1778 Alteration of Teeth Enamel in Celiac Patients
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In 1986 Finnish authors described teeth enamel lesions in celiac patients. Alterations are classified in 4 levels, from change of colour to complete enamel destruction.
We studied 24 celiac patients: 8 had always followed strict gluten free diet since diagnosis within 24 months of age, 12 followed a 4–12 months provocation gluten diet in pre-teens age, and were since then on strict gluten free diet, 4 were on liberal diet. Age varied from 13 to 18.
All received accurate teeth cleaning and drying before examination at incident light
AGA and AEM were dosed in all patients.
Results: Patients following strict gluten free diet presented no lesions of enamel and normal AGA and AEM values. Of the 16 patients which had followed for a period diet including gluten, only 5 presented significant lesions (2–3 Ane degree).
Only patients following a gluten diet presented pathological values of AEM and AGA antibodies.
From our preliminary studies, to be confirmed by investigation on larger number of patients, it seems that teeth enamel lesions on patients not strictly on a gluten free diet are rather less frequent than described by the Finnish authors, and not useful as a screening test for celiac disease, as proposed.

1779 Effect of Glutenfree Diet on Intestinal Permeability Measured by the Sugar Absorption Test in Patients with Coeliac Disease
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Permeability probes are used to reflect the functional integrity of the intestinal epithelial layer in coeliac disease (CD). To evaluate the effect of a gluten free diet on the functional integrity of the small bowel -which is impaired in CD- the sugar absorption test (SAT) was performed in coeliaics at the moment of diagnosis and in the follow up during gluten free diet. In the SAT a solution of lactulose [L] and mannitol [M] was given simultaneously to the fasting patient after which the L/M ratio was measured in 5 hours urine. A ratio >0.100 was considered abnormal. The L/M ratio (median, range) was significant higher at the moment of diagnosing CD (0.234, 0.062–0.804, n=22) compared to the ratio in the group of 0–2 years glutenfree (0.128, 0.037–0.265, n=13, p < 0.05) and ≥ 2 years glutenfree (0.143, 0.030–0.322, n=17, p < 0.05).
There was a significant correlation between the SAT and the degree of villous atrophy. The L/M ratio (median, range) was significant higher in case of biopsies with total villous atrophy (0.362, 0.062–0.804, n=11, p < 0.05), subtotal villous atrophy (0.210, 0.062–0.343, n=15, p > 0.05) and villous irregularity (0.150, 0.078–0.366, n=16, p < 0.01) compared to the L/M ratio in case of biopsies with normalized histology after gluten free diet (0.078, 0.030–0.180, n=10).
In the majority of patients without improvement of the SAT and villous abnormalities, dietary errors seemed to be responsible. We conclude that gluten free diet improves intestinal permeability in CD. The SAT is useful in the follow up of coeliaics to evaluate the effect of gluten free diet on the permeability of the small bowel.

1780 Antiendomyosium Antibodies in the Diagnosis of Adult Coeliac Disease
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Purpose: To evaluate IgA anti-endomyosium antibodies (EmA) in the diagnosis of adult celiac disease.
Methods: 146 consecutive adult patients (aged 17–84 years) with suspected malabsorption or dyspepsia who underwent small bowel biopsy were included. No patient had concomitant dermatitis herpetiformis or IgA deficiency. IgA anti-gliadin antibodies (AGA) and EmA were analysed.
Results: Nineteen patients (13%) were found to suffer from coeliac disease. The sensitivity of EmA for coeliac disease was 74% and the specificity was 100%. The positive and negative predictive values of EmA was 100% and 96% respectively and the diagnostic efficiency was 97%. The sensitivity of AGA for coeliac disease was 79%, but the specificity was only 70%. The positive and negative predictive values of AGA was 28% and 96% respectively and the diagnostic efficiency was 71%. Three of the 19 patients with coeliac disease had neither detectable AGA nor EmA. Two patients had AGA but not EmA and one had EmA but not AGA.
Conclusions: When EmA are found in adults, small bowel biopsy is not necessary. As the sensitivity of the EmA test for coeliac disease is rather low, a small bowel biopsy must be performed in patients without EmA if there still is clinical suspicion of coeliac disease. Furthermore, we suggest that IgA anti-endomyosium antibodies could replace IgA anti-gliadin antibodies as a diagnostic test for adult coeliac disease due to the higher diagnostic efficiency.

1781 Analysis of HLA DPB Gene in Susceptibility to Coeliac Disease
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The association of coeliac disease with particular HLA class II genes led to the suggestion that a gene or genes encoded within the HLA class II region contribute to disease susceptibility. In order to further substantiate the possible contribution of HLA DPB genes in susceptibility to coeliac disease we investigated the segregation of HLA DPB alleles in 24 coeliac disease families including 41 affected patients. The results were analyzed by an explorative linkage analysis.
Methods: The family members were typed for HLA DPB alleles by conventional RFLP analysis using Rsa I as restriction enzyme. Linkage analysis was performed under the genetic model with a disease allele frequency of 0.0005 and penetrance of 0.90 which enabled us to calculate the LOD scores of coeliac disease versus marker gene. Results: Two alleles were distinguished at HLA DPB designated alleles A1 (4.0 kb fragment) and A2 (2.1 kb fragment). 13 pedigrees were informative for segregation of the two HLA DPB alleles resulting in a LOD score of –1.361 at a recombination fraction of zero. Conclusions: No significant linkage relationship (LOD score >3) or exclusion of linkage (LOD score <–1.361) was observed for the marker gene tested but generally, positive LOD scores indicate evidence for linkage and negative LOD scores indicate exclusion for linkage. The resulting LOD score might be attributed to the limited sample size or to the limited information of the polymorphic marker used in this study.

