method, to effect union without constitutional disturbance; and in those cases where I have cut down upon and pegged the bones, the patients have all done well. Those on the femur are undoubtedly the testing cases. In several of Mr. Lister's eight cases, we find the operation had to be repeated before union was accomplished; in one, it failed; and in one, amputation was resorted to in order to save life. In the only case I have met with and operated on, as stated in my paper, the case did well without special antiseptic precautions; but I do not draw deductions from one case, and, in such cases as resection of the femur for ununited fracture, I should not be inclined to neglect any means likely to preclude risk.

Mr. Lister seems to object to my saying that I considered his statement about the treatment of abscesses connected with diseased bones or joints as exaggerated, and likely to interfere with what I considered one of the best parts of the system. He asks, "Can Mr. Spence suppose," etc. Now the question is not what I suppose, but what Mr. Lister said; and I repeat that anyone who contrasts Mr. Lister's present explanation of the course of such cases with his previous statement, will see that there is a great difference. As to the question of the subsequent discharge not being purulent, that is a matter of opinion and observation. But the question as to the length of time required for the probable cure of such cases is a most important one as regards hospital management, and would almost suggest the necessity for special institutions for their treatment. There is one of Mr. Lister's statements in regard to opening abscesses and sinuses connected with diseased joints, which I cannot pass over. "Such cases," he says, "are indeed too common; and I would venture to say in all seriousness to Mr. Spence, that, for this unfortunate fact, teachers like himself are in a great measure responsible", etc. I would say to Mr. Lister in all seriousness, that, before he makes a charge of this kind, he ought to be sure that it is true. I never taught that to plunge a knife into an abscess connected with a joint, without due precautions, was proper practice. The precautions used might be different from Mr. Lister's, but, long before his system was known, the dangers were fully recognised, and special methods in dealing with such abscesses were recommended. Opening by various forms of exhausting apparatus, or with tubing under water, injecting iodine and water, opening freely to get rid of curdy pus, and then painting the whole pyogenic surface with tincture of iodine or chloride of zinc solution, were amongst these precautions. And in cases where abscesses existed, in knee-joint disease, the rule in my own practice, and that of other surgeons in the Royal Infirmary, was to avoid opening them before amputating. Fortunately, my teaching can be found in my published Lectures; and anyone, by referring to pages 25 to 28, may judge how far Mr. Lister is warranted in his statement regarding my teaching. This want of "a little charity towards a late colleague" reminds me that Mr. Lister has not replied to my remarks on his teaching regarding antiseptic suprapubic lithotomy, and the results of his practice.

NOTE.—The following is the simple method of dressing stumps referred to in the preceding communication.

Suppose an amputation of the thigh. After the operation is completed and the drainage-tube inserted, the stump is laid upon a Gooch's splint, padded and covered with gutta-percha tissue, and fastened to the splint by a turn of carbolised gauze bandage; the end of the stump and the drainage-tube should project a little beyond the end of the splint. The patient is then laid on a mattress, about one-third of which has been cut away on the side corresponding to the amputated limb. The stump is then swung from a cradle with the point dependent, and under it a plate containing a strong solution of carbolic acid or chloride of zinc receives the blood or other discharges as they fall from the wound. The cradle is covered with a veil of gauze.

Thus no textile fabric is in contact with the wound, and, as the stump is slung, all discharges drain away at once into the plate, and are there acted on by the antiseptic fluid. As no manipulation beyond lightly touching the cicatrix with a moist camel-hair pencil occasionally is required, perfect rest is ensured.

PRESENTATIONS.—Mr. Alfred S. Perkins of St. Sidwells, Exeter, upon resigning as Medical Officer to the "Loyal Rougemont" Lodge of Odd Fellows, has been presented with an inkstand of polished oak mounted with silver, inscribed "Presented to A. S. Perkins, Esq., as a mark of esteem from the members of the Loyal Rougemont Lodge, I.O.F., M.U. February 26th, 1880."—Mr. Frederick J. Parsons of Portland has been presented with an elegant clock, as a mark of esteem, by his patients and friends.

THE sum of £107 has already been subscribed towards a painted window to be placed in the Bampton parish church, and a monument in the old church-yard, as a memorial to the late Mr. Alexander Thom.

