

Biomarkers of GI tract diseases

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Biomarkers of GI tract diseases

- **Introduction**
- The gastrointestinal (GI) tract is a complex system performing multiple biological functions which are anatomically distributed
- Site for food processing and absorption
- Largest immune organ also
- At the interface with external environment constitutes barrier against ingested foreign materials like microbes, toxins
- Like with many tissues, succumbs to diseases
- Several biomarkers available

Biomarkers of GI tract diseases

- The GI tract

- **The GI tract**

(gastrointestinal tract)

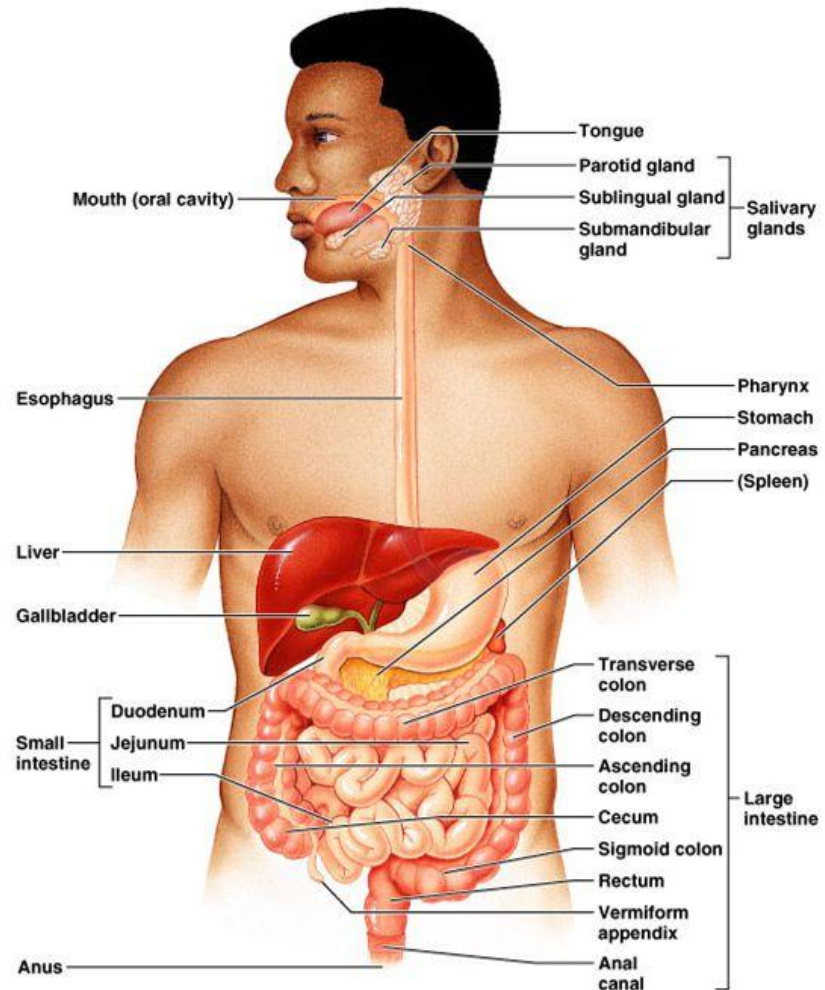
The muscular alimentary canal

- Mouth
- Pharynx
- Esophagus
- Stomach
- Small intestine
- Large intestine
- Anus

