The British Society of Gastroenterology

The twenty-eighth Annual General Meeting of the British Society of Gastroenterology was held at Dublin on 2-4 November 1967 with Professor Oliver Fitzgerald as President and Dr. B. G. Alton as local secretary.

The first Sir Arthur Hurst memorial lecture was delivered by Dr. C. Code from the Mayo Clinic. A memorable dinner was held at the Royal College of Surgeons of Ireland. Dr. T. C. Hunt spoke about the life and contribution of Sir Arthur Hurst to British gastroenterology and Dr. Code was presented with a framed photograph of our founder.

At the annual general business meeting the following officers and members were elected:—

President Elect: Norman Tanner
Honorary Members: Professor L. J. Witts, Sir Charles Illingworth
Overseas Members: W. H. J. Summerskill, J. Balint

Sir Arthur Hurst memorial lecturer, 1968: B. Creamer:
The following were elected Ordinary Members:—

The following were elected Associate Members:—


EFFECT OF MICELLAR LIPID ON TRANSPORT OF VITAMIN D INTO LYMPH

G. R. THOMPSON, R. K. OCKNER, M. A. BUDD, AND K. J. ISSELBACHER (Massachusetts General Hospital, Boston, Mass.) The intestinal absorption of vitamin D has been shown to occur in two phases: rapid uptake, followed by a prolonged exit from the mucosa into lymph. The purpose of the present study was to investigate the nature of the uptake step and the effect of concomitant lipid absorption on the exit of vitamin D into lymph.

Vitamin D uptake by rat intestinal mucosa was measured in vitro by incubating vitamin D_{2-1, 2-3H} with purified preparations of brush borders. Uptake was shown to be very rapid (half within one minute), temperature-dependent but energy-independent. It was rapidly reversible if the brush borders were reincubated in a vitamin D-free medium.

The exit of vitamin D_{2-1, 2-3H} from mucosa into lymph was studied in rats with cannulated intestinal lymphatics. Fasted rats were given intraduodenal infusions of a mixed micellar solution (fatty acid, monoglyceride, and taurocholate in buffered saline) one hour before and 30 minutes after a 5 m\mu mole dose of vitamin D. This resulted in a 40% increase in 0 to three hours of lymph radioactivity as compared with results in control rats given taurocholate or saline without lipid. The enhancement of vitamin D transport by mixed micelles was independent of any changes in lymph flow but was correlated with increased amounts of triglyceride in lymph. Additional studies of the distribution of radioactivity within the lumen and wall of the small intestine showed that vitamin D uptake was not affected by the simultaneous presence of mixed micelles. These results suggest that administration of micellar lipid results in an increased rate of absorption of vitamin D. This effect is not on mucosal uptake but is on the exit step into lymph.

POSTPRANDIAL SMALL INTESTINAL BILE SALT PATTERNS IN HUMANS

G. M. MCLEOD AND H. S. WIGGINS, introduced by E. N. ROWLANDS (Medical Research Council Gastroenterology Research Unit, Central Middlesex Hospital, London) The ileum is the site of active bile salt absorption and normal bile salt metabolism depends on an intact enterohepatic circulation. Ileal disease or resection can interfere with these functions and may lead to bile salt deficiency.

To investigate this latter possibility total bile salts in small bowel aspirates during digestion of a fatty meal were measured using B steroid dehydrogenase. Individual bile acids were identified by thin-layer chromatography. Total bile salt concentrations in post-meal samples from normal subjects were 4.7-15.0 \mu mol./ml. Two severely malnourished patients with flat jejunal biopsies had levels below 0.5 \mu mol./ml. but others with a variety of malabsorption syndromes had levels in the normal range. In patients with ileal resections (20-150 cm.) 80% of samples analysed had total bile salt concentrations below 4.0 \mu mol./ml. (range 1.5-14.2 \mu mol./ml).

Chromatograms revealed conjugates of cholic and chenodeoxycholic acids as the major constituents in all subjects. Conjugates of deoxycholic acid were either much reduced or completely absent following ileal resections of over 30 cm. Free bile acids were found in small amounts in some post-resection cases, other malabsorption cases, and the normal ileum.

These findings confirm hypotheses that total bile salt concentrations during fat digestion are often markedly

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reduced following ileal resection. Bile salt deficiency may also accompany severe malnutrition. In both circumstances this deficiency may give rise to or aggravate pre-existing fat malabsorption.

DYNAMICS OF POST-FRANIDIAL SMALL INTESTINAL FLORA

B. DRASAR AND G. M. MCLEOD introduced by E. N. ROWLANDS (Wright-Fleming Institute of Microbiology and the Medical Research Council Gastroenterology Research Unit, Central Middlesex Hospital, London) Intestinal contents have been cultured many times but usually from fasting subjects. Results obtained are not representative of the usual intraintestinal milieu as man seldom fasts for long.

We have investigated changes in small bowel flora during digestion of a sterile meal by normal humans. Specimens were obtained through a clean tube and culture techniques were those described by Drasar. 1

Fasting subjects had virtually sterile jejunal contents. For about one hour after a meal numbers of bacteria are present (10^2-10^4/ml). These are presumably of salivary origin. This post-prandial wave of bacteria is not maintained beyond an hour. Gastric secrections probably gradually sterilize remaining stomach contents preventing further passage of viable organisms into the duodenum. Any already present are either incapable of long survival or move on down the gut.

Possible relations of this transient flora to bile salt metabolism are of special interest. Among organisms cultured from the jejunum are some which can survive in bile and degrade bile salts (bacteroides and bifidobacteria). These will have a selective advantage and could multiply during transit through the bowel. The ileal contents of normal subjects may contain large numbers of these bacteria (bacteroides 10^2-10^5/ml) and analyses of some ileal fluids has revealed small amounts of free bile acids.

Thus degradation of bile salts in transit and small bowel absorption alone could then account for all deoxycholate in bile without invoking caecal or colonic absorption.


FACTORS INFLUENCING THE UPTAKE OF 55 COBALT-LABELLED,VITAMIN B12 BY ESCHERICHIA COLI

A. W. DELLIPIANI, R. SAMSON, AND R. H. GIRDWOOD (Gastrointestinal Unit of the University Department of Therapeutics at The Royal Infirmary, Edinburgh) Using 55Cobalt-labelled vitamin B12 the patterns of uptake of the vitamin by various faecal type organisms isolated from the small intestine of patients with blind or stagnant loops are compared. The commonest organism found is Escherichia coli, 1 2 and detailed studies using a strain isolated from the small intestine are illustrated.