RESULTS OF SURGICAL TREATMENT, WITHOUT ANTISEPTICS, IN THE KILMARNOCK INFIRMARY.*

By JOHN C. McVAIL, M.D., Kilmarnock.

THE important discussions lately published on antiseptic surgery have induced me to collect the chief statistical results of the simple or non-antiseptic treatment practised by Dr. John Borland in the Kilmarnock Infirmary. During the past three years, much fuller tabular statements than formerly have been issued in the annual reports; I therefore confine myself to that period.

The total surgical cases treated to a termination were 543, and Table I contains a list of the deaths that occurred.

TABLE I.

No.	Nature of case.	Time in Hospital, or after the Operation.	Notes.
1	Railway injury.	4 hours.	All moribund on admission.
2	Extensive burns.	9 hours.	
3	Internal injuries.	5 minutes.	
4	Smashed legs.	2 hours.	
5	Smashed legs.	3 hours.	
6	Fracture of pelvis, etc.	9 hours.	
7	Laceration of lungs from fractured ribs.	13 hours.	
8	Gangrene of feet and legs.	11 days.	Gangrene, caused by exposure to cold, in a tramp, with broken-down constitution.
9	Laceration of legs.	11 days.	Died of tetanus.
10	Disease of knee.	45 days.	A hectic emaciated subject, who lived almost entirely on stimulants. Knee quite disorganised, and discharging from numerous sinuses. A series of abscesses formed along the thigh, a new one appearing every two or three days. Never was fit for operation.
11	Syme's amputation.	41 days.	A strumous subject. Stump healed in about twenty-eight days. Patient was taking out-door exercise, and was about to be dismissed, when a very large abscess formed over the sacrum, in 48 hours, and death resulted from pyæmia.
12	Amputation of both legs.	7 days.	Aged 52. Died from gangrene of back (the result of a blow from an engine-buffer) and internal abdominal injuries.
13	Amputation of thigh.	3 days.	Aged 76. Internal injuries caused death.

This gives a death-rate of 2.33 per cent. But if we eliminate the seven cases under twenty-four hours in the wards, the following is the result.

In 1877		4 deaths in 171 cases, or 2.3 per cent.
In 1878		2 deaths in 167 cases, or 1.1 per cent.
In 1879		0 deaths in 199 cases, or 0.0 per cent.

Total 6 deaths in 537 cases, or 1.1 per cent.

Operations.—In the above 537 cases, 107 operations were performed, of various degrees of importance. The deaths were three—Nos. 11, 12, and 13 in the table. The rate is therefore 2.8 per cent. The following are the fifty principal cases. Those marked * are included, owing to joints having been opened—the elbow in two, and the wrist in one case.

TABLE II.

Operation.	No.	Deaths.
Amputation of thigh	11	1 (No. 13)
" both legs	1	1 (No. 12)
" leg	8	0
" ankle (Syme)	5	1 (No. 11)
" foot (Chopart, 2; Hey, 1)	3	0
" arm	5	0
" forearm	1	0
Excision of elbow	1	0
* " head of radius	1	0
" mamma	2	0
" cancer of back	1	0
" cancer of upper jaw	1	0
" epithelioma of arm	1	0
* " metacarpal bone	1	0
* Reduction of compound dislocation of elbow	1	0
Removal of sarcoma from head of tibia	1	0
Exposure and stretching of sciatic nerve	4	0
Ligature of superior circumflex artery of humerus	1	0
Extirpation of eyeball	1	0

Of these fifty cases, eleven were primary, with two deaths, and thirty-nine for disease, with one death.

* Read before the Glasgow Medico-Chirurgical Society.

The compound fractures were eight in number, namely, ten of the thigh, six of the leg, and one of the forearm. All recovered.

Under the name *injuries* are included severe bruises, as well as wounds. On inquiry, however, I find that forty-two wounds, of varying severity, were treated. Of these, one died from tetanus (No. 9, Table I).

In endeavouring to compare these statistics with Mr. Lister's, I have been unable to obtain his total admissions and total death-rate while in Edinburgh. Placing the figures, however, alongside of those of Dr. Cameron of the Glasgow Royal Infirmary, recently referred to in the BRITISH MEDICAL JOURNAL, I find that his death-rate is 5.1 against Dr. Borland's 2.3 per cent.; and, omitting from Dr. Cameron's cases all deaths under forty-eight hours, his rate is 2.9; while Dr. Borland's, with deaths under twenty-four hours left out, is 1.1 per cent.

