

Feature Article

Collaboration between doctors and veterinarians for the greater good of all species

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160 character Summary: Improved collaboration between doctors and veterinarians is needed to tackle challenges facing human and animal health. This article discusses the history and importance of One Health.

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1 **Abstract**

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3 The One Health Initiative was founded to improve collaborative clinical and research
4 efforts between medical, veterinary and environmental experts. Human and veterinary
5 medicine share common issues and challenges, such as zoonotic diseases and
6 antimicrobial resistance. However, the fields of human and veterinary medicine are
7 largely divided and collaboration is limited. An interdisciplinary approach may be
8 effective in overcoming the challenges common to both human and animal health. To
9 improve communication and teamwork between the two fields, interdisciplinary
10 education could be introduced into both veterinary and medical school curricula.
11 Medical and veterinary students should consider how collaboration could benefit their
12 education and their future patients.

13 **Introduction**

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16 *“Between animal and human medicine there is no dividing line – nor should there*
17 *be”* – Rudolf Virchow [1].

18
19 The One Health Initiative is an international movement encouraging interdisciplinary
20 collaboration between human, animal and environmental experts in order to improve
21 the lives of all species [2]. While there are clear differences between human and
22 animal medicine, both disciplines share a common body of knowledge in anatomy,
23 physiology, pharmacology and pathology. More importantly, doctors and
24 veterinarians share the common goal of improving the quality of life of their patients.
25 Increasing collaboration between these two professions may allow doctors and
26 veterinarians to better achieve this goal.

27 **History and Development of One Health**

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29
30 The concept of One Health was first described as early as the late 19th century. Rudolf
31 Virchow was the first to propose a close link between human and animal health.
32 Virchow coined the term “zoonosis” to describe infectious diseases that are
33 transmissible from animals to humans, and suggested that there should be no
34 distinction between human and veterinary medicine [3]. William Osler, Virchow’s
35 student, continued this theme. Osler taught both veterinary and medical students,
36 published on comparative pathology, and was a promoter of the “One Medicine”
37 concept [4]. Unfortunately, with the expansion of both fields in the 20th century, the
38 divide between veterinary and human medicine grew [4].

39
40 In order to rebuild and strengthen the relationship between doctors and veterinarians,
41 the American Medical Association (AMA) and American Veterinary Medical
42 Association (AVMA) endorsed the concept of One Health in 2008 [2]. The AMA and
43 AVMA have pledged to improve communication between the two professions,
44 develop joint educational programs, and build cross-species research collaborations
45 [2]. In Australia, the Australian Veterinary Association (AVA) is working to increase
46 awareness of the One Health Initiative [5]. However, the Australian Medical
47 Association is yet to publicly endorse this concept. The Australian Medical
48 Association and AVA should consider implementing a joint One Health taskforce
49 similar to that of their counterparts in the United States.

50

1 **Importance of One Health**

2
3 A One Health approach is particularly relevant to the major health issues of zoonotic
4 diseases and antibiotic resistance. It has been estimated that 60-75% of emerging
5 infectious diseases are zoonotic [6, 7]. These diseases are a significant health and
6 economic burden [6, 7]. Five of the top six ‘category A’ disease agents identified as a
7 potential bioterror threat by the Centers for Disease Control and Prevention (CDC)
8 are zoonoses [8]. Given the critical role of animals in the epidemiology of these
9 diseases, the effective control of zoonoses requires research in both human and animal
10 populations conducted by multidisciplinary teams. This integrated research is
11 currently lacking [9].

12
13 Antimicrobial resistance (AMR) is another major health issue with significant
14 consequences. The sub-therapeutic doses and long exposure periods used in animal
15 production systems may create the ideal circumstances for microbes to develop
16 resistance to antibiotics [10, 11]. This resistance can be transmitted to human
17 pathogens or to human microbiota [10, 11]. The World Health Organisation suggests
18 that a multidisciplinary effort is required to effectively halt antimicrobial resistance
19 [12-14]. In 2002, Canada became one of the first countries to develop a joint
20 programme for the surveillance of antibiotic resistance in humans and animals [15]. In
21 2015, all WHO Member States committed to developing a multidisciplinary national
22 action plan to tackle AMR. Seventy-nine countries had a finalised plan by 2017 [13,
23 14]. The Australian Government has published the National Antimicrobial Resistance
24 Strategy, outlining their response to the threats of antibiotic misuse and resistance.
25 The Australian AMR Steering Group is co-chaired by the Australian Chief Medical
26 and Chief Veterinary Officers. One of the goals of the AMR Strategy is to establish
27 and maintain linkages between the medical, veterinary and environmental sectors.
28 The Steering Group recognises that collaboration between medical and veterinary
29 boards, and professional colleges and societies, is vital to ensure the AMR Strategy is
30 executed effectively [16].

