Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

several studies. This fall in DLCO might be associated with parenchymal destruction, in which case the total lung capacity, FVC, and residual volume would also decrease. However, without more detailed reporting of the carbon monoxide transfer coefficient and alveolar volume—the two components that define the single-breath carbon monoxide diffusion test—it is difficult to dissect fully the pathological abnormality in the lung periphery in long COVID. An exploratory hyperpolarised ^{129}Xenon MRI study in patients approximately 6 months after acute COVID-19 infection showed striking reductions in the ratio of ^{129}Xe in red blood cells to tissue plasma, despite near-normal CT imaging and preserved lung function.[10] These observations further support the notion that damage to the alveolar–capillary interface might be a hallmark of the longer-term pathogenesis of COVID-19 lung disease.

How can we proceed to resolve pathological disease from symptoms alone following COVID-19 infection? Some health-care economies have established effective long COVID surveillance clinics. Given the apparent discordance between respiratory symptomatology and peripheral lung disease observed, it might be prudent to ensure that all patients presenting to these clinical services are offered detailed pulmonary function testing, including diffusion measurements. For those patients who are triage-positive in these tests, more detailed imaging and physiological testing could be done, such as inspiratory and expiratory CT scanning with quantitative radiological analysis, cardiopulmonary exercise testing, and ^{129}Xe MRI, to identify abnormal physiological host response or pulmonary vascular gas transport abnormalities due to COVID-19 pulmonary vasculopathy. These tests, coupled with deeper phenotyping, such as multi-omics using patient-derived samples, might provide insights into biological mechanisms for the long-term impact of COVID-19 on lung function and identify specific populations that warrant relevant therapeutic interventions.

Until that time, the studies exploring lung function after COVID-19 infection provide important clues—a whisper—from the quiet zone of the lung and indicate that a more precise understanding of the pathogenesis of organic lung disease after COVID-19 infection, focusing on the lung periphery, is warranted.

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COVID-19 vaccines: addressing hesitancy in young people with allergies

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According to the COVID-19 dashboard by Johns Hopkins University, as of July 30, 2021, there have been 196 910 814 cases of COVID-19, with more than 4·1 million deaths globally. Rollout of several COVID-19 vaccines provided hope towards mitigating disease burden, and, thus far, more than 3·9 billion vaccine doses

have been administered around the world. Any return to normalcy relies on high vaccine uptake. As noted by a recent piece in *The New England Journal of Medicine*, "we look to vaccines to give us back our world".[1]

On May 10, 2021, the US Food and Drug Administration expanded its emergency use authorisation for the Pfizer-BioNtech mRNA COVID-19 vaccine (BNT162b2) in adolescents aged 12–15 years.[2] This approval now demands increasing focus on achieving high immunisation rates within adolescent populations. Immunisation within these populations has the dual direct benefit of protecting children and adolescents against disease morbidity and mortality, and reducing spread among the clinically vulnerable.[1]

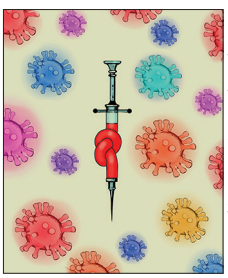
Despite evidence that COVID-19 vaccines are both safe and effective, there is increasing evidence of COVID-19 vaccine hesitancy among children and adolescents and their families.[2] A survey, done in the USA between April 15 and April 23, 2021, by the Centers for Disease Control and Prevention (CDC), found that only 55·5% of 1022 parents and guardians of unvaccinated adolescents aged 12–17 years would "definitely" or "probably" allow their child to receive a COVID-19 vaccine, and only 51·7% of 985 adolescents aged 13–17 years would "definitely" or "probably" receive a COVID-19 vaccine.[2] Among parents who expressed hesitancy, a commonly reported factor that would increase the likelihood of COVID-19 vaccine acceptance was more information about safety. In fact, for families of individuals with allergies, including those with asthma, one of the major concerns is fear of an allergic reaction to the vaccine.[3,4]

This concern is easy to address. It must be emphasised to children and adolescents and their families, including to those with allergic conditions such as asthma, that the risk of having an anaphylactic reaction to a COVID-19 vaccine is exceptionally rare. A systematic review and meta-analysis noted that the incidence of an allergic reaction to an mRNA-based COVID-19 vaccine is 7·91 cases per million doses (95% CI 4·02–15·59).[4] In a prospective study of health-care employees in Boston, MA, USA, COVID-19 mRNA vaccine anaphylaxis was confirmed in only 16 (0·025%, 95% CI 0·014–0·040) of 64 900 employees, who all completely recovered without any episodes of shock or intubation.[5] No fatalities from COVID-19 vaccine-related anaphylaxis have been reported to date, the allergic reactions resolve rapidly without long-term sequelae,[4] and revaccination after an initial reaction is well tolerated.[6] Clinicians must reiterate such messaging to families to mitigate vaccine hesitancy due to concerns over anaphylaxis.

