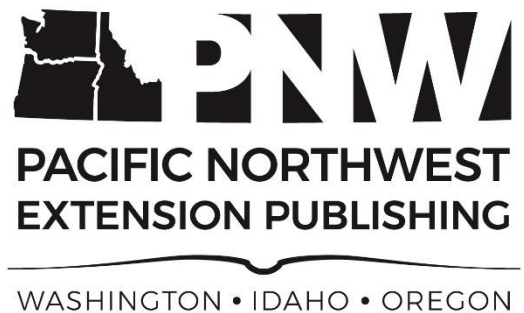
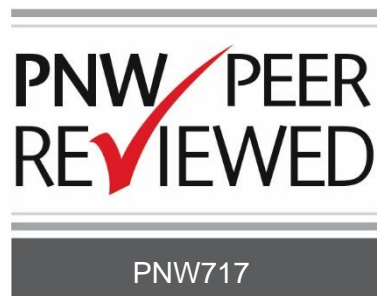




**THERE ARE DANGERS LURKING IN YOUR FLOUR**



# There Are Dangers Lurking in Your Flour

By

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Flour-based craft products and raw doughs are popular items in the home. Recent flour recalls have highlighted the need to reinforce the message that raw flour can cause serious foodborne illness and should not be treated as a safe product, especially for young children or others who are at high risk for foodborne illness. This publication highlights the risks associated with raw flour products and how to handle and consume flour safely (Figure 1).



Figure 1. Raw flour can pose a serious health risk. (Photo: iStock.)

Raw flour-based doughs and crafts are not only dangerous because of the risk of *Salmonella* poisoning from eggs but also because of possible *Escherichia coli* (*E. coli*) and *Salmonella* poisoning from raw flour. In 2016, the FDA identified General Mills branded flour as the source of a major *E. coli* O121 and *E. coli* O26 outbreak (FDA 2018). A total of 63 people from 24 different states suffered shiga-toxin poisoning (a toxin made by *E. coli*), leading to an expanded recall of flour that included General Mills branded flour products and baking mixes. Three of the infected people reported handling raw dough at a restaurant.

Other major outbreaks include a 2009 outbreak linked to Nestle Toll House refrigerated cookie dough (CDC 2009) that was contaminated with *E. coli* O157:H7. This was the first time that *E. coli* illnesses had been associated with eating raw dough (CDC 2009). This outbreak spanned across 30 states with 72 reported illnesses. *E. coli* is not the only culprit making flour unsafe. A cluster of salmonellosis illnesses, caused by the bacteria *Salmonella typhimurium*, occurred in New Zealand in 2008 (McCallum et al. 2013).

## What Are *Salmonella* and *E. coli*?

*Salmonella* and *E. coli* are both bacteria that can cause foodborne illness (Figure 2). *Salmonella* is usually found in the gastrointestinal tract of birds and reptiles, while *E. coli* is usually associated with the gastrointestinal tract of people and other animals (CDC 2014; CDC 2019). Although most *E. coli* are harmless, there are a handful which can cause severe illness.



Figure 2. *Salmonella* and *E. coli* are responsible for several foodborne illnesses from raw flour. (Photo: iStock.)

*Salmonella* infections cause 1.2 million illnesses and 450 deaths each year in the United States (CDC 2019). Children are at most risk for *Salmonella* infection, but older adults and people with weakened immune systems are likely to have severe infections (CDC 2019). People infected with *Salmonella* usually develop fever, abdominal cramps, and diarrhea within 12 to 72 hours of ingesting the bacteria. Illnesses usually only last four to seven days. However, those at highest risk for severe infections can end up with severe diarrhea and *Salmonella* that spreads to the blood stream and other body sites. These cases may result in death if not treated promptly (CDC 2019).