- **The accessory digestive organs**

Supply secretions contributing to the breakdown of food

- Teeth & tongue
- Salivary glands
- Gallbladder
- Liver
- Pancreas



Biomarkers of GI tract diseases

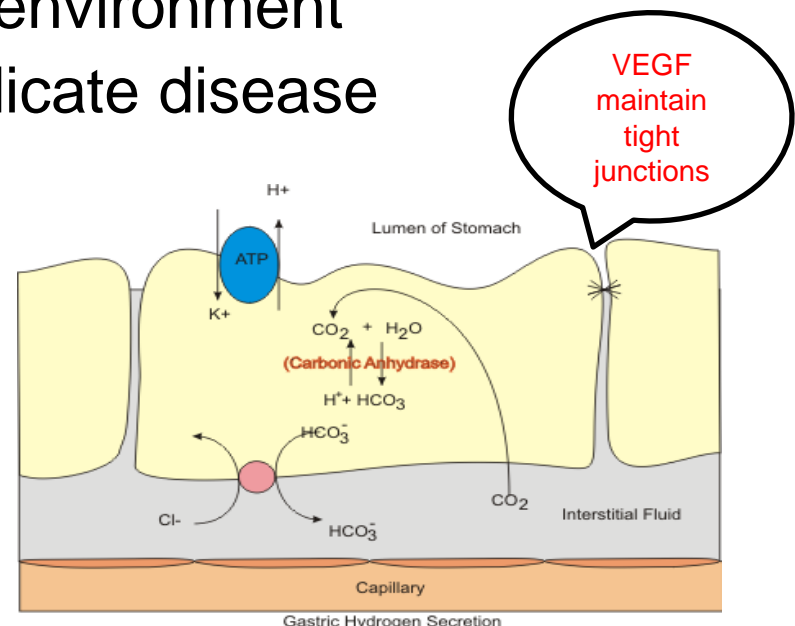
- Introduction
- Sampling methods of GI tract diseases
 - Feces analysis – many diseases
 - Biopsy - cancers
 - Imaging - ulcers

Biomarkers of GI tract diseases

- Digestive Biomarkers
- Elastase 1
 - This is a pancreatic enzyme
 - Secreted as zymogen (inactive enzyme)
 - Activated by trypsin in duodenum
 - Remains undegraded during its transit through intestine
 - So serves as very good marker for the function of pancreas
 - Especially useful marker in acute pancreatitis, and pancreatic insufficiency

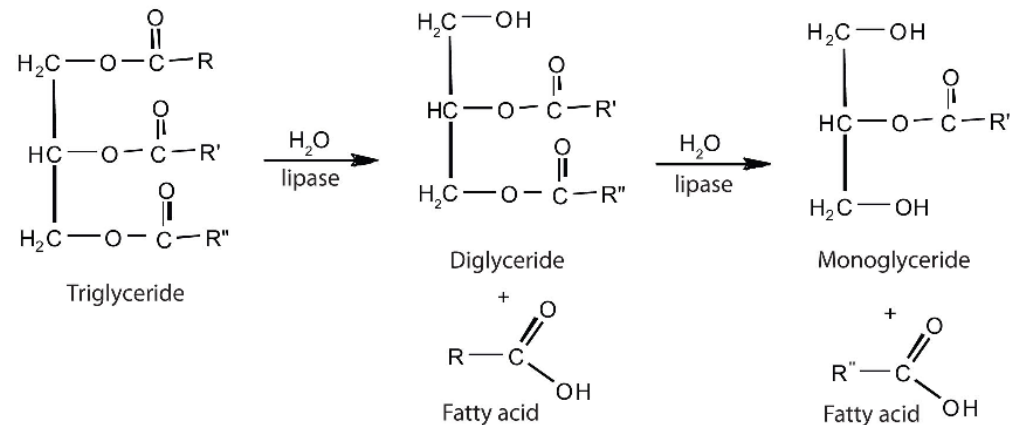
Biomarkers of GI tract diseases

- Digestive Biomarkers
- Hypochlorohydria – VEGF in saliva
 - Characterized by low to no acid production in stomach
 - Leads to improper digestion and absorption
 - VEGF plays role in preventing H^+ leaking back thus maintaining acidic environment
 - Less VEGF in saliva indicate disease



