lax musculature renders it peculiarly unsuitable for operative procedures. Moreover, the risk of rupture of its walls from ulceration or instrumentation must not be ignored.

Cancer of the hypopharynx—in females a by no means uncommon affection—is amenable to diathermy provided the disease is high up and strictly localized, which it rarely is, however. In such cases the growth may be rendered visible with Seiffert's directoscope.

Access to a malignant growth in the oesophagus situated about the level of the bifurcation of the trachea—a common situation—or at the cardia, is naturally difficult, but is possible with the aid of the oesophagoscope. In this situation diathermy is, however, always dangerous owing to the difficulty of ascertaining the degree of mural involvement and the risks of perforation. In every case an attempt should be made to determine the extent of the tumour. This may be done by the method of "coulée reversée," the patient lying in a reclining position with the head lowermost, thus permitting the opaque meal to run backwards and so to outline the lower edge of the growth. An active electrode is then passed and the growth carefully coagulated. The electrode recently designed by Wright of Bristol renders the application of diathermy easier and safer than with any other, since it coagulates from below upwards, and therefore under the observation of the operator, instead of, as is usual with other instruments, from above downwards. If it is desired to irradiate with radium, an endless thread, to which one, two, or three screened tubes containing radium element are attached, is swallowed and the tubes pulled into position in vertical series. The preliminary coagulation and consequent opening up of the stricture will be found to permit of this being done comparatively easily. In two of my cases a lumen sufficient to enable solid food to be swallowed was obtained, while in another case coagulation of the growth was followed by complete cicatricial atresia. In all cases the performance of a preliminary gastrostomy is advisable.

Whether it will ever be possible to excise a malignant growth of the thoracic oesophagus after the performance of a thoracotomy is in the lap of the gods. At the moment diathermic coagulation, with or without the subsequent employment of radium, affords a chance, although a very slight one, of eradicating the disease.

The early and more frequent use of the oesophagoscope in all cases with symptoms of even slight dysphagia should be impressed upon the profession as the one and only means of arriving at an exact diagnosis.

Summary of the Advantages of Diathermy.

1. That it is of definite value when ordinary surgical procedures are contraindicated.
2. That it is followed by little, if any, shock.
3. That with reasonable care it is a practically bloodless operation.
4. That besides sterilizing the tissues it blocks the vascular and lymphatic channels leading to and from the growth.
5. That by so doing it tends to prevent dissemination of the cancer cell.
6. That it affords relief from mechanical symptoms such as obstruction, dyspnoea, etc.
7. That it arrests the tendency to spontaneous haemorrhage.
8. That it relieves pain.
9. That the resulting scar tissue is soft and pliable and does not form adhesions.
10. That septic bronchopneumonia is less frequent than after severe cutting operations.

Disadvantages of Diathermy.

1. That it destroys a certain area of healthy tissue around the original growth.
2. That the walls of blood vessels in the immediate neighbourhood of the growth may become softened and ulcerated, with resulting attacks of severe secondary haemorrhage.
3. That when the skin is involved keloid cicatrices may develop.

The advantage of combining the application of radium with coagulation by diathermy is that the lymphatic area is thereby irradiated, wandering malignant cells are killed off, and the risk of subsequent metastasis is materially lessened.

The results obtained by radio-diathermy, complicated and tedious as the treatment undoubtedly is, will repay all the trouble taken, the patient frequently taking on a new lease of life, free from pain and haemorrhage, and in most instances ending it with greater comfort than would otherwise have been the case.

ON THE ACTION OF CERTAIN ALLEGED INTESTINAL ANTISEPTICS.

BY

LAWRENCE P. GARROD, M.B., M.R.C.P.,
DEMONSTRATOR OF PATHOLOGY, ST. BARTHOLOMEW'S HOSPITAL.

