

# The Pancreas, the Liver, and the Duodenum Work Together

The small intestine consists of three regions:

- **Duodenum:** “12 fingers intestine” – only 1 foot long, but this is the site of most chemical digestion and absorption
- **Jejunum:** Continued absorption of many nutrients
- **Ileum:** Absorption of Vitamin B12 and bile salts
  - The ileocecal valve is a sphincter that regulates the entry of undigested wastes into the cecum and prevents backflow of feces into the small intestine.

**Segmentation** and **peristalsis** rhythmically move foodstuffs through the intestines, ensuring efficient digestion and absorption.

Microbes that live in the small intestine are nourished by the nutrients in our diets. Depending on the macronutrient ratio of our diet, different types of bacteria may thrive.

**In the Duodenum:**

- Bile from the gall bladder (and the liver) is squirted into the duodenum and emulsifies the fats (lipids) in the meal into small droplets. The liver makes bile; the gall bladder stores and concentrates it. These bile salts are reabsorbed in the ileum to be reused.
- Bicarbonate from the pancreas is ducted into the duodenum to raise the pH from 2 up to 8. Because.....
- Pancreatic enzymes are ducted into the duodenum and are not active until the pH of the meal is neutralized.
  - **Lipase** chemically digests lipids→fatty acids and glycerol
  - **Amylase** and other enzymes chemically digest carbohydrates→simple sugars (especially glucose)
  - **Proteases** of various types chemically digest proteins →amino acids

Nutrients are absorbed in the remainder of the small intestine and travel through the **hepatic portal vein** to reach the liver for processing (with the exception of fat, which enters the lymphatic system). **Whatever is absorbed into the blood from the small intestine must go first through the liver for processing.**

**Celiac Disease:** Autoimmune disease in which leukocytes in the submucosa attack the gluten in wheat. This can cause inflammation of the small intestine lining and subsequent malabsorption of nutrients, weight loss, etc. Unfortunately, the damage to the mucosal lining may allow more foreign proteins into the submucosa and/or blood vessels there. This may be why someone with Celiac’s disease is much more likely to also have Rheumatoid Arthritis, Type I diabetes, or autism.