1782 Non Invasive Measurement of Gastric Acid Secretion by Electrical Impedance Tomography
The standard method for measuring gastric acid secretion in man uses gastric intubation and stimulation by pentagastrin. A reliable tubeless test is lacking. Electrical impedance tomography (EIT) measures changes in the electrical impedance in the human body and calculates a tomographic image of a computer scan image. We attempted to investigate, if EIT can distinguish between acid and neutral fluids in the stomach and if EIT can detect acid after weak to moderate physiological stimulation of the stomach.
Methods: (a) 5 fasting volunteers were examined by EIT on 2 days during 60 min., with and without acid inhibition by omeprazole (80 mg 24 hours and 40 mg 12 hours before the test). After collecting baseline images, shamfeeding was performed. (b) 4 fasting volunteers with acid suppression by omeprazole (as above) were examined twice. On one day increasing volumes of artificial gastric juice (0.075 N HCl with NaCl and Pepsin 1:3) were instilled into the stomach. On the other day a isotonic fluid without acid (pH = 5.3) was used. At the end of each experiment, the stomach was marked by a salty soup (region of interest). In this region the impedance was measured and the area under the curve (AUC) was calculated.
Results: (a) The median pH of a long-term pH-meter, performed for control purposes, with and without omeprazole was 3.9 and 0.8 resp. The AUC of the impedance with and without omeprazole was 23.7 ± 7.9 (mean ± SD) and 37.5 ± 19.1 resp. (paired t-test, p = 0.09). (b) Perfusion of 10 ml, 20 ml and 50 ml did not yield a significant difference in the AUC between fluid with and without acid. The difference in the AUC after instillation of 100 ml (7.5 mmol HCl) was 18.6 (p = 0.04), after 200 ml (15 mmol HCl) 39.2 (p = 0.001).
Conclusion: EIT detects physiological amounts of acid (7.5 mmol acid and more) in the stomach and distinguishes it from neutral fluid. It does not detect acid secretion after low physiological stimulation by shamfeeding. Further studies with stronger acid stimulation by pentagastrin are needed to prove, that EIT can distinguish hypo- and achlorhydric patients from normal or high secretors.

1783 Prostaglandin E2 and I2 are the Major Arachidonic Acid Metabolites Secreted by Esophageal Mucosal Cells in Rabbits
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Little is known about the pathways of arachidonic acid (AA) metabolism and the role of eicosanoids in the esophagus. Because each tissue forms a unique profile of eicosanoids and a given eicosanoid may have widely different effects in different organs, this study has determined the profile of AA metabolites of rabbit esophageal mucosal cell and their response to regulatory compounds.
Methods: Primary cell culture of mucosal cells were prepared from...
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1788 Effect of Ethanol and 4-Methylpyrazole (4-MP) on PGE2 Levels in Human Gastric Mucosa. A Possible Role of Acetaldehyde

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Ethanol stimulates the production of PGE2 and PGF2α in human gastric mucosa (Adv. Prostaglandin Tromboxane Leukotriene Res., 1991, 21, 785-788). 4-MP inhibits alcohol dehydrogenase and decreases acetaldehyde production. We demonstrated earlier that 4-MP prevents the ethanol-induced acute gastric mucosal lesions, and now tested the hypothesis that acetaldehyde, but not alcohol, can be the responsible of increased PGE2 levels in human gastric mucosa. Fourteen healthy volunteers received pretreatment with vehicle or 4-MP, 15 mg/kg body weight, dissolved in 50 ml of orange juice and 2 hr later 100 ml of 40% ethanol. Two endoscopic biopsy specimens were taken from the gastric body and antrum before and after 30 min after alcohol for radiomunological determination of PGE2. In vehicle pretreated subjects ethanol increased PGE2 levels from 386.6 ± 228 pg/ml of the extraction solution to 1593 ± 1218 pg/ml in the corpus and from 459.9 ± 217 pg/ml to 1040 ± 318 pg/ml in the antral mucosa (p < 0.03, p < 0.05 respectively). In contrast, alcohol did not affect significantly the mean PGE2 levels in subjects pretreated with 4-MP.

Conclusions: (1) Ethanol increased PGE2 levels in human gastric mucosa; (2) This effect of alcohol is inhibited by pretreatment with 4-MP; (3) The ethanol-induced gastric PGE2 increase is probably due to acetaldehyde.

1789 Isolation of Herpes Simplex Virus (HSV-1) in Patients with Peptic Ulcer Disease

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HSV-1 has been implicated in the pathogenesis of peptic ulcer (PU) mainly by detection of specific antibodies against HSV-1 in the serum of patients with PU. Aim of the study was to isolate and characterize HSV-1 from biopsy specimens of patients with active PU. 35 patients, 12 with prepyloric and 23 with duodenal ulcer (26 male, 9 female, age range 30-81 years) were studied. Malignancy was excluded in patients with prepyloric ulcer histologically. 15/23 (65%) with duodenal and 4/12 (33%) with prepyloric ulcer were positive for HP (CLO test). Biopsies were taken from the crator and rim of the ulcer, 3 cm apart from the ulcer and from endoscopically healthy, distant to the ulcer, mucosa. After tissue homogenization in Hank’s BSS and centrifugation both supernatant and cell pellet were inoculated and cultured in specific, sensitive to HSV-1, cell line (Hep 2). Viral characterization was performed both indirectly (specific complement-fixing or specific interferon assay) and directly (immunofluorescence after secretion of Hep 2 cells with specific antisera for HSV-1). HSV-1 was isolated in 6/23 (26%) with duodenal and in 2/12 (16%) patients with prepyloric ulcer (crator or rim) and in 0/35 from the adjacent or distant to the ulcer mucosa. 4/6 patients with duodenal and 0/2 with prepyloric ulcer positive for HSV-1 were also positive for HP. These results suggest that HSV-1 may play a role in the pathogenesis of peptic ulcer disease.

1790 Gastric Mucosa Adapted to Aspirin (ASA) or Stress is More Resistant to Acute Damage Induced by Strong Irritants


Gastric mucosa adapts to damaging action of ASA or stress but it is unknown whether this adaptation affects the resistance of this mucosa to other topical irritants.

