

Pathogens never rest

By Kevin McCracken

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Over the past couple of weeks we have had two close-to-home reminders of the constant threat of pathogenic microorganisms to human health – a reported spike in malaria cases in some of our Pacific Island and South-east Asia neighbours and a confirmed polio case in Papua New Guinea (the first in 18 years).

Similar stories are found in many other parts of the world. While the Ebola epidemic in the Democratic Republic of the Congo has dominated global media attention it has been by no means the only worrying infectious disease outbreak.

Earlier in the year polio for example, as in PNG, reappeared in Venezuela, the first outbreak of the disease in South America in over a quarter of a century. Measles has also reappeared there and subsequently spread to several neighbouring countries. Brazil meanwhile has had its worst yellow fever epidemic in seven decades (this follows on major yellow fever crises in Angola, DR Congo and Uganda in 2016-17).

Other infectious disease outbreaks that have challenged global health practitioners over the past 12 months include: plague (Madagascar); Nipah virus (southern India); MERS-CoV (Saudi Arabia); and cholera in several African states (e.g. Yemen, Somalia, Mozambique, DR Congo, Nigeria, etc). The cholera outbreak in Yemen started in 2016 and is now rated by the United Nations as the largest documented epidemic of that disease in modern times.

A few years earlier were the challenging high mortality West African Ebola epidemic (2013-16) and Zika virus infection (2013-present). In turn, a few years earlier again were, amongst other things, SARS (2003), swine flu (2009 – H1N1) and periodic avian influenza (H5N1 and H7N9) visitations.

Looming ahead meanwhile is the spectre of a near inevitable future global (flu?) pandemic.

Alongside these episodic outbreaks there are the numerous long on-going infectious disease burdens – e.g. HIV/AIDS, tuberculosis, malaria, hepatitis, dengue. A complacency has developed in some circles around these diseases, but in all of them the global battle is far from won.

For example, HIV/AIDS, which many in western countries now see as a disappearing threat is far from that. Russia for instance had over 100,000 new HIV-positive people identified in 2017.

Nigeria is another with alarming new HIV infection levels. Meanwhile, UNAIDS statistics show AIDS-related mortality has worryingly increased over the past decade in the Middle East and North Africa and eastern Europe and central Asia.

The ultimate cause of each of these diseases is microbial, that is, without the relevant pathogen (e.g. bacterium, virus, protozoan, fungi) entering the human body a person will not contract the disease. However, human factors play critical roles in all infectious outbreaks and are central to infectious disease eradication and prevention efforts.

One of the most recent unfortunate illustrations of this is the Yemen cholera outbreak mentioned above, the country's violent civil war having largely driven the epidemic through widespread destruction of electricity and sanitation facilities and resultant compromising of safe drinking water and food supplies.

Without the conflict, cholera in Yemen would not have exploded in the manner it did (i.e. to over 1 million cases) and those contracting the disease could have been more easily and better treated.

Poverty is another central human factor, operating in a variety of infectious disease-inducing ways. At the national level poverty restricts the resources that can be invested in building strong national and regional health systems. At the individual and household level meanwhile, poverty forces people into unhealthy living and working environments.

Cultural factors, as the West African and DR Congo Ebola epidemics have shown, are similarly important – for example, in the transmission dangers posed by traditional burial practices involving physical contact with the deceased.

Societal gender-based roles are also important contributors, for instance in the pressure on women and girls in many developing countries to take on risky sex worker activities, exposing themselves to a variety of sex-related infections.

Cultural reluctance to accept vaccination measures is another case. Polio eradication measures for instance have been impeded in Pakistan, Nigeria and a number of other countries in the belief by some elements that the vaccine is a western world, anti-Muslim plot.

Opposition to important childhood protective vaccines (e.g. MMR) also rears its dangerous head locally in some groups and communities within developed countries, Australia included.

Vaccine and microbicide developments and gene editing technology all offer tremendous promise in the future prevention and treatment of human infections and tend to get the most press. The successful use of an experimental vaccine (rVSV-ZEBOV) in curtailing this year's DR Congo Ebola outbreak is a good example of this promise being realised.

Efforts to speed up the development of epidemic-prone infectious disease vaccines is an important part of this work. This need was one of the lessons learnt from the West African Ebola epidemic and work on this is being pursued on various fronts. An umbrella for a lot of this activity is the 2016 founded global "public-private" Coalition for Epidemic Preparedness Innovations (CEPI).

Important as these technological developments are however, it is vital not to overlook the importance of human "causes" in facilitating infectious disease outbreaks. Success in reducing the global burden of infectious disease will require integrated work on both fronts.

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