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Closing Remarks

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On behalf of the OIE Members, I thank you for the honour of allowing me to draw the conclusions of your symposium.

The core mandate of the OIE, the World Organisation for Animal Health, is “to improve animal health worldwide.” We were particularly proud to host this symposium which has provided the opportunity for leaders in the field of animal genomics and animal health to come together and discuss new technologies that are changing the way we approach animal health research. Recent advances in biotechnology and genomics present unique opportunities to address global animal health challenges through multidisciplinary scientific collaborations.

These collaborations will pave the way for integrating core competencies by connecting those who are currently engaged in cutting edge genomics research with animal health scientists who are disease experts and understand the real world challenges facing animal health.

The World Organisation for Animal Health has always had a particular interest in biotechnology related to animal health and has established an *ad hoc* group of international experts in biotechnology in charge of advising the organisation. Some of them attended this symposium.

Biotechnology has already had a significant impact on animal health, mainly by improving available diagnostic tools and vaccines. One of the best examples is the use of a recombinant vaccinia-rabies vaccine in Europe and the United-States to eliminate terrestrial wildlife rabies with great success. Last May our organisation hosted an international conference jointly organised with the World Health Organisation, the International Association for Biological Standardisation and the European Union entitled “Towards the Elimination of Rabies in Eurasia,” the ultimate goal being to eradicate terrestrial rabies worldwide.

The OIE expected a lot from your Symposium and it has not been disappointed. The recommendations emerging from your presentations and your discussions will be extremely useful and will help us to accomplish our mandates. We are particularly

interested in research into the interaction between the genomes of pathogens and their hosts in order to dramatically improve our ability to control and eliminate diseases through the discovery of highly effective diagnostics, vaccines and biotherapeutics, and the promise of being able to select livestock with desirable health traits. This is essential for the correct implementation of our core mandate.

Vaccination, when available, is undoubtedly the most cost-effective means of preventing and controlling, and even eradicating infectious diseases, as exemplified by the foreseen eradication of rinderpest. In recent years vaccination has also been used for other purposes in animal production and welfare. In fact, the impact of vaccination goes far beyond the control of infectious diseases. Acting through natural mechanisms, vaccination of animals serves many different purposes, e.g. controlling animal infections and infestations, thus improving animal health and animal welfare and safeguarding our food supply; controlling anthroponozoonoses and food pathogens, thereby protecting public health; solving problems associated with antibiotic and anthelmintic resistance; helping to leave food-producing animals free of chemical residues; controlling the reproduction of certain animal species; protecting the environment and biodiversity; and ensuring animal farming sustainability, thereby helping to alleviate poverty.

Vaccination will help to reach many of the objectives of the United Nations “Millennium Development Goals” especially in the light of the foreseen livestock revolution. We expect an increase of 50% in the world demand for meat in the next 15 years. One billion people will shift from poverty to the middle class, becoming meat consumers.

Last but not least, vaccination is presently the only available means to control viral vector-borne emerging diseases such as Bluetongue associated with serotype 8 in Northern Europe.

In light of this we were very interested in the presentation on the “Genetics of the Response to Vaccination.” The OIE recently received a request from Codex Alimentarius to assess the safety of animal products derived from vaccinated animals, including with recombinant vaccines. We will soon organise an expert group that will work with our expert group on biotechnology. We hope that the recommendations will allow the development of new fields in vaccinology.

One approach could lie in the selection of animals that respond well to vaccination. An analysis of the immune response in different dog breeds to rabies vaccination, in the framework of the “pet scheme” for the introduction of properly vaccinated animals into the United Kingdom, showed considerable variation between breeds. Animal response to vaccination is thus subject to great variability, a factor which could be used in the selection, with or without markers, of good vaccination responders. It should, however, be noted that there is a risk of encountering the same sort of unexpected results as when selecting for resistance to specific diseases.

In fact, there is a growing trend to orient livestock selection not only toward production, but also toward animal health objectives by selecting animals resistant to certain diseases. However, this approach may be limited as it is difficult to imagine a return to the production of more “robust” animals while losing the economic and

social advantages of previous selection. Genetic resistance must also be well defined: is it resistance to the infection or to disease transmission, or to the disease itself? For instance, the selection of sheep resistant to scrapie remains controversial because one may argue that the resistance is not complete but only partial and could hide the pathogen. Despite these potential drawbacks we have many things to learn from your research and we are eagerly looking forward to their applications. Like all other biological technologies, the selection of animals against some specific diseases will find its own niche whenever the benefit exceeds the cost.

Keeping this in mind, it is becoming urgent to maintain the biodiversity of domestic animals and the OIE fully supports the initiative of its sister organisation, the Food and Agriculture Organisation of the United Nations to promote and preserve the diversity of domestic breeds as recommended by the recent Interlaken Conference entitled “From the State of the World’s Animal Genetic Resources for Food and Agriculture to the Global Plan of Action for Animal Genetic Resources”. Some endangered breeds are our main resource for mining resistance genes. In this regard, there should be public financial support for keeping endangered breeds alive both in developing and developed countries.

We must also provide the research community with phenotypically well characterized clinical cases to support their genomics work and accurate clinical data resulting from either field or experimental studies. As far as vaccination or chemotherapy is concerned, there should be good collaboration between the public and the private sectors to share the necessary and available information. We learned about the importance of epigenetic control of gene expression, which is also of great interest and opens a new, fascinating, and particularly complex area. We also learned that there are two individuals, James Watson and Craig Venter who had their genome entirely sequenced in 2007. The original human genome project took 13 years and cost 3 billion dollars, but they were able to do it in just two months for a mere 1 million dollars for each individual. This exemplifies the speed with which new technologies can impact your research area.

Our organisation is also interested in the impact of your work on animal welfare. First of all, whenever a disease is prevented, it has a direct positive impact on animal welfare, animal health being a key component of animal welfare. Moreover there may be other applications of animal genomics in animal welfare. For instance in the framework of the application of the three Rs rules (Replacement, Reduction, Refinement) in animal experimentation, an American group has recently reported the development of painless transgenic strains of mice by inserting a mutated human gene. This is not without ethical implications. Pain has always been a necessary physiological mechanism under strong evolutionary pressure.

To conclude, I want to thank all the members of the Steering Committee of this symposium, the scientific Committee and all the speakers and chairpersons. We look forward to the publication of the symposium proceedings, and especially the results of the questionnaire, which will help map the way forward for animal genomics and animal health. We would also recommend that you consider a follow-up meeting in a couple of years to continue to pave the way forward.

We are at a turning point. Further improvements in animal health and welfare will notably depend on your multidisciplinary approach. I wish you all great success in your endeavours.