I-CARE℠

FOR KIDS

A parent's guide to prevention and early COVID treatment for children

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As a parent, you would do everything in your power to protect your child. So, when a global pandemic strikes and the media subjects you to non-stop messages about an 'unprecedented' deadly virus, of course, you would be concerned. This guide aims to help you understand the real risks and know how to respond.

First, you should know that most children with COVID-19 handle the virus well and recover fully. Despite a lot of fear-mongering, **COVID-19 is not a deadly disease for most children**. In fact, data show that the death rate is extremely low in patients under 17 years old.[i]

Next, you should know that **your child has probably already had COVID.** According to the CDC, by October 2022 more than 95% of children had COVID-19 antibodies.[ii] The virus is endemic, meaning it now circulates widely in our population.

Children have different immune responses than adults, and those differences may help protect them against severe COVID. For one thing, they have less expression of an enzyme called ACE2, which binds to the spike protein in the virus that causes COVID and helps it enter the cells.[iii]

Kids also tend to have highly functional innate immune systems[iv] — which provide generalized protection against a variety of infectious agents — and they have fewer risk factors, like obesity and other diseases, which make many adults more vulnerable to COVID.

During their early years, children are exposed to many coronaviruses, and these could give them cross-protection against COVID-19, although that protection may be related to building their immune system generally rather than developing specific antibodies against the virus that causes COVID.[v]

With that in mind, the good news is that most children do not need to follow very strict prevention protocols. The best thing you can do is focus on making sure your child is healthy overall and that their immune system is strong and robust.

What to do when your child has COVID:

Lifestyle measures like **excellent nutrition**, **good sleep**, and **being exposed to pets and good old-fashioned dirt** will help modulate a child's immune systems so they can appropriately respond to viruses and infectious agents.

We also recommend:

- **Regular handwashing with soap and water**: Upper respiratory viruses are often spread when a child touches infectious material and then touches their nose or eyes, inoculating themselves with the virus. Frequent handwashing can interrupt this cycle.

- **Playing outside in nature**: The chance of catching a virus when playing outside is negligible. Spending time in nature is crucial to a child's health, development, and mental well-being.

What NOT to do when your child has COVID:

The most important thing to remember is: ***Do not panic!***

Remember many children have no symptoms. Those who do have symptoms usually experience COVID as a mild upper respiratory infection. Unlike other infections in babies, which are often more serious in younger infants, babies do surprisingly well handling COVID.

We do not recommend:

- Isolation except when acutely ill.

- Masks: these have not been shown to be effective in limiting cases of COVID and cause respiratory changes, headaches, and anxiety in a subset of children. Children who cannot see the whole faces of the adults and peers in their lives suffer developmental impairments in emotional regulation and interpretation of the expressions of others.

Recommended therapies:

- **Vitamin D:** Depending on skin color and where they live, children can suffer from a lack of Vitamin D. Some children with Vitamin D Receptor mutations have difficulty converting the Vitamin D that we all get from exposure to the sun into the active form our bodies can use.

  Having enough Vitamin D is very important[vi] in helping our bodies fight inflammation and it helps both innate (initial, non-specific) and adaptive (later, specific) immunity. Vitamin D acts in the hippocampus to convert the information a child learns in school today into long-term memory so they will remember it in the future.[vii]

  The American Academy of Pediatrics recommends **400 IU of Vitamin D per day for infants younger than 12 months and 600 IU per day for children/adolescents.** Breastfeeding infants should be given daily Vitamin D supplementation until they are fully weaned and drinking fortified milk.[viii]

  Many functional and integrative clinicians think these guidelines are too low to address issues of mood, prevention of other diseases, and optimal immune function. Ideally, we recommend supplementation to achieve blood levels of 50-80 ng/dl. Since blood levels are dependent on sun exposure, diet, latitude, skin color, obesity, socioeconomic status, and individual genomics, it is difficult to recommend doses that will be optimal for every child. However, as a general rule, this is a good place to start:

  - 0-12 months: 800 IU per day
  - 1-5 years: 1500 IU per day

- 5-12 years: 2000 IU per day
- 12-17 years: 3000 IU per day (or 4000 IU per day once adult size is reached)

- **Vitamin C:** Vitamin C is an excellent antiviral and protects against a wide variety of viruses including COVID-19. It is also a spectacular antioxidant, combatting the oxidative stress that happens when children are sick, hurt, or stressed. Vitamin C is found in red, orange, and yellow fruits and vegetables, so a healthy diet is crucial to providing Vitamin C sources.[ix]

  Dosing recommendations vary, and many official recommendations[x] [xi] are lower than what some functional and integrative doctors would use in their clinical practice. Our recommendations for daily intake are as follows:

  - 0 to 6 months 40 mg
  - 7 to 12 months 50 mg
  - 1 to 3 years 15 mg
  - 4 to 8 years 25 mg
  - 9 to 13 years 45 mg
  - 14 to 18 years 75 mg

  When children are sick, they may benefit from higher doses. We often recommend 500-2000 mg/day when children are sick because they benefit from the antioxidant effects.

