# Food Safety and Coronavirus: A Comprehensive Guide

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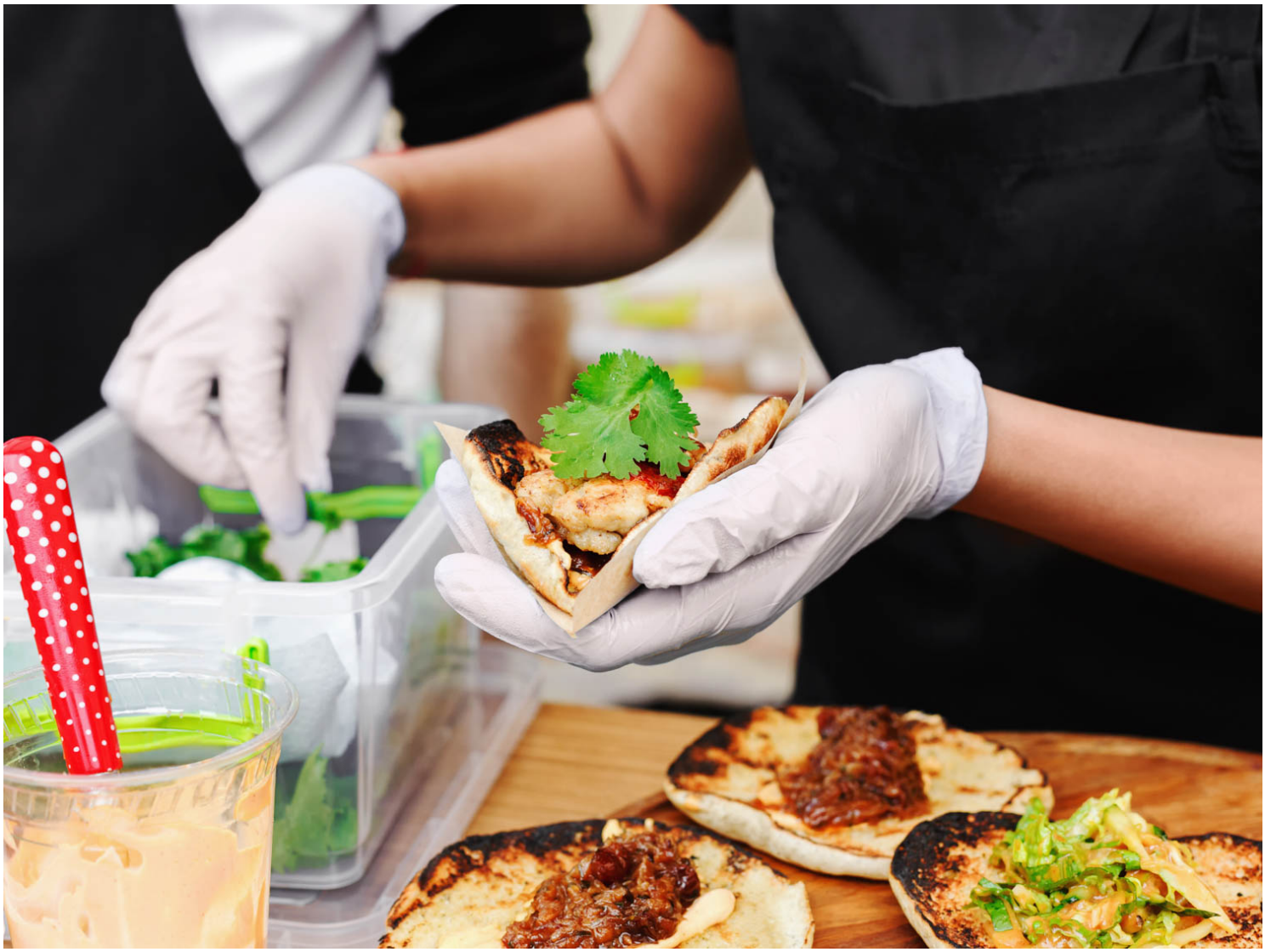

***Editor's Note:*** *We are regularly updating this article to reflect emerging findings and virologist-vetted recommendations. Last updated March 30, 2020.*

As the father of a young toddler, the son of two senior parents in the at-risk age group, and the chef/partner of a restaurant that up until recently employed a few dozen people and fed hundreds on any given night, knowing what is and isn't safe in the current environment is of the utmost importance to me, especially as it relates to food and dining.

Like many densely populated metropolitan areas, the Bay Area is now on complete lockdown. All non-essential businesses are closed, gatherings of large groups of people are banned, and residents have been told to leave their houses only if necessary. Among the businesses still running—at least in limited capacity—are supermarkets and restaurants, the latter of which are solely allowed to operate as take-out and delivery venues. I expect more cities will follow suit in the coming days and weeks.

Even so, plenty of folks—myself included—have been confused or curious about the safety of allowing restaurants to continue preparing and serving food. Is it actually safe? Should I reheat the food when I get it home? Is it better to

support local businesses by ordering food, or am I only putting workers and delivery people at risk? And if I'm cooking my own food, what guidelines should I follow?

