

April 30, 2020

Oklahoma Academy of Science Experts Discuss COVID-19 in Oklahoma

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President of the Oklahoma Academy of Science

During the COVID-19 Global Pandemic, many citizens of Oklahoma have questions about the virus that is responsible for the disease. In this interview, two Oklahoma experts are asked questions about COVID-19 and the underlying virus, SARS-CoV-2. As a collection of scientists, the Oklahoma Academy of Science (OAS) is a tremendous resource for the State of Oklahoma. The experts are members of OAS:

- Earl Blewett, Ph.D., Associate Professor of Microbiology, Oklahoma State University Center for Health Sciences, Chair of the Biomedical Sciences Section of OAS
- Robert Brennan, Jr., Ph.D., Professor and Chair of the Biology Department, University of Central Oklahoma, Member of the Microbiology, Biomedical Sciences, and Environmental Sciences Sections of OAS

Interviewees were asked the same questions. The collection of their responses will increase understanding of the basics of COVID-19 and SARS-CoV-2.

Earl Blewett, Ph.D., Associate Professor of Microbiology, Oklahoma State University Center for Health Sciences, Chair of the Biomedical Sciences Section of OAS

1. What is your area of research?

For many years I worked with herpesviruses, especially viruses of non-human primates. In recent years I have worked with enteroviruses and began focusing more on respiratory viruses last year. I'm working with coronavirus right now.

2. What is a virus?

A virus is an agent, with an RNA or DNA genome, that needs to replicate inside a host cell. The virus encodes its own proteins but relies on the host cell for energy and protein production. Since viruses cannot produce energy or respond to stimuli, some consider them not to be "alive".

3. How long can a virus live on different types of surfaces?

It depends if the virus is enveloped (surround by a lipid layer derived from host cell membranes and studded with viral glycoproteins) or if is naked (covered by a protein shell). The envelope is essential for virus infectivity and can be dried out, removed by soap or solvents. So naked viruses can remain infectious on surfaces much longer than enveloped viruses. Rotavirus, a naked virus, can survive weeks or months in the environment. HIV, an enveloped virus, will only remain infectious for a few hours on a benchtop.

4. How common is it for viruses to be transmitted to humans?

It is estimated there about 5 new animal viruses jump to humans each year. Most don't spread or do much damage. Zoonotic viruses are animal viruses that infect humans. There are lots of them. Rabies is a good example. Another is Influenza A, which is a bird virus originally and circulates all over the world each year.

5. Are there different types of coronaviruses?

Yes. In humans there are four common CoVs that cause the common cold and more sever lower respiratory tract symptoms. These HCoVs grow most efficiently at 33-35 C. There are also three zoonotic CoV in humans, SARS-CoV, MERS and the new SARS-CoV-2. These zoonotic viruses all replicate efficiently at 37 C, a characteristic that adds to their pathogenic potential.

6. How is COVID-19 different?

COVID-19 is a disease, not a virus. Think about HIV and AIDS. HIV is the virus and it can cause a disease called AIDS (acquired immunodeficiency syndrome). SARS-CoV-2 is the virus and it can cause a disease called COVID-19 (coronavirus infectious disease 2019). The COVID-19 naming was done by the WHO (World Health Organization) without input from coronavirologists and it's confusing. SARS-CoV-2 is a typical bat coronavirus. There are viruses from bats that are 96% identical. It does have two new features in the spike protein, a viral glycoprotein found on the outside of the virus that is essential for attachment to host cells and penetration. The spike protein has a receptor binding site for ACE2, a receptor found on human cells and it has a furin protein cleavage site. The spike needs to be cleaved to be functional in penetration. So this additional cleavage site might allow better replication in the upper respiratory and therefore better spread.

7. Who is at risk for complications from COVID-19?

Anyone whose immune system doesn't function well. So the risk of complications rise with age, as the immune system declines. There's probably other comorbidities involved. Other factors are anyone with pre-existing respiratory problems, like asthmatic. People with cardiac problems and diabetics are also at higher risk. If you are immunosuppressed, by medication or cancer treatment you are also at higher risk.

8. How can people avoid COVID-19?

Avoid getting the SARS-CoV-2 virus by practicing social distancing and good hygiene. Wash your hands!

9. Will the Oklahoma summer make any difference for the virus?

Hopefully the change in temperature and relative humidity will reduce spread of the virus. Temperature and humidity affect droplet survival in the air and on surfaces. Since the virus is transmitted that way, there may be reduced transmission.

10. What is the most important thing that you would like to communicate to citizens in Oklahoma about COVID-19?

You are wearing masks, distancing yourself from others and practicing good hygiene to protect yourself but also to protect all the people that are at high risk, such as grandparents. We're all in this together.

