LETTERS TO THE EDITOR

Survival for colorectal cancer

EDITOR,—The EUROCARE study of Gatta et al (Gut 2000;47:533–8) provides important information on survival for colorectal cancer in different parts of Europe. In particular, it relates survival to stage, a feature which was absent from earlier studies. The study also looks at procedures used in determining stage which may be important factors in accurate staging—for example, higher numbers of lymph nodes sampled will be more likely to detect lymph node metastases and consequent upstaging of tumours. However, the usefulness of this study is reduced by inaccuracies in the descriptions of staging and choice of staging system. The authors have chosen to use Dukes’ staging system which has been in use for at least 50 years and has been well characterised by many studies with long term follow-up. Unfortunately, they have given incorrect labels to some of the stages in this system. In tables 2 and 3, Dukes’ stages A and B are described as being “confined to the bowel wall” which is incorrect. Dukes’ stage A is invasion into, but not through, the bowel wall whereas Dukes’ stage B is invasion through the bowel wall but without lymph node metastases. Dukes’ stages A and B combined could have been correctly labelled as no lymph node metastases. In the methods section the authors state that where only the TNM stage was available, TNM categories were converted to Dukes’ stages and where stage was not explicitly stated this was reconstructed from information records (in 45% of cases in the study). It is hoped that the correct descriptions of Dukes’ staging were used for this encoding process.

While it is understandable that the authors have chosen to use a well established staging system, the Dukes’ system does have a major flaw which is improved by the TNM system. The Dukes’ B stage contains tumours which may be in the pT3 stage (tumour invades through the muscularis propria into the sub-serosa or into non-peritonealised pericolic or perirectal tissues) or pT4 stage (tumour directly invades other organs or structures and/or perforates visceral peritoneum) both with a pN0 nodal stage. The prognosis for pT3 pN0 tumours is relatively good whereas the prognosis for pT4 pN0 tumours is very poor with a high risk of local recurrence.2,3 A final histopathology observation on this study is to use a threshold set for the number of lymph nodes examined. The authors state that “it is generally considered that at least 12 lymph nodes should be examined for accurate staging” but this is not a universally accepted threshold. The recommendation from the Royal College of Pathologists in the UK is that all lymph nodes identified in the resection specimen should be examined histologically but does not specify an arbitrary minimum number as it is recognised that the number of lymph nodes identifiable in a specimen varies with a number of factors which include the type of specimen, extent of resection, operative technique and/or radiotherapy, and the patient’s immune response, in addition to the diligence with which the pathologist dissect the specimen. In a recent study in a teaching hospital with optimal dissection and sampling of the entirety of each lymph node the median number of lymph nodes identified was 12 so a blanket statement that “at least 12 lymph nodes” should be examined is an unhelpful pressure on hard pressed diagnostic histopathologists.

These criticisms should not obscure the valuable information that is reported in this study but they do suggest that a greater histopathology input at its inception would have been helpful.

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REFERENCES

Reply

EDITOR,—We thank Dr Cross for his interest in our paper (Gut 2000;47:533–8). The issue he raised concerning the definition of stage at diagnosis is important for meaningful comparison of cancer statistics between populations. We are pleased to offer the following clarifications.

INACCURACIES IN STAGE DESCRIPTIONS

We confirm that we incorrectly referred to Dukes’ A and B colorectal cases as “confined to the bowel wall.” As pointed out by Dr Cross, Dukes’ B includes tumours perforating the visceral peritoneum and directly invading other organs (T4), and our category “Dukes’ A and B” included only “T1–T4 N0 M0.” A better definition of this category would have been “absence of lymph node and distant metastasis.” The stage definitions of Hermanek and Sabin’ were in fact used for the encoding process, as stated in the article. Furthermore, they were specified a priori in the study protocol as the reference standard, so as to avoid problems of comparison between registries.

