ITALIAN JOURNAL OF PUBLIC HEALTH

Increasing the collaboration between human and animal medicine: an effort of the Federation of European Academies of Medicine (FEAM)

Hubert Blum[1], Paolo Villari[2], Luigi Frati[3]

(1) Department of Medicine II, University Hospital of Freiburg, Germany
(2) Department of Public Health and Infectious Diseases, Sapienza University of Rome, Italy
(3) Department of Experimental Medicine, Sapienza University of Rome, Italy

CORRESPONDING AUTHOR: *Paolo Villari, Department of Public Health and Infectious Diseases, Sapienza University of Rome, Piazzale Aldo Moro, 5 – 00185 Rome, Italy. Tel: 0039 06 49914886; fax 0039 06 4958348; email: paolo.villari@uniroma1.it*

Human medicine and animal medicine have developed as "one medicine" starting from the times in which their bases were laid until the mid 18th century when specialisation proved necessary. The separation has been the logical consequence of the construction of different fields of action, made necessary by the evolution of the disciplines and of the social and economic context, but common areas have remained relevant and are strongly required by modern developments.

With the number of emerging infectious diseases on the rise worldwide, researchers and health experts are increasingly recognizing the benefits of integrating human and veterinary medical sciences at sub-national, national and international level. Pathogens originating from an animal or animal-derived product caused approximately 75% of new diseases affecting humans over the past ten years (1). Threats of outbreaks of diseases such as avian flu, SARS and H1N1 pandemic influenza further highlight the need for integration and remind us that human and animal health are intimately connected (2). A broader understanding of health and diseases demands a unity of approach achievable only through a consilience of human, domestic animal and wildlife health - One World, One Health (3).

Infectious diseases and vaccines are among the major medical and public health issues addressed by the Federation of European Academies of Medicine (FEAM), with many of the FEAM Conferences that reserved sessions and presentations to these topics. The aim of FEAM, which was founded in 1993 with the civil status of an international association with a scientific objective, is to promote cooperation between the national Academies of Medicine and to extend to the political and administrative authorities of the European Union (EU) the advisory role that the Academies exercise in their own countries on matters concerning medicine and public health. FEAM now brings together the Academies of 14 European countries including Austria, Belgium, Czech Republic, France, Germany, Greece, Hungary, Ireland, Italy, Portugal, the Netherlands, Romania, Spain and the United Kingdom. One of the scientific sessions of the FEAM Rome Conference of 5-6 May 2011, hosted by National Italian Academy of Medicine and the Department of Public Health and Infectious Diseases of Sapienza University of Rome, addressed specifically the topic of integration of human and animal medicine. Most of the contributions to this issue of the Italian Journal of Public Health originate from the presentations made at this Conference.

Of the 1415 known human pathogens, 61% are zoonotic. Of pathogens causing emerging infectious diseases, however, 75% are zoonotic, with wildlife being an increasingly important source (4, 5). Newly emerging and re-emerging infections are recognised as a global problem, the general public and health professionals perceive that the emergence of a new so called "killer" disease in any area of the world is a threat for all humans (6). In addition to the new pandemic H1N1 influenza, several other recent examples that support this belief include the outbreaks of H5N1 avian influenza in Asia, bovine spongiform encephalopathy in the United Kingdom, West Nile virus and monkeypox in North America, and H7N7

avian influenza in the Netherlands. In this issue, the topic of emerging and re-emerging infections is extensively discussed both in the articles of Fears and ter Meulen (7) and Saegerman (8).

Although better integration of human and animal health is believed to be needed particularly in the context of emerging and re-emerging zoonotic diseases, this interdisciplinary approach is far from being restrictive and is, as a matter of fact, multidimensional. This approach could be extremely useful for reducing other exposures to hazards for humans from animals, such as antibiotic resistance and foodborne zoonosis; for reducing hazards for animals from humans; for developing robust platforms for surveillance in humans and animals for public health purposes, and for improving medical and veterinary education. All these topics will be addressed in this special issue of the Italian Journal of Public Health.

As outlined in the paper of Fears and ter Meulen (7) in this issue, foodborne infectious diseases tends to be regarded as no more than a little inconvenience, but this belief ignores the size of the illness burden: estimates vary from 76 million cases of foodborne disease annually in the United States (9) to 5.4 million in Australia (10) and 1.3 million in England and Wales (11). As well as causing acute symptoms including diarrhoea and vomiting, these infection can have long term implications. Three of the major pathogens - *Campylobacter* spp, *Salmonella* spp, and Shiga toxin producing *Escherichia coli* O157 (STEC O157) - are zoonoses.