The ability of this coliform to take up vitamin B12 in the presence of increasing quantities of human gastric juice was examined. Though even small quantities of juice bound the vitamin so that it was no longer available to the organisms, it could not "pull off" vitamin these had already taken up. The effect of increasing quantities of

gastric juice on vitamin B12 uptake by the organisms was determined after autodigestion and digestion of the juice by physiological concentrations of crystalline enzymes. Digestion before exposure of the juice to vitamin B12 markedly reduced its binding property and assay of the intrinsic factor content before and after digestion indicated that this was due mainly to loss of intrinsic factor. As noted previously the complex of gastric juice and vitamin B12 was more resistant to enzymatic digestion but small though significant amounts of vitamin B12 became available to the microorganisms.

The significance of our findings is discussed in relation to the concept of competition between an abnormal intestinal flora and the host for vitamin B12 in patients with blind or stagnant loops and in the light of what is known of the acid and intrinsic factor output of these patients.


IS COELIAC DISEASE DUE TO A PEPTIDASE DEFICIENCY?

A. P. DOUGLAS AND C. C. BOOTH (Royal Postgraduate Medical School, London) It has been suggested that the intestinal mucosa of patients with coeliac disease may be deficient in an enzyme, possibly a peptidase, which is normally concerned with the final stage of digestion of gluten. To investigate this hypothesis further, we have carried out two types of study.

Firstly, control subjects and patients with coeliac disease were given 25 g. of gluten orally and the changes in the plasma amino-acid concentrations during the next four hours were measured using a Technicon amino-acid analyser. There was no significant difference between the two groups.

Secondly, the capacity of the jejunal mucosa (obtained by peroral biopsy) to digest a peptic-tryptic digest of gluten to its constituent amino-acids was studied in control subjects, and in patients with coeliac disease both before and after successful treatment with a gluten-free diet. There was a marked reduction in the ability of the jejunal mucosa of patients with untreated coeliac disease to release amino-acids from the peptic-tryptic digest of gluten when compared with the mucosa from control subjects. After successful treatment with a gluten-free diet, however, the digestive capacity of the coeliac mucosa returned towards normal, suggesting that any deficiency in intramucosal peptidase activity may be secondary rather than primary in coeliac disease.


MALIGNANT COELIAC SYNDROME

D. O'B. HOURIHANE AND D. G. WEIR (Department of Clinical Medicine, Health Hospital, Dublin) Three adult patients with malabsorption were under observation for three years before they died. Each complained of intermittent diarrhoea and abdominal pain for 11, 10, and three and a half years respectively; two had clubbing of the fingers.
In each patient severe malabsorption of fat, d-xylose, folic acid, and vitamin B₁₂ was demonstrated. Jejunal biopsy showed varying degrees of villous atrophy and each was initially diagnosed as having coeliac disease. There was a minimal response to gluten withdrawal, and steroids were required in every patient. The clinical course of each patient suggested the presence of intestinal lymphoma, but radiological and histological examinations failed to substantiate the clinical suspicion. The mucosal biopsies showed no cellular pleomorphism or immaturity of lymphoid cells. However, the degree of lymphoid infiltrate of crypt epithelium is thought to be excessive, and, together with the presence of cellular debris within crypts, may well be an indication of neighbouring lymphoma.

In each patient, necropsy examination revealed diffuse villous atrophy of the intestine, with small foci of lymphoma related to linear ulcers in two cases and microscopic areas of lymphoma in the other. In no case was there a detectable mass of lymphoma in the intestine.

**ABSORPTION OF FOLIC ACID IN MAN**

G. W. HEPNER, J. COWAN, A. V. HOFFBRAND, C. C. BOOTH, AND D. L. MOLLIN (Royal Postgraduate Medical School, and the Department of Haematology, St Bartholomew's Hospital, London) Using a double lumen tube and a perfusion technique, the absorption of folic acid and glucose was studied in controlled subjects, and in patients with untreated coeliac disease. It was found that the upper jejunum is the site of maximal absorption in controlled subjects, and that very little is absorbed at a site 60 cm. below the ligament of Treitz. The results suggested that absorption of folic acid is not a passive process, for when increasing amounts of folic acid were perfused (from 10 to 10,000 μg. per ml.), the percentage absorption fell. In adult coeliac disease, there was marked impairment of folic acid and glucose absorption in the upper jejunum; absorption of folic acid was not different from normal when folic acid was perfused at a more distal site, where glucose absorption was impaired when compared to normal. The effects of anticonvulsants on folic acid absorption were also studied.

**PROTEIN TURNOVER IN THE DIGESTIVE-ABSORPTIVE SURFACE (BRUSH BORDER MEMBRANE) OF THE RAT SMALL INTESTINE**

R. HOLMES AND R. K. CRANE (Department of Physiology, Rutgers Medical School, New Brunswick, New Jersey, U.S.A.) Over the past few years, a concept has been developed of the brush border of the intestinal epithelial cell as a functional organelle contributing both digestive and absorptive properties to the mucosal lining of the small intestine. The brush border appears to mature cytologically as the cells emerge from the crypts to begin their functional life on the sides of the villi. Available evidence suggests that turnover of cellular protein continues as the cells progress along the villi to extrusion at the tips. However, nothing specifically relating to protein turnover of the brush border membrane has been previously reported.

A technique has been developed whereby the brush borders of two different cell populations can be separately isolated: 1, from cells close to the villous tips, and 2, from cells further down the sides of the villi. Membranes were prepared from these isolated brush borders by methods developed in this laboratory.

Rats were injected with ¹⁴C leucine and brush border membranes were prepared at different time intervals after injection. Significant radioactivity could be detected in the membranes from both cell populations within two hours. A peak of incorporation was reached at about six hours. Labelling declined to very low values at 36 hours.

When compared with the results of studies of the dynamics of cell renewal the present results indicate that membrane elements are not static, i.e., produced only during migration from crypt to villus (during cytological maturation) but are formed, possibly continuously, throughout the life span of the cell.

