Behavioral Objectives

After reading this newsletter the learner will be able to:

1. Discuss the pathophysiology, diagnosis, and clinical manifestations of celiac disease in children.

2. Describe common foods and products containing gluten, as well as implications for the healthcare provider.

Celiac Disease

Gluten is a protein found in the endosperm of grain. It is part of the seed or kernel of wheat, barley, rye and, many experts believe, oat grains. Gluten is composed of two smaller proteins called peptides – gliadin and glutenin. It’s thought that gliadin is mostly responsible for triggering the immune response associated with CD, while glutenin amplifies inflammation. Although the pathologic process is not fully understood, children with CD are unable to digest the gliadin component of gluten, resulting in an accumulation of a toxic substance that damages the mucosal cells. The villi in the small intestine, tiny hair-like projections, that allow the small intestine to absorb nutrients, often become the target of damage. Inflammation commonly occurs not only in the small intestine, but often throughout the body. When a susceptible child consumes gluten, an autoimmune response occurs.

Gluten intolerance is fundamentally different from an allergy in the traditional sense. Although both involve the immune system, someone suffering from CD isn’t suffering from a food allergy to gluten or wheat. Unlike with typical allergies, with gluten sensitivities, the body attacks itself, rather than the foreign substance.

What is Gluten? Gluten is the component of grains that makes raw dough sticky and elastic. It also traps air produced by raising agents like yeast or baking soda, helping the dough to rise. When the dough is baked, the oven heat coagulates or sets the gluten, thereby ensuring that the final product keeps its shape. Gluten in flour is also used as a thickening agent when preparing gravies, sauces, and soups. Examples of gluten-containing foods include all breads and bread products, such as muffins, bagels, stuffing/dressing, pastas, flour tortillas, cookies, crackers, pretzels, cake mixes, pie crusts, many cereals, some ice cream (wheat is often added to prevent ice crystals from forming), packaged meats and cold cuts (which often contain fillers), soups, sauces, and salad dressings. Common foods and products which may contain hidden gluten include:

- Art supplies, such as paints, clay, play dough, and glue (which young children may eat)
- Sunscreen
- Toothpaste/mouthwash
- Self-basting poultry
- Imitation crab
- Sausages
- Licorice
- Vegetables in sauce

- Bouillon cubes
- French fries
- Some supplements / meds
- Glue on stamps and envelopes
- Soy and teriyaki sauce
- Some potato chips / crisps
- Tomato paste – spaghetti sauce
- Dry mustard
- Canned baked beans

Reading labels for hidden gluten is essential.

Diagnosis

Diagnosis of celiac disease involves a two-step process. After consuming gluten for at least 4 weeks, the child’s blood is examined for anti-gliadin antibodies, called tissue transglutaminase (anti-TTG). The level of these antibodies is usually high in people with celiac disease (as long as their diet contains gluten), but is almost never increased in people without celiac disease. If the test is positive for anti-TTG, an endoscope is used to view the small intestine and collect a small portion of the small intestine for biopsy.

If the biopsy is abnormal, the diagnosis of celiac disease is confirmed. In people with celiac disease who eat gluten, the villi, which are normally projecting out of the small intestine, become flattened, which interferes with absorption.
It is important to recognize that such diagnostic tests can determine that a child has celiac disease, but inconclusive or negative results do not necessarily mean the child is not gluten intolerant. Some children and adults have non-celiac gluten sensitivity (NCGS). Those that fall into this group exhibit the classic symptoms of celiac disease, yet have no detectable intestinal damage, and test negative for key antibodies. NCGS is a diagnosis made by default, that is, symptoms improve when a gluten-free diet is consumed. Approximately 15% of the population has NCGS.

**CLINICAL MANIFESTATIONS OF CELIAC DISEASE**

Although CD is linked to intolerance to gluten, a protein in many grains, the timing of when the symptoms first become apparent is not fully understood. A child who develops celiac disease is believed to inherit the risk from one or both parents. Traditionally, celiac disease was viewed strictly as a GI disorder that began in infancy. Now it is known that the disease can appear at any time in life, producing intestinal and systemic inflammation.

Symptoms of celiac disease often occur between the ages of 6 – 24 months, after the child has been eating gluten-containing foods. There is usually an interval of several months between the introduction of gluten into the child’s diet and the onset of symptoms associated with CD. If the child has no symptoms after the introduction of gluten-containing foods at a young age, it may not be until an environmental trigger, from any number of sources, including a serious illness, surgery, or a major stress, such as the death of a parent, causes an immune response to gluten at a later age. Symptoms of celiac disease may first occur anytime in childhood, or even adulthood.

When a child has CD, the body eventually interprets the ingestion of gluten similarly to how it would respond to any invasion - with inflammation. The clinical manifestations of CD vary from child to child, as well as in intensity from time to time in the same person. Infants and children with CD often have classic GI symptoms. Irritability is one of the most common symptoms of celiac disease in children. Others include:

- Diarrhea - watery stools that are often described as appearing grayish or pale in color, as well as fatty or oily, with an unusually offensive odor. Some children will have constipation, or alternate between diarrhea and constipation.
- Abdominal distention, gas, and abdominal pain - in infants and young children, this is readily assessed by inspecting the child’s abdomen for bloating and observing the baby draw up his or her legs while crying.
- Weight loss or difficulty gaining weight occurs - as a result of malabsorption of nutrients. Thus, the child experiences physiologic failure to thrive. Children with CD often have thinning of the bones due to the inability to absorb vitamin D and calcium, as well as short statures, and delays in motor development. Poor absorption of iron leads to anemia. In addition, the child with CD often has anorexia. Vitamins and supplements are often recommended for the child with CD.
- Tooth enamel defects – as a result of CD, the permanent teeth may be cream-colored, yellowish, or have a brownish discoloration, as well as grooves or pits in the teeth.