CHOICE OF STAGING SYSTEM

We used Dukes’ instead of TNM because in 1990 Dukes’ was the most widely used staging procedure in all European registries. The other reason we decided to use Dukes’ was that from the information available to us (patients’ clinical and pathological notes), it was not possible to clearly separate pT3pN0 from pT4pN0 cases (all Dukes’ B) which, as Dr Cross pointed out, differs markedly in prognosis. Furthermore, it was often impossible to distinguish pT2 from pT3 cases, and for this reason we considered Dukes’ A and B together. The population in the study implied the use of information from numerous hospitals and pathology laboratories, which had various ways of recording information. Greater standardisation of stage reporting in pathology notes would be highly desirable.

We are currently engaged in a new high resolution EUROCARE study on colorectal cancers diagnosed in 1997 when the TNM system was more widely used than in 1990. However, the distinction between pT categories is still not adequately made in a considerable number of cases.

NUMBER OF LYMPH NODES EXAMINED

Our statement that “at least 12 lymph nodes should be examined for accurate staging” derives from the International Documentation System, referenced by Fielding and colleagues in their article in 1991. They offered the recommendation that, “Before deeming a radical resection to be without lymph node metastasis, it is recommended that at least 12 lymph nodes be examined.” Furthermore, the 1993 TNM supplement states: “histological examination of a regional lymphadenectomy specimen . . . will ordinarily include 12 regional lymph nodes,” and this number is considered “adequate for staging.”

Our analysis used four categories for number of nodes examined: 0, 1–5, 6–11, and ≥12; choosing other division points did not change the rank of the categories. However, it is interesting to note that in the hospital study taken as an example by Dr Cross’, 12 or more lymph nodes were examined in 50% of cases—well above the percentages reported by our study (range 2–31%). This suggests that in 1990 the extent of resection or the thoroughness of the pathological examination (or both) would not be considered adequate by today’s standards.

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**Helicobacter pylori, Lewis antigens, and inflammation**

**EDITORS**—In a recent issue of Gut, Zheng et al reported a significant ulcer disease associated with increased expression of Lewis (Le) antigens but not caag, iceA, or vacA in Chinese patients infected with *Helicobacter pylori* (Gut 2000;47:18–22). These data raise an interesting question and answer as they add further controversy to an intriguing area of microbiology and gastroenterology.

Le* and/or Le′ blood group determinants are commonly found on the lipopolysaccharide of *H pylori* isolates. These determinants have been identified on approximately 80–90% of isolates from all patient sexes examined to date.1 In our own series, 74/84 (88%) isolates expressed either Le or Le′, with 47/84 (56%) isolates expressing Le′ but no expression of Le*.

The question of whether an association exists between Le* or Le′ expression on *H pylori* strains and ulcer patients and those strains isolated from patients with the duodenal gastric, nor was an association demonstrated between host and bacterial Lewis phenotype. Since the report of Zheng et al we have reviewed our raw data regarding the prevalence of strains expressing two or more Lewis antigens. We found that two or more Le determinants were present in 9/12 (75%) isolates from duodenal ulcer patients and in 4/10 (40%) isolates from gastric ulcer patients. This gives an overall prevalence of 46% (13/29 isolates) for isolates from patients with ulcer disease. Thirty four of 62 (55%) patients with histological evidence of chronic gastritis also had isolates expressing two or more Le antigens.

A significant difference between *H pylori* strains isolated from Chinese patients and those from our population is the finding of 48/104 (46%) isolates expressing three or more Le antigens compared with 11/84 (13%) isolates from a homogenous Irish population. In our series, only one strain expressed all class 1 and class 2 Le antigens—that is, Le*, Le′, and their isomers Le′ and Le*. The relative high prevalence of Le antigens demonstrated this hypothesis. We have previously described this determinant on a *H pylori* strain expressing both Le′ and Le*. However, the role of fucosylated blood group determinants such as blood group A, B, or H type-1 on *H pylori* LPS is as yet undetermined. This contrasts with the well established role of blood group A in *H mustelae* modulation of gastric autoimmunity in the ferret model of gastric autoimmunity.2