In the five years and three-quarters chosen by Mr. Lister, the mortality from operations was 4.4 per cent.; Dr. Borland's was 2.8. Mr. Lister had eighty major amputations, with nine deaths, or 11.25 per cent. Dr. Borland had thirty-four, with three deaths, or 8.8 per cent. The former had sixteen primary amputations, with four deaths; while the latter had eight, with two deaths, so that here the ratio is the same.

Taking major amputations for disease, Mr. Lister's are sixty-four, with five deaths, or 7.8 per cent. Dr. Borland's are twenty-six, with one death, or 3.8 per cent. Mr. Lister very properly excludes two of the five deaths on the ground of irrelevancy. Even allowing this deduction, the rate is in Dr. Borland's favour, and the two lists are very strictly comparable. It is true that, in the Kilmarnock Infirmary, there were no shoulder amputations; but, on the other hand, no part of the list is made up of one of the safest of the major amputations—that of the forearm. The tables are as follow.

TABLE III.

	Mr. Lister.				Dr. Borland.		
	No.	Recovered.	Died.		No.	Recovered.	Died.
Thigh ..	26	25	1	Thigh ..	9	9	0
Leg ..	5	5	0	Leg ..	7	7	0
Ankle ..	10	15	1	Ankle ..	5	4	1
Shoulder ..	1	0	1	Foot ..	3	3	0
Arm ..	6	6	0	Arm ..	2	2	0
Forearm ..	8	8	0	Forearm ..	0	0	0
Total ..	62	59	3	Total ..	26	25	1
		being 4.8 per cent.				being 3.8 per cent.	

But here, in addition to the two irrelevant deaths entirely omitted from Mr. Lister's table, a process of exclusion is brought to bear on the remaining three. Mr. Lister states that two "recovered from the amputation, but died of an independent cause"; and that, in the third case, "the cause of death was wholly independent of the operation". In the same way, I may say that Dr. Borland's case (No. 11, Table I) "recovered from the amputation, but died of an independent cause". This gives in both lists a clean bill of health. In fact, all who died, died cured. And what more can be looked for from any system of surgery? One thing more might be looked for—that the recovery which takes place in all cases be a rapid recovery. Here, unfortunately, I am not able to give the results of Mr. Lister's practice. The time between operation and dismissal in Dr. Borland's operations was the following. The cases are those which constitute Table III.

TABLE IV.

	Time in Days in each case separately.										Average Time.
	28	28	34	27	21	41	38	27	31		
Amputation of thigh ..	26	25	21	22	27	26	22				30.5 days.
" leg ..	37	33	64	29							24.1 "
" ankle ..	32	51	43								40.7 "
" foot ..	32	51	43								42 "
" arm ..	13	13									13 "

In a few of these cases, a spot about the size of a pea remained uncicatrised at the date of dismissal. In all others, the cicatrix was complete.

Injuries.—On comparing results in this class, I find that Mr. Lister has seventy-two cases (including compound fractures, wounds of joints, and other severe wounds), with four deaths, or 5.7 per cent. Dr. Borland treated eight compound fractures, with no deaths, and forty-two wounds, with one death (from tetanus)—being a total mortality of 2 per cent. Did one know how many of Mr. Lister's four deaths were from compound fractures, and how many from wounds, the comparison would be more satisfactory, as in a number of Dr. Borland's cases the wounds were not severe, and "severity" is very much a matter of opinion. But, in order to increase the mortality from 2 to 5.7 per

cent., thirty-three of the forty-two wounds would require to be struck off. And I am not aware that simple dressing has any causal connection with tetanus, from which the solitary death occurred.