**DYNAMIC STRUCTURE OF THE SMALL INTESTINAL MUCOSA: A STEREOSCOPIC STUDY**

C. A. LOEHRY AND B. CREAMER (St. Thomas' Hospital, London) The small intestinal mucosa was examined after death, when autolysis of epithelial cells allows direct vision of the three-dimensional crypt/villus relationship. The revealed structure is complicated, with a preponderance of crypts over villi so that much of each crypt opening is adjacent to other crypts and not in direct continuity with a villus. Because of this, a reappraisal of cell turnover was undertaken, as many cells must either be desquamated at the crypt mouth or migrate some way to the nearest villus. Rat small intestine was perfused at varying time intervals after labelling crypt cells with ⁶⁵Fe, and it was shown that there was no desquamation of cells at the crypt mouth.

An examination of many specimens of autolysed normal human mucosa showed a series of low intervillous ridges running between adjacent crypts. In progressively abnormal mucosae these ridges become higher and broader, and provide the structural basis for the transition of finger villi to leaves, convolutions, and a flat mucosa.

Epithelial cell turnover was altered in various ways in rats and the three-dimensional changes in mucosal morphology were related to the dynamic state. The hypertrophy of the intervillous ridges was shown to be related to high turnover states. It seems likely that cells emerging from the crypts move up on to the nearest villus along a system of intervillous ridges which respond to increased epithelial output by hypertrophy and this combined with loss of villous height is responsible for the changes in mucosal architecture.

**SMALL BOWEL DEOXYRIBONUCLEIC ACID (DNA) AND CELL LOSS FROM HUMAN SMALL INTESTINAL MUCOSA**

D. N. CROFT, C. A. LOEHRY, AND J. F. N. TAYLOR (St. Thomas' Hospital, London) A triple lumen tube has been designed for perfusing a segment of small bowel. Eleven patients with a normal small bowel biopsy or no evidence of small bowel disease, and 10 adults with flat jejunal mucosae (coeliac syndrome) were studied. Two
500 ml. volumes of saline containing polyethylene glycol (P.E.G.) were infused at 16 to 27.8 ml./min. Seventy-five per cent of the infused P.E.G. was recovered from two collecting sites, one proximal and the other distal to the site of entry of the saline. Bile was commonly present in the proximal specimens but was absent or present in insignificant concentration in the distal specimens. Thus secretions from above appeared to be prevented from entering the segment distal to the site of infusion. Distal specimens contained degenerating cells and nuclei which, on staining and electron microscopy, appeared to be predominantly of intestinal epithelial origin. To measure cell loss deoxypenturinolic acid (D.N.A.) was estimated and the rate of accumulation of D.N.A. in the distal segment calculated. Evidence from small bowel perfusion studies in rats with either normal or abnormal mucusae will be presented to show that small bowel D.N.A. rates reflected small intestinal epithelial turnover. Small bowel D.N.A. rates from subjects with the coeliac syndrome indicated a higher than normal rate of cell loss per unit area of mucosa, and it will be suggested that this reflected a high turnover of epithelial cells. The relation between small bowel D.N.A. rate and the clinical activity of the disease will be discussed.

EXPERIMENTAL HYPERPLASIA OF THE GASTRIC MUCOSA

G. P. CREAN, M. W. MARSHALL, AND R. D. E. RUMSEY (Clinical Endocrinology Research Unit and the Southern General Hospital, Glasgow) Two experimental models of hyperplasia of the gastric mucosa will be described. One model, characterized purely by an increase in the parietal cell population, was produced in rats by chronic administration of Peptavlon (I.C.I. 50.123). Rats with chronic gastric fistulas were treated with Peptavlon (4 mg./day) or histamine (12 mg./day) administered in a vehicle of oil and bee-wax, while a control group received vehicle only. Peptavlon caused a fourfold increase in acid output and caused a striking (50%) increase in the parietal cell population; there were no changes in the peptic cell population or in the surface area or mucosal volume of the stomach. Histamine caused a twofold increase in acid output, but exerted no effects on the gastric mucosa. The increase in the parietal cell population caused by Peptavlon was roughly proportional to the increase observed in acid output, suggesting that the effect was due to work hyperplasia.

The second model of hyperplasia is characterized by an increase in the surface area of the stomach with proportional changes in the volume of the mucosa and in the total parietal and peptic cell populations; this effect occurs in rats during the course of pregnancy and lactation and as a result of duodenal obstruction.


THE INORGANIC COMPONENTS OF GASTRIC SECRETION

M. HOBLEY, J. R. C. GARDHAM W. SILEN, AND J. G. WALKER, introduced by L. P. LE QUESNE (The Department of Surgical Studies, The Middlesex Hospital, London) A recent report analysed the inorganic composition of gastric secretion obtained in two subjects with varying doses of gastrin and histamine, and concluded that the gastric juice consisted of an acid component secreted at varying rates, and an alkaline component secreted at constant rate. The swallowing of saliva was prevented.

The present paper describes the inorganic composition of gastric secretion obtained during constant infusion of histamine at fixed submaximal dosage in 23 subjects who were allowed to swallow their saliva. Our findings were complementary, in that while the output of the acid component varied from one subject to another due to differing sensitivities to histamine, the output of the alkaline component was constant. The rate of secretion of the alkaline component was, however, about 0.75 ml/min, whereas the figure of Makhlouf et al.1 was about 0.33 ml/min. Evidence was obtained suggesting that the discrepancy was satisfactorily accountable as swallowed saliva.

These results provide a standard pattern for the concentrations of the inorganic constituents that seems to be applicable to all human subjects. Deviations from this pattern in any sample raise the possibility of contamination by hypersecretion of saliva or by duodenal regurgitation.

Studies on patients with histamine-fast achlorhydria, using phenol red as a marker to permit the results to be corrected for pyloric losses, reveal that such individuals secrete an alkaline gastric juice that approximates in inorganic constitution to the theoretical alkaline component of acid gastric juice.

These data provide factual support for the validity of theoretical deductions concerning the alkaline component of gastric juice.


DIAGNOSTIC INTEREST OF DATA CONCERNING GASTRIC ACID SECRETION, ACID PEPsin CORRELATION (K44), AND GASTROSECRETAGOGUE POWER OF THE URINE (P.S.U.) IN 14 CASES OF THE ZOLLINGER-ELLISON SYNDROME

S. BONFILS, J.-P. BADER, M. DUBRASQUET, AND J. VATIER (Unité de Recherches de Gastro-Entérological, Hôpital Bichat, Paris) Fourteen cases of the Zollinger-Ellison syndrome, histologically confirmed, were tested before operation.

BIOLOGICAL DATA

Basal acid output (one hr.) lies between 2 and 43 mEq.; in six cases the hourly output was below 12 mEq.

