Infectious diseases in a globalised world

Kevin Ariën wrote a blog on the occasion of the 90th anniversary of the Research Foundation - Flanders (FWO).

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Dit is de omschrijving

Professors Kevin AriÃ«n and Johan van Griensven are constantly seeking new solutions for tropical infectious diseases such as Ebola, dengue, HIV and leishmaniasis. On 14 December they will share their views at the 90th anniversary of the Research Foundation - Flanders (FWO).

Outbreaks of infectious diseases have taken place throughout history. The deadly pandemic known as the Spanish flu hit just a century ago, in 1918. With an estimated death toll of between 50 and 100 million people, it is the largest flu epidemic in recent collective memory, but ancient writings also speak of epidemics of infectious diseases like yellow fever, typhoid fever and malaria.

Today's socio-economic conditions have drastically changed compared with those from 1918. The global population is many times larger, and people are fleeing rural areas and living in closer proximity to each other in cities. Feeding all those mouths is taking an increasing toll on our environment. We are disrupting natural biotopes where animals and pathogens live together. Agriculture is taking over their natural habitats. And this results in enhanced exposure to new pathogens. We move around at a pace that would have been totally unthinkable in the past – even just a few decades ago. There are 60 commercial flights per day between the United States and China alone, transporting at least 30,000 people. Just think of the potential consequences when a traveller from China gets on one of these flights with a new variant of the flu virus.

Medicine is also advancing at a breakneck pace, and yet we are insufficiently armed against viruses and resistant microorganisms. Our detection methods have improved – in 1918 it wasn't even known that the Spanish flu was caused by a virus. Recent developments in rapid diagnostic methods that can be used in proximity to the patient and genome analysis are extremely important. Success or failure in detecting and controlling an epidemic depends on good detection methods. We have tests available for known viruses such as the flu, SARS and MERS, Ebola, HIV, Zika and dengue – to name just a few – but of course this does not apply to new viruses that are appearing in humans for the first time.

Although these days we can quickly identify disease causative agents with genome-sequencing techniques, it can take several months before symptoms are recognised or associated with a possible new pathogen. That was the case with Zika, which circulated unnoticed in South America for more than a year before it was clinically recognised. The Ebola virus wandered around West Africa (late 2013, early 2014) for several months before being recognised, and grew into the largest-ever Ebola epidemic. This stresses the importance of adequate monitoring for outbreaks in hotspots.

The Ebola outbreak in West Africa has motivated a large number of diagnostic and pharma companies as well as national and international organisations to develop new diagnostic tests, therapies and vaccines. The American Food and Drug Administration (FDA) and the World Health Organization (WHO) have launched special programmes to use diagnostic tests under the exceptional conditions of an international emergency. Today, two years and three Ebola outbreaks later, only a limited number of the tests developed at the time remain available for an outbreak response.

This is largely the result of a problematic economic model. Businesses specialised in diagnostics weigh a limited sales market, consequently limited volumes and the necessary low sale price of a test (given the special need in countries with low and mid-low incomes) against the high costs of development, production and introduction to the market of tests for conditions whose incidence is difficult to predict. During an epidemic, testing is made available mostly through donor-based financing of governments, NGOs and philanthropies, but testing is much more scarcely available – if at all – at other times for monitoring purposes. A radical, new economic model is needed to more pertinently ensure the availability of diagnostic tests for these

conditions.

In recent years researchers at the Institute of Tropical Medicine in Antwerp have worked intensively at developing new diagnostic tests for tropical fevers, including haemorrhagic fevers like Ebola, Marburg, Lassa, yellow fever, Rift Valley fever, and others. The principle is based on a syndromic approach in which we simultaneously test for a wide panel of viral disease causative agents and malaria. We now use this expertise in the fight against Ebola in the Democratic Republic of the Congo.

We are also developing new tests for very common mosquito-transmitted viruses like dengue, Zika and chikungunya, for genome detection as well as for serology (i.e. detection of antibodies in reaction to an infection by using a viral antigen). The viruses that cause Zika, dengue and yellow fever are flaviviruses, a large family of viruses that are closely related genetically and antigenically. Current antibody detection tests for flaviviruses are not very specific, therefore hindering a correct diagnosis in travellers returning from the tropics but especially also in endemic regions. Together with our partners in Peru, Cuba and the Democratic Republic of the Congo, and with financing from the Flemish and Federal government and the European Commission, we are working on alternatives.

Links

- FWO Kennismakers - 14 December 2018
- Flanders Meeting & Convention Center Antwerp

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