

“If you want to avoid contracting the disease, imagine that you are infected and that you will do everything in your power to avoid transmitting it to others.”

Nobel Laureate Prof. Peter Doherty

*Prof. Peter Charles Doherty is a Nobel Prize winning immunologist. He was jointly awarded the 1996 Nobel Prize for Physiology or Medicine for his pioneering work on how the immune system recognizes virus-infected cells. Their discovery laid the foundation for an understanding of the general mechanisms used by the cellular immune system to recognize both foreign microorganisms and self molecules. In an e-mail interview to **Science Reporter**, Prof. Doherty talks about the immune system and SARS-CoV-2 virus pandemic.*



Meher Wan: *Prof. Doherty, thank you very much for talking to Science Reporter. It is indeed a privilege. Let me begin with asking you a question in the context of the current coronavirus pandemic. How do we keep our immune system healthy during a pandemic of this kind?*

Prof. Peter Doherty: Eat a healthy and balanced diet. There are some suggestions that taking extra vitamin D3 may be helpful, but I know of no scientific evidence specific to COVID-19. Social groups that are known to be Vitamin D deficient do seem to be particularly vulnerable, but there may be other reasons for that, or “confounding variables” as science would have it.

MW: *Different strains of SARS-COV-2 are being detected at different places among different races. Will vaccines developed for one strain be effective in the case of other strains as well?*

Prof. Peter Doherty: We don’t know of any evidence that there are different SARS-CoV-2 strains. The virus has a proof-reading mechanism (unlike influenza) and while there are minor mutations that can allow virus lineages to be tracked, we think that globally it’s essentially the same virus everywhere across the planet.

MW: *How long would a vaccine be effective as the virus mutates with time?*

Prof. Peter Doherty: First, we have to make a vaccine. Modern molecular science is incredible, and my understanding is that there are already in excess of 70 candidates in some form of pre-clinical (animal) testing, and at least one has already been injected into people. I doubt that mutation will be a major problem with SARS-CoV-2 but, as these vaccines mostly use one or the other “platform” technology where you can just “slot-in” a slightly different gene sequence, changing a successful vaccine will not be a big deal.

MW: *Data seems to suggest that SARS-CoV-2 hits men harder than women. Your comments.*

Prof. Peter Doherty: Seems to be true in some communities. Men smoke more than women do, and smoking is a major risk factor as it upregulates the ACE-2 receptor that the SARS-CoV-2 virus uses to get into cells. In general, there’s an impression that women have stronger immune systems into advanced age, but as a consequence may also have more issues with autoimmune disease than men. So far as I know, that’s not strongly based in “hard science”. There are also behavioural issues, e.g. “toughing it out” and not seeing a doctor, that put men at greater risk in many medical situations.

MW: *What is the possibility of anti-inflammatory drugs being effective in treating SARS-CoV-19?*

Prof. Peter Doherty: So far as I know, the medical advice is to avoid Ibuprofen and other non-steroidal anti-inflammatory drugs, though Panadol is evidently fine. In severe, late stage disease, we think there may be a “cytokine storm” issue, and there are promising indications that some people are being saved by blocking the pro-inflammatory cytokine IL-6. Serious, properly controlled drug trials are currently in progress. The problem though is that while these IL-6-blocking monoclonal antibodies (mAbs) are used to treat Rheumatoid arthritis patients, they are expensive to produce and in very short supply.

MW: *Do antibody tests for SARS-CoV-2 tell us anything about our immunity?*

Prof. Peter Doherty: The neutralizing antibody (NA) test is solid, but it needs a “needle” serum sample and is labour and time consuming. So far as I know, when people have been sampled sequentially through the disease, the NA response is as expected. What we need for the mass serological surveys that will tell us about background infection rates is a rapid “blood pin prick” (BPP) test that gives the same answer as the NA assay. Many such commercially produced BPP products are currently being evaluated, some look to be useless, while others are promising. Once we get to have a trustworthy mass screening assay, testing tens of thousands of people will tell us what the true incidence of this disease is in the broader community. These results will be enormously important.

MW: *How effective will an antibody-based therapy be for SARS-COV-2?*

Prof. Peter Doherty: I understand there have been some promising results with convalescent serum, and that proper trials are in progress. Many people are producing SARS-CoV-2 specific mAbs for both treatment and prophylaxis, but these will have to go through pre-clinical (likely in macaque monkeys) testing for safety and efficacy, then human trials, likely via “experimental” treatment protocols following informed consent.

MW: *What is the possibility of an anti-viral drug in the near future?*

Prof. Peter Doherty: “Repurposed” drugs like Remdesivir and hydroxychloroquine (HQ) are currently in trial, so we’re waiting for those results, though my understanding is that HQ is not as useful as some had claimed. SARS-CoV-2 specific drugs are being aggressively sought by both screening chemical libraries and by rational drug design. This could move much faster than vaccine development. Testing a drug for safety and efficacy is generally easier than vaccine evaluation.

We could have decent drugs that might be used for both treatment and prevention (like HIV PrEP) before we have

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a vaccine, but that’s just a guess. The best hope is that we can have available at least two drugs that are cheap and easy to produce in mass quantities and can be used together (to prevent the emergence of escape mutants) to stop people dying from this disease.

MW: *What is the scope of herd immunity for this virus?*

Prof. Peter Doherty: Good antibody surveys will tell us a lot. Current thinking is that we will need about 70% of people to have been infected and be immune before we see herd immunity cause a massive turn-down in case incidence. The analysis will be confounded by the effects of social distancing rules, but keep a close watch on northern Italy, Spain, New York (USA), London (England) and Germany.

MW: *What will the antibiotics scenario be after the SARS-CoV-2 pandemic?*

Prof. Peter Doherty: Haven’t thought about it, but don’t see why it would be any different from now. Unlike the situation for influenza, secondary bacterial pneumonia does not seem to be a major issue for COVID-19.

MW: *What is the overall effect on the human immune system after one’s recovery from SARS-CoV-2 infection?*

Prof. Peter Doherty: Hopefully, we’ll be immune to SARS-CoV-2. Otherwise, intensive studies of the virus-specific host response are in progress, but it’s too soon to say anything about the more general effects.

MW: *How should a country like India prepare itself for a long fight against a SARS-CoV-2 like pandemic?*

Prof. Peter Doherty: What works best is social distancing and genuine concern for all, especially for those who are in vulnerable situations. If you want to avoid contracting the disease, imagine that you are infected and that you will do everything in your power to avoid transmitting it to others. Until we have an effective vaccine and/or drugs, it’s up to each and every one of us. Otherwise, I’m not a policy person and won’t comment on those issues.

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