To answer these questions, I referenced dozens of articles and scientific reports and enlisted the help of Ben Chapman, a food safety specialist from the North Carolina State University and cohost of Risky or Not and Food Safety Talk, as well as Dr. Angela Rasmussen, a virologist at Columbia University, and Dr. Saskia Popescu, an infectious disease epidemiologist and infection preventionist. This article has been thoroughly vetted for scientific accuracy and I will continue to update it with the most up-to-date information as it emerges.

Whether you managed to stock your fridge and pantry, or were left staring at empty supermarket shelves, there's good news: you can still eat safely, even from restaurants, provided you follow a few basic guidelines.

I'll start by going over what we know about the virus, followed by some basic rules to safely shop, cook, and order food.

## COVID-19 Food Safety Questions, Answered



## Footnotes

## SARS-CoV-2: What we know

SARS-CoV-2 is the coronavirus that is causing the current outbreak of COVID-19, the name of the disease associated with it (not to be confused with SARS-CoV-1, the coronavirus that caused the original 2002 SARS outbreak). It's important to remember that while SARS-CoV-2 bears close similarities to other coronaviruses (such as SARS-CoV-1 or MERS), it is a novel virus, and new information is emerging minute by minute.

Consequently, there's a lot we don't know. That said, there's also a lot that we *do* know with a good deal of confidence.

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## How does COVID-19 spread?

Coronavirus is a respiratory virus, which means that it's spread primarily through the respiratory system. According to the Center for Disease Control (CDC), the main transmission route is through person-to-person droplet infection—that is, the inhalation of small droplets of saliva or mucus carrying a viral load. (Viral load is the amount of virus particles in a given volume of liquid—the higher the load and the longer the exposure time, the stronger the chance of infection.) This is similar to previous coronaviruses, such as SARS-CoV-1 or MERS. Additionally, people are most contagious when they are symptomatic; coughing and sneezing spreads the virus around.

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## Aside from inhalation, are there other ways coronavirus can spread?



While droplet inhalation is the main form of transmission, other types of transmission are plausible. Aerosol inhalation—the inhalation of droplets smaller than 5µm—is plausible, though according to Dr. Popescu, aerosolized droplets aren't typically formed outside of specific hospital procedures.

The German Federal Institute for Risk Assesment (BfR) reports that the virus could also be spread through "smear" infection. In these cases, a healthy person would pick up a viral load by touching a recently contaminated surface with their hands—say, a can of soup, a touchscreen ATM, or a subway turnstile—then transferring the virus to their eyes or nose where it could cause an infection. Such objects that carry infectious agents are known as "fomites."

As of March 25, 2020, the Department of Homeland Security's (DHS) updated table of questions lists both fomite amd aerosol transmission as merely "plausible." Washing your hands before touching your face further reduces this likelihood, as coronavirus cannot be absorbed through your skin.

Currently, the CDC reports that there have been no known cases of fecal-oral transmission of COVID-19. In such a case, viral load in the stool of a carrier would make its way into the mouth of a healthy person. Some possible oral-fecal transmission routes would be from poor hygiene during food preparation, or the exposure of food crops to human fecal matter in the field during growth or harvest. After exposure, the virus would also have to be able to infect its host somewhere along the digestive tract.

A recent, non peer-reviewed* Chinese study of 73 possible COVID-19 patients published in *Gastroenterology* reports that the viral RNA was detectable and viable in the stool of over 50% of patients with COVID-19. During the original SARS coronavirus epidemic, the CDC suggests that "fecal/oral transmission may have occurred in some settings." *Harvard Magazine cites* a particular outbreak at a Hong Kong apartment complex where 329 residents were infected with SARS, with a vertical pattern of spread. It's theorized that faulty plumbing could have facilitated the fecal-oral or fecal-respiratory spread of the virus.

*As all research on COVID-19 is new, very little, if any, has been through rigorous peer-review processes thus far.

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## What is the minimum viral load needed to cause an infection?

According to Chapman and Dr. Rasmussen, we don't currently know the viral load needed to cause an infection. With other pathogens, that load can vary depending on the site it's deposited—for instance, only a small amount of virus may be necessary if it is inhaled directly into the lungs, while the load needed to cause an infection through the nose or eyes may be much larger. It's also important to remember that there is no single point where the viral load goes from being non-infectious to infectious—it's all about probabilities. The higher the load and the closer to infectable cells it's deposited, the higher the probability of contracting COVID-19.

The DHS table has updated information on what we know about the infectious dose based on animal testing and other studies.

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## How long does the virus stay on contaminated surfaces?

A study funded by the NIAID and published in the *New England Journal of Medicine* found that SARS-CoV-2 can be detected in aerosols (airborne droplets smaller than five micrometers) for up to three hours, on copper for up to four hours, on cardboard for up to 24 hours, and on stainless steel or plastic for up to three days. (Follow the link for more comprehensive graphs of viral load decay.)