31
32 **One Health in Action**

33
34 There are several examples of scientific breakthroughs made from research
35 collaborations between doctors and veterinarians. One such example goes back to as
36 early as 1893, when Theobald Smith, a doctor, and F. L. Kilbourne, a veterinarian,
37 discovered that ticks were responsible for the transmission of babesiosis [17]. In the
38 late 20th century, Hendra virus was first described in Australia following an outbreak
39 of fatal equine and human cases in Queensland [18]. In response to the outbreak, the
40 Queensland Government quickly established an expert taskforce to identify the
41 natural host of the virus [18]. The successful taskforce included animal and human
42 clinicians and scientists, as well as a number of other experts from a range of
43 disciplines. Some of the key people from this taskforce attribute the advances in
44 knowledge they made to the diversity of the group and the mutual respect they shared
45 [18]. These are just two historical examples of human and veterinary medical
46 professionals collaborating to discover new scientific knowledge that can be applied
47 across species.

1 More recently, the Duke Comparative Oncology Group, made up of veterinarians,
2 doctors and scientists, was created with the goal of using a cross-species approach to
3 improve the treatment of soft tissue and bone sarcomas [19]. The genetic profiles of
4 canine and human osteosarcomas have been shown to be very similar, providing a
5 unique opportunity for cross-species research [20]. Companion dogs develop
6 osteosarcoma in similar sites to humans, with similar histology, response to traditional
7 therapies, and risk of metastasis [20]. However, over 10,000 new cases are diagnosed
8 in dogs every year while only 800 new cases of osteosarcoma are diagnosed in
9 humans annually [20]. Given the greater number of cases and the accelerated biology
10 of osteosarcoma in dogs, there is an opportunity to increase the rate of research into
11 this disease by using both canine and human populations compared to research
12 conducted in humans alone [20]. Collaborative research between medical and
13 veterinary professionals has the potential to discover novel treatments for
14 osteosarcoma for the benefit of human and animal patients.

15
16 In addition to combined research groups, interdisciplinary clinical teams are
17 becoming increasingly common. Human and animal conditions have historically been
18 treated as separate entities. However, some interdisciplinary teams are working to
19 rectify this divide. In Los Angeles, specialist physicians from the University of
20 California-Los Angeles (UCLA) Medical Centre consult on veterinary cases at the
21 Los Angeles Zoo and sit on the zoo's Medical Advisory Board [21]. In several
22 American academic hospitals, doctors invite veterinarians to their ward rounds and
23 vice versa [21]. In 2011, the Zoobiquity Conference was launched with the aim of
24 bringing doctors and veterinarians together to discuss clinical cases and solve the
25 shared challenges facing human and veterinary medicine. These examples highlight
26 the steady progression of interdisciplinary collaboration under the One Health
27 Initiative.

28 29 **Introducing One Health to Students**

30
31 One possible strategy for improving the level of collaboration between doctors and
32 veterinarians is to introduce interdisciplinary group projects into the curricula of
33 medical and veterinary schools. This would foster teamwork and early networking
34 between veterinary and medical students. Similar projects are already being
35 implemented in the United States. The Zoobiquity Research Initiative pairs UC-Davis
36 veterinary students with UCLA medical students to work collaboratively on projects
37 affecting animal and human health [21]. Encouragingly, Edwards et al. [22] reported
38 that medical student attitudes towards collaborative learning were more positive after
39 an interdisciplinary surgical skills session with veterinary students.

40
41 It is important to note that there are logistical challenges in implementing such a
42 system in Australia. In particular, there are a disproportionate number of medical
43 students compared to veterinary students. There are 21 medical schools compared to
44 only seven veterinary schools nationwide. In Victoria alone, there are more than 3000
45 medical students compared to only 500 veterinary students [23, 24]. However, five of
46 the seven Australian institutions with veterinary schools also have a medical school.
47 These are James Cook University, University of Adelaide, University of Melbourne,
48 University of Queensland, and University of Sydney. It may be more feasible for
49 these institutions with co-located veterinary and medical schools to introduce
50 collaborative learning.

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A pilot study trialing collaborative learning between medical and veterinary students in Australia would provide insight into the feasibility and potential benefits of such a program. Rabies and tuberculosis are two potential project topics that would emphasise the importance of collaborative work in achieving successful outcomes for human and animal populations. Projects exploring the similarities and differences between the pathogenesis and treatments for common diseases affecting both animals and humans, such as cancer or heart disease, would help medical and veterinary students appreciate the clinical challenges shared by both fields. These learning exercises will encourage medical and veterinary students to consider how a collaborative approach might benefit their future patients, while also providing an early networking opportunity.

Conclusion

The current lack of collaboration between doctors and veterinarians represents a missed opportunity to benefit from interdisciplinary research and clinical practice. To seize this missed opportunity, Australian medical and veterinary schools should consider incorporating the One Health Initiative into their curricula. Medical and veterinary students should be encouraged at this early stage of their careers to consider how their future patients could benefit from interdisciplinary collaboration. Given the complex challenges facing humans and animals today, it is critical to recognise the connection between human and animal medicine. Improving communication between the two currently divided disciplines would be a good starting point in fostering the collaboration required to tackle our shared challenges.

Corrected Proof

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