The maximum acid concentration (free acidity) of the basal secretion is in 12 cases above 104 mEq./l.

The ratio, hourly basal output to one hr. post-histaminic output, exceeds 0.6 in eight patients but is below 0.4 in three others.

Acid-pepsin correlation was studied in the basal secretion according to the K44 coefficient (pepsin output for 25 ml. of parietal component). In all cases but one, the K44 was less than 35 with a mean value of 29. The
difference between these figures and those of a group of 33 hyperchlorhydric duodenal ulcer cases is statistically significant.

The gastrosecretagogue power of the urine depends on a polypeptide (P.S.U. factor) available by column chromatography. The bioassay is performed on the rat, and in every case the test was positive.

**DISCUSSION**

The following are discussed: comparative appraisal of the diagnostic value of the different tests; correlation of the test with the extension of the tumour; comparison between this group of 14 cases of the Zollinger-Ellison syndrome and four other cases with concordant positive tests without histological confirmation.


**EXPERIENCES WITH A BIOASSAY METHOD FOR THE DIAGNOSIS OF THE ZOLLLINGER-ELLISON SYNDROME**

C. G. THOMSON AND W. SIRCUS (The Gastro-Intestinal Unit and the Teaching and Research Centre, the Western General Hospital, Edinburgh) Using fundic pouch dogs the presence of a gastric secretagogue in the circulation of subjects with the Zollinger-Ellison syndrome has been demonstrated (Sircus, 1964). Subsequently a modification of the anaesthetized rat preparation described by Lai (1964) has been developed as an assay animal.

The method of preparation of the animal for pergastric perfusion and continuous monitoring of H ion output is described. The acid secretory response to intravenous infusion of suspet serum is assessed semiquantitatively against a standard reference infusion of gastrin or Peptavon. The method will be critically discussed. Sera from 17 subjects with suspected Zollinger-Ellison syndrome have been examined. In most cases the clinical data were not made available until after the assays were reported.

Six cases were proven to be true examples of the syndrome and the rat assay was positive in all. The number of false positives was nil and there were no false negatives. An equivocal result was obtained in two subjects.

Two subjects with multiple endocrine adenomatosis as the provisional diagnosis have had positive assay results. Both have not yet had abdominal exploration. Five subjects have been shown by laparotomy not to be cases of the Zollinger-Ellison syndrome and the test was negative in four and doubtful in one. Three of four tests on four other subjects with suspected Zollinger-Ellison syndrome have been positive but the clinical evaluation of the cases has not yet been made available.


**GASTRIC EMPTYING, ACID SECRETION, AND DUODENAL REGURGITATION IN GASTRIC ULCERATION**

J. D. GEORGE, T. KENNEDY, AND A. M. CONNELL (Department of Surgery, Royal Victoria Hospital, Belfast) The stasis theory on the aetiology of gastric ulceration has recently been questioned, and biliary regurgitation postulated as a more important aetiologic factor.

In order to test these two theories, gastric emptying, duodenal regurgitation, and acid secretion have been estimated in three groups of subjects: normal controls, patients with duodenal ulceration, and patients with gastric ulceration. Duodenal regurgitation has been estimated by measuring the concentration of bile acid conjugates in resting gastric juice while gastric emptying and acid secretion have been measured by the double-sampling test meal. In this test the volume of gastric contents is estimated by a dye-dilution and double-sampling technique at regular intervals following the ingestion of a fluid test meal. The acid secretion in response to the test meal is measured simultaneously.

The rate of gastric emptying in 48 gastric ulcer patients has been compared with 25 normal subjects and 34 duodenal ulcer patients and found to be significantly slower. It has been found that although many gastric ulcer cases have a low or normal response to maximum acid stimulation, they have an abnormally large amount of acid in their stomachs following ingestion of the test meal. These cases have therefore a larger acid contact time with the gastric mucosa than normal controls. The mean concentration of bile acid conjugates in resting juice of the gastric ulcer patients is greater than in both normal subjects and duodenal ulcer patients but the increase is not statistically significant.


**CONSERVATIVE SURGERY IN THE TREATMENT OF BENIGN GASTRIC ULCER**

T. KENNEDY AND J. D. GEORGE (Department of Surgery, Royal Victoria Hospital, Belfast) Descriptions of 'conservative' operations for benign gastric ulcer have been recorded as early as 1918 but opinions still differ regarding the wisdom of this form of therapy.

A trial of vagotomy and Finney pyloroplasty in the treatment of gastric ulcer is being carried out in Belfast. To date, with a follow-up period of from one to five years, the results are very satisfactory. Several cases have been treated by pyloroplasty alone; this has not proved successful in preventing recurrence of the ulcer.

This treatment is based on the Dragstedt's stasis theory on gastric ulceration. Emptying studies on patients before and after pyloroplasty and vagotomy have been carried out and indicate that this operation does increase the rate of gastric evacuation.

Criticism has been levied at this form of therapy because of the occasional reported occurrence of a gastric ulcer following vagotomy and drainage procedure for duodenal ulceration. Emptying and acid studies in such a case will be described.


**A RADIOLICAL 'SAFETY CHECK' FOR TUBELESS VAGOTOMY**

A. D. BARNES, D. K. M. TOYE, AND J. A. WILLIAMS (Birmingham) One of the most unpleasant features of
the post-operative period after abdominal surgery is the presence of a nasogastric tube. There are also good surgical reasons to avoid gastric drainage tubes. However, distention of a hollow organ bearing a suture line is dangerous because of disruption and leakage. This is particularly likely after vagotomy and pyloroplasty.

In an attempt to avoid gastric drainage we have studied the rate of gastric emptying in a group of 100 patients undergoing vagotomy and pyloroplasty for duodenal ulcers. The test required the administration of 50 ml. Gastrografin on the morning after surgery and one anteroposterior radiograph one hour later. This examination detected all cases of delayed gastric emptying. This small number of patients (10%) required intravenous fluids and gastric decompression through a nasogastric tube beyond 48 hours. The test enabled 90% of our patients to be nursed safely through their operation without a nasogastric tube.

A STUDY OF COLONIC PERISTALSIS

J. D. HARDCASTLE, C. V. MANN, A. G. PARKS, AND R. S. MURRAY (The London Hospital) Colonic peristalsis occurs infrequently and has proved difficult to investigate.1 In this study, peristalsis has been regularly stimulated by surface agents, thus making it possible to study some of the underlying mechanisms.