This means that if a delivery person or package handler infected with the virus coughs or sneezes on packages or envelopes, the virus can stay on those packages for up to a day, while plastic take-out containers or steel work surfaces can hold the virus for three days. The viral load on any surface will decrease exponentially with time; that is, the number of virus particles decreases rapidly at the start, then slowly approaches zero over time.

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## If inhalation is the main form of transmission, why has everyone been stressing hand washing?

Though the likelihood of getting COVID-19 by touching contaminated objects may be a small risk, it's still a risk, and easily avoided. That risk can also vary greatly depending on several factors, such as how recently the object was contaminated, how frequently it's cleaned, and how moist or porous its surface is. Because of the wide range of situations we find ourselves in, it is easier to be safe than sorry.

Moreover, frequent hand washing can also help prevent the spread of pathogens aside from coronavirus. This is important, as our goal is not just to avoid COVID-19, but to avoid getting sick or injured at all during this critical period while hospitals and staff are overworked.

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## What are the "hot zones" on my face? Which areas should I avoid touching?

According to Dr. Rasmussen, the nose is the main hot zone. The eyes could potentially be as well, as some viruses transmit via mucosal membranes in the eyes. (According to the WHO , fewer than 1% of infected individuals report conjunctivitis—eye infections.) The mouth is another potential route for infection, especially when you are not actively salivating, chewing, or swallowing (i.e. sucking a finger, biting your nails, or any other activity that increases exposure time also increases risk.)

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## Should I avoid touching things other people have touched?

Avoiding all potentially contaminated surfaces is unrealistic. Still, there are two easy ways you can minimize the risk: Transfer food and other goods—whether delivered to your door or bought at the store—to clean containers when it makes sense to, and wash your hands thoroughly after checking the mail or venturing out of your home. You can also set aside packages and shelf-stable groceries in a garage or spare room for a few days to allow any potential viral contamination to fade and effectively take already-small odds and reduce them even closer to zero.

Coronavirus is fragile and easily destroyed by hand soap, disinfectant wipes, and cleaning sprays (we'll get to more specific details on this).

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## How long does the virus last on food?

The data for how long the virus can remain viable on food is limited, but in general, viral loads remain more stable on non-porous surfaces like metal and plastic, and break down faster on organic surfaces like cardboard.

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## Can I get COVID-19 from touching or eating contaminated food?

***there is currently no evidence that COVID-19 has spread through food or food packaging***

According to multiple health and safety organizations worldwide, including the CDC, the USDA, and the European Food safety Authority, there is currently no evidence that COVID-19 has spread through food or food packaging. Previous coronavirus epidemics likewise showed no evidence of having been spread through food or packaging.

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## Are we sure food isn't a vector of COVID-19 transmission?

No, we don't know for sure. However, there is strong evidence to suggest that food is not a vector. The epidemiology of food-borne pathogens is well studied, with government data going back to 1938. The spread pattern of COVID-19 does not fit models of foodborne outbreaks, which are defined as two or more people getting sick from the same contaminated food or drink.

For instance, Singapore has tracked its COVID-19 patients and submitted them to extensive interviews by teams from the Ministry of Health to try to determine patterns of spread. It's been found that most cases are linked to clusters of people, including hotel guests attending conferences, church groups, and shoppers, while none are linked to contaminated food or drink.

The fact that every person eats multiple times a day and thus far no link has been found between eating and viral clusters is strong evidence that no such link exists.

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## I'm still not convinced. How could food *not* be a vector?

Let's say a food worker coughs while preparing my food, how could I *not* pick up the virus from eating it? This confused me as well, which is why I specifically inquired about it. According to Chapman, the risk is minimal. Even if a worker sneezes directly into a bowl of raw salad greens before packing it in a take-out container for you to take home, as gross as it is, it's unlikely to get you sick.

This 2018 overview of both experimental and observational study of respiratory viruses from the scientific journal *Current Opion in Virology* (COVIRO) explains that respiratory viruses reproduce along the respiratory tract—a different pathway than the digestive tract food follows when you swallow it. And while you might *say* that you just inhaled that salad, more likely you ate it with a fork and swallowed it.

Dr. Rasmussen concurs, adding that when actively eating—that is, producing saliva, chewing, and swallowing—we are protected from infection in two ways. First, saliva contains proteolytic enzymes—chemicals that break down proteins—which help break down our food *and* pathogens. Second, the act of chewing and swallowing minimizes the amount of time that any potentially infectious viral load is in contact with mucosa or the upper respiratory tract. The less time a pathogen spends in contact with potentially infectable cells, the lower the likelihood of actual infection.

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## What about eating with your hands?