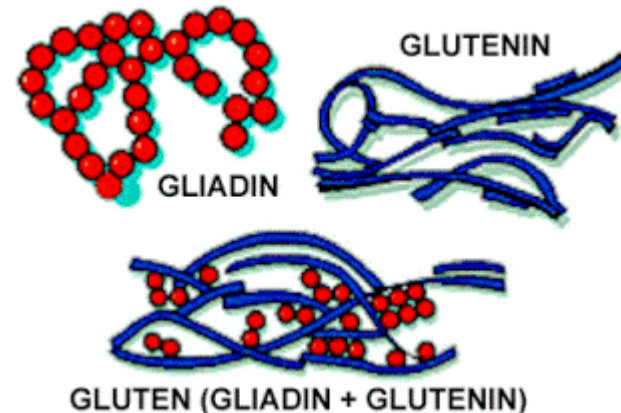
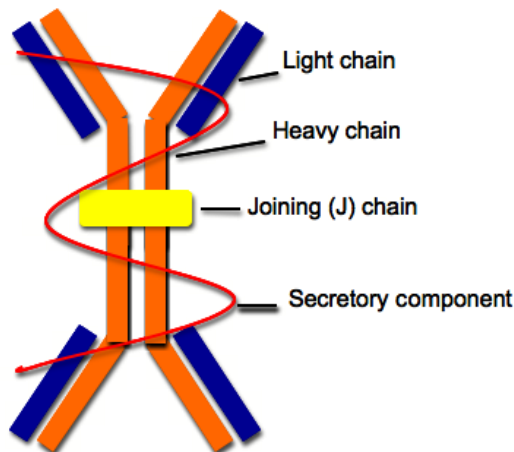
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- Digestive Biomarkers
- Triglycerides
 - High levels of triglycerides in feces indicate problems with fat digestion
 - Could result from pancreatic insufficiency, insufficient bile



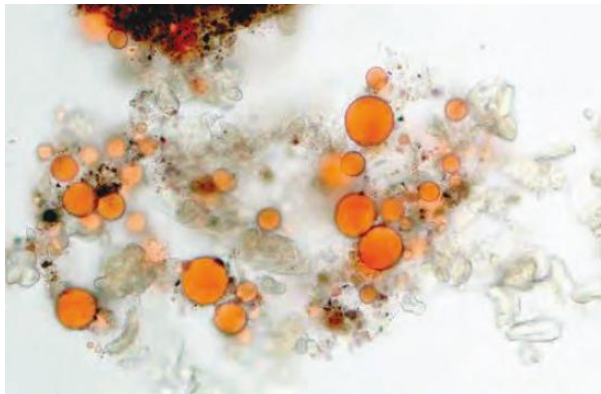
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- Immune Biomarkers
- Fecal IgA
 - IgA found mainly in body secretions
 - Increased sIgA is found in conditions like inflammation
 - Specific sIgA like anti-gliadin IgA indicate gluten intolerance



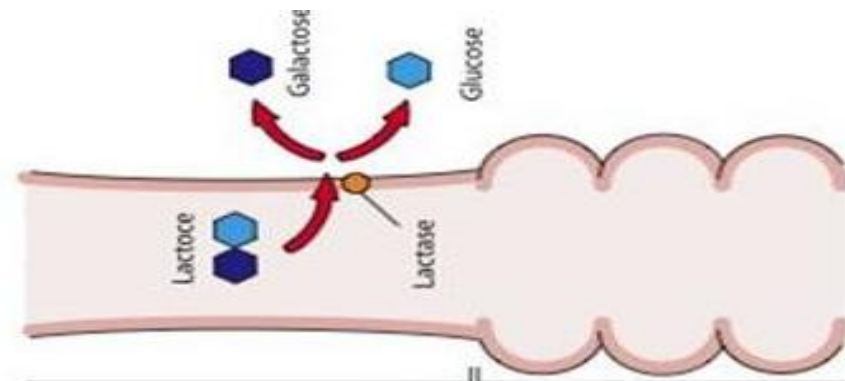
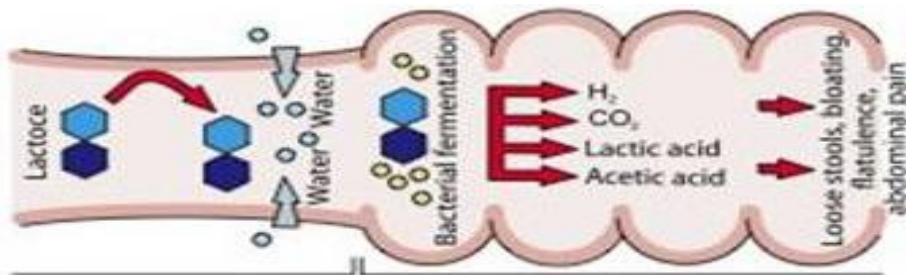
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- Absorption biomarkers
- Long chain fatty acids, total fat, cholesterol
 - Healthy GI tract absorbs, malabsorption will result in elevation in stools
- Vegetable fibers and muscle fibers
 - Poor digestion and absorption results in appearance of muscle fibers in feces



