One Health: a doctor’s perspective

One Health has been gaining traction over recent years, particularly among veterinarians and veterinary scientists, but the medical sector appears to be less engaged. Here, Josef Järhult, a doctor practising in Sweden, who is also a proponent of One Health, suggests some reasons why medics have yet to embrace the idea and how this could be overcome.

THE concept of One Health has attracted an increasing amount of interest from policymakers and the general public in the past few years. However, although One Health promotes collaboration between the human and veterinary medicine sectors among others, the concept has generally been embraced more wholeheartedly by veterinarians than medics. There may be several explanations for this, but one important factor is probably that the interplay of animal, human and public health is much more pronounced in veterinary than medical education.

Another reason may be the increasing degree of specialisation in human medicine, which tends to detract from a holistic perspective. Being a medical doctor and a One Health enthusiast, in this article I will try to argue for the importance of the involvement of medics in the One Health movement, and to give some examples of educational and scientific projects, networks, and modes of communication which have increased collaboration between sectors. The examples will be chosen from my own experience, and thus do not constitute a representative selection of important One Health institutions, but rather my own view.

Doctors and One Health

For One Health to get the attention that it merits from policymakers and the general public, it is essential to make the connection between One Health and human and public health as clear as possible. There are many key players in this process, but medical doctors in particular can play an important role in linking discussions about environmental and animal health to concrete human health examples, and by employing a medical voice that many people are used to trusting. This can help policymakers and the general public to relate to the importance of One Health at a more personal level, and not only as a theoretical concept.

The participation of medical doctors in One Health is also important as they are able to contribute their knowledge of human medicine to scientific discussions within One Health, and to the process of developing the One Health concept and movement. However, for this to happen, it is crucial for medical doctors to rise above the common anthropocentric viewpoint and to realise that they are only one of many important contributors.

Engaging medics

As previously mentioned in this series of articles, The Veterinary Record and The BMJ published a joint issue in 2005 on ‘One Medicine’. This represented an important cooperation statement from two influential journals in veterinary and human medicine. As will be further discussed below, integrating One Health at an educational level is essential to make this perspective a natural part of the outlook of future professionals in general, and medics in particular. It is therefore satisfying to see the strong cooperation being formed between the international student organisations in veterinary and human medicine (IVSA and IFMSA) around the theme of One Health (VR, September 13, 2014, vol 175, p241). Together, IVSA and IFMSA organise joint events such as the One Health Workshop, participate in the World Health Assembly, and organise joint campaigns such as World TB Day.
Education

A major obstacle in developing and implementing One Health perspectives is that they can sometimes clash with people’s underlying perceptions of what falls within the scope of ‘their subject’ and what does not. These perceptions are, to a large extent, formed during early education. Interventions during education can therefore help to open up the minds of young people to the perspective (or other interdisciplinary collaborations) and make a holistic approach part of their professional mindset. How organisations such as One Health Sweden are educating children about One Health while still at school is discussed later.

Networks

Networks are essential tools to promote One Health to medics and other sectors, but because One Health is so interdisciplinary in its approach, pre-existing networks can seldom be employed. Networks can be either large, governmental or institution-funded, or smaller, pro bono ones. Both types are important; governmental/institutional networks can provide stability and more funding, while smaller, pro bono ones allow greater flexibility and accessibility. Both types are important; governmental or institution-funded, large, governmental or institution-funded, pro bono one. One Health Initiative (OHI) represent each type of network and both contribute to the development of One Health.

Some One Health research requires networking at the practical level. Today, many laboratories are only designed to deal with research that falls into one discipline; for example, samples from either humans or animals or either viruses or bacteria. Therefore, new laboratory facilities and networks need to be established to accommodate One Health research with its potentially diverse needs for techniques and competencies.

Communication

Communication is crucial to create and maintain interest in One Health – both within the scientific community and among policymakers and the general public. Now, when One Health is getting an increasing amount of attention, all involved have a responsibility to make the term ‘One Health’ substantial, to avoid it being just a buzzword. This is crucial to make the concept of One Health last. Several types of communication need to be employed:

- Successful One Health projects need to be showcased to demonstrate the positive effects that can be achieved;
- One Health related research needs to be published; this is especially important as most scientific journals have a specific focus that often does not suit One Health work;
- Evaluation of how well the One Health perspective works in research is important to objectively show the value that it adds.

Medics play an important role in all parts of this communication. Concrete examples of this are given below.

Case studies

One Health Sweden

One Health Sweden (OHS) is an informal, pro bono network of professionals from any discipline that have an interest in One Health. At the time of writing, the network has approximately 320 active members, many of whom are medics. There is a steering group consisting of four to eight people, and several Swedish universities help to fund the network. However, there are no formal ties to any universities or other organisations and, as all the work in the network is provided in kind, the budget is small and just covers communication, meetings and so on. There is a webpage (www.ohs.se) and ‘research pubs’ (informal seminars with invited speakers where food and drinks are available) are held regularly. OHS arranges a yearly meeting, the Nordic One Health Conference, which normally attracts 70 to 100 scientists. OHS is in contact with many international networks including the OHI. OHS, working alongside OHI, helped in the development of the ‘One Health Umbrella’. The umbrella and its relationship to the definition of One Health, research and education are discussed in Lerner and Berg (2015).