So if ingesting the virus isn't a concern, what about this scenario: a worker coughs on a cutting board then assembles a hamburger directly on that board before placing it in a take-out container. You then come home and eat that burger with your bare hands, then pick your nose, or do something else that deposits the virus along your respiratory tract. In this situation, the viral load has been diluted several times. First when it was transferred from the board to the burger bun. Next, more viral load was shed when the bun was placed in the takeout container. It is diluted again when you pick up the burger before interacting with your face in inadvisable ways. While he didn't rule out the possibility of picking up the disease this way, Chapman described it as "a moonshot, even before you touch your face."

Using clean silverware when possible, avoiding touching other parts of your face while eating, and washing your hands after eating (and before touching your face) further minimizes that risk.

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## Are there *any* special risks associated with food?

None that have been recognized. Food handlers are specifically trained in proper safety and hygiene procedures. Federal and state-level regulations mandate everything: the location of handwashing sinks, the type of soap used in them, the frequency of work-surface sanitization, the temperature of the dishwasher, the temperature to which various foods must be cooked, the rate at which they must be chilled, the cleaning and storage process for raw product, et cetera. Any restaurant or market that handles, packages, or serves food should be—and usually is—following all of these guidelines. The penalties for noncompliance vary by jurisdiction, but are typically severe, ranging from posted notices for minor violations to outright shut-downs to multiple minor violations or major violations. (Here are California's code and enforcement guidelines, for reference.)

The point is: Eating food is not any riskier than any number of other activities you perform on a daily basis in which you come into contact with items other people have handled. Indeed, the hygiene standards in place at food service operations make that risk even smaller.

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## Am I more likely to get COVID-19 from take-out, delivery, or cooking at home?



The main risk factor is proximity to other people, so inasmuch as you have a higher chance of coming in contact with other people outside your own home, picking up food is a higher risk than having it delivered or cooking it yourself.

That said, there are other risks associated with cooking at home, particularly in shopping at supermarkets and handling potentially contaminated food packaging. The cook at your local restaurant most likely follows stricter hygiene and safety protocols than the supermarket worker stocking the shelves. A good rule of thumb is to treat anything that comes into your home from outside, whether food, mail, or other people, as potentially contaminated and act accordingly. Wash your hands after bringing it home, transfer to clean containers and/or sanitize packaging when possible, and wash your hands before, during, and after cooking. (And stop picking your nose.)

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## Does Chinese food pose a greater risk than other food? What about imported food and goods?

There's no indication of additional risk associated with imported foods or other products. Viral load decreases on all products with time —whether that's a plastic toy or a bunch of bananas. The increased transportation time for imported goods means that it's far more likely to be contaminated by the person unloading the shipping container or stocking the grocery store shelf than anyone at its point of origin.

While it is true that COVID-19 originated in China, all indications show that the transmission to other countries has been person-to-person, which is why efforts by authorities ranging from state and local governments to the WHO are focused on limiting person-to-person contact, not the movement of goods.

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## If I'm still concerned, does reheating food before eating it destroy the virus?

Yes. As with any bacteria or virus, safe cooking is a function of temperature and time. The hotter the temperature, the less time you'll need to reduce viral or bacterial load to a safe level. With salmonella, for instance, 165°F (75°C) is hot enough to make a 5-log reduction in bacterial load in under a second (that is, only one out of every 100,000 bacteria will survive that temperature and time). At 145°F (63°C), the same reduction in pathogens would take around 10 minutes. (Bear in mind this is the temperature of the food, not the oven.)

Temperatures and times for coronavirus are not yet fully researched, but scientists suggest a temperature of 149°F (65°C) for at least 3 minutes is sufficient. Experts assume that the virus will respond like other pathogens and that hotter temperatures will require shorter times, but we currently do not have experimental data to prove it.

When reheating or cooking solid foods, such as a chicken breast, a steak, or a loaf of bread, it is very unlikely that any viral or bacterial load will have penetrated past the surface unless the food has been pierced or cut, so heating just the exterior is sufficient (for safety, if not for palatability).

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## How do I sterilize my food?

- Heat liquids like soups, stews, and sauces to a brief simmer, making sure to stir frequently so that it heats evenly throughout.
- Microwave vegetables, pasta, thick purées like mashed potatoes, and meat until piping hot—hot enough that you'd worry about burning your mouth if you took a bite. For most microwaves, that means about 90 seconds per serving on high heat (but microwave power can vary).

- Sauté loose bite-sized items like short pasta shapes, loose vegetables, or stir-fries until they maintain a steady sizzle as you stir them around the pan. A minute or two in a preheated skillet is sufficient for a couple of servings.
- To reheat cutlets, casseroles, or bread in the oven, preheat the oven to 400°F (205°C), place the food on an oven-safe tray with shallow sides (high sides can block hot air from circulating), and heat until the surface of the food is too hot to touch for more than an instant.
- If you own a sous-vide circulator, follow the appropriate sous vide recipe guide in our archives. Treat whatever food you are reheating as if it were starting from raw. (See the next section for more information on the safety of slowly reheating food.)
- Chopped-and-formed foods like meatloaf, meatballs, dumplings, falafel, etc. should be thoroughly heated to the center, following the time and temperature guidelines stated above (heat to an internal temperature of at least 149°F/65°C, and hold it there for at least 3 minutes).