We come now to the important subject of hospital diseases. Here, if anywhere, the antiseptic method should triumph. Mr. Lister has six deaths from these diseases. His major operations were 725, and the percentage is therefore .82. But there is no reason why the percentage should be calculated on the major operations. Compound fractures and wounds of all kinds may be followed by blood-poisoning. Therefore, adding the injuries to the total operations, we get six deaths in 917 cases, or .65 per cent. Dr. Borland has one death in 161 cases, or .62 per cent. In the Kilmarnock Infirmary, sixty-one abscesses were treated. If these be included, the rate is reduced to .45 per cent. But, as I have no list of Mr. Lister's abscesses, a comparison cannot be made on this point. But, on Mr. Lister's six deaths, the process of exclusion is again brought to bear. The major operations are divided into antiseptic and septic. The former were 553, with two deaths. The latter were 292, with four deaths; regarding which, Mr. Lister remarks, "the deaths were eight times as numerous. That seems to me very instructive." And it certainly looks bad for the "septic" treatment. But, as Mr. Lister also says, "cases should be pondered, not numbered". And the result of pondering is as follows. The two deaths in the antiseptic list occurred after removing the breast. The four "septic" were (1) amputation of the penis, (2) a plastic operation on the nose, (3) excision of the tongue, and (4) the opening of a small abscess of the neck. Now, it is obvious that, under any system of treatment, excision of the mamma is much less likely to be followed by blood-poisoning than the first three of the septic cases. In fact, of all operations, the three are among the most liable to be followed by hospital diseases. And as the list of antiseptic cases may be presumed not to contain any such, and the septic list may include a number which recovered, the two lists are simply not comparable. But the fourth septic case is the opening of a small abscess in the neck. Mr. Lister takes credit for calling all operations resulting in death "major" operations. Therefore the comparatively small list of septic operations is saddled with a death which occurred after opening a small abscess in the neck. And it is to be borne in mind that this death took place in wards where the septic cases were sure to enjoy all the advantages which, Mr. Lister says, accrue to septic surgeons whose practice is conducted in the same hospitals where the spray treatment is carried on. "If they do these things in the green tree, what shall be done in the dry?" In other words, what might be looked for in the Kilmarnock Infirmary, where there is no benign influence of a neighbouring Listerite to ameliorate the terrible state of affairs produced by old-fashioned surgery? Surely something worse than a mortality from blood-poisoning of less than a half per cent. in cases liable to hospital diseases.

Turning to the antiseptic operations, we find that Mr. Lister explains one of the two deaths after excision of the mamma by the fact that he observed the spray not playing on the axilla during the removal of a drainage-tube. To one who has, over and over again, seen the raw surface of an amputated thigh exposed freely to the air of a small operating theatre, separated only by the width of a narrow passage from wards occupied by septic cases of all kinds, and who has seen the patient leaving the hospital entirely cured three or four weeks afterwards, it is difficult to imagine that the momentary absence of carbolic spray could result in such sudden and fatal erysipelas. The explanation is, however, quite consistent with the germ-theory, and no fault can be found with it on that score. But it at once raises the question, Is this the only case in which the spray failed for one moment to play on some corner of the wound-surfaces in these 553 operations? Besides, there are the minor operations, and the seventy-seven injuries. When one recollects how long these cases were in the wards, how often they may have been dressed, and how long each surface remained uncovered at every dressing, it seems almost certain that, in some cases, at some moment or moments in the course of treatment, the spray would be diverted from its proper direction, and the cases thus placed on a par with the excision of the mamma. The accident did take place in one case, and was observed. May it not have taken place unobserved in many cases? If so, seeing that the death in question is attributed to septic causes, should the cures be set down to antiseptic treatment? It is quite impossible, of course, to say how many such occurred, or even that any occurred; but it is equally impossible to say that there were none, and the doubt vitiates, to some extent, the value of the whole statistics.

But, in regard to hospital diseases, and, in fact, to these statistics in general, I may be met by the criticism that no fair comparison can be made between the results of a small hospital like the Kilmarnock

* Used throughout this paper as meaning "simple" or "non-antiseptic."