In this study, acidified ASA (100 mg/kg) was given p.o. for 4 days (series A) or 3.5 h of water immersion and restraint stress (WRS) (series B) was applied every other day up to 8 days. When the gastric adaptation to ASA or WRS fully developed, rats of series A and B were divided into 6 groups and challenged with 1.5 ml of vehicle (control), 100% ethanol, 250 mM NaCl, 200 mM acidified taurocholate, 200 mM acidified ASA for 1 h or 3.5 h WRS. During maximal gastric adaptation to ASA or WRS, an increase in mucosal blood flow (MBF measured by laser Doppler) and a rise of mucosal expression of EGF and its receptors were observed. Mucosal PGE2 generation was suppressed with ASA but increased with adaptation to WRS. In non-adapted rats, single exposure of gastric mucosa to 100% ethanol, 25% NaCl, 200 mM TC, acidified ASA (100 mg/kg) or 3.5 h WRS resulted in gastric lesions with an area averaging 88 ± 6, 27 ± 2, 43 ± 3, 58 ± 4 and 14 ± 1 mm², respectively. These lesions were accompanied by a significant reduction in MBF and in mucosal expression of EGF and its receptors. In rats adapted to ASA (series A) and then challenged with 100% ethanol, 25% NaCl, 200 mM TC, acidified ASA or WRS, the area of gastric lesions was reduced (as compared to that in non-adapted rats) by 88%, 95%, 92%, 85% and 78%, respectively, and the mucosal expression of EGF and its receptors was enhanced. Similar decrease in the area of gastric lesions caused by all five ulceration dependent increase was found in rats adapted to WRS (series B), being accompanied by a rise in MBF and a marked increase in expression of mucosal EGF and its receptors.

We conclude that adaptation to ASA or stress enhances the resistance of mucosa to injury by strong irritants and this is probably mediated by gastric hyperemia and increased expression of EGF.

1791 Role of Endogenous Polyamines (PA) in Inhibition by Epidermal Growth Factor (EGF) of Acid Production by Parietal Cells and in Protection and Adaptation of Gastric Mucosa to Stress


Growth factor such as EGF are known to activate ornithine decarboxylase (ODC), the key enzyme in PA synthesis. This study was designed to determine the role of ODC and spermine in gastric acid inhibition, gastric protection and adaptation to stress.

Enriched parietal cells population (~75%) were obtained from rat gastric mucosa. Percent reduction in acid production (PA) uptake stimulated by histamine (10-5 M) and ODC activity shown in concentrations of histamine when EGF (0.001-1.0 μg) was added to the incubation medium. Both those effects were blocked by difluoromethylornithine (DFMO) (5 mM). Like EGF, spermine which is a direct product of enhanced ODC activity also inhibited (PA) uptake induced by histamine but this effect was not altered by DFMO. EGF infused s.c. in graded doses (12.5-100 μg/kg) h 30 min before and during exposure of rats to 3.5 h water immersion and restraint stress (WRS) prevented dose-dependently the formation of acute gastric lesions and this effect was also completely reversed by the pretreatment with DFMO (200 mg/kg i.p.). whereas the protection afforded by spermine (10 mg/kg) was not altered by DFMO. WRS applied every other day resulted in gradual decrease in ulcer incidence, the maximal gastric adaptation to stress being reached after 6-8 days. Removal of salivary glands, which reduced gastric luminal EGF content by 80%, completely abolished the adaptation of mucosa to stress and this effect was reversed by addition of EGF (100 μg/kg per day p.o.) and reduced by the addition of DFMO to EGF.

We conclude that: 1. EGF-induced gastric inhibition and gastroprotection are mediated by activated ODC and PA and 2. EGF and PA contribute to gastric adaptation to stress.

1792 Acupuncture Affects Perception of Gastric Distension by Naloxone-Sensitive Pathways in Healthy Volunteers

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Acupuncture is widely used empirically in patients with chronic abdominal pain or discomfort. The analgesic effect is thought to be mediated by endogenous opioid pathways. It has been shown, that acupuncture can relieve epigastric pain, and that it alters gastrointestinal motility by parasympathetic pathways (Dig Dis Sci 1992; 37: 1576-62). Until recently, no systematic studies have investigated the effect of acupuncture on gastric perception. Thus, the aims of this study were to investigate the effect of acupuncture on gastric sensitivity to balloon distension, and to examine coinciding alterations of gastric motility. (2) Pancreatic polypeptide (PP) is a valuable marker to appraise vagal activity, and PP plasma levels increase at gastric distension (Gastroenterology 1983; 85: 1411-25). Therefore, the effect of acupuncture on PP-release due to gastric distension was evaluated in parallel. (3) The role of opioid pathways in the effects of acupuncture was assessed.

Methods: In each of 8 healthy volunteers, acupuncture (A), sham-acupuncture (SA) and treatment with plus 2 mg naloxone s.c. (AN) were performed in randomized order. Under these conditions, gastric compliance and intensity of gastric perception (questionnaire; scores from 0: no perception to 10: intensive pain), were determined using an electronic barostat device (Synectics Medical). Responses to the successive increase of gastric pressure (2 mmHg/3 min) were monitored until the patients scored > 8 (pain) or until balloon volume exceeded 900 ml (= procedure endpoint). Blood samples were drawn before and at every second step of pressure increase, and PP levels were measured by RIA.

Results: (ANOVA and Student-Newman-Keuls test; x ± SEM). Acupuncture did not affect gastric compliance, but it had a significant and dissimilar effect on gastric perception, which was blocked by naloxone (see table; p < 0.05 vs. sham acupuncture).
At all experimental conditions, PP levels first significantly increased (p < 0.01) by gastric distension from basal (SA: 66 ± 9; A: 55 ± 4; AN: 81 ± 14 pg/ml) to a maximum at an average volume of 202 ± 44 ml (SA: 153 ± 58; A: 100 ± 20; AN: 157 ± 22 pg/ml), and then decreased again, nearly reaching basal levels (SA: 79 ± 16; A: 62 ± 5; AN: 103 ± 11 pg/ml) at the endpoint (average volume of 407 ± 63 ml). At maximal PP levels, gastric compliance was 15 ± 3 cm/cmHg, and increased significantly to 27 ± 5 cm/cmHg at procedure endpoint (p < 0.01).

Conclusions: These studies show that acute acupuncture affects gastric perception, mucosal tolerance to noxious gastric distension by naloxone-sensitive pathways. We speculate, that the inverse changes of compliance and PP levels at the endpoint are due to a decrease in effenter vagal activity, since gastric distension exceeded a critical point.

1793 Aspirin Related Esophagitis is pH Dependent and Reduced by Prostaglandin E2 in Rats

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ASA and other NSAIDs are progressively recognized as potential damaging agents in patients with esophagitis (J Clin Gastroenterol 1991; 13: 622), but the mechanisms of ASA-induced esophagitis are not well known. To see potential therapeutic targets we have studied the effects of ASA (18 mg/100 ml) on an "in vivo" esophagitis model in rabbits induced by a recirculating 50 ml solution of acidified pepin (AP) (saline at pH 2 ± 2000 U of pepin/ml) for 60 minutes (Gut 1990; 39: 11). The extent of both macroscopic and microscopic mucosal damage was graded to 2 uniformed observers from 0 = Normal to 3 = Confluent haemorrhage and/or erosions. Mucosal barrier function was measured by H+ (μEq), K+ (μEq) flux rates and total hemoglobin (Hb) content (mg). Each experimental group contained 6-8 animals and results (x ± ES) were analyzed using the Students' unpaired two tailed t-test.