If you want to be extra-careful, use a digital thermometer to check the temperature of your food inside and out before serving or eating.

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## Does "the danger zone" apply to SARS-CoV-2?

You may be familiar with the concept of "the danger zone," the temperature range of 41°F to 135°F in which bacteria thrive. Proper food handling dictates that foods spend no longer than four hours total between those temperature ranges before consumption. When reheating food, this includes the original cook time, the cooling time, and the reheating time (pay extra attention to this when reheating foods sous vide). The good news is that viruses require a host cell to replicate, which means that the coronavirus will not multiply on your food, even within the danger zone. Indeed, just as it does on other surfaces, the viral load on your food will decrease with time.

That said, you should still continue to follow good food safety procedures and mind that danger zone—all the normal bugs are around, even during the coronavirus pandemic.

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## Are we going to run out of food?

Because limiting your time out of home can slow the spread of the virus, it's a good idea to make fewer, larger trips to the supermarket. But how much food do you really need? Initial panic and hoarding behavior has caused short-term shortages at supermarkets and grocery stores across the country. But there's good news: the FDA reports that there are currently no long-term issues with food supplies. In all likelihood, you're still going to be able to buy eggs, dairy, dried and canned goods, paper products, fresh meat and produce, and even soap next week and next month. There's no need to buy a three month supply of canned soup or years' worth of toilet paper.

That said, we have yet to see the long-term effects of COVID-19 on farms (especially as it relates to seasonal workers whose dense living arrangements are ripe grounds for coronavirus spread), or the trucking and shipping industry. Food wholesalers will also have to alter supply chains to accommodate higher sales in supermarkets and online retailers, and lower sales in restaurants. Many restaurants have shuttered for an indeterminate period, and others, like my own restaurant, Wursthall, have shifted to limited, take-out-and-and-delivey-only menu formats. (Beyond food safety, this brings with it a host of other economic implications.)

Time will tell, but the reality is that those of us who were food-secure before this outbreak will likely remain so. It's those of us who were most vulnerable before the outbreak who are most likely to suffer now. I urge you to look into local organizations that assist families and individuals in need to see how you can help. Time and money are equally valuable resources these days.

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## What's the safest way to shop at the grocery store or supermarket?



Here's my strongest recommendation: go to the local grocery store instead of the big shops. Smaller stores mean fewer customers, which lowers the odds of running into infected people and contaminated surfaces.

Moreover, while the Costco and Safeway near my house have had trouble keeping anything on their shelves, I've made trips to my local Japanese market, Chinese supermarket, and Latin produce market and found them fully stocked with goods, and nearly empty of people. (And I promise you, they'll appreciate the business right now).

Here are a few ways you can keep yourself safe at the supermarket:

- **Go at off-peak hours to avoid crowds.** Bonus: Most supermarkets restock their shelves with deliveries late at night. Hit them up at this time or early in the morning and you'll be rewarded with wide open, freshly-stocked aisles.
- **Keep your distance in line.** I've seen people lining up right next to each other for the pharmacy and the supermarket checkout. Don't do that! Wait in line at least 6 feet away from the person in front of you, and gently request that anyone behind you follow the same rule, for everyone's safety.
- **Overfill your prescriptions if possible.** Talk to your Doctor about ensuring you have enough of your prescription medications to last for at least several weeks to avoid extra trips to the pharmacy.
- **Using the self-checkout lane** reduces your contact with other people, but it also increases interaction with secondary potential infection points, like the touchscreen display and the bar code scanner. On balance, I'd recommend avoiding person-to-person contact over surface contact and stick with the self-checkout. If you do go with a cashier, bag your own groceries rather than having them handled by another person any longer than necessary.
- **Wash your hands when you get home** and if possible, use a hand sanitizer after leaving the store and before touching the door to your vehicle or home.
- **Don't hoard.** This is not the zombie apocalypse. Get what you'll need for a few weeks at most.

- **Use touchless pay systems.** Your phone probably already has a touchless pay system you can link to your bank account. If you can't go touchless, use a credit card and avoid cash when possible.

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## Is it okay to buy produce from open bins?

So long as you are following proper food preparation procedures at home—clean, separate, cook, and chill —and following the basic hygiene guides explained here and elsewhere, the risk from getting COVID-19 through produce that other people have touched is minimal.

Remember: not a single positive case has been linked to food.

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## Paper or plastic? Which is safer? What about my own reusable bag?

The likelihood of any disposable bag you get from the shop having an infectious load on them is very slim, due to the length of time those bags sit in transit or storage. The bags then get pulled and opened one at a time on a per-use basis. With your own bags, the risk is also minimal. Cloth has a small advantage because you can wash it with detergents, which are very effective against viruses.

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## Should I be using an antibacterial soap?