Colonic movement has been measured in patients with well established colostomies by the use of intraluminal balloon kymography2 and cineradiography.

Forty-six control studies were performed. Colonic peristalsis was observed on only four occasions. Speed of conduction of the wave averaged 22 cm./min. Distension of the colon did not cause peristalsis.

Peristalsis was induced by bisacodyl in 17 patients, by Oxphenisatin in eight, and by glycine suppositories in six. In seven patients, simultaneous cineradiography was carried out. The stimulated wave appeared similar to spontaneous peristalsis; the average speed of conduction was 25 cm./minute. The peristaltic wave appeared to be conducted by a local repetitive response and was similar in all regions of the colon. Peristalsis was never observed in the rectum. The wave did not pass across a loop colostomy and could be prevented by prior application of Lignocaine; once peristalsis was established, Lignocaine was without effect. After the bowel was 'sensitized' by recent peristaltic activity, many stimuli previously without effect were able to trigger a peristaltic wave.

The possibility that the colonic peristaltic wave may be propagated through a local mechanism involving a double nerve plexus will be discussed.


GASTROINTESTINAL TRANSIT IN CONSTIPATION

J. M. HINTON AND J. E. LENNARD-JONES (St. Mark’s Hospital, London) A method of measuring gastrointestinal transit using radioopaque pellets and radiography of the abdomen and stools has been described (British Society of Gastroenterology, 1966, Gut, 7, 718). This technique has been applied to the study of a series of 37 patients complaining of constipation in whom no organic cause could be found for the symptom. The patients fell into three groups: (a) those with transit times within the normal range (11); (b) those with transit times greater than normal (23); and (c) those with normal transit around the colon but with delay in the rectosigmoid (3). Within the group with slow transit were three patients who denied having any bowel actions during the period of study although the technique proved that stools were being passed. Group c, with delay in the rectum, all presented with overflow incontinence. Different clinical types of constipation require different management. The measurement of transit time by the radiopaque marker technique provides a simple means of distinguishing between different clinical groups.

THE ABSORPTION AND SECRETION OF WATER, SODIUM, AND POTASSIUM BY THE INTACT HUMAN COLON IN ULCERATIVE COLITIS

J. HARRIS AND R. SHIELDS (Cardiff) In ulcerative colitis the faecal loss of fluid and electrolytes may be increased. The only previous direct measurement of the absorptive and secretory ability of colon in ulcerative colitis has been made by Duthie et al.,1 who studied segments of intestine isolated during colectomy.

The present paper reports a study of the net transport and unidirectional flux of water, sodium, and potassium by the intact colon of 24 conscious subjects, of whom 11 had ulcerative colitis of varying degrees of severity. The remaining 13 subjects were healthy medical students.

The technique employed was that of peroral intubation of the caecum2 and subsequent perfusion of the colon with isotonic solution containing isotopes and polyethylene glycol so that the rates of net transport and of unidirectional flux of water, sodium, and potassium could be measured.3

In severe and diffuse colitis, the colon secreted an excessive amount of water, sodium, and potassium. The movement of sodium and potassium ions into the colonic lumen was accelerated, and the rates at which sodium, potassium, and water moved out of the lumen were diminished. In distal colitis and proctitis (in remission) the colonic handling of water and sodium did not differ from normal but increased loss of potassium was still evident. The effect of steroids on the disturbed handling of water and electrolytes in ulcerative colitis will be briefly indicated.


TOXIC DILATATION OF COLON: AN EXPERIENCE OF 55 CASES

K. N. JALAN (introduced), W. SIRCUS, W. I. CARD, SIR JOHN BRUCE, C. W. A. FALCONER, W. P. SMALL, A. N. SMITH, AND J. F. A. MCMANUS (The Gastro-Intestinal Unit, Western General Hospital, Edinburgh) From 1950 to 1967 55 cases of 'toxic dilatation' complicating ulcerative colitis have been admitted to the Gastro-Intestinal Unit,
Western General Hospital, Edinburgh. A detailed analysis of our experience is presented.

Twenty-three patients developed the complication during the first attack, and the remainder during a relapse. Perforation of the colon occurred in 16 cases, and massive haemorrhage in six. Overall mortality was 45-47%. Of the 45 patients treated medically, 10 had only supportive therapy, and 35 had also corticosteroid or corticotrophin. Six of the 10 treated only by supportive measures died, three others required emergency operation, and one had complete remission. Of the 35 having steroid therapy, 17 improved and had an elective surgical procedure, eight required emergency operation, six achieved complete remission, and four died.

A comparative evaluation is made of the medical and surgical treatment of this complication. The outcome is analysed in relation to the extent of involvement, age, sex of patient, rapidity of onset, and the course of the disease.

Evidence is presented of the difficulty of preoperative diagnosis of perforation, of the significance of the relationship of toxic dilatation to perforation, massive haemorrhage, and to mortality. A case is made out for a multicentre investigation into the mode of management of toxic dilatation of the colon.

PROGNOSTIC VALUE OF SERUM PROTEINS DURING SEVERE ATTACKS OF ULCERATIVE COLITIS AND CROHN'S DISEASE

F. T. DE DOMBAL (University Department of Surgery, Leeds) The mortality during severe attacks of ulcerative colitis may be as low as 1-3%, provided patients who do not respond to conservative management are brought to surgery at an early stage; but often the individual patient's response to conservative management may be extremely difficult to assess.1

However, further recent studies concerning the electrophoretic patterns of the serum proteins in a total of 54 such patients have enabled the outcome of individual severe attacks of ulcerative colitis to be accurately forecast. All 25 patients with severe ulcerative colitis who showed a high or rising gamma globulin during their recent attack also recovered on conservative management alone. By contrast all but one of those with a low or falling gamma globulin came to radical surgery, because conservative management failed to control their symptoms. Similar findings were noted in 15 patients suffering from active Crohn's disease.

It is suggested that serial electrophoretic studies of the serum proteins, particularly the gamma globulin fraction, may be a valuable adjunct in the management of severe attacks of ulcerative colitis and Crohn's disease.


CARCINOMA OF THE COLON AND CROHN'S DISEASE

A. D. PERRETT, S. C. TRUELOVE, AND G. R. MASSARELLA (Radcliffe Infirmary, Oxford) Carcinoma of the colon is not normally considered to be associated with Crohn's disease, although Crohn and Yarnis reported two cases in a series of 273. However, in a recent survey of Crohn's disease undertaken at the Radcliffe Infirmary, three cases of carcinoma of the colon were found occurring concurrently with Crohn's disease.