These observations on the role of expression of multiple Le determinants are interesting, given the nature of our study population where patients with ulcerative disease made up only 26% of the overall study population. These individuals were infected with strains with a relatively well conserved pattern of Le determinant expression. Both preacquired colonization and adaptation of *H pylori* to host populations is well recognized in *H pylori* infection. Clonality is a recently described property of this bacterium and merits discussion in relation to Le determinants. In recent studies, *H pylori* strains isolated from human hosts and 16 experimentally infected rodents showed Le expression to be highly uniform in isolates from different rodents infected for up to 20 weeks’ duration.3 Substantial differences in Le expression were found among isolates from human patients and these differences were related to the presence of random amplified polymorphic DNA sequences or caaA status. It has been suggested therefore that variation in *H pylori* Le expression in genetically similar microorganisms in the host may provide a pool of bacterial phenotypes for the continuous selection of host adapted populations for persistence.4 Clonality such as that reported for Le determinants could result in the presence of antibiotic markers and prefer the predominant Le epitope in strains from an individual host in vivo. A previous study has suggested that in mimicking host epithelial *H pylori* isolates not only express Le* and Le′, but that their relative proportion of expression corresponds to the host Le blood group phenotype (secretor status).5 We and others have found no evidence to support this hypothesis.6

In Asian populations, where the prevalence of caagA genotype is high among *H pylori* isolates, no association between caagA genotype and ulceration has been found.7 Recent data have demonstrated that the prevalence of caagA *H pylori* isolates is 44% among a group of 1025 men from 18 British towns.8 The consequence of this prevalence to disease in the general population is uncertain. However, given the association between caagA and more aggressive pathology within Western populations,9 the relationship between various virulence factors such as caagA and putative modifying or colonisation factors such as Le determinants must be clarified. Other data from our group and others support the preliminary evidence that caagA, iceA, vacA, or vacA expression does not correlate with the level of Le antigen expression.10 However, no large dataset is available from a homogenous Western population. The observation that suggested that caagA status was related to Le antigen expression had 94 isolates from 19 countries and therefore is subject to marked bias.11

Lastly, one issue that appears to require further clarification is the relationship between bacterial Le antigen expression and neutrophil or lymphocytic infiltration in the gastric mucosa compared with non-O non-secretors. We have also demonstrated that blood group O non-secretors had a significantly higher grade of lymphocyte infiltration of the gastric mucosa compared with non-O non-secretors.2 We have also demonstrated that Le′ expression was associated with increased acute inflammatory infiltrates in patients with gastric and duodenal ulcer disease (duodenal and gastric) or chronic gastritis.12 Based on the high prevalence of both Le* and Le′ expression in Chinese patients, the role of inflammation needs to be explored further.

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**Relation of *H pylori* to gastric mucins and gastric surface mucous gel layer**

**EDITORS**—We read with considerable interest the recent excellent article on *Helicobacter pylori* and its effects on the gastric lining in conjunction with MUC5AC in the human stomach by Van den Brink et al (Gut 2000;46:601–7). The authors used antibodies against gastric mucin core proteins (anti-MUC5C and MUC6) in conjunction with antibody against *H pylori* and demonstrated attachment of *H pylori* to gastric surface mucous cells and the presence of *H pylori* in extracellular mucins derived from gastric surface mucous cells.

