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The scary R-word: Should we worry about reinfection?

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Recently, the first documented case of reinfection with SARS-CoV-2 has apparently surfaced in Hong Kong. A day later, Belgium and the Netherlands also reported a reinfection each. Is it time to worry about acquired immunity and vaccine efficacy? There are three scenarios how this might turn out.

Scenario 1: Bad Tests – No Worries

Even the most advanced PCR test used to diagnose Covid-19 are far from perfect with a [false positive rate of 0.08%](#). With 1 in 125 tests producing a false positive it is not hard to imagine a scenario where someone is declared reinfected when in fact the person either didn't have Covid-19 yet or/and doesn't have it now. Even with two tests, the odds still allow for 1 double false positive in 15 000 cases.

The odds for a triple false positive are 1 to 2 million. With millions infected across the globe, false positive rates sometimes reported as high as 4% and no way of going back to verify a supposed primary infection it is rather surprising we have not seen more "reinfections" sooner.

Scenario 2: No Absolutes in Real Life – No Worries

The real world is messy and does not work in absolutes. Just like there will probably never exist a 100% effective vaccine, it is unreasonable to assume that with millions of infected people there won't be a small percentage of people, who, due to a combination of hitherto unknown environmental factors, comorbidities and plain bad luck, will not develop immunity to SARS-CoV-2.

Even with measles, a disease that is known to elicit life-long immunity after infection or vaccination, there exist rare reported cases of reinfection (recent papers in [Clinical and Vaccine Immunology](#) and [NEJM](#)).

Scenario 3: Short Immunity – Some Worries

Leaving aside the catastrophic scenario of enhanced reinfection, as seen in Dengue fever, for which we have no evidence, the worst case would suggest that immunity against SARS-CoV-2 is short-lived (6-12 months).

This does not automatically mean that vaccines won't be able to elicit longer lasting immunity. Unlike the flu, SARS-CoV-2 appears to not mutate much and the probable reason why immunity might be short lived is that the body does not maintain the relevant antibodies.

This implies that a larger dose of the vaccine or annual booster shots of the same vaccine might be enough to do the trick. In that case, combatting the pandemic becomes a logistical problem rather than a medical problem. In the case of booster vaccines, global vaccine production capabilities would need to be expanded considerably to vaccinate 6-7 billion people annually.

In summary, unless we see a massive surge of hundreds of reported reinfection cases, there is no reason to believe that the three cases known thus far are anything more than outliers. An end to the pandemic and a solid economic recovery in the medium term are still the most likely scenario.

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