With cold and flu season around the corner and the coronavirus pandemic still looming, many are taking a renewed interest in nutrition strategies to support immune health. While proper nutrition doesn’t necessarily “boost” the immune system (and in fact, excess boosting could actually be detrimental), a balanced diet can help to support the immune processes that occur in the body. This helps put the immune system in a position where it’s ready to work in the most optimal way possible.

**HOW DOES THE IMMUNE SYSTEM WORK?**

To understand how nutrition impacts immunity, let’s brush up on how the immune system itself works. This system is a complex set of organs, cells, and pathways with one common goal: prevent disease.

Everyone’s body has bone marrow which contains stem cells. These can develop into different types of white blood cells, which are a major part of the two types of immune system responses:

1. **Innate immunity**: This is a general attack against perceived intruders. It includes first-line responder white blood cells like neutrophils, basophils, eosinophils, or monocytes.

2. **Adaptive (or acquired) immunity**: This attack is specific to the type of pathogen, and acts as the “memory” system. White blood cells known as lymphocytes—our T cells and B cells—recognize when the body is fighting off certain
Vitamin A

This vitamin helps maintain the health of tissues throughout the digestive and respiratory systems. These tissues act as barriers to pathogens. Within the intestinal system, there is also much research going on as to Vitamin A’s role in influencing various immune functions that occur there.

Studies have linked Vitamin A deficiency to increased risk of infectious diseases. In fact, one research article in the European Journal of Immunology stated that “Of the estimated 250 million preschool children who are vitamin A-deficient (VAD), 10 percent will die from their increased susceptibility to infectious disease.” Vitamin A deficiency is a major issue in developing countries.

Occasionally, the body gets mixed up, and creates antibodies for our own cells. These faulty B cells are supposed to be removed, but sometimes they are not. When this happens, someone can suffer from an autoimmune disorder. This is why we don’t necessarily want to “boost” the immune system, because an overactive system is not ideal either.

Instead, the goal is a properly functioning immune system—and a balanced diet helps make that happen.

**THE ROLE OF NUTRITION IN IMMUNE HEALTH**

A variety of individual nutrients and overall dietary patterns play a role in supporting the immune system. Here’s an overview of some of the key players, and food choices that you can incorporate as a CDM, CFPP:

**Protein and Calorie Intake**

Protein energy malnutrition is a major concern among low-income families in developing countries, but it can also occur in elderly adults in the United States (particularly those suffering from certain diseases, like cancer).

A lack of protein and calories affects both innate and adaptive immunity, causing decreased production of certain immune cells. It can also negatively affect how the body remembers certain pathogens and the antibodies that match up to them, which can make the immune response less effective.

A variety of foods can be used to increase calorie needs. Focusing on foods that are amenable to the client and are calorie-dense in small portions can be a useful strategy. For example, oils can be mixed into pasta dishes or nut butter can be spread on toast. Supplemental options, like shakes and high-calorie manufactured foods, can be utilized as needed.

There are also a wide range of foods to increase protein intake. Here are just a few options:

- Beef
- Chicken
- Fish
- Tofu
- Eggs
- Lentils
- Beans
- Dairy products (especially Greek yogurt)

**PROTEIN ENERGY MALNUTRITION**

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countries that lack access to many Vitamin-A rich foods. In the United States, though, deficiency is rare (<1 percent) thanks to the variety of food choices accessible to us. To follow are some examples:

• Sweet potatoes
• Carrots
• Pumpkin
• Spinach
• Eggs
• Liver
• Red peppers
• Apricots

Vitamin C
When people think of immune health, this is usually the first vitamin that comes to mind. Vitamin C deficiency puts the immune system at risk by affecting the immune cell responses as well as the body’s ability to fight excessive free radicals (components in the body which, in high amounts, can damage immune cells).

Research has suggested that Vitamin C may play a role in the prevention or alleviation of symptoms of numerous infections. However, the benefit likely varies based on the specific infection type and population.

For example, while additional Vitamin C does not prevent the common cold among the average population with adequate intake, there is some evidence it may be helpful in reducing the duration of symptoms among children with upper respiratory infections, according to a meta-analysis in the European Journal of Clinical Pharmacology.

The good news is that Vitamin C is quite abundant in foods, so it’s easy for a foodservice manager to provide many sources:

• Oranges
• Kiwi
• Mango
• Tomatoes
• Strawberries
• Bell peppers
• Leafy green vegetables
• Broccoli

Vitamin D
Vitamin D has long been known for its role in bone health, but over the last several years there’s been growing research on its connection to immune health. Vitamin D has the ability to increase antimicrobial activity of certain cells, helping to fight off pathogens when they enter the body.

For example, a study in Archives of Internal Medicine found that Vitamin D deficiency was associated with increased risk of upper respiratory infections. A systematic review in BMJ found that supplementation with Vitamin D was linked to reduced infections among those who were initially deficient. Similarly, another study in the journal Cytokine found that Vitamin D supplementation was linked to reduced respiratory infections in asthma patients.

The good news is that Vitamin C is quite abundant in foods, so it’s easy for a foodservice manager to provide many sources:

Low Sodium • Allergen-Free • Clean Label
Ada Valley’s Pot Roast contains only 80 mg of sodium per 3 oz. serving. With a quality and consistency that is unmatched, this product is a delicious and healthy addition to any menu.