THERE are on the market several preparations described as "intestinal antiseptics." To my mind the meaning of the advertisements can only be that the preparations are capable, when taken by the mouth, of destroying at least a proportion of the organisms in the intestinal tract. The total extent of that effect, and its degree in the case of each different type of organism present in the bowel, are not described; it may, in fact, be said that the claims made for these products are, with one exception, unsupported by any evidence, generally known, of their action in the human subject.

The flora of the bowel undergoes very radical changes between the jejunum, where organisms are first found in any considerable numbers, and the rectum.¹ The organisms found in the former situation disappear even before the ileo-caecal valve is reached, and those present in the faeces make their first appearance certainly no higher than the middle of the jejunum. What the action of an alleged intestinal antiseptic may be on the organisms in the upper part of the intestinal tract is almost impossible to ascertain, and the following observations are concerned only with those present in the faeces. These, or certain of them, are the organisms which it is regarded as desirable to destroy when an intestinal antiseptic is employed, and they are those which these drugs are generally understood to be capable of destroying.

The enumeration of living aerobic organisms in the faeces is not a difficult matter. To enumerate living anaerobes with accuracy is almost impossible, and these have therefore to be left out of account, it being assumed that the numbers of coliform bacilli and Gram-positive cocci obtained in aerobic cultures are a sufficient index to the total numbers of living organisms of all kinds in the specimen. Certain factors have, however, to be taken into account which render such an investigation less simple than would at first appear. Of these the principal is that wide variations may occur from day to day in the total numbers of living organisms in the faeces. A fluid stool may contain one hundred times as many living organisms as a scybalous stool from the same subject. It is therefore desirable that the subject of an experiment with one of these drugs should be accustomed to passing daily stools of reasonably uniform character, and further, that the observations should be continued over a considerable period, in order to obtain a reliable average. It is necessary, also, to cultivate the specimen within a few hours of its being passed, or to keep it in the cold, since rapid multiplication of the organisms contained in it will occur at room temperature. Lastly, in view of the well established effect of diet on the bacteriology of the faeces, it is desirable that the subject should remain on a fairly consistent diet throughout the experiment. These precautions were observed in the investigations to be described. The method employed was the following:

Method of Investigation.

About half a gram of faeces is placed in a large sterile tube of known weight and accurately weighed. Sufficient sterile water is added to give a convenient dilution, such as 1 in 50. Complete emulsification is carried out by forcing the fluid in and out of a long syringe with a wide-bore needle (this process will do in

two minutes what will occupy a mechanical shaker half an hour). Decimal or other convenient dilutions are then made from the emulsion, and from each of the last two, three, or four dilutions 0.1 c.cm. is sown on to large plates, previously dried thoroughly (at least 5 per cent. of the water in the medium being evaporated by standing on a 55° C. oven), and spread until the fluid sown has been absorbed by the surface of the medium, leaving it dry. After incubation the colonies are counted, and the results expressed in millions of living organisms of each type per gram of faeces.

Cultures made by this method yield uniformly spaced discrete colonies, and, apart from their value as affording quantitative results, are superior to those made by the ordinary method.

The syringe employed for emulsification and the 0.1 c.cm. pipettes for sowing had to be specially made for the purpose.

That the numerical accuracy of the results can be relied on was shown by duplicating the process, consistent results being obtained.

The procedure followed was, to examine daily by this method the faeces of a subject who was either a normal individual or a patient not known to be suffering from any intestinal disorder, for a period of about a fortnight, during one-half of which the drug was administered in what are understood to be adequate doses. The results may be shown in the form of a graph, but they can most concisely be presented as the average numbers of living organisms in the faeces during the two periods. The following table shows the whole of the results obtained by experiments *in vivo*.

TABLE I.—Effect of Intestinal Antiseptics on Total Numbers of Living Organisms in Faeces.