  Vitamin C is a water-soluble vitamin, so any excess will be excreted in the urine. Note that when Vitamin C is given as an oral supplement, some children may develop diarrhea if too much is given at one time.

- **Vitamin A:** Vitamin A is an excellent antiviral that has been used to successfully treat measles, and it is found in red, yellow, and orange vegetables. It is also one of the main components in cod liver oil (in addition to Vitamin D and Omega-3 fatty acids). Our recommended dosages are as follows:

  - 0 to 6 months 400 mcg/1300 IU
  - 7 to 12 months 500 mcg/1600 IU
  - 1 to 3 years 300 mcg/1000 IU
  - 4 to 8 years 400 mcg/1300 IU
  - 9 to 13 years 600 mcg/2000 IU
  - 14 to 18 years (boy) 900 mcg/3000 IU
  - 14 to 18 years (girl) 700 mcg/2300 IU

- **Zinc:** Many children are deficient in zinc, which strengthens innate and adaptive immunity[xii] and inhibits viral entry.[xiii]

Food sources of zinc include oysters, clams, nuts, and seeds — foods that most self-respecting toddlers and children do not eat often.

Zinc has an impact on appetite and is often lacking in the diet of picky eaters. Correcting via food intake alone may be challenging, so zinc supplements may be a good option. Zinc supplements should be given with food since children sometimes feel nauseous if it is given on an empty stomach.

Zinc and copper maintain a see-saw relationship. When zinc is low, copper tends to be high.

When children are deficient in zinc, supplements do not typically bother them. But after their zinc stores are replenished, they may start to be disturbed by a metallic taste. If this happens, decrease or stop giving zinc supplements.

Dosing guidelines:
Give one dose close to bedtime, since it is valuable for the detoxification processes that happen during sleep.

- Under 5 years old: work up to 5- 10 mg twice a day, given with food
- 5-12 years old: most children can tolerate 10-15 mg twice a day, given with food
- 12-18 years old: doses of 20-25 mg twice a day with food is usually well tolerated.

- **Ibuprofen:** Acts to reduce fever, treat aches, and fight inflammation. Do not use it just to treat a low-grade fever. The pediatric dose is 10 mg per kg or around 5 mg per pound. Give with food or a full glass of liquid because some children have stomach aches or diarrhea with ibuprofen. It is given at 6- to 8-hour intervals.

- **Quercetin:** Quercetin, a mast cell stabilizer that prevents the release of inflammatory cells and histamine, has direct virus-killing properties against the virus that causes COVID.[xiv] It is a potent antioxidant and anti-inflammatory agent[xv] that is usually well tolerated in children.

  A flavonoid, quercetin is found in many fruits, vegetables, seeds, and nuts. Rich sources include berries, onions, shallots, tomatoes, and Brassica vegetables like broccoli and Brussels sprouts. Supplements should not serve as a substitute for a nutrient-dense diet.

  Due to a possible interaction between quercetin and ivermectin, if you are giving your child ivermectin we suggest staggering the doses so one is given in the morning and one at night.

  Reasonable starting doses for pediatric patients follow, but doses can be doubled in consultation with your pediatrician and based on your child's circumstances.

  - 2-4 years: 50 mg daily
  - 4-8 years: 50-100 mg daily
  - 8-12 years: 100-200 mg daily
  - 12-18 years: 200-400 mg daily

- **Probiotics:** The gut is the seat of the immune system in children; the microbiome they develop in the first 1,000 days of life can have major implications for their health as adults.[xvi]

  Probiotics help train the immune system to attack pathogens (rather than itself) and inhibit the growth of microbial pathogens.[xvii]

  The composition of gut flora evolves as the child grows. Therefore, for infants, we recommend probiotics that correspond to the composition of gut flora in breast milk (which provides abundant lactobacillus and bifidobacterial). Probiotics come in powders for infants, which can be sucked off a finger or mixed in soft foods.

  Toddlers can use powders or chewable tablets, which tend to be tart. Older children can swallow capsules.

  As always, supplements should not substitute for a diverse, nutrient-dense diet. Good sources of probiotics and prebiotics include Kefir, low-sugar yogurts, and fermented foods like pickles and sauerkraut.

  Children who are exposed to tart and savory foods in infancy are more likely to enjoy those foods later, compared to babies who are mostly offered the sweet foods they innately prefer.