Nutrition Facts

<table>
<thead>
<tr>
<th>33 servings per container</th>
<th>Serving size 3 oz. (85g)</th>
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<tbody>
<tr>
<td><strong>Calories</strong></td>
<td>165</td>
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<tr>
<td>% Daily Value</td>
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<tr>
<td>Fat</td>
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<tr>
<td>Total Sugars</td>
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</tr>
<tr>
<td>Protein</td>
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due to limited dietary sources. While Vitamin D can also be produced via sunlight on the skin, this is not always feasible or practical (due to limited outdoor time and skin cancer concerns).

Researchers estimate around 9 percent of people have a clinical Vitamin D deficiency, but up to 40 percent may have sub-optimal levels. These adults may need their doctor or dietitian to prescribe supplements to help bring their levels up to normal.

However, as a foodservice manager, it’s still beneficial to include Vitamin D-rich choices on your menu, even if options are limited:

• Fatty fish (salmon, tuna, sardines)
• Egg yolks
• Fortified orange juices
• Fortified cereals

Vitamin E

Vitamin E has multiple roles in immune function, including increased activity and activation of certain cells. It’s been most studied for its ability to prevent some of the age-related declines that occur within T-cells. Some studies have shown the Vitamin E supplementation led to reduced risk of pneumonia or colds in certain population subgroups like smokers or elderly adults.

That said, a varied diet can easily meet Vitamin E needs among most clients by including these common sources:

• Nuts
• Seeds
• Vegetable oils
• Broccoli
• Spinach
• Fortified cereals

Zinc

This mineral is involved in signaling pathways that take place for both innate and adaptive immunity. Zinc deficiency can cause decreased levels and activity of certain immune cells.

Zinc may also be involved in the clearance of both acute and chronic viral infections, possibly helping to shorten symptoms. For example, a meta-analysis in the *Journal of the Royal Society*

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*Continued on page 16*
of Medicine Open found that zinc lozenges reduced the common cold duration by an average of 33 percent.

The prevalence of zinc deficiency is up to 20 percent worldwide, though it’s lower in the United States. Significant deficiency is more likely in patients with chronic diarrhea or digestive disorders, due to absorption problems.

Marginal deficiency—when zinc intake is slightly below ideal—is common in the elderly, though, and can still be detrimental. You can help combat this by including a variety of zinc-rich foods on the menu such as these:

- Red meat
- Poultry
- Nuts
- Seeds
- Shellfish
- Legumes

OVERALL DIETARY PATTERNS AND GUT HEALTH

In addition to individual nutrients, we know that overall dietary patterns can influence the immune system, presumably by affecting gut health. Those good bacteria in your gut play an intricate role in immunity—one that scientists are still discovering.

An overall balanced diet with lots of nutrient-dense, plant-based foods has been shown to improve the overall balance of gut bacteria. It’s wise to minimize excessive added sugars, unhealthy fats, and overly processed convenience foods.

In addition, prebiotic and probiotic foods may also help support gut health. Prebiotic foods are those which feed the bacteria already in your intestinal system. Common sources are garlic, onions, asparagus, greener bananas, and seaweed. Probiotic foods are those which actually contain live bacteria cultures, and include options like yogurt, kefir, and traditionally fermented vegetables.

While it might seem like a lot to remember, you’ll likely touch on all of the nutrients above by simply incorporating a variety of foods each week.

FINAL THOUGHTS

This is by no means an exhaustive list of foods that impact immune health. Other vitamins and minerals like Vitamin B6, folate, selenium, and iron are important too. By working to include many nutrient-rich foods on your menu each day, you can help ensure your patients, clients, and students are supporting their immune system.

REFERENCES

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Reason</th>
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<tbody>
<tr>
<td>1. What is the term for the type of immunity that mounts an attack specific to a certain pathogen, and acts as the “memory” system for recognizing past pathogens?</td>
<td>C. Adaptive immunity</td>
<td>Innate immunity refers to the body’s first line of defense against pathogens, while adaptive immunity is a more specific immune response.</td>
</tr>
<tr>
<td>2. Which nutrient helps maintain tissues that act as barriers to pathogens throughout the digestive and respiratory systems?</td>
<td>B. Vitamin C</td>
<td>Vitamin C is crucial for maintaining the integrity of the body’s barriers and supports immune function.</td>
</tr>
<tr>
<td>3. Which food would be the best choice to increase Vitamin C at a meal?</td>
<td>C. Strawberries</td>
<td>Vitamin C-rich foods are essential for immune support.</td>
</tr>
<tr>
<td>4. While most nutrients that support immunity can easily be met through dietary planning, which nutrient has limited dietary sources (and as such, may require an MD or RD to provide a supplement)?</td>
<td>C. Zinc</td>
<td>Zinc is essential for immune function and may require supplementation for some individuals.</td>
</tr>
<tr>
<td>5. Which nutrient has been linked to reducing some of the age-related declines that occur in T-cells?</td>
<td>C. Vitamin E</td>
<td>Vitamin E supports immune function and helps reduce age-related declines in T-cells.</td>
</tr>
<tr>
<td>6. Which food would be the best choice to increase zinc at a meal?</td>
<td>A. Beef</td>
<td>Beef is a good source of zinc, which is crucial for immune function.</td>
</tr>
<tr>
<td>7. Which option is an example of a probiotic, a food that contains live bacteria cultures which may improve gut health and support immunity?</td>
<td>A. Yogurt</td>
<td>Yogurt contains beneficial bacteria that support gut health and immunity.</td>
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