Drug.	Dose.	Before Administration.		During Administration.		Reduction or Increase.
		Days.	Average Number of Living Organisms per Gram in Millions.	Days.	Average Number of Living Organisms per Gram in Millions.	
Dimol ...	gr. 8	21	520	14	416	-20%
Kerol ...	m 12	6	2,050	7	2,061	+0.5%
Yatren ...	0.5 gm.	7	767	5	1,450	+89%
Izal (1922) ...	m 6	10	453	7	44	-90%
Izal (1925) ...	m 6	13	690	7	632	-8%
Izal (1925) ...	m 22	7	40	6	100	+150%

The figures under "Dose" indicate the total quantity given daily. All the drugs, except yatren, were administered three or four times a day.

Of some of these results there is a good deal further to be said in explanation.

The case of dimol and of kerol is comparatively simple; the change in numbers is so slight (in the former a decrease of 20 per cent., and in the latter an increase of 0.5 per cent.) as to afford no evidence of antiseptic action.

Yatren is a preparation the use of which is advocated in amoebic dysentery²; it claims, in fact, only to be an amoebicide, and its general antiseptic effect was only investigated because it had been supposed to exert a favourable influence on non-dysenteric ulcerative colitis. The actual increase in the number of living organisms in the stools during the administration of this drug is presumably fortuitous.

The case of izal presents a different problem. The capabilities of this preparation were investigated no less than twenty-four years ago by Gordon,³ and his findings represent the single exception referred to in the first paragraph of this article. These were confirmed, as indicated by the figures under "Izal (1922)" in the above table, which show a very great reduction in the number of living organisms in the faeces during its administration. This experiment was repeated in 1925, with entirely negative results, and again in the same year, under the strictest precautions against error which could be devised, including the carrying out of most of the cultures in duplicate throughout, and with the employment of a much larger dose of the preparation. So far from any antiseptic action being demonstrated, the total number of living organisms in the faeces was actually greater during the administration of the drug than before and after it. The purpose of this paper is to record certain results without attempting to draw any but fully warranted conclusions, and it

can therefore only be suggested that the cause of this discrepancy may perhaps be a recent change in the composition of izal; the boxes in which it is now sold are labelled "Improved Izal Perles," and if the "improvement" referred to has had the effect which these results appear to indicate it will be well for its manufacturers to revert to the original process employed in preparing it.

Granting the conclusion suggested by the above results—namely, that three well known "intestinal antiseptics" are incapable of affecting appreciably the numbers of living organisms in the faeces—it may well be asked, What are the ideal requirements for an "intestinal antiseptic," and in which respect do these preparations fail?

Assuming that such a preparation can exist, it should have the following properties:

1. It should not be decomposed by the processes of digestion.
2. It should not combine with, and be rendered inert by, any substance present in the intestinal tract.
3. It should not be absorbed by the intestinal mucous membrane.
4. It should be capable of destroying intestinal organisms even in high dilution.

That certain of these preparations fulfil the last of these requirements is claimed by their manufacturers. But it must be remembered that the usual method of titrating antiseptic power *in vitro* involves exposing a saline suspension of such an organism as *B. coli* to the unhindered action of the antiseptic, a proceeding which takes no account of the first three postulates suggested above. In which of them the truth lies as to the failure of these drugs *in vivo* it is not possible to say, but some indication may be afforded by the following experiments, in which the antiseptic power of these preparations was investigated, not on single organisms, but on the faeces themselves, *in vitro*.

A 1 in 10 emulsion of a specimen of faeces was made. From this emulsion further dilutions were prepared, and cultures sown by the method described above. Another portion of the original emulsion was mixed with an equal amount of a solution of the antiseptic to be investigated at 37° C. for one hour. Decimal dilutions were made immediately, and cultures made in the same manner.

It should be observed that none of the preparations here concerned is readily soluble in water. Izal and kerol are oily substances from which adequate emulsions in water can be prepared only with difficulty. Yatren is very sparingly soluble (its exact solubility was not determined). Dimol (of which a tablet described as containing 1 grain weighs, after removing its sugar coating, about 4 grains, so that it is presumably mixed with some other material) is not completely soluble even in the higher dilution employed. The following table indicates the results obtained.