The use of antibiotics in animals has raised controversy, particularly with respect to their use as feed additives to promote growth of livestock (12). There can be little doubt that the clinical therapeutic use of antibiotics in animals is justified, and, with large collections of animals, individual treatment is not feasible—hence drug delivery in water or feed is necessary and justified. However, the difference between mass prophylaxis and growth promotion is poorly defined. For example, the fluoroquinolone enrofloxacin is used to treat respiratory infections in turkeys and chickens and is sometimes given to an entire flock in water. The concern is that the use of enrofloxacin leads to drug resistant *Campylobacter* and the prevalence of fluoroquinolone resistant *Campylobacter* in humans is increasing (13). As a result, the US Food and Drug Administration has recently banned enrofloxacin's use in poultry (July 2005). Certain growth promoters have also been banned in the European Union, but controversy continues to exist concerning the potential health risk of transfer of antibiotic resistance from animals to man when set against the increased production costs and food prices - a trade off between public health and economic benefits as outlined in the paper of Fears and ter Meulen in this issue (7).

The re-emergence of zoonoses, together with other issues such as the burden of foodborne infections, antimicrobial resistance, and the socioeconomic importance of food production, make a collaborative interprofessional approach a public health priority. Multidisciplinary teams comprising all those who contribute to the treatment, control, and prevention of diseases of animal origin are essential, not only to determine the source of disease but also to assess the risk of further outbreaks and to make recommendations for future controls (14, 15). Although primary prevention of foodborne zoonoses is considered mainly a veterinary responsibility, organisms causing human illness do not necessarily have animal health implications and surveillance data from clinical investigations can help policy makers target resources, in such way that veterinarians and physicians form either end of a chain (from primary prevention at one end to dealing with its failures at the other). Through emerging infectious diseases, foodborne infections and antimicrobial resistance the medical and veterinary professions share a common agenda.

But in the relation between animal and human health, it is a mistake to focus only on the hazards animals pose to humans. Actually humans pose threats to animals too, and emerging diseases can do terrible damage to wildlife and domesticated animals (5, 16-18). Transmission of diseases from humans to animals has been documented (19, 20), and this transmission is another important component of emerging zoonotic illness. There have been confirmed cases of 2009 influenza A(H1N1) transmission from humans to ferrets and domestic cats, and one suspected case of transmission to a monkey. In addition to the impact infection might have on animal health, such transmission is a concern because of the potential for the virus to undergo genetic reassortment with animal influenza viruses and possibly become more virulent (21). Also these aspects highlight the strategic need of collaboration efforts between human and animal health professionals to control emerging infectious diseases. The topic of the hazards to animals from humans is analyzed by the paper of Pastoret in this issue, particularly in terms of attacks to animal biodiversity (22).

Threats given by emerging diseases and foodborne infections of animal origin should be addressed through surveillance systems that include domestic and wild animal and human populations, which would contribute to more effective control measures (23). However, surveillance systems in place to

identify emergent infectious diseases are fragmented. Separate systems are used to detect outbreaks among humans and animals and there is little communication between the two. For example, it would have been beneficial for physicians treating the initial West Nile virus (WNV) patients in New York City in 1999 to know that, for the previous month and concurrently, veterinarians in the surrounding area had been seeing dozens of dying crows with neurologic symptoms similar to those of the affected humans (24). Additionally, although disease surveillance laboratories are heavily concentrated in the United States and Europe, most diseases are emerging in developing countries, where there may be little or no surveillance. As a result, many emerging diseases are not identified until they have spread widely in human populations. Avoiding this scenario will require identifying disease outbreaks in animals before they spread to humans and identifying environmental disturbances which contribute to disease emergence in animals as well as adopting preventive measures (21).

Joint surveillance of animal and human zoonotic disease outbreaks is already reaping benefits worldwide. For example, recognition of the first human case of H5N1 avian influenza in Hong Kong in 1997 was facilitated by the surveillance of ducks, geese, and chickens in southern China during the preceding decades (25). Despite this, there is some evidence of limited use of animal data to quantitatively predict human risk and the problem might stem from a lack of understanding by researchers of the importance of animal data as a "sentinel" for human health (26). A higher degree of integration between medical and veterinary surveillance is strongly needed. The paper of Delogu et al. in this issue offers a very interesting example of this kind of integrated surveillance (27).

Despite significant similarities between training and practice in human and veterinary medicine, the two professions tend to articulate, rather than merge, in areas of potential overlap, including training and education (28). There is more that unites the two disciplines than divides them, and there is scope for exploring shared learning selected components. Collaboration between veterinary and medical educators should be seen as a powerful and fruitful area of future development and research, particularly in areas such as assessment, use of simulation, and education about professionalism. The public health perspective is crucial both for physicians and veterinarians when considering health risks for humans from animals and for animals from humans, respectively, and it could be a common teaching area in which both professions can collaborate at each level (undergraduate level, postgraduate level, continuing professional education). Some considerations on integration of human and veterinary education are expressed in the paper of McConnell in this issue (29).

The paper of McConnell (29) focuses, however, on the analysis of the essential interplay between the disciplines of medicine and veterinary medicine, through illustrations of areas such as prion diseases, zoonotic infectious diseases and genetic diseases of dogs. This essential and fascinating interplay between them can do more to advance knowledge in both medicine and veterinary medicine than either can achieve on their own.