Results: Exposure of the esophageal mucosa to a perfusion solution of acidified ASA (saline + ASA; pH 2) followed by AP induced severe mucosal damage and increased significantly (** p < 0.01) all the indicators of damage when compared to control experiments (exposure to acidified saline pH 2 followed by AP). ASA also completely inhibited hyperplasia of the basal layer developed in control experiments (p < 0.001). These ASA-effects were significantly (** p < 0.05) reduced by prostaglandin E2 (μg/kg), administered (s.c.) prior to acidified ASA exposure, and by increasing the pH of AP solution up to 6 (ASA pKa = 3.5).

We conclude that aspirin induced-mucosal damage to the esophagus is, at least in part, pH dependent and can be reduced by prostaglandin E2 cotherapy.

1794 Anti-Oxidants Inhibit Ethanol-Induced Gastric Injury: Role of Manganese and Carotene

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The pathogenesis of ethanol (ET)-induced tissue injury may involve generation of oxygen derived species. Manganese ion and carotene have been shown to act as anti-oxidants, attenuating tissue and cellular damage. The aim of this study was to evaluate the effect of manganese ion and carotene on ET-induced gastric damage in the rat and on ET-cytotoxicity exerted on epithelial cell monolayers in culture.

Methods: ET (96%; 1 ml) was instagastically (IG) administered to fasted male rats. Mucosal lesions were blindly scored 1 h later by their number and diameter (mm). MnCl2 (50 mg/rat) was injected SC and 0.5 ml of 10%ascorbic acid per fresh carrot juice (CJ) or water soluble β-carotene (CAR) were given IG, 2 h and 30 min prior to ET administration, respectively. Control rats were treated with 0.9% saline. Epithelial cell monolayers were prepared from BGM cells grown to confluency and labeled with either 31Cl or 1H-Arachidonic acid. The extent of ET-induced oxidative stress was assessed by measuring the release of the isotopes into the medium. In some additional experiments, further enhancement of cell injury was obtained following the addition of taurocholate or trypsin at sub-toxic concentrations to the ET + GO containing media.

Results: Manganese, CJ and CAR significantly reduced ET-induced gastric injury. (Mean ± SE):

<table>
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<tr>
<th>Control</th>
<th>CJ</th>
<th>CAR</th>
<th>Mn²⁺</th>
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<tr>
<td>n</td>
<td>11</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>lesion score</td>
<td>56 ± 7.3</td>
<td>11.2 ± 3</td>
<td>0.6 ± 0.3</td>
</tr>
<tr>
<td>p (t-test)</td>
<td>&lt;0.01</td>
<td>&lt;0.001</td>
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</table>

Mn²⁺ and CJ, dose-dependently inhibited ET + glucose oxide-induced epithelial cell injury in monolayers culture. Mn²⁺ (3 mM) and CJ (70 μl) decreased cytotoxicity by 83% and 92%, respectively. Similar protection was also observed against the enhanced cell damage induced by the combination of three noxious compounds.

Conclusions: (1) Manganese and carotenes, especially β-carotene, significantly protect against ET-induced injury in rat's gastric mucosa and in epithelial cell culture. (2) The mechanism of this protection may involve the anti-oxidative action of these agents. (3) ET-induced gastric injury may, in part, be associated with generation of oxygen-derived species.

1795 Gastric Mucosal Biochemistry of Indomethacin (IND)-Induced Gastric Ulcer in Rats with Intact Vagal Nerve

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It is known that nonsteroidal antiinflammatory compounds (NOSAC) produce gastrointestinal (GI) mucosal damage. The gastric ulcer can be produced in rats by s.c. administration of indomethacin (IND). This model offers an excellent possibility to study its development mechanisms.

Materials and methods: The observation was carried out in both sexes of CFY (originated from the Sprague-Dawley) strain rats, weighing 180 to 210 g body weight. The animals were fasted for 24 h before experiments, but they received tap water freely. The observations were carried out at 8 AM. The gastric ulcer was produced by IND (20 mg/kg s.c.) administration. The animals were sacrificed at 0, 1, 2, 3 and 4 h after IND administration, when the gastric ulcer (number and severity) was noted and the biochemical examinations were carried out from the total homogenate of scraped gastric mucosa. Adenosine triphosphate (ATP), adenosine diphosphate (ADP), adenosine monophosphate (AMP) and lactate were measured enzymatically (Boehringer, Ingelheim, Germany), and cAMP by RIA (Beckton Dickinson, Oregon, USA). The protein content was assayed by the method of Lowry et al. (1956).

The biochemical results were calculated in accordance to 1 mg mucosal protein (means ± SEM). The ratio of ATP/ADP, adenyate pool (ATP + ADP + AMP) and "energy charge" [(ATP × 2 + ADP)/(ATP + ADP + AMP)] were calculated.

Results: (1) The IND-induced ulceration appeared at 1 or 2 h after IND administration, and thereafter increased gradually. (2) The tissue levels of ATP and ADP decreased at 1 and 2 h after IND administration; (3) The tissue level of CAMP decreased at 1 h after IND-treatment; (4) No significant change was found in the lactate level of gastric mucosa during 4 h after IND.

Conclusions: (1) The changes in the tissue energy metabolism precedes the gross appearance of gastric ulcer. (2) The tissue hypoxia exists in the gastric mucosa during the induction of gastric ulcer. This study was supported by the grant of Research Fund of the Hungarian Ministry of Health and Welfare (EFT T02 1825) and Hungarian National Research Fund (OTKA No. 2466).