Note that children with less diverse gut flora or with a history of Caesarean section birth, early antibiotic use, or lack of breastfeeding, are more at risk for chronic illnesses later.[xviii]

- **Ivermectin:** Children in many countries around the world receive ivermectin regularly as a dewormer. Experience suggests that the medication is safer than aspirin. Safety and effectiveness in pediatric patients weighing less than 15 kg (33 pounds) have not been established, according to the package insert, although one published paper suggested it is safe under 15 kg.[xix] This body weight limitation would apply to children on average less than 3 years old, who usually tolerate COVID quite well and may even be asymptomatic.

  While the FDA has not approved ivermectin to treat COVID-19 in pediatric or adolescent patients, our clinical experience, as well as the analysis of worldwide data of efficacy in multiple populations — coupled with our dissection of the flaws of trials that did not show ivermectin to be effective against COVID-19 — lead us to conclude that ivermectin is safe and effective in the prevention and early treatment of COVID-19 in children.

  For pediatric dosing guidelines, we extrapolate from dosing recommendations for use against parasites. Most studies in pediatric patients use doses of 0.2-0.3 mg/kg/dose for parasite treatment. Ivermectin in pediatric patients has been shown to be safe in doses up to 600 mcg/kg/day. Continuous high-dose ivermectin has been shown to be safe in children with leukemia.[xx] Case reports of ivermectin toxicity in children show neurologic symptoms with full recovery at a dose of 30mg/kg (100 times the usual dose).[xxi]

  Empirical experience by many integrative and functional medicine practitioners leads us to feel comfortable with dosing ivermectin at 0.4 mg/kg/dose for 5 days as early treatment in at-risk children. The side effect profile is less concerning than most other drugs we prescribe.

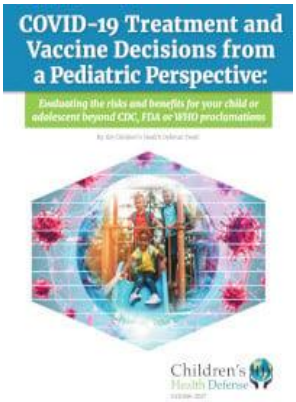
  For prevention, we recommend weekly dosing at 0.4 mg/kg for most vulnerable children. This can be modified based on exposure patterns and caseloads in the child's community.

  For post-exposure prevention, give an initial 0.4 mg per kg dose then repeat a second dose in 24 to 72 hours.

  The package insert recommends taking on an empty stomach with water. However, higher ivermectin levels are obtained when taken with a fatty meal,[xxii] which is what we recommend for COVID.

Children who might benefit the most from early treatment with ivermectin include those who have chronic conditions like obesity, diabetes, or chronic lung and heart disease.

Note: The American Academy of Pediatrics does not recommend its routine use in children for COVID at this time.



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- **Melatonin:** Melatonin is a **potent antioxidant with important anti-inflammatory effects**. In young children who cannot swallow the extended-release pills, the short-acting forms can be associated with nightmares and rebound night wakening about 4-6 hours after sleep onset. If it is given at night, extended-release formulations are preferred if the child can swallow pills.

  Multiple studies in adults have shown melatonin beneficial in treating COVID, but pediatric studies are lacking. However, a robust body of literature about the use of melatonin for sleep disorders in children with neurodevelopmental disorders, including ADHD and Autism Spectrum Disorder, shows safety and efficacy.[xxiii]

  A good starting dose for pediatric patients is 0.5 to 1 mg/kg/dose. Dosing should be flexible depending on how the child responds and whether they have side effects. Doses can be increased as follows: for infants (1 mg), older children (2.5–3 mg), adolescents (5 mg), and for children with special needs (0.5–10 mg) irrespective of age.[xxiv]

  The most common side effect is morning sleepiness. Other side effects reported in the package insert include headache, dizziness, and diarrhea.

Melatonin might be particularly indicated for children with autism since they often have disrupted melatonin production and may have lower baseline melatonin levels.[xxv xxvi xxvii xxviii xxix xxx]

Children with autism frequently have ongoing inflammation and high levels of oxidative stress,[xxxi] so the anti-inflammatory and antioxidant effects of melatonin may be particularly helpful in resolving COVID-19 symptoms.

- **Essential oils:** Used therapeutically since ancient times, essential oils have bioactivity as anti-bacterials, antivirals, and antioxidants. Essential oils possess antiviral activities without having any toxicity so consider trying lemongrass, peppermint, and eucalyptus. Essential oils can act as anti-bacterial agents against many pathogenic bacterial strains – thyme, oregano, and tea tree oil have demonstrated antibacterial properties. The essential oils of basil, cinnamon, clove, nutmeg, oregano, and thyme are natural sources of phenolic components that have proven antioxidant properties.[xxxii] Essential oils are diffused in the room or applied topically to the skin; they should not be ingested.