These finding are similar to those previously reported by us using histochemical staining specific for gastric mucins (dual staining consisting of galactose-oxidase-cold dihydrothiophen reaction and periodic acid–Schiff reaction with deoxial mucin-specific staining (PCS))7 and immunostaining for *H pylori*. GOTS recognises galactose or N-acetyl galactosamine residues of gastric surface mucous cell mucins and stains gastric surface mucous cells blue (fig 1A). Histochemical reaction of GOTS is identical to that of immunostaining with anti-MUC5AC (45MA1) (fig 1B). PCS recognises the specific sugar residues with peripheral glycosaminoglycan in gastric gland mucous cells (cardiac gland cells, mucous neck cells, and pyloric gland cells) and stains gastric gland mucous cell mucins brown (fig 1A). We used tissue sections from surgically resected stomachs fixed in Carnoy’s solution which has the

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The surface mucous gel layer (SMGL) had a characteristic structure consisting of laminating layers of two types of mucins; the surface mucous cell type (blue) and the gland mucous cell type (brown) (dual staining of GOTS-PCS followed by immunostaining for H. pylori). (D) H. pylori is stained red by an immuno-alkaline phosphatase method with anti-H. pylori antibody. Numerous H. pylori inhabit the SMGL. The SMGL encompasses the surface mucous mucus cells. In the SMGL, these receptors appear to be mixed with the surface mucous cell type mucins. The SMGL inhabited by H. pylori revealed marked derangement of the multilaminating structure with fragmentation of the mucin layers and formation of vacuoles (fig 1D, E).1,2 After eradication of H. pylori, the SMGL regained the laminating structure.1 Alteration of the SMGL found in H. pylori infected stomachs suggests destruction of the SMGL by bacterial lipase and protease from H. pylori.1,2 H. pylori in the SMGL was more abundant than that attached to the surface mucous cells (fig 1D, E).3 The SMGL appears to be the major site of H. pylori colonisation and may serve as a vehicle for diffusion of H. pylori to other sites in the stomach and duodenum.

Advantage of fixing the gastric surface mucous gel layer (SMGL) in paraffin embedded tissue sections.

Dual staining of GOTS-PCS of Carnoy fixed gastric mucosa with H. pylori infection showed that SMGL had a characteristic structure consisting of laminating layers of two types of mucins: the surface mucous cell type and the gland mucous cell type (fig 1C).4,5 Dual staining of GOTS-PCS in conjunction with immunostaining for H. pylori in Carnoy fixed stomachs with H. pylori infection revealed that H. pylori characteristically existed on and between the surface mucous cells in the SMGL (fig 1D).6 In the SMGL, this organism was most often associated with the layer of surface mucous cell type mucins (fig 1D, E).7 Receptors responsible for adherence of H. pylori might exist only on the plasma membrane of surface mucous cells. In the SMGL, these receptors appear to be mixed with the surface mucous cell type mucins. The SMGL inhabited by H. pylori revealed marked derangement of the multilaminating structure with fragmentation of the mucin layers and formation of vacuoles (fig 1D, E).1,2 After eradication of H. pylori, the SMGL regained the laminating structure.1 Alteration of the SMGL found in H. pylori infected stomachs suggests destruction of the SMGL by bacterial lipase and protease from H. pylori.1,2 H. pylori in the SMGL was more abundant than that attached to the surface mucous cells (fig 1D, E).3 The SMGL appears to be the major site of H. pylori colonisation and may serve as a vehicle for diffusion of H. pylori to other sites in the stomach and duodenum.

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Reply

Editor,—I thank Dr Ota et al for their interest in our work. I was already familiar with the exquisite pictures of the laminated structure of gastric mucus by these authors. The present new data as shown, in conjunction with our previous data, shed more light on the phenomenon of Helicobacter pylori attachment in the stomach. Although I generally support the conclusions of Ota et al, the following remarks are in order.