There are many types of *E. coli*, and not all of them make you sick. However, some of the worst kinds of *E. coli* produce a toxin known as shiga toxin (*E. coli* STEC), and this type of *E. coli* can cause very severe illness. STEC infections cause 265,000 illnesses each year in the United States and result in 3,600 hospitalizations and 30 deaths (CDC 2014). Symptoms include severe stomach cramps, diarrhea which is often bloody, and vomiting. Although many people recover within five to seven days, some people can develop life-threatening hemolytic uremic syndrome (HUS). HUS can destroy blood cells involved in forming blood clots, damage small blood vessels, cause severe kidney damage, and can damage other vital organs such as the brain or heart (CDC 2014; National Kidney Foundation 2019; CDC, n.d.; Gould et al. 2011). Those who develop HUS may face life-long health problems or die (CDC 2014).

## Risk of Flour-Based Crafts for Children

Flour-based, do-it-yourself crafts and homemade products have saturated the internet. Some of the more popular recipes for projects, like homemade playdough, cloud dough, moon sand, hacky sacks, and squeeze balls, target a young audience. The combination of young children—who like to put their hands and toys in their mouths, potentially causing accidental ingestion (FDA 2016)—and flour-based craft supplies are a dangerous mix. However, most parents are unaware that raw flour is not considered a safe, ready-to-eat product and can pose very serious health risks, especially to young children.

When children handle products containing raw flour, such as homemade playdough (Figure 3), they are likely to place their hands near their faces and mouths. This may cause accidental ingestion of microbes from the contaminated flour, which may result in illness (FDA 2017). Young children, especially those under age five, are at higher risk for foodborne illness because their immune systems are not fully developed (FDA 2020).



Figure 3. Homemade playdough and other flour-based products can be hazardous to your health. (Photo: iStock.)

## Risks of Raw Dough

The process of handling flour, then touching your face with flour and dough coated hands could result in foodborne illness from accidental ingestion of flour (Figure 4). Moreover, cross-contamination can occur from handling flour near foods that are ready to eat, such as already cooked cakes, pies, cookies, and other items stored nearby on counters.



Figure 4. Although flour is a common household item, it can present a risk for foodborne illness. (Photo: iStock, 541992944.)

If you have children and like to eat out at restaurants, many restaurants are happy to supply children with raw dough as a way to provide entertainment while waiting for a meal. However, there is a risk of contracting *E. coli* and *Salmonella* from handling any raw flour products (Figure 5), even if it is supplied by a restaurant.

Children are not the only ones at high risk from handling raw flour-based doughs. Older adults (especially those age 55 and older), the immune-compromised (those whose immune systems are less able to fight off harmful bacteria), such as cancer patients, diabetes patients, those with HIV/AIDS, transplant recipients, or those on immune-suppressing medications, and women who are pregnant are extremely vulnerable to foodborne illness (FDA 2020). People who fall into these categories should take extra precautions when handling raw flour-based dough.

### Why Is Flour So Problematic?

Raw flour is problematic because unlike ready to eat foods, such as roasted nuts, cereals, and baked goods, flour is a raw agricultural product, and there is no “kill step” (i.e., heating step) to rid grains of bacteria



Figure 5. Children may inadvertently come into contact with *E. coli* or *Salmonella* by playing with raw dough. (Photo: iStock.)

that the wheat comes in contact with in the field. Heating flour or wheat to 160°F will kill *E. coli* and *Salmonella*.

Wheat, the main grain used to make most flours, is often grown in very large fields which prohibit the placement of barriers to keep animals out. *Salmonella* and *E. coli* contaminate wheat when birds, deer, elk, and other animals defecate on the wheat (Figure 6). Wheat is harvested by combines and then transferred to grain silos, which can cause contaminated wheat to come into contact with non-contaminated wheat, thus, increasing the risk for widespread contamination.

