circuiting was performed a large collection of pus had been drained from the pelvis, and an enema administered soon after had given a good result. This convinced me that the pelvic colon itself was not paralysed, but only the small intestine, as was subsequently verified.

As a rule, however, it would, I presume, be wiser to combine caecostomy with the anastomosis.

A married woman, aged 47, had mild pain in the abdomen on January 21st, 1925, and vomited once. The next day she called in Dr. Poole of Norwich. The temperature was 99° F. and the pulse below 80. She had slight abdominal pain, but there were no local signs, either abdominally or on pelvic examination, sufficient to enable a diagnosis to be made. The symptoms remained about the same until January 26th, when the abdomen became distended, and the patient vomited two or three times. An enema gave a good result.

First Operation.

I saw the patient in consultation with Dr. Poole on January 27th. The symptoms were increasing. There was marked distension of the abdomen, but no rigidity. The temperature was 101.5° F. and the pulse 80. A tender tense swelling could be felt in Douglas's pouch. Under general anaesthesia an incision was made in the posterior fornix of the vagina, and a large collection of thin, stinking pus and a loose faecal concretion were evacuated. A drainage tube was inserted. The presence of the concretion in the pus confirmed a diagnosis of appendicitis.

The next day (January 28th) the temperature was normal and the bowels were opened well after a soap enema. On January 29th the distension recurred; there was some forcible vomiting. A small amount of flatus was passed after giving eserine and pituitrin. The next day the distension was very great. Vomiting continued, forcible and in moderately large quantities. No flatus resulted after repeated injections of eserine and pituitrin and turpentine enemata. The pulse had risen to 96, and the patient was obviously very ill.

Second Operation.

Right paramedial laparotomy was performed. Very distended and intensely congested coils of small bowel were found, with patches of lymph gluing them together in places, up to the level of the umbilicus. The transverse colon was empty and not inflamed. The small intestine was incised at two places, and gas and liquid contents evacuated. The incisions in the bowel were closed. A loop of the middle or lower part of the jejunum, which was distended and somewhat inflamed, was anastomosed (side-to-side) with the middle of the transverse colon. A cigarette drain was inserted down to the pelvis and the laparotomy wound closed. Two pints of glucose in saline solution were given intravenously.

On February 1st flatus passed in quantities; there was less distension. The following day there was a good liquid result from enemata, and on February 3rd good natural reliefs; there was still less distension.

On February 6th there had been no vomiting since the operation a week before. There was still considerable distension of the lower abdomen. Stools were frequent and loose. There was some pyrexia, and the tongue was dry and raw, but the patient was taking nourishment well. She was obviously suffering from septic absorption, and antistreptococcal serum was given. On February 12th there was still some pyrexia; the tongue was still dry and raw. Antistreptococcal serum was given. Two days later a stinking left ischio-rectal abscess was opened.

By February 18th the general condition had improved; the abdomen was quite soft, and there was no distension. The next day the tongue was moist, and she was taking food well. The bowels acted two or three times daily.

On February 22nd the patient had sudden acute diarrhoea, and she was very ill. The tongue was dry and raw. Two pints of glucose in saline were given intravenously. A large slough was discharged from the ischio-rectal abscess. The next day she was semi-conscious. Three pints of glucose in saline were given intravenously.

The patient died on February 24th.