1796 Inhibition of Thiol Protease Cathepsins B, H and L: A Key Element in Gastric Mucosal Protection

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Our previous results implicated an activation and release of cysteine protease cathepsins B, H and L in the pathogenesis of chemically-induced gastric hemorrhagic mucosal lesions (HML) in rats. In this study we have investigated mucosal presence and activity of the cysteine protease inhibitors and cathepsin B in the mechanism of HML. Fasted rats (150–200 g) were given 1 ml of 75% ethanol or 1% ammonia solution instрагastrically and were killed 1, 3, 6, 12 or 15 min later. Stomachs were analysed for HML by stereomicroscopic planimetry. Mucosal cathepsin B activity was measured by a specific fluorogenic substrate ZARRMNA in Barrett's buffer (pH 6.0). Inhibitors of cathepsin B were also extracted and partially isolated in the gastric mucosa and tested in vitro on 2 μg of purified cathepsin B. We have also evaluated naturally occurring and newly synthesized malamide, acetophenone and butyltolane derivatives for in vivo gastrointestinal and in vitro assays for inhibition of cysteine proteases papain or cathepsin B. Other gastroprotective compounds such as capsacain, beta-carotene, GSH, GSSG, taunene, sodoacetate (IA), N-ethylymaleide (NEM) were similarly tested. We found a rapid inactivation of protease inhibitors and activation of cathepsin B in the early phase
of ethanol or ammonia-induced gastric mucosal damage. Negative correlations were found between activities of cathepsin B and its inhibitors in the pathogenetical range of HML induced by either ethanol or ammonia-water (r = -0.58; p < 0.001). Significant correlation was found between gastrointestinal and in vitro inhibition of papain (r = 0.76; p < 0.001) by several maleimide or bromoacetonephene derivatives. Capsaicin, IA or NEM markedly inhibited the activity of cathepsin B. Conclusions: 1. Cysteine proteases and endogenous protease inhibitors may participate in the mechanisms of gastric mucosal lesions and gastrointestinal. 2. New maleimide and acetophene derivatives exerted gastrointestinal which correlated in vitro inhibition of cysteine proteases. 3. Endogenous and exogenous cysteine protease inhibitors represent a novel type of gastrointestinal and antulcer agents.

1797 Serum and Urine Electricities After Intake of Aluminium-Magnesium Containing Antacids in Therapeutic Doses

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Aluminum-magnesium containing antacids (AA) are widely used drugs for the treatment of discomfort of the upper gastrointestinal tract. Despite their excellent tolerance some uncertainties concerning their enteral absorption still exist. The objective of this investigation was to determine the serum and urine concentrations of different electrolytes before, during and after a 3 week treatment period with two different AA.

The study was performed with 12 healthy volunteers during a run-in phase of 8 days, a treatment phase of 21 days and a posttreatment observation phase of 8 days. All volunteers were hospitalized during the run-in and the treatment phase. Two different AA were applied in a daily dose of 4 × 10 ml: An Aluminum-magnesium hydroxide suspension (Maaloxan®, M) and a magaldrate suspension (Riopan®, R). Aluminum (Al), magnesium (Mg), calcium (Ca) and phosphate (P) were measured in serum and urine by flameless atomic absorption spectrometry or flame photometry.

A. Serum concentrations (median, n = 12):

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Al (µmol/l)</th>
<th>Mg (µmol/l)</th>
<th>Ca (µmol/l)</th>
<th>P (µmol/l)</th>
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<tr>
<td>29</td>
<td>34.0</td>
<td>86.7</td>
<td>2.40</td>
<td>2.45</td>
</tr>
</tbody>
</table>

B. Urine concentrations: Irrespective of the drug administered, the urine concentrations of all monitored electrolytes were characterized by strong interindividual differences. There was no major difference in the concentration time course between the two drugs.

Conclusions: - No toxicologically relevant changes in serum concentrations were observed for any electrolyte under both treatments - Both AA induced comparable changes in serum concentrations of Al, Mg, Ca and P.

- Due to the fact that the renal elimination of all monitored electrolytes differs significantly interindividually, major influences of any treatment on this parameter cannot be detected.

1798 Equieffective Molar Ratios of Agonists of Active Duodenal Bicarbonate Secretion in Guinea-Pigs

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Duodenal mucosal HCO3-secretion is stimulated by a number of agonists, whose relative potency is uncertain. This issue was investigated in the anesthesitized guinea-pig. The proximal duodenum was isolated in situ and perfused with 24 mmol NaHCO3 (ensuring active secretion of HCO3) and net duodenal HCO3-secretion was measured. Histamine, theophylline, dbcAMP VIP, glucagon, secretin, dbcAMP and PGE2 were infused in dose range 10-6 to 10-8 mol/kg.

Results: All agonists (except secretin) amplified HCO3-secretion dose-responsively. Potencies of agonists were ranked by computing Equiefective Molar Ratios [agonist concentration in molf causing same stimulation of HCO3-secretion as 10-10 molf of dbcAMP]1(10-10 molf of dbcAMP).

Another was found between activities of cathepsin B and its inhibitors in the pathogenetical range of HML induced by either ethanol or ammonia-water (r = -0.58; p < 0.002) or ammonia-water (r = -0.58; p < 0.001). Significant correlation was found between gastrointestinal and in vitro inhibition of papain (r = 0.76; p < 0.001) by several maleimide or bromoacetonephene derivatives. Capsaicin, IA or NEM markedly inhibited the activity of cathepsin B. Conclusions: 1. Cysteine proteases and endogenous protease inhibitors may participate in the mechanisms of gastric mucosal lesions and gastrointestinal. 2. New maleimide and acetophene derivatives exerted gastrointestinal which correlated in vitro inhibition of cysteine proteases. 3. Endogenous and exogenous cysteine protease inhibitors represent a novel type of gastrointestinal and antulcer agents.

1799 Physiological Components of the Cerebral Evoked Potentials by the Electrical-Stimulation of the Esophagus in Normal Humans

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It has already been shown that reproducible evoked potentials can be recorded from the scalp after electrical stimulation of the esophagus and that these are transferred centrally via vagal afferents (Friedel et al., Gastroenterology, 1989; 97: 475-84). Cervical responses from esophagus were investigated in 7 healthy female 39-54 yr old and in 3 healthy male volunteers, 24-53 yr old. The stimulus was applied by a nasso-esophageal probe equipped with bipolar ring electrodes. It was positioned at a distance of 25 and 30 cm from the nostrils in the esophagus. The stimulus intensity applied was 50 ± 10 mA at a rate of 0.5 Hz, sweeps were averaged on line at 1 s time-base. Recording of the evoked potential was from the cortex by Ag-AgCl Beckman cups electrodes attached to the Cz and Fz (reference electrode) following the EEG 10-20 I.S. configuration.