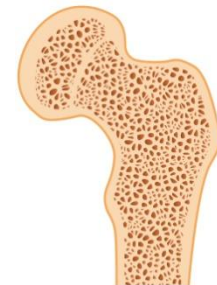
Biomarkers of GI tract diseases

- Absorption biomarkers
- Lactose intolerance
 - Disaccharides are converted in to monosaccharides
 - Lactase required for digestion of lactose
 - Lactase is limited in humans
 - Results in lactose intolerance
 - Leads to production of gas, pain, loose stools....



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- Absorption biomarkers
- Steatorrhoea
 - Presence of fat in stools
 - Because of defective fat absorption
 - Defective fat absorption also leads to defective absorption of fat dissolved vitamins
 - Vitamin D and Vitamin K deficiency especially



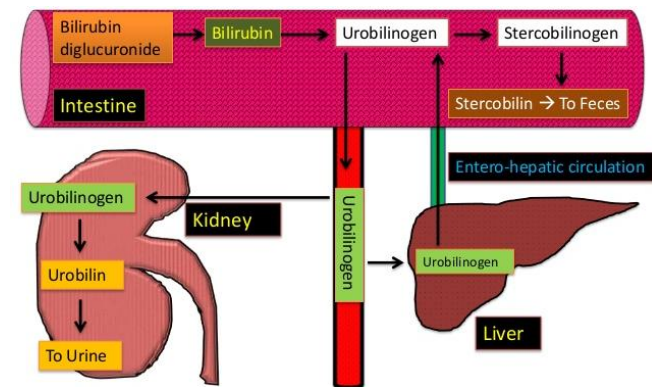
Healthy bone



Osteoporosis

Biomarkers of GI tract diseases

- Other biomarkers
- Color
 - Abnormal color may be because of excess intake of pigmented food
 - Brown color because of action of intestinal bacteria to produce stercobilinogen
 - Red color because of blood could indicate many conditions like
 - Cancer
 - Ulcer
 - Inflammation
 - Injury

