THE BRAIN IN THE GUT

- There is a brain in the human gut and the two brains are interconnected. When one gets upset, the other does, too.
- The gut's brain is known as the **enteric nervous system**, is located in sheaths of tissue lining the esophagus, stomach, small intestine and colon.
- Considered a single entity, it is a network of neurons, neurotransmitters and proteins that zap messages between neurons, support cells like those found in the brain proper and a complex circuitry that enables it to act independently, learn, remember and, as the saying goes, produce gut feelings.
- The gut's brain plays a mjor role in human happiness and misery. Many gastrointestinal disorders like colitis and irritable bowel syndrome orginate from problems within the gut's brain.
- Major neurotransmitters like serotonin, dopamine, glutamate, norephinephrine and nitric oxide are in the gut. Also two dozen small brain proteins, called neuropeptides are there along with the major cells of the immune system. Enkephalins are also in the gut.
- The gut also is a rich source of benzodiazepines - the family of psychoactive chemicals that includes such ever popular drugs as valium and xanax.
- The gut contains 100 million neurons - more than the spinal cord.
- The myenteric and submucosal plexuses (tissues) also contain glial cells that nourish neurons, mast cells involved in immune responses, and a "blood brain barrier" that keeps harmful substances away from important neurons.
- Patients with bowel problems have been shown to have abnormal rem sleep. This finding is not inconsistent with the folk wisdom that indigestion can produce nightmares.
- Fear also causes the vagus nerve to "turn up the volume" on serotonin circuits in the gut. Thus overstimulated, the gut goes into higher gear and diarrhea results.
- When nerves in the esophagus are highly stimulated people have trouble swallowing.
- Stress signals from the head's brain can alter nerve function between the stomach and esophagus, resulting in heartburn.