TABLE II.—Action of Intestinal Antiseptics on Faeces *in Vitro*.

Drug.	Total Number in Faeces (millions).		Total Number after 1 hour at 37° C. with Antiseptic (millions).		Reduction or Increase.	
	Streptococci.	Coliform Bacilli.	Streptococci.	Coliform Bacilli.	Streptococci.	Coliform Bacilli.
Izal (1925) 1 in 200	3.6	75	0.66	0	-82%	all killed
Izal (1925) 1 in 2,000	3.6	75	16	10	+344%	-87%
Dimol 1 in 200 ...	10.6	7.4	0.046	0	-99.6%	all killed
Fimol 1 in 2,000	10.6	7.4	10.8	1.5	+2%	-80%
Kerol 1 in 200 ...	10.6	7.4	2.7	0.0002	-75%	-99.99%
Kerol 1 in 2,000	10.6	7.4	12.4	1.46	+17%	-81%
Yatren 1 in 430...	218	3	774	2	+255%	-33%
Yatren 1 in 4,000	218	3	526	2.8	+141%	-6%

In control emulsions incubated without antiseptic streptococci increased and coliform bacilli diminished to a moderate extent, approximately the same as in the tubes containing yatren. The dilutions named are those obtained after admixture with the faecal emulsion.

The interpretation of these results would appear to be as follows.

Yatren has no antiseptic effect whatever; during incubation the organisms in the emulsion multiplied. Since this

drug is claimed only to be an amoebicide, this result is what might be expected. The other three preparations exhibit a common action, varying little in degree, which is of considerable interest. They destroy all *B. coli* in a dilution of 1 in 200, and a large proportion of *B. coli* at 1 in 2,000. On the other hand, they destroy only a proportion of streptococci at 1 in 200, and at 1 in 2,000 streptococci actually multiply. This is a selective action paralleled by the well known property of phenol of inhibiting the growth of *B. coli* in dilution of approximately 1 in 200, at which streptococci will grow vigorously, a property which has been found of considerable use in routine bacteriology. This suggests that all these three preparations are closely allied in action, and presumably in composition, to phenol.

To those who regard the predominance of streptococci in the faeces as accountable for chronic ailments such as arthritis, this action on the part of these drugs will hardly commend itself. But before applying such findings to the presumed effect of these drugs on the human subject, it must be asked in what dilution they were present in the intestinal tract when taken in ordinary doses. This cannot be determined unless it is known whether they are absorbed, combined, or destroyed, or unless a method be devised for estimating them in the faeces themselves. The latter, having in view that their composition is unstated, is hardly feasible. But some indication as to their activity, if any, in the colon may perhaps be obtained by comparing the results of the two above series of experiments *in vivo* and *in vitro* respectively. The latter clearly show that in certain dilutions three of these antiseptics exert a selective action on coliform bacilli.

If, in experiments on the human subject, it were shown that although the total numbers of organisms in the stools were unaffected the proportion of streptococci to coliform bacilli was increased, it might be presumed that this change had been brought about by the action of the antiseptic, and therefore that its dilution in the bowel is something in the neighbourhood of 1 in 2,000. That this is probably not so is shown by the following figures, which refer to the same series of experiments as in Table I.

TABLE III.—Average Percentage of Streptococci in Faeces before and during Administration of "Intestinal Antiseptics."

Antiseptic.	Average Percentage of Streptococci.	
	Before Administration.	After Administration.
Dimol	34	54
Kerol	4	3.9
Izal (1925)	31	36
Izal (1925)	46	37

In only one case, that of dimol, is there an appreciable increase in the number of streptococci in the stools during treatment, and even this is not sufficient, as an unconfirmed observation, to indicate with certainty that the drug is exerting its selective action *in vivo*, although the fact that it possesses this power *in vitro* to a greater extent than either kerol or izal suggests that this may be the case. Kerol and izal do not appear to affect the relative proportions of the two types of organism at all.