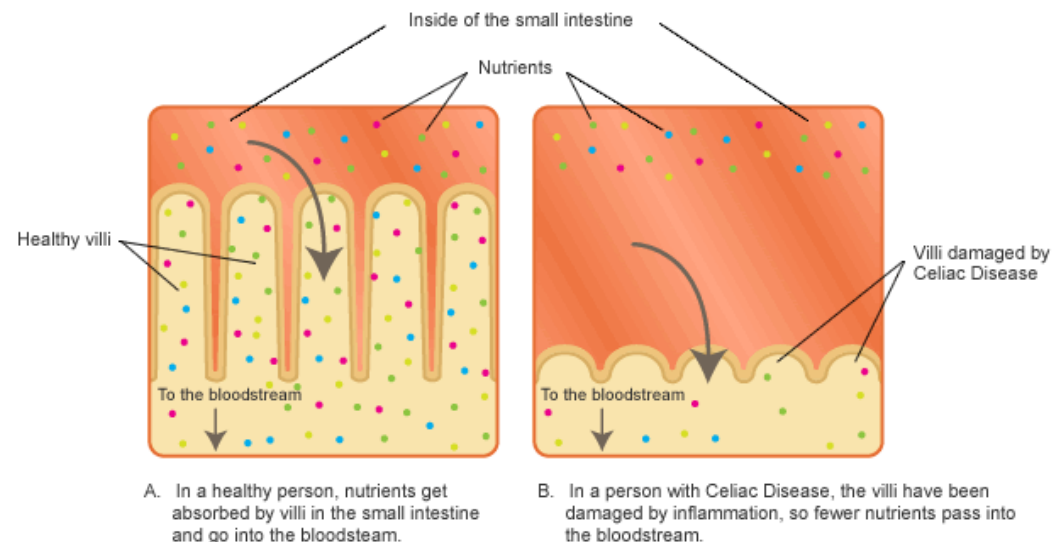


Biomarkers of GI tract diseases

- Other biomarkers
- Neutrophils
- Neutrophils are found in feces during infection with bacteria like *salmonella*, *shigella*, *yersinia* and *E. Coli*
- Toxin mediated or viral mediated diarrhea do not cause appearance of neutrophils
- Can be detected by imaging and staining procedures

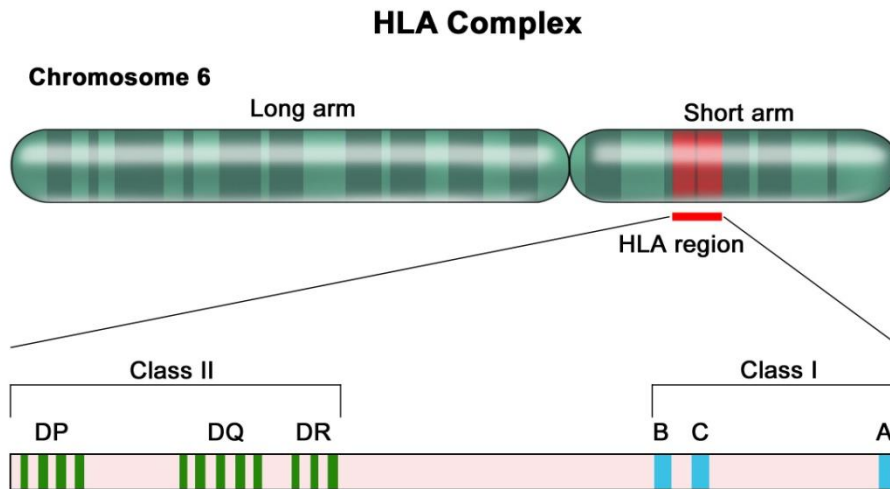
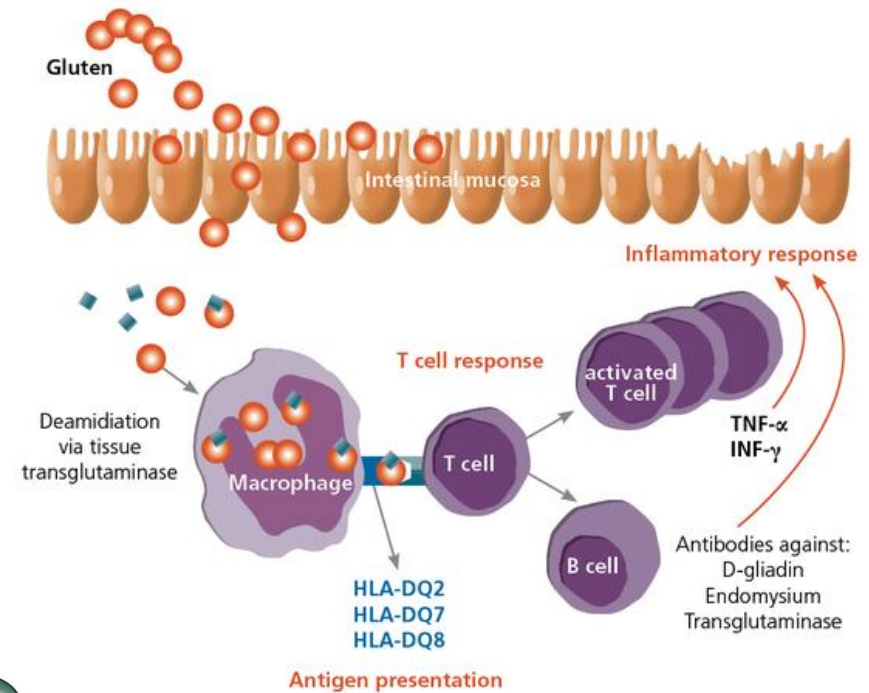
Biomarkers of GI tract diseases