In each case the clinical presentation was that of a colonic neoplasm and this was confirmed at operation and at histology. The additional diagnosis of Crohn's disease was based on the histological changes in the resected colon adjacent to the carcinoma.

In two cases the diagnosis was further confirmed by the subsequent clinical pattern of the illness and by changes typical of Crohn's disease in bowel resected at later operations.

The incidence of carcinoma complicating Crohn's disease of the colon may not be greatly different from that associated with ulcerative colitis. Only a long-term follow up of a large number of cases will provide this answer. Perhaps the important factor in the predisposition to carcinoma of the colon is chronic inflammatory change regardless of whether it is of granulomatous or nonspecific type.

Attention is drawn to these three cases in order to stimulate other workers in clinical gastroenterology to examine their data and thus to help establish whether or not Crohn's disease predisposes to carcinoma of the colon.

THE NATURAL HISTORY OF DIVERTICULAR DISEASE OF THE COLON

T. G. PARKS AND A. M. CONNELL (Department of Surgery, Queen's University, Belfast) Information about the aetiology and pathophysiology of diverticular disease of the colon was derived from a detailed study of 521 cases seen over a 15-year period.

It was impossible to differentiate patients with 'divercilitis' from those with diverticulosis and frequently the clinical, radiological, and pathological diagnoses did not agree.

Increase in the number of diverticula occurred within the segments initially affected, but progressive spread to involve other segments was rare.

One half of the patients had histories of less than one month on presentation at hospital, although many had advanced pathology on referral. Many of the fatalities occurred at this stage.

Factors which influenced the final outcome were the age of the patient, the length and nature of the history, and the severity of the presenting attack. Inflammatory complications depressed the prognosis more than any other factor, both in medically and surgically treated patients. The overall prognosis was no worse in patients with total colon involvement than those with segmental disease.

RELATIONSHIP BETWEEN CENTRAL VENOUS PRESSURE, BLOOD VOLUME, AND RED CELL VOLUME IN PATIENTS WITH ACUTE GASTROINTESTINAL BLEEDING

T. C. NORTHFIELD AND T. SMITH (M.R.C. Gastroenterology Research Unit, Central Middlesex Hospital, London) Measurements of central venous pressure (C.V.P.), red
cell volume, blood volume, and blood loss in the stool, have been carried out in 20 patients with acute gastrointestinal bleeding. A method has been developed for carrying out three separate, successive red cell volume measurements at intervals of up to 24 hours. A study has been made of the relationship between C.V.P. and blood volume, and between changes in C.V.P. and changes in red cell volume.

The results suggest that C.V.P. measurements are of value in the management of acute gastrointestinal bleeding, and that they can be used for the following purposes:

1. **Assessment of Transfusion Requirement**: In eight out of 11 patients, the blood volume following transfusion to a normal C.V.P. was within 10% (500 ml) of the predicted normal, according to weight and sex.

2. **Prediction of the Likelihood of Rebleeding**: No rebleeding occurred in five patients with an initial transfusion requirement, according to C.V.P., of less than 2 units blood. Rebleeding occurred in all six patients with a transfusion requirement of more than 5 units blood. This raises the possibility of considering emergency surgery in the latter group under optimum conditions, before bleeding recurs.

3. **Early Detection of Rebleeding**: A fall in red cell volume was accompanied by a rapid fall in C.V.P. to zero in 80% cases, by a haematemesis in 45% cases, and by a significant change in pulse or blood pressure in 20% cases.


**Effects of Splanchinic Nerve Stimulation on Pancreatic Secretion, Blood Flow, and Electrical Conductance**

J. R. Greenwell, A. A. Harper, and T. Scratcherd

(University of Newcastle upon Tyne, Newcastle upon Tyne, I) Both excitatory and inhibitory effects on pancreatic enzyme secretion have been attributed to splanchic nerve stimulation (see Babkin, 1950). These effects have been reexamined and correlated with pancreatic juice volume, blood flow, and transverse electrical conductance in cats anaesthetized with chloralose-urethane. The blood supply to the adrenal glands was tied off and a background flow of juice of low enzyme content was maintained by continuous intravenous secretin infusion.

During stimulation of the peripheral end of a splanchic nerve (10–15 V, 1 msec. pulse width for 30 seconds) the blood flow and volume of secretion decreased, but the concentration and output of amylase increased. The conductance, which in general mirrors the blood flow, usually decreased. After stimulation the volume flow of juice returned to, or briefly exceeded, the control level, and the blood flow and conductance records usually showed a more persistent increase, lasting five to eight minutes.

Atropine prevented the increase in enzyme output on stimulation, but had no effect on the conductance record. Stimulation after injection of bretylium tosylate to prevent release of catecholamines from the splanchic nerve terminals produced no change in conductance, but the increase in enzyme output was unaffected, and the rate of secretion augmented instead of inhibited. Previous injection of the α-receptor blocking agent, phenoxybenzamine, almost completely prevented the immediate vasoconstriction and reduction of blood flow during nerve stimulation, and the later vasodilator response was considerably reduced after the β-receptor blocking agent, Alderlin. Neither agent affected the increase in enzyme output.


**Trypsin in Serum**

O. Fitzgerald, K. McGeehney, and J. Reynolds (Department of Medicine and Therapeutics, University College, Dublin) The fate of trypsin in serum is largely unknown, due to the multiplicity and complexity of serum trypsin inhibitors. The serum level of α₂ macroglobulin antitrypsin is known to decrease in acute pancreatitis. This is thought to be due to binding of pancreatic trypsin. However, it was found by Ganrot and ourselves in in vitro studies, using 125I-labelled trypsin, that trypsin was also bound to α₁ antitrypsin forming a stable, enzymatically inactive complex.

Rabbit antibody to trypsin, when tested on gel diffusion, precipitated human serum to which trypsin had been added. Precipitation occurred down to 6 μg. trypsin, indicating that circulating antitrypsin-bound trypsin was precipitated by immunological antitrypsin. Normal serum gave no precipitation.

Normal rabbit serum, immune rabbit serum, and immune rabbit serum from which the antibody had been precipitated, were fractionated by gel filtration. In addition to the α₂, α₁ and inter-α antitrypsins of the normal, the immune serum exhibited an inhibition at a point in the gel filtration profile, corresponding to 7S proteins.