Robert Brennan, Jr., Ph.D., Professor and Chair of the Biology Department, University of Central Oklahoma, Member of the Microbiology, Biomedical Sciences, and Environmental Sciences of OAS

- 1. What is your area of research?** I am a microbiologist who focuses on infectious disease. I have spent more than 20 years in the area of infectious disease research involving projects including host/pathogen interactions, infection prevention, vaccine development, and diagnostics.
- 2. What is a virus?** Viruses are acellular obligate intracellular parasites (meaning they can't replicate on their own. They must be inside of a host cell). They are composed of either DNA or RNA and protein coat. Some, such as SARS CoV-2, are surrounded by a lipid membrane (enveloped). There are viruses that infect people, animals, bacteria, and plants.
- 3. How long can a virus live on different types of surfaces?** The viability of a given virus on a surface depends on many factors (type of surface, concentration of viral particles, environmental conditions such as moisture, heat, sunlight). In general enveloped viruses, such as SARS CoV-2, are less stable in the environment than are non-enveloped viruses, such as norovirus. I believe there have been some reports of this virus (SARS CoV-2) remaining viable on cardboard surfaces for up to 24 hours and on plastic surfaces for up to 72 hours.
- 4. How common is it for viruses to be transmitted to humans?** Very common. There are a number of viruses that have human to human transmission. For example, measles, mumps, rubella, Herpes, chicken pox, EBV (cause of mono) are all transmitted via the respiratory route. If you are asking about transmitted from animals to human (zoonotic transmission), there are several examples of that as well. Ebola, Marburg, West Nile, Rabies, Monkeypox, Avian influenza. Fortunately, to date, cases of these infections in humans are not a frequent occurrence, in part because they are not as easily transmitted to humans or within people as viruses such as the measles or influenza.
- 5. Are there different types of coronaviruses?** There are a number of different coronaviruses, which are subdivided into 4 groups. Some have been shown to only infect mammals, while others tend to target birds. Most of the coronaviruses that infect people generally result in mild upper respiratory tract illness (colds), but there are now 3 (SARS-CoV, MERS-CoV, and SARS-CoV2) that cause severe respiratory illness in people.
- 6. How is COVID-19 different?** I do want to make clear that the virus is SARS-CoV-2 and the disease is COVID-19, like HIV is the virus and AIDS is the disease. With regard to the virus, at this point in time there is still a great deal to learn as to how SARS-CoV-2 is different from other

April 30, 2020

coronaviruses, particularly SARS-CoV and MERS-CoV, but it does appear that it differs in its ease of transmission (asymptomatic transmission) and host cell susceptibility.

- 7. Who is at risk for complications from COVID-19?** In general, people with weakened immune systems and other underlying or preexisting conditions (heart disease, lung disease, diabetes, elderly). Other factors as yet to be identified may also play a role.
- 8. How can people avoid COVID-19?** Stay at home as much as possible and venture out for essentials only. Maintain social distancing guidelines when out in public. I would suggest that the 6 feet is a minimum and can keep a larger personal space bubble when possible. Keep gatherings to a minimum (≤ 10). Wash hands with soap and water after touching high contact surfaces. Carry alcohol-based hand sanitizer to use when soap and water are not readily available. Soap and water is preferred because the efficacy of alcohol-based hand sanitizers can be reduced if other materials such as mucus, dirt, grease, oil, are present on the hands. I would also recommend the wearing of masks over the mouth and nose to reduce asymptomatic spreading. This is a measure that protects people from you rather than necessarily protecting the person wearing the mask. Clean high contact surfaces with disinfectants such as Lysol, chlorox, and bleach. As a rule of thumb any chemical listed as a disinfectant, by definition, can't be used on or in the body. Disinfectants are not to be used on living tissue, period.
- 9. Will the Oklahoma summer make any difference for the virus?** Other established viruses such as ones that cause the common cold and even influenza, do demonstrate some seasonality, in which the numbers of cases do decrease significantly during the warmer summer months. A number of factors play a role in this phenomenon, such as environmental conditions (in the summer it is warmer and more humid, which has been shown to be detrimental to these other viruses). Human behavior (we tend to be outside more and less confined to indoor spaces with reduced ventilation). Also, by the time summer rolls around, there are fewer susceptible people in the population. With all of this being said, it would be very speculative to expect that this SARS-CoV-2 virus will follow the same pattern, since this is a completely new virus and we have such a large susceptible population.
- 10. What is the most important thing that you would like to communicate to citizens in Oklahoma about COVID-19?** As social distancing guidelines are relaxed, don't let your guard down. I would urge people to continue to over practice hand hygiene and personal space, at least until we get broader availability of reliable and rapid diagnostic testing. We can all do our part to help protect the more vulnerable people in the population, because if we all look at our circles of family, friends, and colleagues, there is likely someone we know who has an elevated risk of complications from this disease. That is the Oklahoma Way.

OAS has promoted science to the citizens of Oklahoma since its founding in 1909. The mission of OAS is to stimulate scientific research through encouragement of fraternal relationships and the sharing of ideas among Oklahomans working in the sciences. OAS fosters knowledge through meetings and science related publications for all Oklahomans interested in the sciences. OAS also promotes the scope and relevance of science to state citizens through the investigation and publication of natural, educational and other resources of the state. OAS counsels governmental and educational agencies on the advancement of state science programs and enlists participation by the private sector in scientific

April 30, 2020

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