- Other biomarkers
- HLA-DQ variants in celiac disease – (predisposing)
- Mainly a autoimmune disorder
- Sensitivity to gluten
- Effects the villi of small intestine, resulting in less absorption
- Chronic condition may turn in to cancer



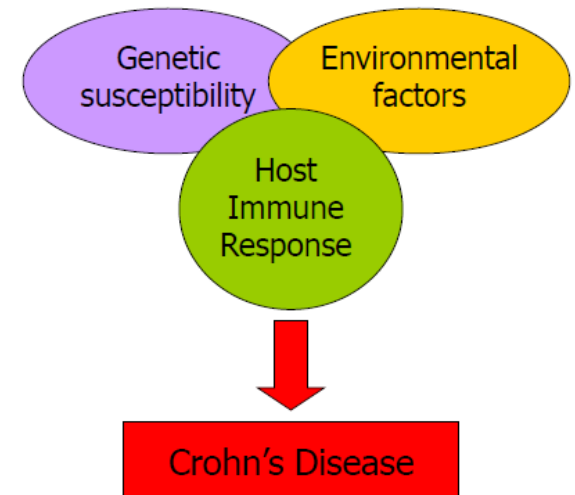
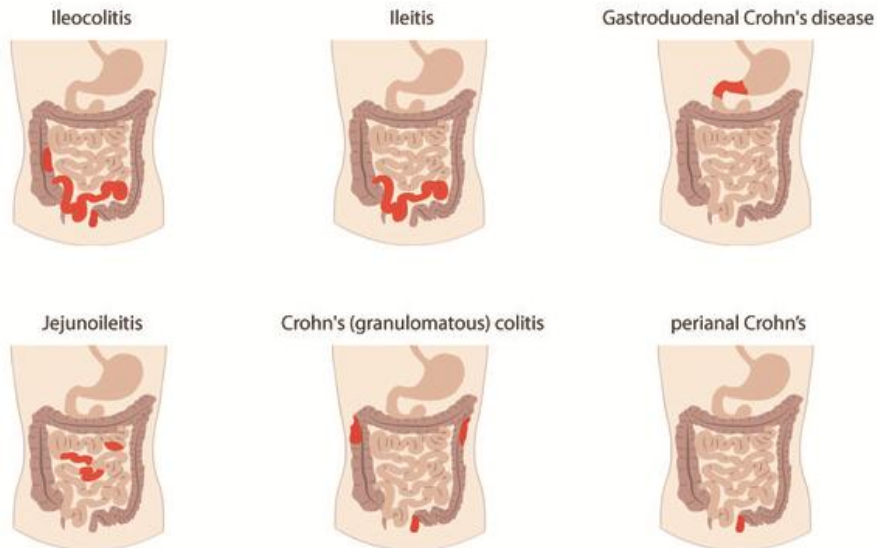
Biomarkers of GI tract diseases