Immune precipitated serum does not have this 7S inhibitor. Immune serum exhibited both binding and protection of added trypsin by α₂ macroglobulin and inhibition of trypsin by α₁ inhibitor. This seems to offer radiotracer and enzymatic evidence of trypsin binding by α₁ antitrypsin. This illustrates the complex carriage of trypsin in serum.


**Effect of Metoclopramide upon Gastric Motility and its Value in Barium Progress Meals**

F. H. Howarth, R. Cockel, and C. F. Hawkins (Queen Elizabeth Hospital, Birmingham) Metoclopramide is a new type of drug which belongs to a series called the orthopramides. Amongst other effects, it increases motility in the upper gastrointestinal tract. Experimental work has been carried out in animals but no controlled study has been performed in man. We have investigated...
motility changes by barium progress meals and balloon studies.

Barium studies have been carried out on 125 patients: 50 after 20 mg. Metoclopramide intravenously, 50 without any drug, and 25 after saline intravenously. Deep peristaltic waves (shown also by manometric studies) started within three minutes of injecting the drug and at the same time the pylorus opened and the duodenum dilated. Gastric emptying time was significantly shorter in those receiving the drug than in controls, the mean being 83 min. compared with 142 min. Gastric hyper-peristalsis caused rapid filling of the small intestine and this acted as a stimulus to further peristalsis. Mean transit time of barium through the small intestine was 55 min. in those given the drug compared with 163 min. in controls.

Metoclopramide is useful to the radiologist, improving examination of the duodenum because of adequate and rapid filling. Deep gastric peristalsis enables early neoplastic infiltration to be detected more readily. This drug also permits thorough examination of the entire small bowel by the usual techniques in a short period of time.


EFFECTS OF PHENACETIN ON RATS WITH SMALL INTESTINAL BLIND LOOPS

G. NEALE, G. P. CANELLOS, M. J. L. PATTERSON, D. J. EVANS, AND M. C. BRAIN (Royal Postgraduate Medical School, London) Selwyn1 and Hutchison2 recorded seven patients with haemolytic anaemia due to the ingestion of phenacetin. Four had had gastrointestinal surgery and one had idiopathic steatorrhoea which suggests that there might be a relationship between gastrointestinal disease and oxidative haemolysis. To investigate this problem further, we have studied the effects of phenacetin on rats with blind loops.

Seven out of 21 blind loop rats developed Heinz bodies and severe haemolysis when given 50 mg. phenacetin a day for two weeks. Control rats fed the same amount of phenacetin did not produce Heinz bodies and neither did 18 rats with intestinal blind loops not given phenacetin. Blind loop rats were also more susceptible to oxidative haemolysis caused by acetyl-phenylhydrazine given intraperitoneally.

No abnormality of phenacetin metabolism in blind loop rats could be detected by thin-layer chromatography of urinary metabolites. Nor was phenacetin altered by incubation with intestinal bacteria in vitro. On the other hand, the red cells of blind loop animals sensitive to phenacetin were more readily oxidized in vitro than those of controls.

These results suggest that the blind loop syndrome renders the red cells of some animals more sensitive to oxidative haemolysis. Other cells in the body may be similarly affected, because at necropsy a heavy deposit of lipofuscin was found in the proximal renal tubules of blind loop animals sensitive to phenacetin but not in normal controls.


ASCORBIC ACID DEPLETION IN ALIMENTARY DISEASE

I. W. DYMOCK (introduced), W. TURCK (introduced), W. SIRCUS, W. P. SMALL, AND C. G. THOMSON (The Gastro-Intestinal Unit, Western General Hospital, Edinburgh) The role of vitamin C in the repair and healing of tissues is established. The state of vitamin C metabolism of patients with ulcerative and inflammatory diseases of the alimentary tract may be of importance to management and to the outcome of their disease.

We have examined a large group of patients admitted with alimentary diseases for evidence of depletion of ascorbic acid and correlated the findings with the clinical evidence for scurvy and with the dietary intake of ascorbic acid.

The method employed was the measurement of theuffy layer ascorbic acid content, expressed as micrograms per 106 white blood cells. Healthy adult controls had a mean level of 28-71 ± 8-08 micrograms per 106 white blood cells (range 18-7–53-3 micrograms).

It will be shown that depletion is present in a variety of alimentary disorders, including oesophageal and gastric lesions, hepato-biliary disorders, malabsorption syndromes, and chronic inflammatory diseases of the small bowel and colon. Particular attention was paid to patients who had previously undergone gastric surgery. Those who were well and without symptoms were found in the main to have normal levels, but in patients suffering from various 'post-gastrectomy' syndromes depletion was commonly present.

No correlation was found between depleted levels and clinical signs of scurvy. A fair correlation was found, however, between the buffy layer levels and the ascorbic acid content of the diet of the individual subjects.

THE OESOPHAGUS IN DYSAUTONOMIA: A MANOMETRIC AND CINEFLUOROGRAPHIC STUDY

P. W. BRUNT, S. I. MARGULIES, W. M. COBURN, M. W. DONNER, AND T. R. HENDRIX, introduced by D. A. PRICE EVANS (Johns Hopkins Hospital, Baltimore, Maryland, U.S.A.) Familiar dysautonomia (Riley-Day syndrome) is an inherited disease with widespread systemic effects characterized by autonomic imbalance (labile blood pressure, erythematous blotching, excessive sweating, alacrima), sensory deficits (diminished appreciation of pain and taste), motor incoordination and certain episodic phenomena (fever, vomiting). Difficulty with swallowing is almost invariably present from the first days of life. Death from bronchopneumonia, often related to aspiration, is common in the early years. The present preliminary studies define the oesophageal defect and explain the frequent episodes of aspiration.

Cinefluorography in 11 patients has shown a delay of up to 1½ seconds in relaxation of the cricopharyngeus as the bolus advances, with spillover into the trachea. In one case there was marked dilatation of the lower end of the
oesophagus. In addition, manometry studies, using open-tip catheters, have shown abnormal oesophageal motility—essentially an almost total lack of normal peristaltic waves. Administration of methacholine to three patients produced a change from simultaneous contractions on swallowing towards normal progressive contractions.

The significance of these findings in explaining the pathogenesis of this syndrome and the wider implications in the physiology of the nervous control of the oesophagus is discussed.