Misinformation regarding vaccine safety (allergic or other related events) is rampant. The CDC survey on vaccine hesitancy found that federal, state, and local health officials and primary care health-care workers were the most trusted sources of COVID-19 vaccine information among families.[2] Clinicians have an essential role in discussing how and where families obtain information, in providing accurate information in the clinical encounter, and, when indicated, in directing people to reliable sources of online information.[7] As noted by the CDC, "efforts focusing on clearly communicating to the public the benefits and safety of COVID-19 vaccination for adolescents, particularly by health care professionals, could help increase confidence in adolescent COVID-19 vaccine and vaccination coverage".[2]

Certain groups of children and their families have expressed higher vaccine hesitancy rates; these groups are more likely to face other adverse social determinants of health.[2] The CDC survey found that there were significantly fewer parents reporting intent for their adolescent to receive a COVID-19 vaccine among respondents identifying as Hispanic or who had less than a bachelor's degree.[2] Similarly, other studies have found higher rates of vaccine hesitancy in minority ethnic populations.[3] Those facing adverse social determinants, including lower health literacy, and minority ethnic populations have been disproportionately impacted by COVID-19 morbidity and mortality.[8] Social determinants of health must be prioritised as part of pandemic research and policy implementation.[8] In addition, efforts to reduce vaccine hesitancy should focus on such groups.

Clinicians must approach vaccine hesitancy with respect and empathy regarding the pre-eminent fears on the minds of children and their families. Best practices to address COVID-19 vaccine hesitancy should build off past successful approaches to vaccine hesitancy. For example, through motivational interviewing techniques, clinicians can establish connection, demonstrate respect, support the autonomy of children and families, and create a space where meaningful conversations can occur.[9] Understanding the family's readiness to receive new information and exploring where families experience



Fanatic Studi/Gary Waters/Science Photo Library

For the **COVID-19 dashboard** see https://coronavirus.jhu.edu/map.html

uncertainty in their decision making creates opportunities for information exchange that can change health behaviour. Such an approach can help families to better understand the true risks and benefits of vaccination and "evoke a person's own argument for vaccination to decrease vaccine hesitancy".[9]

Moving forward, conveying the message that COVID-19 vaccines are safe and effective, and that potentially serious complications, such as allergic reactions, are very rare (and occur with minimal morbidity), might help to mitigate misinformation and alleviate concerns among children, adolescents, and their families, and particularly those with allergic conditions. Keeping an open mind by inviting and hearing the lived experience of children and families can help to facilitate conversations in which families can be provided with the information they need to help them make informed decisions. Change can happen slowly, but always begins with a first step.

EMA is an employee of the Public Health Agency of Canada, but the views expressed in this Comment are her own and not those of the Public Health Agency of Canada. MS is a member of the Joint Taskforce on Allergy Practice Parameters; has a family member who is the chief executive officer of Altrix Medical; and serves on the editorial boards of the *Journal of Food Allergy* and the *Annals of Allergy, Asthma & Immunology*. IS declares no competing interests. MG is an expert panel and coordinating committee member of Guidelines for Peanut Allergy Prevention sponsored by the National Institute of Allergy and Infectious Diseases; has served as a consultant for the Canadian Transportation Agency, Thermo Fisher, Intrommune, and Aimmune Therapeutics; is a member of physician or medical advisory boards for Aimmune Therapeutics, DBV Technologies, Sanofi/Genzyme, GlaxoSmithKline, Genentech, Nutricia, Pfizer, Novartis, Kaléo Pharmaceutical, Nestlé, US WorldMeds, Aquestive, Allergy Therapeutics, Allergenis, Aravax, Prota, and Monsanto; is a member of the scientific advisory council for the National Peanut Board; has received honorarium for lectures from Thermo Fisher, Aimmune Therapeutics, DBV Technologies, Before Brands, multiple state allergy societies, the American College of Allergy Asthma and Immunology, and the European Academy of Allergy and Clinical Immunology; is an associate editor for the *Annals of Allergy, Asthma & Immunology*; and is a member of the Joint Taskforce on Allergy Practice Parameters.

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Respiratory syncytial virus and asthma: untying the Gordian knot

Asthma is a highly heritable disease; however, host environmental factors also influence variable susceptibility to disease development. One environmental exposure and asthma risk factor that has been the focus of decades of study is respiratory syncytial virus (RSV). A study of the hospital records of 100 children (76% of whom were infants) with bronchiolitis in the late 1950s first established a strong association between severe infection early in life and asthma, setting the stage for the association of RSV with asthma over the past 60 years to focus exclusively on RSV infections that are severe.[1] Despite the consistency of this association since the late 1950s, there has remained a decades-old debate about whether RSV causes asthma, or whether the association represents a shared genetic predisposition, or both—a Gordian knot.

There are several reasons why researchers have not made more progress in understanding this association. First, nearly all studies of the RSV–asthma association have focused on the less than 20% of infants with RSV