- Other biomarkers
- HLA-DQ variants



Biomarkers of GI tract diseases

- Other biomarkers
- Crohn's disease
- A type of inflammatory bowel disease
- Characterized by abdominal pain, fever, diarrhoea....
- Still not clear why this disease occurs
- Collective effect of genetics, environment and lifestyle choices may result in disease



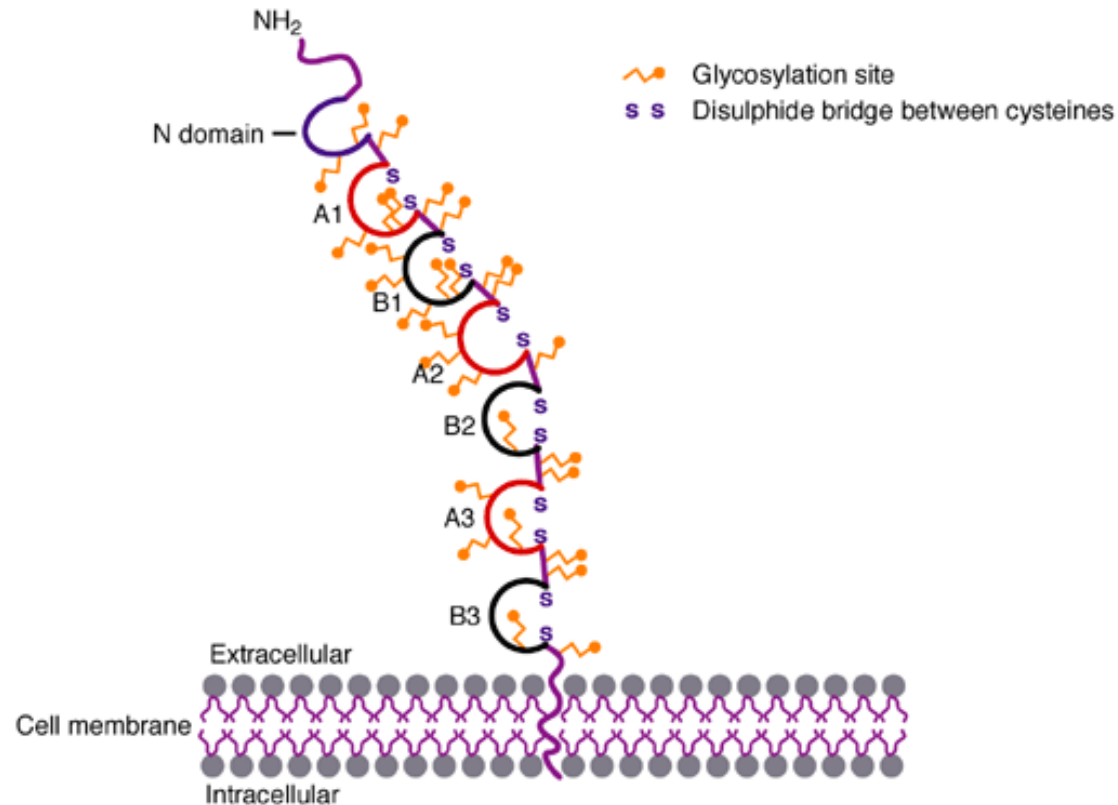
Biomarkers of GI tract diseases

- Other biomarkers – cancer markers
- Mostly non-specific
- Unpredictable and changes from case to case
- CEA – Carcino embryogenic antigen
- A cell adhesion glycoprotein
- Well studied marker for colorectal cancer
- Produced by fetus, no production after birth
- Some cancers tend to activate the gene and expression level increases
- Can be tracked in blood

Biomarkers of GI tract diseases

- Other biomarkers – cancer markers

b Structure of CEA protein (the 70-kD protein becomes 180 kD when glycosylated)



Schematic representation of the human carcinoembryonic antigen (CEA) gene and protein

Next class

- Next class.....
 - Biomarkers of renal diseases