Cerebral responses consisted of a succession of six negative-positive peaks in the 2.3 to 3.4 µA amplitude range. Latencies of the negative peaks ranged from 74 ± 10 ms (N1) to 182 ± 9 ms (N3) at 25 cm and from 77 ± 11 ms (N1) to 191 ± 13 ms (N3) at 30 cm. Minimum and maximum conduction velocity between the two points of stimulation were 0.5 and 16 m/s respectively. Interpeak (N1-N2) distances were 42 ms at 25 cm and 46 ms at 30 cm position, respectively.

These results suggest that the cortical excitation from electrical stimulation of the esophagus depends from the activation of both small size myelinated (sensory and/or antidromic motor) and unmyelinated (autonomic) peripheral nerve fibers.

1800 The effect of Na+/H+-Antipot on Restitution of Guinea Pig Gastric Epithelium in vitro

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Restitution of gastric surface epithelium after superficial injury is known to depend on migration of the survived epithelial cells over the area of damage. An impaired transformation capacity of plasma membrane is a prerequisite for the process. The role of volume regulation during the process is unclear. Na+/H+-antipot is known to be closely involved with volume regulation. This study evaluates its role in restitution. Methods: Guinea pig corpus mucosa was dissected from the seromuscular layer and paired halves were mounted in Using chambers (37°C). The mucosa was exposed to 1.25 M NaCl (57°) and, subsequently, to 150 mM NaCl (pH 7-8). Simultaneously, the tissue was perfused serosally either with HCO3-buffered gassing with 95% O2-5% CO2 or with Hoesps-buffered fingers-solutions (gassing with 100% O2 (pH 7.4) and exposed to 1 mM amiloride (LS) for 4 h. Simultaneously, PD- and tissue resistance were recorded. Results: The mean PD increase in tissues exposed to 1 mM amiloride (LS) during restitution was 1.1 ± 0.4 mV in control tissues the respective value was 9.0 ± 3.2 mV (N = 5) (p < 0.05). Likewise, the mean PD increase after Na+ replacement (LS) was 0.8 ± 0.3 mV whereas the respective value in control tissues was 7.7 ± 1.1 mV (N = 5) (p < 0.05). HCO3- replacement (LS) had no effect on restitution. The results of tissue resistance recordings paralleled with PD results as well as with the morphological findings. Conclusions: Inhibition of Na+/H+-antipot of the surface cells in gastric epithelium in vitro inhibits also restitution.
1801 Low Levels of Glutathione-Transferase-Alpha in Small Intestine of Patients with Celiac Disease May Account for Their Increased Tumor Risk

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Patients with subtotal villous atrophy due to celiac disease (CD) have an increased risk for the development of small intestinal lymphomas and adenocarcinomas. Small bowel biopsy specimens were studied by immunohistochemical and electrophoretic analyses. The levels of glutathione (GSH), glutathione transferase (GST), and the GSH-dependent GST activity were determined after densitometric analysis of immunoblots and the electrophoresis of proteins. 6 patients with villous atrophy and 13 with flat jejunal mucosa were studied in CD patients on a gluten free diet (n = 4), and in CD patients on a gluten free diet (n = 4).

Conclusions: Since GST levels in the entero-gastro-intestinal tract are directly related to the tumor risk (low risk at sites with high activity and vice versa; Brit. J. Cancer 67: 1413, 1993), the decreased activity found in the small intestine of patients with active CD could very well explain their increased tumor risk.

1802 Does Ranitidine Induce In Vitro Interleukin 1β Production?

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Histamine (H2) receptor mRNA expression was recently found in the gastric lumen and appeared to be within intracellular vesicles. Furthermore, interleukin 1 (IL-1) has been demonstrated to be an inhibitor of both gastric acid secretion and experimental ulcerogenesis. Therefore, we studied the effects of ranitidine (RA) upon IL-1, interleukin 6 (IL-6) and tumor necrosis factor a (TNF)-alpha production by human monocytes in vitro.

Methods: Monocytes were obtained by cytopheresis and elutriation in healthy donors. After a 24 hour incubation (106 cells/ml) they were cultured 24 hours later in the presence of increasing concentrations of ranitidine (10, 20, 100 μM) with or without interferon γ (IFN: 500 U/ml) and lipopolysaccharides (LPS: 1 μg/ml). Interleukin 1, IL-6 and TNF expression were measured by ELISA.

Results: In all experiments ranitidine potentiates the IL-1 production induced by IFN-LPS; i.e. 72 ± 3 pg/ml (controls) vs 740 ± 6 pg/ml (controls with IFN-LPS) or 1091 ± 13 pg/ml (RA 10 μg/ml + IFN-LPS) vs 1278 ± 256 pg/ml (RA 20 μg/ml + IFN-LPS) or 1250 ± 11 pg/ml (RA 100 μg/ml + IFN-LPS) (p < 0.01). Furthermore, in 50% of normal subjects, ranitidine alone induced IL-1 production; i.e. 18 pg/ml (controls) ± 126 ± 24 pg/ml (RA 10 μg/ml) vs 176 ± 161 pg/ml (RA 20 μg/ml) ± 220 ± 50 pg/ml (RA 100 μg/ml) (p < 0.01). In contrast, there was no experimental condition in which ranitidine modified IL-6 concentrations.

Conclusions: (1) Ranitidine was shown to potentiate IL-1 production induced by IFN-LPS stimulated human monocytes. (2) Ranitidine alone induced IL-1 production in 50% of donors. (3) TNF and IL-6 production were not modified by ranitidine addition in the culture medium. (4) These results suggest that monocytes/macrophages are a possible site of action for ranitidine and could therefore play a key role in gastric acid secretion. (5) The heterogenous response of monocytes to ranitidine alone remains unexplained.

1803 Structural Study of Rat’s Gastric Adherent Mucus: Protective Effect of Diosmectite from Alcohol Injury


The effect of alcohol-induced injury is now well known. The aim of this investigation is to assess the protective action of diosmectite (IPSEN-France) against this effect on rat’s gastric mucus. Rhesus, chromatographic and electrophoretic analyses were performed.

Materials and methods. 12 male, Wistar rats (250-280 g) fasted for 18 hours but allowed free access to water, received an oral administration of 1 ml 40% alcohol. Then there were killed 1 hour later. The gastric mucus was gently scrapped from gastric mucosa. A second group of 12 rats was treated in the same conditions, but received an oral administration of diosmectite in 1 ml water at a dose of 500 mg/kg, one hour prior the alcohol administration.