It seems very likely from figure 1A and 1B of their letter that the surface mucous cells that produce MUC5AC (by 45M1 immunostaining) were stained blue on galactose-oxidase cold thionine Schiff reaction (GOTS). (A) Galactose-oxidase cold thionine Schiff reaction (GOTS) stains gastric surface mucous cell mucins blue and paraxial, concanavalin A staining (PCS) stains mucous neck cell mucins brown (dual staining of GOTS-PCS). (B) Immunostaining with anti-MUC5AC (45M1) labels gastric surface mucous cells. The reactivity of anti-MUC5AC (45M1) is identical to that of GOTS (see (A)) (immuno-peroxidase method with anti-MUC5AC (45M1)). (C) Carnoy fixed gastric mucosa without Helicobacter pylori infection. The surface mucous gel layer had a characteristic structure consisting of laminating layers of two types of mucins; the surface mucous cell type (blue) and the gland mucous cell type (brown) (dual staining of GOTS-PCS). (D, E) Carnoy fixed gastric mucosa with H. pylori infection. (D) H. pylori is stained red by an immuno-alkaline phosphatase method with anti-H. pylori antibody. Numerous H. pylori exist in the surface mucous gel layer and on and between the surface mucous cells. In the surface mucous gel layer, H. pylori preferentially colonise in the layer of surface mucous cell type mucins (dual staining of GOTS-PCS followed by immunostaining for H. pylori). (E) H. pylori is stained red by an immuno-alkaline phosphatase method with anti-H. pylori antibody. Numerous H. pylori preferentially exist on and between the surface mucous cells but not on pyloric gland cells (dual staining of GOTS-PCS followed by immunostaining for H. pylori).
molecules. Glycosylation is a complex process that may easily become disturbed in *H pylori* infection, for example. Thus as glycosylation may change under pathological conditions, I would urge the authors and other workers in the field to concentrate on the invariant part of the mucins: the non-O-glycosylated parts of the protein, as discussed by us previously.1

One of the issues addressed by Ota et al is the correlation of *H pylori* infection with disturbance of the laminated gastric mucus layer, as demonstrated in fig 1C versus fig 1D. In common with the authors, it is tempting to speculate that *H pylori* has a direct role in this disturbance. Similar to most bacteria, *H pylori* produces enzymes that in principle can degrade mucus, such as proteases and "mucinases", as referred to by the authors. I personally doubt whether *H pylori* is directly responsible for disturbance of the mucus layer for two reasons. Firstly, as the bacterium resides in the mucus layer, what would be the benefit of destroying its own milieu? Secondly, there are data by many authors to indicate that the tissue dynamics of the gastric mucosa is altered by *H pylori* infection. Accompanying the inflammatory response, epithelial turnover is enhanced, and there are profound shifts in cell populations within the epithelium. As a result, what was also mentioned in our previous Gut article, MUC6 may be over expressed in *H pylori* expression. From our own work, and that of investigators have reported elevated acid secretion after eradication in patients with GU (group A: MAO decreased more than 1 mEq/h; group B: no change; group C: MAO increased more than 1 mEq/h) and found that group C patients had the lowest serum pepsinogen (PG) I levels and PG II ratios among the three groups (PG I: group C = 44.7 (1.6), group A = 64.5 (2.5), group B = 57.8 (2.6)); PG I:II: group C = 2.52 (0.18), group A = 3.98 (0.24), group B = 3.60 (0.19); p<0.05). These data indicate that patients in group C had suffered atrophy of the fundic mucosa.

Data on changes in gastric stimulated acid secretion after eradication in patients with DU are controversial, although most reports show a decrease in acid secretion. As Iijima et al indicated, the most likely reason for the controversy may be that a considerable number of patients with DU had corpus gastritis, which may somehow cause hypo-acidity. We previously reported that gastric acidity. We previously reported that gastric

Figure 1 Effects of Helicobacter pylori eradication on maximum acid output (MAO) in Japanese patients with duodenal (DU) and gastric (GU) ulcers. MAO in response to pentagastrin (6 µg) was measured before and six months after *H pylori* eradication. *p<0.05 v before eradication.