**IMPLICATIONS**

The only treatment for celiac disease is a 100% gluten-free diet for life. Once gluten is completely eliminated from the child’s diet, the villi will eventually heal and absorb nutrients normally. This often takes 6 months or longer. However, after starting a gluten-free diet the child will usually begin to feel better in a couple of weeks.

Adhering to a strict gluten-free diet can be a challenge for the entire family, whose dietary practices, ideally, need to change as a whole. Wheat and wheat-based products are dietary staples in many American families, and favorites of many children, such as spaghetti, sandwiches, birthday cakes, cookies, hamburgers and hotdogs, pizza, and pancakes. It is fairly easy to eliminate these foods from the very young child’s diet, but once the child is eating outside of the home, such as attending preschool or school, going to friends’ homes, attending parties, eating in restaurants, and gaining increased independence, adherence is much more difficult. Children don’t want to be different from others. If the child is currently symptom free from symptoms of CD, adherence, naturally, becomes more difficult.

A key implication is teaching parents, and if age-appropriate, the child with CD, foods containing gluten, as well as the importance of reading labels for hidden gluten. Interpreting food labels is often challenging. Not so obvious terms, such as malt, graham, spelt, and kamut, indicate the product contains gluten. In addition, letters like HVP (hydrogenated vegetable protein), HPP (hydrolyzed plant protein), TVP (textured vegetable protein), MSG (monosodium glutamate) often contain gluten. Phrases or words on food labels, such as modified food starch, stabilizers, binders, fillers, natural and artificial ingredients, caramel coloring, vegetable gums, to name a few, may contain gluten. Parents should be referred to a dietician for help with meal planning and identifying foods containing gluten. Additionally, gluten may be added to drugs as binders or “glues.” There are currently no requirements for labeling gluten found in medications, prescription or over-the-counter. Healthcare professionals, as well as parents, should check with a pharmacist before administering a medication to a child with CD.

*Fresh meats, fruits, vegetables, including corn and potatoes, are gluten free and safe for the child with CD. Gluten-free flour is available, as well as multiple gluten-free options that can be included in the diet of children with CD. However, investigators have found that gluten-free foods, on average cost 24% more than similar gluten-containing foods.*
CELIAC DISEASE

Mark, 10 months old, is admitted for chronic diarrhea, weight loss, and delayed growth. Celiac disease is suspected. There is no known family history of celiac disease. A dietary history includes that Mark began eating solid foods at 6 months of age and is eating infant rice cereal, wheat cereal, as well as pureed carrots, peas, and peaches.

1. Celiac disease is a/an:
   a. complication of cystic fibrosis.
   b. autoimmune condition that occurs in response to the ingestion of gluten.
   c. allergic response to wheat, after the infant has had frequent exposures.
   d. condition where the foreign food allergen containing gluten is targeted.

2. Which of the following in Mark’s diet contains gluten?
   a. Rice cereal
   b. Wheat cereal
   c. Carrots
   d. Green beans

3. Besides Mark’s presenting symptoms, all of the following are also common symptoms of celiac disease in children EXCEPT?
   a. Abdominal distention and gas
   b. Abdominal pain
   c. Projectile vomiting
   d. Anemia

4. In children, CD often becomes apparent as soon as solid foods are first introduced into the diet.
   a. True
   b. False
5. Gluten is a:
   a. carbohydrate.
   b. fat.
   c. protein.
   d. mineral.

6. If Mark tests positive for anti-gliadin antibodies:
   a. a biopsy of his small intestine is indicated.
   b. it is indicative that he has celiac disease.
   c. a genetic screening will be performed.
   d. a second step, determining anti-glutenin antibodies, will be done.

7. Mark’s father says, “If he does have celiac disease, what does that mean?” The healthcare provider’s best response is:
   a. “His food intake is going to be significantly limited. You'll need to prepare special meals and avoid taking Mark to restaurants.”
   b. “Mark has a food allergy which he’ll outgrow. He’ll just have to stay away from pasta and baked goods, and things like that until he does.”
   c. “Your son is reacting to a substance called gluten. I’ll have a dietician come talk with you about foods and products which contain gluten.”
   d. “I’m not really sure. You’ll need to talk to Mark’s pediatrician.”

8. Which of the following meals is recommended for an older child with CD?
   a. A fried egg and rye bread toast with butter
   b. A hamburger with lettuce, tomato, and ketchup on a toasted whole wheat bun
   c. Fried chicken and french fries
   d. Steak and corn on the cob with butter

9. Which of the following is most likely to contain “hidden” gluten?
   a. Mayonnaise
   b. Soy sauce
   c. Cider vinegar
   d. Black pepper

10. Celiac disease is a GI disorder that begins in infancy.
    a. True
    b. False