Therapeutic considerations for special circumstances

- **Hydroxychloroquine:**
  Hydroxychloroquine is used to prevent and treat malaria in pediatric patients over 31 kg (about 68 pounds). It is also used off-label for arthritis in children. However, there are safety concerns that lead us to conclude the risk-to-benefit profile is not favorable for using hydroxychloroquine as a first-line treatment for COVID-19 in children and adolescents.

  The mechanism of action is not fully understood.[xxxiii] The drug has a long half-life, which means it stays in the body for a long time and is widely distributed throughout the body.[xxxiv]

  Potential side effects include heart toxicity related to the prolongation of the QT interval. In simple terms, that means there is an extended interval between when the heart contracts and relaxes. Other medications that can also increase the QT interval must be avoided when hydroxychloroquine is used in children. In addition, potential side effects of hydroxychloroquine include retinal problems, severe skin rashes, blood changes, kidney toxicity, and psychiatric changes — including suicidal thinking, Hydroxychloroquine can also lower the seizure threshold, making some children more likely to have a seizure.[xxxv]

  Given the generally mild course of COVID in most children, we conclude that hydroxychloroquine would not be needed in most cases. Decisions to use hydroxychloroquine in selected high-risk individuals would involve informed consent discussions between the clinician and family.

- **Azithromycin:**
  Azithromycin is formally recommended for certain bacterial illnesses and has the advantage of indications down to the age of 1 month. Its value in the treatment of COVID-19 is related to its role as a zinc ionophore, which means it allows zinc to enter cells.

  In July 2020, there was a call for studies utilizing azithromycin at the first signs of COVID illness,[xxxvi] but there is little in the published literature about COVID and azithromycin and children.

  Most protocols that utilize azithromycin for pediatric patients use the standard dose of 10 mg/kg/day for 1 day, then 5 mg/kg/day for 4 days; maximum dose 1.5 gm total dose.[xxxvii]

- **Asthma medications:** Children with asthma are at higher risk of complications from COVID infection. When COVID is circulating, it is wise to make sure that your asthmatic child keeps taking any controller medications (such as inhaled steroids) and has refills of any rescue medications (like albuterol). If the child seems to be getting worse after the first 3-5 days of symptoms, consider giving prescription prednisone at a dose of 0.5 mg/pound (up to 60 mg) for 3-5 days.

- **N-acetyl cysteine (NAC):** This supplement helps promote detoxification and is classically used for acetaminophen poisoning. A dose of 300-600 mg orally twice a day for pediatric patients above age 5 is recommended, with the lower doses for younger children usually well tolerated.

- **Omega-3 essential fatty acids:** These are excellent anti-inflammatories. Food sources include salmon and other oily fish, nuts (when age-appropriate, as they are a choking hazard for toddlers), and avocado (an excellent first food for babies). The gel caps tend to be big, so children may do better with liquid or smoothie consistency options. Aim for 1 – 2 grams per day.

- **Mouthwashes and nasal sprays:** See details in the I-CARE: Early COVID treatment protocol. These have not been studied in children with SARS-CoV2 and some children are resistant to using them. Our best medical judgment is that their use can be helpful, and children can be coached or bribed into tolerating nasal sprays and mouthwashes.

Not routinely recommended

- Acetaminophen in repeated doses: this can cause suppression of glutathione, which is important for proper immune balance, good detoxification, regeneration of gut epithelium, mitochondrial function, and as the major intracellular antioxidant. Too much acetaminophen can cause liver damage. Avoid repeated doses over the course of several days.

- Antihistamines: these are no more effective than cherry syrup in relieving congestion and can cause drowsiness, paradoxical irritability, and agitation.

- Antibiotics early in the illness: these do not work for viruses; they are overprescribed and have potential side effects and adverse impacts on the gut microbiome.

- Decongestants: these are associated with increased heart rate and potential psychosis in pediatric patients.

- Cough suppressants: associated with sleepiness, and addiction, these can cause depression of the respiratory system. Honey by the teaspoon or stirred into herbal teas can be helpful for coughs. Honey should not be given to babies under 1 year old, due to the risk of botulism.

- Aspirin for fever: this is associated with potential Reye's syndrome, a rare but serious condition that most often affects children aged 6-12 years old with viral infections. Aspirin use has been correlated with swelling of the liver and brain and altered neurologic status that characterizes Reyes, so we do not recommend it for routine fever control. However, in cases of blood clotting and hyperinflammation after the initial viral load phase, baby aspirin once or twice a day can be very helpful.

In an age when the media covers current and predicted pandemics so frequently, parents can become very worried about their children's health and well-being. Attention to the cornerstones of a healthy lifestyle, including nutrient-dense whole foods, regular exercise, good sleep and nurturing relationships will make your child more resilient to infections.

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[i] https://www.nature.com/articles/d41586-021-01897-w
[ii] https://covid.cdc.gov/covid-data-tracker/#pediatric-seroprevalence
[iii] https://jamanetwork.com/journals/jama/fullarticle/2766522
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