References

(1) De Vito C, Marzuillo C, D'Andrea E, et al. Emerging and re-emerging infectious diseases: tackling the challenge on a global level. Ital J Public Health 2011; 8: 1-4

(2) Fauci AS, Morens DM. The perpetual challenge of infectious diseases. N Engl J Med 2012; 366: 454-61

(3) FAO, OIE, WHO, UNSIC, UNICEF, The World Bank. Contributing to One World, One Health. A strategic framework for reducing risks of infectious diseases at the animal-human-ecosystems interface. Consultation Document. 14 October 2008

(4) Taylor LH, Latham SM, Woolhouse ME. Risk factors for human disease emergence. Philos Trans R Soc Lond B Biol Sci 2001; 356: 983-9

(5) Daszak P, Cunningham AA, Hyatt AD. Emerging infectious diseases of wildlife - threats to biodiversity and human health. Science 2000; 287: 443-9

(6) Meslin FX, Stohr K, Heymann D. Public health implications of emerging zoonoses. Rev Sci Tech 2000; 19: 310-7

(7) Fears R, ter Meulen V. Human and animal health in Europe: the view from the European Academies Science Advisory Council (EASAC) on challenges in infectious disease. Ital J Public Health 2012; 9: 5-12

(8) Saegerman C, Dal Pozzo F, Humbler M-F. Reducing hazards for humans from animals: emerging and re-emerging zoonoses. Ital J Public Health 2012; 9: 13-24

(9) Mead PS, Slutsker L, Dietz V, et al. Food-related illness and

death in the United States. Emerg Infect Dis 1999; 5: 607-25
(10) Hall G, Kirk MD, Becker N, et al. Estimating foodborne gastroenteritis, Australia. Emerg Infect Dis 2005; 11: 1257-64
(11) Adak GK, Long SM, O'Brien SJ. Trends in indigenous foodborne disease and deaths, England and Wales: 1992 to 2000. Gut 2002; 51: 832-41
(12) Soulsby EJ. Resistance to antimicrobials in humans and animals. BMJ 2005; 331: 1219-20
(13) Piddock LJ. Quinolone resistance and Campylobacter spp. J Antimicrob Chemother 1995; 36: 891-8
(14) Scottish Executive Health Department, Food Standards Agency (Scotland). Report of the E coli O157 task force. Edinburgh: Stationery Office, 2001. www.food.gov.uk/news/newsarchive/2001/oct/ecolitask [accessed 6 May 2012]
(15) Bräunig J, Hensel A. Risk assessment of foodborne infections. Dtsch Tierärztl Wochenschr 2004; 111: 304-7
(16) Easton G, Alder M. One medicine? BMJ 2005; 331:0.7
(17) Cunningham AA. A walk on the wild side—emerging wildlife diseases. BMJ 2005; 331:1214-5
(18) Cunningham AA, Daszak P, Rodríguez JP. Pathogen pollution: defining a parasitological threat to biodiversity conservation. J Parasitol 2003; 89: S78-83
(19) Seguin JC, Walker RD, Caron JP, et al. Methicillin-resistant Staphylococcus aureus outbreak in a veterinary teaching hospital: potential human-to-animal transmission. J Clin Microbiol 1999; 37: 1459-63
(20) Ocepek M, Pate M, Zolnir-Dovc M, Poljak M. Transmission of Mycobacterium tuberculosis from human to cattle. J Clin Microbiol 2005; 43: 3555-7
(21) Kuehn BM. Human, animal, ecosystem health all key to curbing emerging infectious diseases. JAMA 2010; 303: 117-8
(22) Pastoret P-P. Reducing hazards for animals from humans. Ital J Public Health 2012; 9: 25-28
(23) Kahn LH. Confronting zoonoses, linking human and veterinary medicine. Emerg Infect Dis. 2006; 12: 556-61
(24) US General Accounting Office. West Nile virus outbreak. Lessons for public health preparedness. Washington: The Office; 2000. GAO/HEHS-00-180
(25) Shortridge KF, Peiris JSM, Guan Y. The next influenza pandemic: lessons from Hong Kong. J Appl Microbiol. 2003; 94: 70S-9S
(26) Scotch M, Odofin L, Rabinowitz P. Linkages between animal and human health sentinel data. BMC Vet Res 2009; 5:15
(27) Delogu M, De Marco MA, Cotti C, et al. Human and animal integrated influenza surveillance: a novel sampling approach for an additional transmission way in the aquatic bird reservoir. Ital J Public Health 2012; 9: 29-36
(28) Quentin-Baxter M, Spencer JA, Rhind SM. Working in parallel, learning in parallel? Vet Rec 2005; 157: 692-5
(29) McConnell I. Comparative Medicine – with some thoughts about the integration of medical and veterinary education. Ital J Public Health 2012; 9: 37-45