Infirmaries, and those of such institutions as the Glasgow or Edinburgh Royal Infirmaries. To this argument, I will allow Mr. Lister himself to reply. He says (in the discussion at St. Thomas's Hospital), regarding Mr. Savory's statistics: ".....We cannot regard these statistics, excellent as they are, as statistics of a hospital where no antiseptic treatment is adopted.....Even if Mr. Savory had used no antiseptic means whatever, he would, nevertheless, have benefited by the antiseptic practice of his colleagues." Further on, he says: ".....The effect of strict antiseptic treatment by three surgeons, and non-antiseptic by the fourth, is simply to convert a large hospital into a small one, with reference to the question of hospital disease." Now, it is an obvious deduction that, if the benefits to the septic wards are so great as to make them practically similar to a small hospital, the ward or wards of any one of the antiseptic surgeons must enjoy even greater advantages. Hence, on the whole, the Kilmarnock figures are very fairly comparable with Dr. Cameron's. And if the not very great amount of antiseptic treatment in St. Bartholomew's were of so much benefit to Mr. Savory, the greater amount in the Edinburgh Infirmary would be of still greater benefit to Mr. Lister's wards, and to the septic cases treated in them. Therefore, Dr. Borland's .45 per cent. of blood-poisoning is obtained in, perhaps, as unfavourable surrounding conditions as Mr. Lister's 1.3 per cent.—three times that of Dr. Borland—in the 292 septic operations. In fact, the allegations of antiseptic surgery are so great that, instead of septic surgeons requiring to produce long lists of the most "tremendous" operations, the burden of proof lies with those who practise the new treatment. They ought to be able to show not merely equal, nor even slightly better results, but statistics as much superior to those of simple surgery as the claims of the new system are superior to those of the old.

I may state that the Kilmarnock Fever Hospital and Infirmary is capable of containing 120 beds. The main building is arranged for 106 beds. It is a three-storeyed structure. The upper storey contains the fever-wards; in the mid flat, ordinary medical cases are treated; and on the ground flat is the surgical department. The number of cubic feet to each bed is a little over 800. The surgical wards are small, containing from six to ten beds each; and, when patients are few, one or two of the wards are kept closed, so that the inmates do not get full advantage of the extra air-space.

In conclusion, I agree with the opinion that the value of statistics may very easily be overestimated. But that they have a value, and a considerable value, cannot be denied. And the fact that the discussion of the rival merits of the two systems of surgery has lately taken a statistical form, is a sufficient reason for publishing an account of the work done in the Kilmarnock Hospital by an old surgeon, working according to the old methods.

THERAPEUTICAL EXPERIENCES WITH THE DIGESTIVE FERMENTS.

By F. ARNOLD LEES, L.R.C.P., M.R.C.S., F.L.S.;

WITH A REPORT OF EXPERIMENTS,

By GEORGE BROWNEN, F.C.S.

At the present time, when the physiological rôles and therapeutic values of diastase, pepsine, and pancreatine, are being traversed afresh on new bases of use, by some of the leaders of the profession, the report by Mr. Brownen, with which I shall conclude my remarks, can hardly fail to be interesting. The experiments which the report relates—undertaken by Messrs. Savory and Moore for my information and satisfaction more especially—I believe to be of no small value, as tending to cast doubt, at the very least, upon the at-present-accepted theories in regard to salivary and pancreatic digestion in presence of acid; and upon the assumed necessity for the administration of an alkali, such as bicarbonate of soda, with a dose of pancreatine—when intended to digest fatty and starchy matter in the upper bowel after passing the pylorus—for the purpose, or with the intention rather, of guarding it from destruction in its transit through the stomach. I am not denying, of course, that nature provides a neutral or slightly alkaline secretion, after the chyme has crossed the pyloric portal; but I hold that, so far from imitating nature by giving soda with a dose of pancreatine, we only succeed in retarding epigastric digestion of albumen, gluten, or casein.

The contrariety of opinion expressed by different observers, with respect to the efficacy or inutility of pepsine "wines", pepsine powders, "lactopeptine", "ingluvin", etc., in the vomiting often connected with the earlier months of pregnancy, first led me to inquire whether or not more than was generally supposed depended upon the preparation used. The digestive potency of the market varieties clearly differed widely. Professor Tuson demonstrated this, and established the superiority of

Bullock's pepsina porci, in 1870; but, of late years, many new preparations have been put before the public as well as the profession; some of them compounds of more than one digestive ferment, and others derived from the gizzard of the fowl—popularly supposed to have a digestive apparatus capable of dissolving anything. With the view of reconciling, if it should so hap, these conflicting statements, and (at first) for my own information entirely, I determined to ascertain their relative values by submitting each one to tests of artificial digestion. My simple experiments were made without the slightest bias in favour of one maker or another, and under equal conditions as to temperature during the process, and the task set each preparation.