Postharvest, wheat is ground up to make flour products, and it is often packaged for sale in smaller bags for retail sale. Although the entire process can take months or longer, *Salmonella* and *E. coli* can survive these dry conditions for months to years (Farakos and Frank 2014). As soon as someone ingests contaminated flour, they can become ill. Wheat is not covered by the new produce safety regulations, meant to increase food safety of agricultural products, because wheat (or its processed product of flour) is not intended to be consumed raw (FDA 2021).

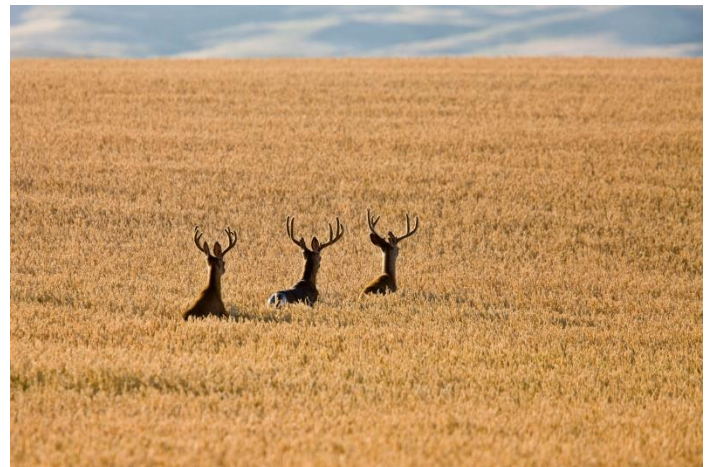


Figure 6. Deer are a carrier of *E. coli* and are known to be in contact with wheat, the ingredient that makes flour. (Photo: iStock.)

## How to Handle Flour Safely to Avoid Illness

There are steps that can be taken to reduce the risk of illness from *Salmonella* and *E. coli* when handling raw flour or products made with flour. In general, treat raw dough in the same way you would treat raw meat.

- Never eat or play with raw dough or other raw flour containing products, regardless of whether it contains egg (FDA 2017). Do not allow small children to play with raw dough at home or in restaurants.
- Wash your hands with soap and warm water for 20 seconds after handling raw flour.
- When baking or cooking with children, always supervise children closely to make sure they do not place their hands near their face or mouth, inadvertently ingesting raw dough. Make sure children wash their hands thoroughly after handling raw flour products, using the proper hand washing technique above.
- Cook flour or flour-based products to 160°F to kill *Salmonella* and *E. coli*. Do not eat flour-based products prior to cooking. Cook flour to 160°F before using flour for crafts or home-made playdough. This can be done by spreading the flour in a thin layer onto a cookie sheet and baking at 350°F for 5–10 minutes. After baking, pour the heated flour into a bowl and immediately measure the temperature of the flour using a food thermometer to ensure it has reached 160°F.
- Do not cross-contaminate other foods. Make sure flour is handled away from other foods, especially foods that will not be cooked. Remember that flour has a tendency to spread and hide due to its powdery nature, so always clean up well with soap and warm water (FDA 2017).
- Wash work surfaces and utensils thoroughly with soap and warm water after contact with flour and raw-dough products (FDA 2017).
- Follow label directions to chill products containing raw dough promptly after purchase until baked (FDA 2017).
- Bake raw dough according to the directions in the recipe or on the packaging for store bought doughs.

Foodborne illness from raw flour is an emerging public health problem; however, steps can be taken to reduce your risk of becoming ill. Keeping in mind that flour is an untreated, raw, agricultural product is the first step to ensuring safety. Flour should be handled in the same way that you would handle raw meat, including following proper hand washing techniques, cooking flour-based products to the proper temperature, preventing cross-contamination, and washing utensils and work surfaces thoroughly with warm, soapy water. When children are assisting you with cooking and baking, supervise to ensure they follow proper handwashing techniques and do not ingest raw flour products. Although we have highlighted the risk of severe illness associated with raw flour, following the guidelines above can ensure safety and prevent foodborne illness while enjoying homemade crafts and tasty treats.

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