There is no advantage to using an antibacterial soap over any other soap. First off, COVID-19 is caused by a virus, not a bacterium. More importantly, the mechanism by which soap protects against viruses is inherent to all soaps. The same properties that make soap effective for cleaning greasy pots and pans make it effective against viruses.

Viruses are protected by a lipid and protein membrane. Soap is a surfactant specifically intended to dissolve lipids. As Professor Pall Thordarson, acting head of chemistry at the University of New South Wales explains in The *New York Times* , soap molecules act like miniature crowbars that pry open virus particles, effectively neutralizing them.

Any hand or body soap is effective for washing ourselves, no antibacterial agents needed.

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## What about hand sanitizers?

Assuming you can get a bottle , the CDC recommends using a hand sanitizer with at least 60% ethanol or 70% isopropanol. Most brands of hand sanitizer fall into this range. I would recommend sticking to regular old soap at home and carrying around a small bottle of sanitizer with you when venturing outside. It's especially useful to have when you want to sanitize your hands before re-entering your vehicle or touching your front door knob.

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## What about masks? Do surgical or N95 masks protect you?

Surgical masks can offer some amount of protection against droplets and aerosols, but only if they are used correctly. Masks should cover the nose and mouth, and once in place, should not be touched other than to discard them.

Because masks can become damp, it's possible that virus particles could collect and concentrate on them, increasing the risk of infection if they are not removed and disposed-of properly. New research in Hong Kong shows that infectious virus can be detected on a surgical mask for seven days, making used masks a potential route for infection.

A recent article in the Washington Post written by data scientist Jeremy Howard suggests using homemade masks will decrease likelihood of transmission. However, according to both Drs. Rasmussen and Popescu, this suggestion ignores studies that show that even trained healthcare workers make errors when putting on and removing Personal Protective Equipment (PPE) which can increase the likelihood of infection.

If you are infected or a non-symptomatic carrier, a surgical mask can help protect others you may come in contact with, as it reduces the distance and spread of droplets.

N95 masks offer protection against aerosols, but according to Dr. Popescu, it is unlikely that most people will be in situations that expose them to aerosolized virus. These situations are more likely to occur in hospitals during certain procedures. She also emphasizes that the length of exposure is a major factor in likelihood of infection. Masks are especially useful during prolonged, close exposure to potentially infected individuals. It's unclear whether they are as useful when worn in fast, transactional situations.

Even more so than surgical masks, N95 masks have to be properly fitted, and you must be properly trained in their use for them to be effective.

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## How long does an infected individual remain contagious after their symptoms clear up?

If you've had flu-like symptoms including a fever, coughing, sneezing, runny nose, or shortness of breath, but have not been tested for COVID-19, the CDC recommends staying at home for 72 hours after your fever clears and at least 7 days after your symptoms first started. If you have tested positive for COVID-19, they recommend home isolation (that is, staying in a designated "sick room" in your home with minimal contact with other people) until your fever and symptoms have cleared, and two tests taken 24 hours apart both return negative results.

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## What special precautions should restaurant owners, kitchen managers, or other folks with food-related businesses be taking?

As the chef/partner at a restaurant, I have a few priorities.

First and foremost is to keep my employees, customers, and community safe from the virus, and to ensure that we are doing our part to keep the virus from spreading. To this end, we've implemented the following procedures. Given the unlikelihood of foodborne transmission, many of these steps may be overkill, but they cost us very little to implement and every reasonable chance to reduce transmission is one we should take.

**Safety for staff:**

- **Schedule staffing density to levels that allow a minimum of six feet of distance between all employees at all times.** As too many small business owners are aware, this is probably the easiest one to implement right now, as there simply isn't work for a full staff at the moment. Most of our employees have been furloughed for the time being (more on that in the section below).

- **Do not incentivise working while ill or going out while symptomatic.** Encourage your staff to take the epidemic seriously. If you can, offer short-term sick leave without the need for a doctor's note to avoid unnecessary hospital or doctor's office visits. If an employee is symptomatic, send them home (with sick leave pay, when possible). If your operation has a sick leave policy that involves the accrual of hours, ignore the accrual and offer full sick leave benefits even to new employees. Currently, the contagion period after symptoms clear up is not known. Any employee who has been positively diagnosed with COVID-19, or has shown the symptoms should continue to stay at home until local health officials deem it safe to resume work.
- **Hold meetings remotely when possible.** If in-person meetings are necessary, keep attendance at a bare minimum and hold the meetings sitting at least six feet apart from one another.
- **Create systems for contact-free exchange of necessary documents, food, and equipment.** Rather than passing equipment or food to each other, one employee will set it on a table, step away, and allow the other to come pick it up. Pay checks and other documents are laid out on a table for employees to walk up to one at a time and pick up as necessary.
- **Prop open any doors that are regularly accessed**, including the entrance to the main kitchen, dish room, prep kitchen, offices, and bathrooms.
- **Reiterate the importance of hygiene and food safety protocols** to all crew members. Communicate those protocols in all languages spoken in the kitchen (in our case that's English and Spanish) both verbally and in print.
- **Ensure that hand washing stations in particular are well-maintained**, and that every worker has an adequate supply of soap and gloves to use as necessary.
- **Provide hand-sanitizing stations to non-kitchen workers** where hand washing sinks are not as readily available, such as by the front door or the dining room-side of the pass.