Figure 2 Correlation between decrease in serum gastrin concentration (ΔGastrin) and increase in maximum acid output (ΔMAO) in response to pentagastrin (6 µg) by Helicobacter pylori eradication in Japanese patients with duodenal (DU) and gastric (GU) ulcers. Groups A, B, and C show DU patients in whom MAO decreased (more than 1 mEq/h), did not change, and increased (more than 1 mEq/h) after eradication, respectively.
It has been a matter of debate whether gastric acid hypersecretion observed in patients with DU is a result of *H pylori* infection or if the infection accelerates development of DU in subjects who originally had acid hypersecretion. Our data showing that acid secretion was reduced in association with the decrease in serum gastrin levels in some DU patients and that MAO levels in patients with DU after eradication are still higher than those of normal subjects without *H pylori* infection may support the latter idea. Moreover, this idea may explain the fact that there are more patients with GU than DU among Japanese subjects, who exhibit lower acid secretion than Western patients.

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BOOK REVIEWS


I was taught as a medical student that the major function of the colon was that of a storage organ. Since then premises about the colon have evolved and the complexities of colon function is much better understood, as described by Gibson and Roberfroid’s (editors) multiauthored book *Colon Microbiota, Nutrition and Health*.

Although the editors state that the purpose of the book is to overview current knowledge of the activities and functions of the gut microflora, it goes beyond these boundaries and takes us on an ecological journey into the exciting life of gut microflora and their impact on colon function in health and disease, and the intimate critical relationship between diet, bacteria, and health. It is a complex ecosystem in which the numerous and different species of bacteria degrade and ferment substrates that have escaped digestion in the small bowel. Major genera include bacteroides, bifidobacteria, lactobacilli, clostridia, and enterobacteria, and the main products of bacterial fermentation of the substrate that reaches the colon are short chain fatty acids (SCFA) and gases, including hydrogen, carbon dioxide, and in some individuals, methane. The relevance of SCFA is that they act as a source of energy for intestinal mucosal cells and reduce the pH of colonic contents. One particular SCFA, butyrate, may be important in protecting against colorectal cancer. The relevance of fermentation to human metabolism can be gauged from the fact that the energy equivalent of 15–40 g of carbohydrate is metabolised by the body.

The book outlines the technological revolution that has occurred in understanding the natural microbial world. Molecular biology has invaded gut microbiology with the limitations of enrichment culture techniques being integrated into techniques based on the detection of genomic DNA or analysis of rRNA.

A fascinating aspect of the book that concerns and affects all of us is the impact of the chapters on food. With the craze of low carbohydrate diets to counter obesity sweeping the USA, it is refreshing to realise the importance of carbohydrates and the concept of functional food. These foods contain substrate that reaches the colon and can be fermented to produce substances that have health enhancing ingredients. Colonic foods are an example of such functional foods that target the large intestine. These are foods that contain an ingredient that does not undergo significant modification during transit through the small intestine but reach the colon where they are utilised by the resident bacteria producing metabolites that influence the physiological and biochemical processes in a beneficial manner. Dietary fibre is the best known of the “colonic foods” and is divided into soluble and insoluble fibre. Soluble fibres include pectin, guar gum, B glucan, and psyllium, and result in modest reductions in blood lipids affecting total and LDL cholesterol fractions. Insoluble fibres (cellulose and lignin) are mainly responsible for faecal bulking. Dietary fibre may play a protective role in diverticular disease and colorectal cancer. Other functional foods are the fructans and resistant starch which, in animal models, affect triglyceride rich fractions. A novel and potentially important approach to prevention and therapy of colonic diseases is the concept of prebiotics and probiotics. The probiotic approach involves adding live microorganisms to the gastrointestinal tract while prebiotics enhance certain components of the existing flora. Prebiotics have potential in the prevention and treatment of rotaviral and clostridial diarrhea, lactose malabsorption, and food allergy. Tentative claims for benefits of prebiotics include reduction in obesity, improved control of non-insulin dependent diabetes, reduction in the risk of atherosclerotic cardiovascular disease, and prophylaxis of acute gastroenteritis.

How does the above affect individuals? It seems that we should include the following foods in our diet: garlic, onions, asparagus, chicory, dandelion, artichokes, soy beans, leeks, Jerusalem artichokes, wheat, bananas, and rye. Quite a tall order!

