

COVID-19 pandemic period, where are the seasonal viruses?

Jean Michel Mansuy¹, Maximin Bourcier¹, Pauline TREMEAUX², Chloé Dimeglio¹, and Jacques Izopet¹

¹University Hospital Centre Toulouse

²Centre Hospitalier Universitaire de Toulouse

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Jean-Michel Mansuy¹, Maximin Bourcier¹, Pauline Trémeaux^{1,*}, Chloé Dimeglio^{1,2}, Jacques Izopet^{1,2}

1 – Toulouse University Hospital, Virology department, Toulouse, France

2 - INFINITy; Toulouse Institute for Infectious and Inflammatory Diseases, INSERM UMR1291 / CNRS UMR5051 / Université Toulouse III, Toulouse, France

* corresponding author, Dr Pauline Trémeaux: Virology department, Toulouse University Hospital, 31059 Toulouse France. Phone +33 5 61 77 71 34; Fax + 33 5 61 77 22 45; e-mail: tremeaux.p@chu-toulouse.fr

Short running title: **seasonal viruses during COVID-19 outbreak**

The whole world has been struggling to cope with the SARS-CoV-2 pandemic since the beginning of 2020.

The measures initially used to combat the epidemic were non-pharmaceutical, such as physical distancing, mask wearing, tightened basic hygiene, quarantine and even curfews because no effective antiviral molecule had been identified and no specific vaccines yet developed. These measures were applied, accepted, and effective to varying degrees, depending on the country.

Their application did reduce the transmission of SARS-CoV-2 and decreased the virus reproductive number R_0 . However, the epidemic flared up from time to time and new waves of epidemic appeared, undoubtedly due to non-compliance and/or the partial lifting of containment measures such as curfews and movement restriction.

Such measures effectively control the transmission of other viral pathogens with or without respiratory tropism (1,2), as has been demonstrated in the Southern Hemisphere. Australia and New Zealand have had extremely low incidences of influenza since mid-April 2020 (3). But few data are available on the circulation of respiratory syncytial viruses (RSV) and rhinoviruses during the SARS-CoV-2 pandemic as the surveillance networks are more concerned with influenza.

Our university hospital has been monitoring these three types of virus for the past 10 years. We have found that RSVs are first detected at the beginning of winter, usually between weeks 40 and 43 (the second half of October) while influenza viruses appear later, from mid-December to early January. Unlike these viruses, rhinoviruses are endemic throughout the year and their prevalence in winter varies from 20 to 35% in our area depending on the year.

The circulation of flu, RSV and rhinoviruses during the first winter in which SARS-CoV-2 was controlled using only non-pharmaceutical methods was quite special. The effectiveness of these measures seems to depend on the prior circulation of the particular virus.

The measures were effective for influenza viruses and RSV, whose circulation is only epidemic (i.e. not detected prior to winter). They were not detected even in children under 6 years old, who are currently exempt from wearing a mask and continue to go to school in France. In contrast, the response of rhinoviruses, which circulate all year round, was quite different. Their prevalence was stable, and the figures were the same as in previous years. However, the patients who tested positive for rhinoviruses were younger than those identified during past winters. The ages of those patients infected during the winter 2020/2021 (median: 1.21, IQR [0.17;4.28]) differed significantly from those of patients infected during the two previous winters (2018/2019 and 2019/2020; median: 1.82, IQR [0.24;60.25], $p=0.01$ by Wilcoxon).

The reasons for these differences in prevalence are difficult to pinpoint and probably multifactorial, each of varying importance. Virus tropism could be determinant, with flu and RSV preferentially targeting the lower respiratory tract and rhinoviruses propagating in the upper tract. The longer infectious period of rhinoviruses could be partially responsible for them being more infectious than RSV despite the fact that their R_0 was lower than that of RSV (4). We believe that the differing responses of viral epidemic episodes to non-pharmaceutical control measures should be known and fully understood in order to design defenses against future viral epidemics.

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