In 2012, OHS, in collaboration with the Swedish Veterinary Institute, published a themed issue of the journal SVAvet about infectious diseases in a changing world (Swedish Veterinary Institute 2012). A manual on the use of the journal in high school teaching and containing questions and other educational material was also produced and promoted at several events for high school teachers in Sweden (Fig 1). There has been significant interest in the material, and many high school students in Sweden have already come into contact with the concept of One Health.

‘Many high school students in Sweden have already come into contact with the concept of One Health’
Zoonosis Science Center

The Zoonosis Science Center (ZSC) was founded 2014 in response to Sweden’s lack of One Health laboratory facilities in the area of infectious diseases. It is located in Uppsala, the natural One Health hub of Sweden, which offers the country’s only undergraduate degree in veterinary medicine at the Swedish University of Agricultural Sciences, the Swedish Veterinary Institute, and Uppsala University (teaching medics as well as students in most other subjects).

The ZSC is developing the Zoonotic Laboratory, a facility that can handle all types of microorganisms, be they viruses, bacteria or parasites. Furthermore, samples from humans, animals and the environment can all be analysed in the same laboratory. At the moment, culturing and standard molecular biology techniques are up and running and an adjacent biosafety level 3 facility is being constructed. The research group of the ZSC is rapidly expanding and has already attracted many students at graduate and undergraduate level. The ZSC is a joint venture and several of the scientists involved are also active medics. The setup of the ZSC and the Zoonotic Laboratory may serve as an example of interdisciplinary One Health collaboration at a practical research level.

Tamiflu resistance

When patients are treated with oseltamivir (Tamiflu), the active metabolite is excreted in an unchanged form, mainly via the urine. If it remains stable in sewage water and throughout sewage treatment processes, it will finally enter rivers and other waterways that receive sewage discharge. Dabbling ducks, which usually reside in rivers, constitute the main natural reservoir for influenza (Olens and others 2006). Influenza virus is very well adapted to dabbling ducks and replicates in the epithelial cells in the gastrointestinal tract. In aquatic environments close to outlets of sewage treatment plants, Tamiflu and replicating influenza virus can therefore coexist in the intestines of dabbling ducks, potentially enabling the development of resistance. If a Tamiflu-resistant influenza virus is established in the pool of viruses circulating among wild birds, there is a risk of transfer to humans either via aerosolisation (the route of the last four influenza pandemics) or by direct transmission (exemplified by highly pathogenic H5N1 avian influenza). A Tamiflu-resistant influenza virus capable of transmitting and causing severe disease among humans is a frightening scenario, as Tamiflu is a cornerstone in pandemic preparedness plans worldwide, especially in the first phase where vaccines can be mass-produced. Billions of Tamiflu capsules have been stockpiled globally (Wan Po and others 2009), and they would be useless during an outbreak of resistant influenza.

Fig 2 shows a summary of how Tamiflu is thought to exist in the environment and how potentially resistant influenza viruses exist in different species. This is explained in more detail in the review by Järhult (2012). Using a One Health approach, an interdisciplinary research team has demonstrated that the active metabolite of Tamiflu is not degraded in a model of sewage treatment (Fick and others 2007), and that the active metabolite can be detected in river water during an influenza outbreak (Söderström and others 2009). Furthermore, when mallards were infected with influenza and exposed to low levels of Tamiflu in their water environment, resistance developed in both of the main phylogenetic groups of influenza A viruses (Järhult and others 2011, Gillman and others 2013). When the drug pressure was removed, the resistance persisted (Gillman and others 2015), indicating that there is a risk of circulation of resistant influenza viruses among wild birds during periods when there is no drug pressure (that is, in between outbreaks). Ongoing experiments are trying to assess the risk of Tamiflu-resistant influenza viruses undergoing reassortment or transmission to poultry.

The research team in the influenza project consists of scientists from many disciplines including human medicine, veterinary medicine, environmental chemistry, ecology, molecular biology, ornithology and virology. The project has received funding from both major Swedish Research Councils, and is a good example of One Health research.

Publication

Once One Health research is produced, it needs to be published in order for the scientists to get credit, and for policymakers and the general public to know about the results. To allow free dissemination of the results worldwide, Open Access publication is important. However, One Health research is often difficult to publish due to its multidisciplinary nature that often makes it fall in between traditional scientific journals. The establishment of a dedicated One Health journal could help to make sure One Health research is published and, if it was marketed to the right audiences, serve to engage more medics in the discipline.

Evaluation

To demonstrate the value of the One Health approach, it is essential to be able to evaluate it and compare it to conventional approaches that often employ the perspective of a single discipline. The recently founded Network for Evaluation of One Health deals with this question. The network is supported by European Cooperation in Science and Technology. It aims to (i) develop a framework to evaluate One Health research, (ii) apply the evaluation framework to One Health case studies, (iii) conduct meta-analyses on several studies evaluated in this way, and (iv) communicate the results to the scientific community, policymakers and the general public.

Conclusion

Medical doctors are needed in the development of One Health, although it can be hard to motivate them to participate in the process. Putting One Health on the educational agenda is essential to prime the next generation of professionals for this and other multidisciplinary approaches. Communication of successful One Health projects as good examples, enabling the publication of One Health research and evaluation of One Health research are important steps to promote One Health among medics, the scientific community, policymakers and the general public.

References


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