**Safety for customers and community:**

- **Transition to take-out only service.** We no longer offer dine-in service and will not resume until scientists and state officials deem it safe to continue.
- **Remove all physical menus and payment points.** Printed menus can be a source of surface transmission of viral particles. We have transitioned to an online-only ordering system. If you must continue to use printed menus, either sanitize plastic-coated menus with an EPA-approved sanitizing product, or use single-use paper menus that customer can discard on their own.
- **Switch to no-contact payment methods.** All of our take-out orders must be ordered online. We accept no cash or on-site credit card orders. If you can't go online-only, encourage the use of contact-free credit card devices and have the POS operator step back from the device before allowing a customer to come up to tap their phone or insert their credit card. Avoid cash as much as possible.
- **Offer contact-free door opening if possible.** Restaurants and businesses that follow current American Disabilities Act guidelines will likely have pneumatically-operated doors with a push switch both inside and out. Encourage its use among staff and with signage for customers, and push the button with a knee or elbow instead of your hand. If possible, keep the front door propped open.
- **Offer contact-free pickup.** We place ready-to-go orders on a table by our front door with the name of the customer who ordered it. We have signage asking guests to maintain six feet of distance with the party in front of them in case of a line (we have not had a line yet, for better or worse).
- **Remove all condiment bottles, loose napkins, loose silverware, water bottles, and table decorations.** Anything that may result in more than one customer touching the same surface is a potential point of cross-

contamination.

After physical health, my and my team's second priority is to work as hard and smart as we possibly can to come up with creative ways to generate revenue that will allow us to rehire employees that we have been forced to furlough, to make sure that employees and their families suffer as little as possible during these tough times, to guarantee that they'll have a job to return to when this is all over, and to use our resources to help those who are most vulnerable in our greater community. To this end, we suggest the following and are still working around the clock to come up with new ways to tackle the problem.

No small business owner wants to see their employees suffer or struggle. We'd move mountains to guarantee their wellbeing if we could.

- **Guarantee jobs for all furloughed employees as soon as you can generate the revenue to rehire them and guarantee their safety,** and allow any benefits that are dependent on length of employment to continue rolling during any shut-down period.
- **Facilitate the transition to unemployment benefits for all employees who qualify for them.** I do not know of any restaurant that is able to keep their full staff employed, which means many folks will be relying on unemployment benefits to make ends meet. Research your state's unemployment benefit policies and procedures and get the messaging out to staff in all languages spoken at your facility.
- **Directly assist employees who may be struggling to make ends meet.** Those with children out of school, with large families, or with spouses who are also currently out of work especially need help. Our goal is to tactfully and proactively help by providing meals to deliver to employees who need them, and to rehire those who are hit especially hard before those who can weather the storm more easily.
- **Sell gift cards.** We currently offer gift cards redeemable when we eventually reopen that will give customers an additional 10% value when redeemed. This extra cash goes towards maintaining the minimum operating expenses of the business. (Gift cards are not a viable long-term revenue solution, as they don't generate extra income in the long run, they merely put off debt to an unknown future date.)
- **Come up with creative alternate revenue streams.** Many restaurant owners are forgoing profits and salaries and putting that money back towards directly helping staff and feeding needy community members. Personally I take no income from Wursthall and I am donating 100% of the commission from my two books sold on bookshop.org towards a fund that will be used to make meals for employees and the greater community. Additionally, we are currently in contact with several organizations to figure out how we can best use our facilities to prepare and get food to those in need. Ideally our take-out business will be supplemented by a free-meal service that generates enough revenue through donations to be able to hire back our kitchen staff in shifts to prepare meals, and our front of house staff to coordinate and deliver. It's not easy to redesign a business from the ground up, but every chef I have spoken to is working in the same boat and working on similar projects.

Every other food business owner and chef I've spoken to has the same goals in mind. If you have ideas for what business operators could be doing to help their employees or community at this time, please do not hesitate to comment with specific or broad suggestions.

## To Sum It All Up:

Social distancing, good hygiene, and avoiding touching your face are the most important precautions you should be taking, but there are other ways to help stay healthy. First, as much as you can, try to get good sleep, reduce stress, eat well, and relax. Meta-analyses of scientific research show that long-term stress and fatigue can weaken your immune system's response to infection, and a healthy immune system is your first line of defense not just against the coronavirus, but against a host of other pathogens that could get you sick and potentially take up valuable healthcare resources.

As difficult as it may be to keep your mind relaxed, now is not the time to stress about work or get angry about politics (or to stay up all night researching and writing articles, for that matter). Turn toward hobbies you know bring you comfort and relaxation. Play some video games. Do some puzzles. Spend time with your family.