The authors have made an important contribution to the concept of local and systemic effects of food. The practical value. This is particularly the case in IBD, and blends insights into pathogenetic mechanisms with new therapeutic approaches. As with most Falk symposia, the selection of authors is truly international and each is a leader in the field. Several of the chapters provide more than a review, and are actually quite useful in translating research information to clinical implications of practical value. This is particularly the case in chapters dealing with genetics, cytokines, stemoid therapy, and cancer in IBD. The standard of writing is not uniform and, although six editors are listed, I doubt if any had significant editorial input to the chapters.

The quality of the book relies therefore on the expertise of the authors which is impressive. What is remarkable is that such a large amount of information can be presented in a concise fashion in such a slim volume and in such a readable manner. I rarely recommend books of this nature for general readership but anyone seeking a concise pain free update and overview of the field would not go far wrong with this text.

F SHANAHAN
P98 AN INVESTIGATION INTO THE IMPACT OF ALGINATES AND EPIDERMAL GROWTH FACTOR ON ENDOCYTOSIS-A STUDY IN FOUR OESOPHAGEAL CELL LINES

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Introduction: Endocytosis is a process whereby eukaryotic cells take up extracellular material by a variety of different mechanisms. These endocytic functions are of great importance and are involved in the regulation of cell surface receptor expression, maintenance of cell polarity, cholesterol homeostasis and a host of other physiological processes. In this investigation we looked specifically at fluid phase endocytosis and the impact alginates and epidermal growth factor (EGF) have on this activity.

Background: Alginates are extracted from seaweed with their structure and properties related to the species of seaweed. They are carbohydrate polymers made up of D-mannuronic (M block) and L-guluronic (G block) acid residues, and may also be made up of sequences of mixed residues (MG blocks). These carbohydrate polymers appear to promote migration and restitution in gastrointestinal epithelial cells in vitro and in vivo by modulating the expression and functional activity of cell junctional proteins such as the E-cadherin-catenin complex. EGF is a 6kd polypeptide that has a role in tissue repair, cell proliferation, ulcer healing and cell migration. EGF also inhibits acid production and imparts a cytoprotective mechanism protecting the oesophageal mucosa from gastric refluxate. Similar biological effects have been recognised with alginates that are used extensively in medications to alleviate symptoms associated with gastric reflux.

Methods: In this study we have used four oesophageal carcinoma cell lines, 2 squamous cell carcinomas and two adenocarcinomas. Cells were incubated with combinations of fluorescent microspheres (0.02µm), alginate and EGF for 1 hour, and then analysed by FACScan®. Alginates were used at a concentration of 2mg/ml and EGF at 10ng/ml.

Results:
- All alginates used in this study up-regulate fluid phase endocytosis.
- EGF up-regulates endocytosis.
- Incubation with EGF and alginate up regulates fluid phase endocytosis.
- Levels of up-regulation varied depending on alginate used.
- Alginates up-regulate fluid phase endocytosis more than physiological levels of EGF.

Conclusions: We have shown that both alginates and EGF up-regulate fluid phase endocytosis in all cell lines used in this study. However alginates up-regulate this process significantly whereas EGF does not. The mechanism for this alginate action is not yet identified, but it is possible that alginates interact with the receptor for EGF.

REFERENCES

9th Asian Conference on Diarrheal Diseases and Nutrition

This meeting will be held on 28–30 September 2001 in New Delhi, India. The organisers hope the meeting will promote meaningful and effective collaboration among individuals/institutions towards control of the major health problems in Asia, particularly those affecting women and children. Further information: Professor M K Bhan, Coordinator, Centre for Diarrheal Disease and Nutrition Research, All India Institute of Medical Sciences, New Delhi. Tel: +91 11 6963822; fax: +91 11 6862662; email: ascodd2001@rediffmail.com
Helicobacter pylori, Lewis antigens, and inflammation

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