

# Oxford Study Shows That SARS-CoV-2 Antibodies Decreases And Losses Effectiveness Pending Factors Such As Age, Symptoms And Ethnicity

**SARS-CoV-2 Antibodies:** A study by scientists from the University of Oxford involving UK healthcare workers shows how antibody responses to SARS-CoV-2 infection can wane over time, depending on age, previous symptoms and ethnicity.



SARS-CoV-2 IgG antibody measurements can be used to estimate the proportion of a population exposed or infected and may be informative about the risk of future infection. Previous estimates of the duration of antibody responses vary.

The study team presented 6 months of data from a longitudinal seroprevalence study of 3217 UK healthcare workers (HCWs). Serial measurements of IgG antibodies to SARS-CoV-2 nucleocapsid were obtained. Bayesian mixed linear models were used to investigate antibody waning and associations with age, gender, ethnicity, previous symptoms and PCR results.

The study findings in this cohort of working age HCWs showed that antibody levels rose to a peak at 24 (95% credibility interval, CrI 19-31) days post-first positive PCR test, before beginning to fall. Considering 452 IgG seropositive HCWs over a median of 121 days (maximum 171 days) from their maximum positive IgG titre, the mean estimated antibody half-life was 85 (95%CrI, 81-90) days. The estimated mean time to loss of a positive antibody result was 137 (95%CrI 127-148) days.

The team observed variation between individuals; higher maximum observed IgG titres were associated with longer estimated antibody half-lives. Increasing age, Asian ethnicity and prior self-reported symptoms were independently associated with higher maximum antibody levels, and increasing age and a positive PCR test undertaken for symptoms with longer antibody half-lives.

IgG antibody levels to SARS-CoV-2 nucleocapsid wane within months, and faster in younger adults and those without symptoms. Ongoing longitudinal studies are required to track the long-term duration of antibody levels and their association with immunity to SARS-CoV-2 reinfection.

The study findings showed that serially measured SARS-CoV-2 anti-nucleocapsid IgG titres from 452 seropositive healthcare workers demonstrate levels fall by half in 85 days. From a peak result, detectable antibodies last a mean 137 days. Levels fall faster in younger adults and following asymptomatic infection.

The study findings were published on a preprint server and are currently being peer reviewed. <https://www.medrxiv.org/content/10.1101/2020.11.02.20224824v1>

The study team's longitudinal seroprevalence study of more than 3,200 healthcare workers found that immunoglobulin G (IgG) antibodies against the SARS-CoV-2 nucleocapsid protein waned within months, falling more quickly among young people and asymptomatic

The team also observed higher antibody titers and moderate evidence of longer antibody half-lives among Asian healthcare workers, compared with White healthcare workers.

Dr Sheila Lumley from the Oxford University Hospitals NHS Foundation Trust, Oxford, UK told Thailand Medical News, “Relatively short-term antibody responses have two epidemiological consequences: Firstly, seroprevalence testing could miss previous infections, particularly among younger people who had an asymptomatic or mild infection. Secondly, testing may be unable to determine whether SARS-CoV-2 has circulated historically, within a particular geographic region, for example.”

She added, “Antibody dynamics have significant implications for the course and management of pandemic. Ongoing longitudinal studies are required to determine the long-term kinetics of antibody-mediated response to SARS-CoV-2, and responses to re-exposure.”

Numerous previous estimates of antibody duration vary. Antibodies against SARS-CoV-2, which are generally detectable within 1 to 3 weeks, can be assayed to help estimate the proportion of a population that has been exposed to or infected with the virus.

Such serological responses can also provide some information about the risk and severity of future infection.

Dr Lumley added, “Most epidemiological outbreak models assume that SARS-CoV-2 infection leads to the development of post-infection immunity for a defined duration.”

But it must be noted that measurable IgG antibodies against SARS-CoV-2 antigens do not always develop following infection, and previous estimates of the duration of antibody responses vary.

The team presented findings from a longitudinal seroprevalence study of 3,217 UK healthcare workers who underwent quantitative serial measurements of IgG antibodies against SARS-CoV-2 nucleocapsid protein.

PCR or Polymerase chain reaction testing and antibody testing were offered to both symptomatic workers (from March 27th onwards) and asymptomatic workers (from April 23rd onwards) by the Oxford University Hospitals NHS Foundation Trust across all four of its teaching hospitals in Oxfordshire, UK.

Dr Lumley said, “39% of HCWs [healthcare workers] were asymptomatic throughout, and therefore our data also represent an important contribution to the literature, which to date has mainly focused on trajectories following symptomatic infection.”

Subsequently a Bayesian statistical model was used to investigate the trajectory of SARS-CoV-2 IgG antibody levels and any association with age, ethnicity, previous symptoms and gender.

The study showed that among this cohort of working-age healthcare workers (up to 69 years), antibody levels peaked 24 days following the first positive PCR test, before then beginning to fall.

Dr Lumley added, “By following quantitative antibody responses, we could separately analyze changes in initial antibody levels and rates of waning.”

Interestingly among 452 IgG-seropositive healthcare workers tested over a median of 121 days, the estimated mean antibody half-life was 85 days and the estimated mean time until loss of seropositivity was 137 days.

Also higher maximum IgG levels were correlated with longer estimated IgG half-lives (a slower fall in IgG over time).

The study team reported that older age was associated with higher maximum IgG titers and longer IgG half-lives.

Dr Lumley said, “This study highlights that sero-epidemiological surveys performed several months into this pandemic are likely to underestimate prior exposure in younger adults, as they tend to lose detectable antibody faster.”

Interestingly healthcare workers of Asian ethnicity had higher maximum antibody levels, compared with their White counterparts, along with marginal evidence for longer antibody half-lives.

Also prior self-reported symptoms were associated with a higher maximum antibody level, but not with changes in antibody half-lives.

No associations were observed between gender and maximum antibody levels or half-lives.

Dr Lumley commented, “We demonstrate that the half-life of SARS-CoV-2 anti-nucleocapsid IgG antibody responses in a cohort of adult HCWs [healthcare workers] is 85 days and varies between individuals by age, ethnicity and prior symptom history. The extent and duration of immunity to SARS-CoV-2 infection following COVID-19 and its association with antibody titers remains a key question to be answered.”

The study team points out that the durability of immunity following infection or vaccination will dictate the overall course of the current COVID-19 pandemic.

The study team concluded, “Longitudinal cohorts with baseline immunology are required to determine immune correlates of protection, to determine whether measurement of the current antibody status is enough to infer whether an individual have functional immunity or not, whether waning IgG titers are representative of waning immune protection, or whether protection remains even after an individual seroreverts.”

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