One good way to keep yourself occupied? Clean your living space, especially hard, high-traffic surfaces. Wipe down counters, refrigerators, doors (especially the handles), and bathroom fixtures with an EPA-approved disinfectant cleaning product a couple times a day, and more frequently if you are still going in and out of your house or handling packages that have been delivered to you.

(And if you're the type of person that finds cooking and eating relaxing, well I know a great place to find recipes, a pretty good cookbook ,** and a decent restaurant that's still open for take-out in the Bay Area. )

**If you order either my first book, *The Food Lab*, or my upcoming children's book *Every Night is Pizza Night* through that link, not only will 100% of my sales commission be going directly towards producing food to be served free of charge to needy families and individuals affected by school and business shut-downs in San Mateo, an additional 10% of the sale cost will go to a nationwide network of independent bookstores.

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## How can I help?

Aside from keeping yourself, your family, and your community safe by following distancing and hygiene protocols, the best way you can help is most likely at a local level. In my own research I've found that the organizations most in need are those addressing folks who were already food-insecure before the outbreak occurred. Homeless shelters and programs that distribute food to children and seniors seem to be particularly hard-up for monetary and food donations.

Local healthcare workers and emergency responders are also working hard around the clock. In many communities, grassroots organizations are already springing up to try and connect individual donors and restaurants with food resources to spare with hospitals and healthcare workers. It's worth a local Google search to try and find organizations in your area.

On a national level, Charity Navigator has a list of highly-rated charities that are directly working on COVID-19 relief.

# Footnotes

Here are a couple more frequently asked questions that are not directly related to food safety.

## How fast does Covid-19 spread?

The International Journal of Infectious Disease reports that the early phase of the COVID-19 epidemic has shown exponential growth—in line with the World Health Organization's assessment. What is exponential growth? It means that over each given measurement period (say, each day), the number of cases will increase by the same factor.

With exponential growth, small differences in the growth factor can effect large downstream changes. That is why slowing the spread early on ("flattening the curve") is so important.

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## Why does Covid-19 seem to be spreading faster than previous coronavirus epidemics?

One likely answer is "stealth" spreading. Those infected with SARS-CoV-2 typically don't show symptoms for several days, and even then, symptoms can be mild, leading them to attend public events and mingle with crowds as they normally would. Consequently, according to a mathematical simulation published in the journal *Science*, 86% of Covid-19 infections were undocumented prior to the January 23rd travel restrictions implemented by many countries, following the World Health Organization declaration that the outbreak was an international emergency.

Here in the US, folks have still been partying like it's 1999 as recently as last weekend, despite the advice given by Anthony Fauci, the director of the National Institute of Infectious Disease (NIAID), to lawmakers last Wednesday, urging them to tell constituents to cancel parties and large events. Some politicians have even suggested people go out to the pub. (This is bad advice.)

Additionally, the journal *Nature* reports that researchers have identified an enzyme found in human cells called *furin* that might factor into Covid-19 activation. This is significant because furin is found in cells in the lungs, liver, and small intestines, making them all potential sites for Covid-19 infection, though the scientists warn that this is still an untested hypothesis, and that coronaviruses can act unpredictably.

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## I've heard that the coronavirus attaches to cells that have "ACE-2" receptors. Does this mean that all cells with ACE-2 receptors are possible routes for infection?

Angiotensin Converting Enzyme 2 (ACE-2) has been shown to be the entry point for coronavirus to infect cells. However, it is unlikely that *all* cells expressing ACE-2 are infectable. With coronaviruses, there are many proteins we think are involved and many more that could feasibly be involved in its infection route, meaning that ACE-2 expression is a necessary condition for infection, but it's not a sufficient condition.

Basically, if the coronavirus were a global game of Guess Who?, knowing that it requires ACE-2 receptors is like saying we've managed to rule out all the people wearing hats. It does not immediately follow that everyone without a hat

should not be trusted.

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## What exactly does "flatten the curve" mean?

"Flattening the curve" is not necessarily about limiting the total number of infections caused by the outbreak. Rather, the idea is to spread those infections out over as long a period of time as possible in order to ease the strain on our healthcare system.

The *New York Times* reported on a Harvard University analysis that showed that even in a moderate scenario that assumes 40% of American adults contract the coronavirus some time in the next 12 months, hospitals in many areas of the country will need two to three times the number of beds they currently have. If that same 40% gets infected in a six month period, that number jumps up to four to six times as many.

Intensive Care Units (ICU) will be hit even harder. New York State has a total of 3,000 ICU beds, only 600 of which are currently unoccupied. At the current rate of spread, epidemiologists—scientists who study the spread of diseases—predict that the outbreak will peak in New York in 45 days, requiring 37,200 ICU beds. That's over 60 times as many beds as are currently available.

Spreading out the infections over a longer period of time can also buy medical researchers more time to work on a vaccine to further slow the spread of the disease. This visualization can help you understand these effects.

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