At first, I experimented with twelve "makes" only; but later, I have had experience of ten other more recently introduced preparations.

The fact that comparisons are generally said to be odious and invidious makes me somewhat unwilling to give the distinctive names; and yet I do not know that any injustice is likely to result from so doing, since the "makes" I have examined are all well known, and may be taken to represent something more than favourably the host of other (unexamined) preparations in the market. The price, too, at which they can be sold to remunerate the maker differs widely, and should, I think, not be altogether lost sight of in one's final choice; for no one, I suppose, expects for an instant that pepsine in the cake, or pepsine *B. P.*, which can be made and sold at about three shillings the ounce, is nearly so energetic as pepsina porci at twelve shillings the ounce. If it proved to possess one quarter the potency, that would be quite as much as could be expected of it. Again: uniformity in strength, if that be any more than a minimum, cannot be guaranteed, since much more than is generally supposed depends, I believe, upon the intensity of hunger felt by the animal previously to death. The length of fast enjoined upon the animal should doubtless be exactly such as ensures a maximum of activity as to gastric secretion: to kill a beast four hours or two days after its last meal would be equally a mistake. And yet the manufacture of digestive ferments must have considerably improved since Professor Tuson's experiments in 1870; for only one of the twenty-two preparations I examined proved practically devoid of digestive power. Again: there seems little room for doubt that preparations of pepsine (in dry, powdery form especially) deteriorate with keeping, however carefully they may be preserved from atmospheric influences. Fluid preparations remain active much better and longer, for some reason which, however, it is difficult to explain; although, in all the alcoholic ones I have seen, there is a tendency towards turbidity and deposit. Chloride of sodium and glycerine seem the best preservatives. On the other hand, pancreatic preparations are said to increase in activity for some time—an increase which, so far as I can speak from a limited acquaintance, appears to be coincident with the formation of lactic or sarcocollactic acid.

The twenty-two preparations examined were as follows.

Of *Pepsine*.—In powder, six: Pepsine, *Brit. Pharm.*, 3s. per oz.; Boudault's pepsine, 4s. per oz.; "ingluvin" (Warner's), 4s. 6d. per oz.; saccharated pepsina porci (Wyeth's), about 8s. per oz.; Morson's pepsina porci, 8s. per oz.; Bullock's pepsina porci, 12s. per oz. In fluid form, seven: "Pepsin-Essenz" (Corbyn's), 3s. for five ounces; liquor pepticus (Burgoyne's), 6s. per lb; liquor pepticus (Benger's), 10s. 6d. per lb; pepsine wine (Morson's), 5s. per lb; acid glycerine of pepsine (Bullock's), 12s. 6d. per lb; saline essence of pepsin (Savory's), 10s. 6d. per lb; and vinum pepsinae (Burgoyne), 3s. 8d. per lb.

Of *Pancreatine*.—In powder, two makes; Savory's, about 7s. per oz.; and another 3s. per oz. In fluid form, three: Pancreatine wine (Savory); saline essence of pancreatine (Savory); and liquor pancreaticus (Benger's), the latter about equal in price.

Of combination preparations, three: Lactopeptine (Richards's), 4s. 6d. per oz.; peptonic tablets (Wyeth), about 10s. 6d. per oz.; and in fluid form, "peptocolos" (Richardson), costing about 7s. per lb.

In regard to each of the *pepsines* enumerated above, the point I set myself to ascertain was the quantity of the preparation required to completely dissolve one hundred grains of albumen, in the form of thinly sliced hard boiled white of egg, the substance recommended in the *British Pharmacopœia* as affording the easiest observed and estimated test of the activity of its pepsin. Two grains of the official product are stated to be able to dissolve one hundred grains of albumen, digested for four hours at 98° Fahr. in an ounce of water with five minims of hydrochloric acid.

In each of my pepsine experiments, I likewise used one ounce of water, acidulated according to the *Pharmacopœia*, and digested the albumen where necessary (for some of the more active preparations dissolved it in less time) for four hours. I, however, kept up by water-bath a temperature of 100° F., somewhat higher than the *Pharmacopœia* directs, as being more likely to bring out quickly whatever digestive energy the "make" used might possess. The heat in the stomach, too,