The spinability of the mucus, that gives an idea of the glycoproteins polymerisation state, was directly read on a digital display.

High pressure liquid chromatography (HPLC) was performed on a Superose 6 column (Pharmacia). Gradient electrophoresis in 8-25% polyacrylamide slab gel was performed according to the Laemmli’s method.

Results. Gastric mucus of alcohol administrated rats exhibits lower spinability. However this spinability is recovered again after diosmectite pretreatment as evidenced by our study (Fig. 1).

Electrophoretic and chromatographic profiles consist mainly of three components of high, medium and low molecular weight (respectively: HMW, MMW and LMW). The amount of MMW compounds is greater for diosmectite + alcohol treated rats than for alcohol administrated ones (Fig. 2). Accordingly, the formation of LMW compounds under alcohol administration is totally inhibited.

Conclusions. The alcohol-induced alteration of gastric mucus consists of the dissociation of MMW glycoproteins into LMW proteins or peptides. The protection afforded by diosmectite looks like an indication of such a dissociation and was demonstrated by rhologeoical behaviour, electrophoretic and chromatographic patterns.

1804 Effect of Prolonged Sulglycotide Administration on Gastric Mucosal EGF Receptor Expression

J. Piotrowski, A. Czajkowski, V.L. N. Murty, B.L. Slomiany, A. Slomiany. Res. Ctr., UMDNJ, Newark, NJ, USA

Among the factors that play role in the preservation of gastric integrity is the mucosal epithelial growth factor receptor expression. The binding capacity of the growth factor to the receptor leads to the activation of the intrinsic receptor tyrosine kinase and subsequent phosphorylation of the receptor on tyrosine residues. This process is considered to be a central event for the mediation of the proliferative effects of EGF. The purpose of this study was to evaluate the effect of prolonged administration of a gastroprotective agent, sulglycotide, on the mucosal expression of EGF receptor.

The experiments were conducted with groups of rats, one receiving twice daily for 5 consecutive days a dose of 200 mg/kg body weight of sulglycotide, and the other only vehicle. Mucosal cell membranes were isolated from the stomachs 16 hours after the last dose, for alcohol-EFG receptor assays. EGF binding experiments were carried out by incubating the membrane preparations with [125I]-EGF, and the membrane bound EGF was separated by centrifugation at 10,000 g for 10 min at 4°C, followed by counting in a gamma counter. The results of binding assays revealed a marked increase in mucosal EGF receptor expression with sulglycotide administration. Compared to the control, the sulglycotide-treated group showed a 4-fold increase in the EGF receptor. The results demonstrate that sulglycotide exhibits remarkable ability to enhance the mucosal expression of growth factor receptors essential to the process of proliferation associated with gastric mucosal repair.

1805 Characterization of Mucoin Receptor in Gastric Mucosa

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Cell membrane of gastric epithelium along with the adhering layer of mucus constitute essential element of gastric mucosal defense. The maintenance of the integrity of this system depends upon the tenacity of interaction between the epithelial cell surface and the mucin constituent of the mucus layer. Here, we present evidence that this interaction involves a mucin-specific cell membrane receptor. Gastric epithelial cell membranes were prepared from rat stomach and subjected to solubilization with octylglucoside. The solubilized receptor protein was purified by affinity chromatography on Sepharose-bound wheat germ agglutinin. Elution of the column with...
N-acetylglucosamine yielded a fraction containing the mucin receptor protein. The receptor protein gave on SDS-PAGE a single protein band of 97 kDa and displayed specific activity, in a concentration-dependent manner, towards the nitrocellulose discs coated with gastric mucin. The receptor showed requirement for carbohydrate chains in mucin for binding, as the deglycosylated mucin lost 67% of its receptor binding capacity. Scatchard analysis of specific binding resulted in a linear plot consistent with a single class of high affinity receptors. The results from "Ligand" program data gave a Kd value of 43.8 nm and a Bmax of 140 pmol/mg protein. These results attest to the role of mucins in the maintenance of gastric epithelial integrity, and suggest that the mucosal mucin receptor expression may be yet another important factor in the complex phenomenon of gastroprotection.

**1806 The Mucoid Cap and Mucosal Blood Flow Inhibit Carcinogen Penetration into Damaged Rat Gastric Mucosa**

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After a superficial gastric mucosal damage, the presence of a mucoid layer over the damaged mucosa (mucoid cap) and the following hyperemic response has been shown to protect the mucosa against deeper damage and against new noxious assaults (adaptive protection). We recently found that, immediately, after gastric mucosal injury caused by exposure to 4.5 M NaCl for 5 min, carcinogen penetration to the proliferative cells in the mucosa was inhibited. We wanted to find the mechanism(s) behind this protection.

All rats received bromodeoxyuridine to label cells in S-phase and were exposed to 4.5 M NaCl for 5 min. Group 1 was left untreated. Group 2 had the mucoid cap removed 10 min after the salt damage. Group 3 had the celiac arteria ligated 10 min after the salt damage. Group 4 had the mucoid cap removed and the celiac arteria ligated. Ten min after salt damage N-(3-methyl-N-nitrosourea (3H-MNNG) was given intragastrically 10 min before the end of the experiment. Carcinogen penetration from the gastric lumen to the proliferative cells in the gastric mucosa was evaluated in histological sections after immunohistochemistry and autoradiography. S-phase cells labeled with 3H-MNNG is the cell population at risk of MNNG-induced carcinogenesis.

Ligation of the celiac arteria abolished gastric mucosal blood flow and gastric fluid efflux. Removal of the mucoid cap had no effect on mucosal blood flow. In antrum the percentage of S-phase cells labeled with 3H-MNNG was 0.2, 10.1, 1.5 and 28.2% in groups 1–4. In corpus the percentage of S-phase cells labeled with 3H-MNNG was 0.1, 2.0, 9.8, and 21.9% in groups 1–4.

Our results show that both the mucoid cap and the increased mucosal blood flow contribute to protect against carcinogen penetration to the proliferative cells in the superficially injured gastric mucosa.