Carcinoma at the Juncture of the Main Hepatic Ducts

M. J. Whelton, Mary Petrelli, Phyllis George, W. B. Young, and Sheila Sherlock (Departments of Medicine, Pathology, Surgery, and Radiology, The Royal Free Hospital, London) Twenty-three cases of carcinoma of the hepatic duct junction are analysed. The largest previous series of this condition was that of Klatskin1 who recorded 13 cases. Clinical, biochemical, pathological, and radiological features are correlated. This rare type of obstructive jaundice is frequently missed even at laparotomy. Eighteen of our cases had a previous laparotomy at which no extrabiliary obstruction was discovered. In all these, the significance of a collapsed gallbladder and bile ducts in the presence of a turgid liver was not appreciated. Men are affected slightly more commonly than women, unlike the situation in primary biliary cirrhosis. Liver biopsy normally has clear-cut features of extrabiliary obstruction and this diagnosis can be made on a needle specimen. The most valuable radiological examination is percutaneous transhepatic cholangiography. This was performed successfully, preoperatively, in 20 cases and confirmed the diagnosis in all. It was also valuable in deciding on corrective surgical measures. Immunological studies for mitochondrial antibodies2 were invariably negative. Hepatic scintiscan-ning was sometimes misleading and results need cautious interpretation. Patients treated with corticosteroids withstood surgery less well than others with similar tumours. The combination of obstructive jaundice, in a middle-aged man with hepatomegaly and a 'negative laparotomy', with collapsed gallbladder and ducts is almost diagnostic. The overall prognosis is not good but individual cases benefit greatly from surgery.


Cytomegalovirus Infection and Liver Disease

P. J. Toghill, H. Stern, and Roger Williams (From King's College Hospital and St. George's Hospital, London) Hepatitis is a well recognized complication of cytomegalic inclusion disease of the newborn and recently there have been reports of three adult patients with cytomegalovirus infection who developed jaundice in association with an atypical glandular fever syndrome (Lamb and Stern, 1966; Toghill et al., 1967). This paper describes further studies on the incidence of this infection in relation to liver disease.

In 19 children with atypical glandular fever one child with abnormal liver function tests was found to excrete the virus. Of 25 children with unexplained jaundice or transient hepatosplenomegaly, two were excreting virus, one having an illness resembling viral hepatitis and the other a respiratory infection, jaundice, and thrombocytopenia.

Sixty-eight adults with atypical glandular fever were examined and 10 proved to have active cytomegalovirus infection. All had abnormal liver function tests and three of the 10 were frankly jaundiced, with a severe cholestatic jaundice in two, and hepato-cellular damage in the other. No evidence of cytomegalovirus infection was found in 82 adults with various forms of chronic liver disease or in 56 young adults with infective hepatitis.

Cytomegalovirus excretion in the urine, without clinical signs of disease, was found in 10% of 136 children examined under the age of 5. However, it was found in only 1% of 101 children aged from 5 to 10 years and in none of 474 older children and adults examined.

It is concluded that in children under 5 evidence of liver damage due to cytomegalovirus infection is difficult to assess. In older children and in adults 15% of patients with atypical glandular fever have cytomegalovirus infection, and hepatic damage forms an integral part of the syndrome.


The Varying Molecular Size, Thermostability, and Urea Sensitivity of Human Alkaline Phosphatases

J. Fennelly, J. Dunne, K. McGeeney, L. Lee Chong, and M. Fitzgerald, introduced by O. Fitzgerald (Department of Medicine and Therapeutics, University College, Dublin) Most studies on separation of mammalian phosphatases have relied on methods using starch gel. Results from various sources show varying conclusions, so we have investigated phosphatase differentiation using three parameters: (a) molecular size;4 (b) differential thermostability at 56°C;2 and (c) urea inhibition at concentrations ranging from 0-1 to 8 molar strength.5 Gel filtration was performed, using Sephadex G 200, collecting fractions in an L.K.B. automatic collector.

Two clear patterns emerge as regards molecular size: (a) a 7S moving enzyme in controls and patients with osseous disease; (b) two peaks, 19S and 7S, in those with liver disease. Both peaks in hepatic disease showed a relative thermostability compared to the one peak in osseous disease. These changes were reflections of findings in whole serum. The inhibition shown on exposure to urea falls into two stages: a mild inhibition at lower concentrations increasing to complete inhibition at high concentrations. Inhibition was more marked in serum of osseous diseases. Inhibition of the separated peaks was also studied in the separated peaks. The results of these studies will be presented in detail in so far as they explain the mechanism of production of the macromolecular enzyme.

Gel filtration is a valuable method of separating enzymes for further investigation, while urea inhibition may help explain the mechanism of enzyme variations.
However, differential thermostability is the most valuable method for identifying enzyme patterns at the clinical level.


TREATMENT OF CHRONIC INTRAHEPATIC CHOLESTASIS WITH PHENOBARBITONE

R. P. H. THOMPSON AND ROGER WILLIAMS (King’s College Hospital, London) Four patients with chronic intrahepatic cholestasis have been treated for one to two months with oral phenobarbitone, 90–180 mg. per day, without changing their previous treatment. Liver biopsies had shown the appearances of primary biliary cirrhosis in three and of postnecrotic cirrhosis in one. All had had constant plasma bilirubin levels for at least six months, with itching.

Plasma total and direct-reacting bilirubin levels were measured two to three times weekly by the Michaelis method. About four days after starting treatment these levels fell by 40 to 50%, and levelled off at about the tenth day. The proportion of direct-reacting bilirubin rose. All patients noticed less itching and improved well-being, and they and their relatives commented on decreased jaundice. Side effects were limited to drowsiness, controlled by reducing the dose.

The mechanism of this reduction of plasma bilirubin levels may be related to the known induction by phenobarbitone of microsomal detoxicating enzymes in animals, in particular glucuronyl transferase. A similar reduction of serum bilirubin levels has been reported by other workers in three patients with unconjugated hyperbilirubinaemia in whom the activity of glucuronyl transferase is low. In the present patients with conjugated hyperbilirubinaemia the plasma level may fall as a result of increased uptake into the liver. The rise in the proportion of direct reacting bilirubin suggests an increased regurgitation into the blood, and the possibility of this and other mechanisms will be discussed.

CORRECTION

In Table V of the paper by H. G. Sammons et al. (‘Modification in the xylose absorption test as an index of intestinal function’, Gut, 8, 348) there should be readings for cases 7 and 13, namely, the words, ‘After oral iron treatment’, refer to the second set of figures for case 7, and the words, ‘After treatment’, refer to the second set of figures for Case 13. The Table as originally published is misleading.