If this comparison is justifiable, therefore, it would appear that these drugs do not reach the colon in an active form and sufficient concentration to exert the effect which they are shown to produce on faecal organisms *in vitro*.

Conclusions.

The only conclusion which can with certainty be drawn from these experiments is that the drugs investigated, when given by the mouth, do not appreciably reduce the total number of living aerobic organisms in the faeces. Whether it can therefore be said that they are therapeutically useless is a matter upon which it would be rash to pronounce an opinion. But it may reasonably be submitted, in view of these findings, that specific and detailed evidence as to the alleged action of these drugs should be published in support of the claims which are constantly made for them. It is possible that data exist upon which these claims are founded, obtained by other methods, which traverse the deductions suggested by the experiments here described. If not—if, in fact, these claims are made without due investigation of the results obtainable in the living

subject by the administration of these drugs—then it may reasonably be asked whether any indication exists for their employment.

Summary.

The experimental results obtained may be summarized as follows:

1. Four preparations, of which three are described as intestinal antiseptics, were found to exert no appreciable effect on the total numbers of living aerobic organisms in the faeces when administered by the mouth in adequate doses.

2. Of the same preparations the three referred to above were found to exert on faeces *in vitro* an antiseptic action much greater for coliform bacilli than for streptococci, the concentration of the drugs being considerably higher than that in the intestinal tract which presumably follows their administration by the mouth. The fourth preparation had no evident action whatever in any dilution employed.

This work formed part of a research undertaken for the Gillson Scholarship of the Society of Apothecaries. I am indebted to them, and to Dr. Geoffrey Evans, whose patients were some of the subjects in the investigations.

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GASTRIC PAIN.*

BY

CHARLES MILLER, C.B.E., M.D.CAMB.,
F.R.C.P.LOND.,

ASSISTANT PHYSICIAN TO THE ROYAL DEVON AND EXETER HOSPITAL;
CONSULTING PHYSICIAN TO THE LONDON HOSPITAL.

NORMAL digestion should be without sensation except for such feelings as those of satisfied hunger and a renewal of energy. Unpleasant sensations such as discomfort and pain after the ingestion and during the digestion of food are symptoms of the abnormal. The abnormality may be in the patient's consciousness in that he is in such a state of nervous sensitiveness that the ordinary actions of digestion are felt by him and are unpleasant. But even in these cases the general condition of debility affects the digestive apparatus and produces faulty working. Gastric pain is associated in our minds with the patient who complains of indigestion because there is something wrong with the stomach.

There is no more difficult task in medicine than to unravel the tangle of symptoms which drive a dyspeptic to consult us. Of these symptoms discomfort and pain are prominent. The investigation of the symptoms—that is, the taking of the history—is of the greatest value as an aid to diagnosis. It is to surgery, and not to physiology and medicine, that the credit is due for elucidating the disorders of digestion. Physicians at one time were content to treat indigestion with alkalis and, if that failed, with acids; since surgical measures have come to the fore our knowledge of gastric disorders has increased and the methods of investigation have become more numerous and more trustworthy.

The tripod on which a gastric diagnosis rests is: (1) the clinical examination, of which the history is by far the more important part; (2) the test meal; (3) the radiological appearances of an opaque meal. Of these the radiological findings can be the most definite. An ulcer can in some cases be demonstrated and we then have direct evidence. But most of the radiological evidence is indirect, and is concerned with the observations of position, filling, emptying, and peristalsis. The test meal is valuable, but is more variable as the gastric secretions may vary from day to day and are subject to influences from outside.

The clinician, therefore, still has work to do in examining the patient. The physical examination in gastric disorders seldom reveals any gross sign. There may be a tumour, or visible peristalsis, or a dilated stomach with a splash; but usually rigidity of the abdominal muscles is the only objective sign. At the same time it must be remembered that a full examination must be made, which includes

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