**1807 Immunohistochemistry of Gap Junction in Human Gastric Epithelial Cells of Normal and Various Gastric Diseases**

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Gap junction mediated intercellular communication has been postulated to be an important mechanism to maintain tissue homeostasis. Furthermore, recent studies with gap junction antibodies revealed that certain carcinomas have a reduced level of gap junction proteins. This could be also important in neoplastic progression. In order to identify the presence of connexin 32 gap junction protein in human gastric mucosa of normal and various diseases, we performed an immunohistochemical study.

Materials and Methods: Bifidus specimens of gastric mucosa taken through a endoscope were obtained from healthy subjects and patients with atrophic gastritis, erosive gastritis, metaplastic gastritis or gastric carcinoma. The specimens were fixed with formalin and embedded in paraffin. Deparaffinized sections were stained immunohistochemically by the avidin-biotin complex method. The avidin-biotin complex kit, Vector Laboratories Inc, Burlingame, (CA), using mouse anti-connexin 32 monoclonal antibody (Takeda, Japan) as primary antibody.

Results: In normal mucosa immunohistochemical staining for connexin 32 was localized to the lateral cell membrane predominantly between foveolar epithelial cells. No faint staining was also seen between gastric glandular cells. The similar fashions were observed in the atrophic mucosa. On the other hand, the foveolar epithelial cells near erosion were faintly stained. None or faint staining was seen between intestinal metaplastic cells, and also carcinoma cells.

Conclusion: It indicates that gap junction mediated intercellular communication was impaired in erosive gastritis and metaplastic gastritis, and this impairment might allow these epithelial cells to escape local control mechanisms. Then a decreased level of gap junction mediated intercellular communication in erosive gastritis and metaplastic gastritis might increase a risk of malignant change as well as metaplastic process.

**1808 Inhibition of Gastric Epithelial Restoration by Bile Acid and Protective Effect of Teprenone....Evidence Using a Culture Cell Model**

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Bile acids have been thought to be one of the causative agents in gastric mucosal damage. However, the cellular mechanism of bile acids is still unclear. Recently, we established a new gastric epithelial restoration model for quantitative assessment of wound repair (Gastro. 104:A222, 1993). Using this model, we investigated effects of bile acids with or without gastric defense pro-epithelial factors, on epithelial restoration process. Method: Isolated rabbit gastric epithelial cells (90% mucous cell) were cultured in F-12 medium and formed complete monolayer cell sheet in 48 h. A wound with cell-free area of constant size (2 mm²) was created by cell denudation using rotating silicon tip. The restoration was monitored by measuring wound size every 2 h. The series of experiments was conducted in the presence of deoxycholic acid (DC) 1 x 10⁻⁶ - 1 x 10⁻⁴ M and teprenone (TP) 1 x 10⁻⁶ - 1 x 10⁻⁵ M were assessed. Result: The change of the size of cell-free area was presented in a table. Data: mean = n, number; mm², *p < 0.05

<table>
<thead>
<tr>
<th>O h</th>
<th>12 h</th>
<th>24 h</th>
<th>36 h</th>
<th>48 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>2.1</td>
<td>1.1</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>DC: 1.4 x 10⁻⁴ M</td>
<td>2.0</td>
<td>1.2</td>
<td>0.9*</td>
<td>0.6*</td>
</tr>
<tr>
<td>TP: 1.0 x 10⁻⁵ M</td>
<td>2.0</td>
<td>1.1</td>
<td>0.6</td>
<td>0.2</td>
</tr>
<tr>
<td>DC + TP</td>
<td>2.0</td>
<td>1.1</td>
<td>0.4</td>
<td>0.2</td>
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</table>

Effect of DC was dose-dependent. Addition of TP prevented the inhibitory effect of DC on mucosal restoration. Proliferative cells were detected in mainly 24–36 h in controls. DC also retarded the cell proliferation. Conclusion: Present data show that bile acids modulate gastric epithelial repair after damage and TP might act protectively in this process.

**1809 The Role of Therapeutic Endoscopy in Upper Gastrointestinal Bleeding. Experience of a University Hospital**

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Background: Upper gastrointestinal (GI) bleeding has a 6–10% mortality, depending upon specific cause, being up to 50% for variceal bleeding. Despite the availability of diagnostic endoscopy, this rate has not changed. The proposed beneficial effect of therapeutic endoscopy has not been fully evaluated.

Objectives: To describe: (1) The etiology of upper GI bleeding; (2) Overall mortality and adjusted to etiology; and (3) The impact of therapeutic endoscopy on mortality.

Methods: From May 1992 to May 1993 all adult patients with clinical evidence of upper GI bleeding (hematemesis or melena), were prospectively included. Upper GI endoscopy was performed in every patient within the first 6 hours of admission by a fellow supervised by an attending physician, using an Olympus GIF-XQ 20 endoscope. Demographic and anatomic data were collected from each patient. Peptic ulcers and lesions described were considered for sclerotherapy if they showed signs of active or recent bleeding (adherent clot and/or visible vessel). Patients were followed during hospitalization until discharge or death. Results are expressed as mean ± standard deviation or relative frequency. Comparisons were done by Student’s test and the significance level set at p < 0.05.

Results: 280 were included, 190 males and 90 females. Mean age for males and females was 48 ± 12 years and 56 ± 13 years, respectively (p = 0.003). Mean age for duodenal and gastric ulcers patients was 48 ± 19 years and 63 ± 17 years, respectively (p = 0.001). Sclerotherapy was performed in 76 (27%) cases with peptic disease and in all variceal bleedings. Total in hospital mortality was 10.7% (n = 30).

<table>
<thead>
<tr>
<th>Lesion</th>
<th>Frequency (%)</th>
<th>In hospital mortality (%)</th>
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<tbody>
<tr>
<td>Esophagal varices (n = 92)</td>
<td>32</td>
<td>28</td>
</tr>
<tr>
<td>Peptic ulcer (n = 82)</td>
<td>29</td>
<td>4.8</td>
</tr>
<tr>
<td>Erosive gastritis (n = 65)</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Peptic esophagitis (n = 22)</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous (n = 12)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Mallory-Heiss Tears (n = 7)</td>
<td>3</td>
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Conclusions: Esophageal varices, peptic ulcer and erosive gastritis, comprised 85% of upper GI bleedings in this report. The 10.7% total in hospital mortality is similar to that found in literature. However, variceal bleeding treated with sclerotherapy had a 28% mortality, lower than previously reported. Therapeutic endoscopy therefore, has a positive impact on mortality from GI bleeding due to esophageal varices.