European Veterinary Vaccinology Workshop

May 9th -10th 2016

Ghent

Minutes

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1. Participant lists

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2. Agenda

European Veterinary Vaccinology Workshop
Het Pand, Ghent - Belgium

AGENDA
DAY 1 – 9th May 2016

Room: rector Blancquaert

08:00-08:30	*Arrival and Registrations*
08:30-10:20	**Development of veterinary vaccines : gaps and requirements -** *Catherine Charreyre (MERIAL)*
10:20-10:50	*Coffee/tea break*
10:50-13:00	**The reality of vaccine use in the field and the socio-economic aspects of using vaccines** *- Jonathan Rushton (RVC)*
13:00-14:00	*Lunch*
14:00-15:50	**New technologies in veterinary vaccine development-** *Michael Francis (BioVacc Consulting Ltd)*
15:50-16:20	*Coffee/tea break*
16:20-18:10	**Innate immunity in livestock and adjuvants -** *Danny Goovaerts, (consultant)*
18:10-19:30	**Debate & Round table** Chairman: Bruno M. Goddeeris (KU Leuven)
19:30-23:00	*Social event at Het Pand*

AGENDA
DAY 2 – 10th May 2016

Room: rector Blancquaert

09:00-10:50	**Markers of vaccine efficacy, immuno-monitoring, the use of "omics" in vet vaccinology-** *Artur Summerfield (Bern U)*
10:50-11:05	*Coffee/tea break*
11:05-12:30	**Challenges of developing effective vaccines for multicellular parasites -** *Jacqui Matthews (TMI)*
12:30-13:30	*Lunch*

3. Minutes

The Workshop was organised in order to provide integrated and up-to-date knowledge on the challenges facing the development of effective veterinary vaccines.
This workshop was targeting early career and senior scientists and other members of the animal health profession from public and private organisations.
This event was organised by:

- The H2020 SAPHIR project
- The UK Veterinary Vaccinology Network
- The H2020 PARAGONE project

The workshop was moderated by Bruno Goddeeris from Leuven University.

3.1. Development of veterinary vaccines: gaps and requirements

The first presentation was made by Catherine Charreyre from Merial and from SIMV (*Syndicat de l'Industrie du Médicament et réactif Vétérinaires*). This presentation focused on gaps and requirements for the development of new veterinary vaccines from a private company point of view.

The main points to keep in mind are the following ones:

- Motivation to launch a vaccine development is money (calculation of the Net Present Value / Time to market analysis/ Return on investment/ risks/ feasibility)
- A common understanding among the various R&D functions is important to define the proof of concept (feasibility and demonstration of principle)
- In average, 8 to 12 years are needed to develop a veterinary products (12-15 years for human)
- In a private company, 3 main functions will be involved in the product development process: R&D, Manufacturing and Business (marketing)
- Several constraints from the national and European regulatory authorities exist to develop a vaccine (administrative part of the dossier) to obtain the marketing authorisation/ license. The unpredictable questions from EMA are negative factors.
- A vet vaccine developer has a combined knowledge in science, legal affairs, manufacturing and marketing, and is different from a researcher in the academic meaning.

- *For more details, please have a look at the presentation made.*

3.2. The reality of vaccine use in the field and the socio-economic aspects of using vaccines

The second presentation was made by Jonathan Rushton and Alexis Delabouglise from RVC. The presentation focused on the socio-economic aspects of using vaccines in the field.

The main points to keep in mind are:

- Importance to carry out an impact assessment: *(i)* to provide support for advocacy for disease management, *(ii)* to indicate where resources are being used to manage disease and *(iii)* to indicate a misallocation of resource
- Lack of information is available on veterinary disease economic impact. Most is based on expert opinion, but not on measured costs. There are important invisible costs, from the disease effects and from the human reactions.

- A cost benefit analysis estimates the economic profitability of a change. The main metrics for this analysis are: the Net Present Value, the Benefit-Cost Ratio (BCR) and

the Internal Rate of Return. The iso-cost line corresponds to the optimal balance between health losses vs expenditures. Often disease eradication is far too costly.
- Willingness to pay for vaccine is affected by: the attributes of the vaccine, the risk perception and aversion, the timing of costs and benefits
- Choice of solutions (i.e. vaccine or not) for animal health depends on the global context at the farm level: we must identify the sure loss option and the risky option to help farmers

For more details, please refer to the presentations.

3.3. New technologies in veterinary vaccine development

The third presentation was made by Michael Francis from BioVacc Consulting. This presentation focused on new technologies available for the development of new veterinary vaccines.

Technologies presented included:
- Inactivated/ killed vaccine technologies: subunit vaccines, peptide vaccines, anti-idiotype vaccines/ conjugate vaccines.
- Attenuated/ modified live vaccine technologies: rational attenuation and live vectors
- Vector vaccines, with concerns on immunity to vectors
- Nucleic Acid Vaccines
- Reverse vaccinology
- DIVA (marker) vaccines, some are on the market (IBR, PRV, CSF)

For more details, please refer to the presentations.

3.4. Innate immunity in livestock and adjuvants

The fourth presentation was made by Danny Goovaerts from DGVAC Consultancy. The presentation focused on adjuvants available for the vaccine development.

The main point to keep in mind are:
- Adjuvants are needed to enhance or help the immune response induced by the antigen components of the vaccines.
- Several types of adjuvants exist with 2 main functions: vehicles + immunostimulants.
- The choice of the adjuvants must take into account a risk/ benefits analysis (in terms of safety versus efficacy)
- The choice of the adjuvant must take into account the technical and the commercial vision.
    - From a technical point of the view, the choice depends on the species, the targeted immune response, the antigen, and the purpose of the vaccine.
    - From the commercial side, the cost, the supply, the ease of manufacturing, the syringeability, etc. will be important.
- The formulation (process and condition) of the vaccine is at least as important as the actual ingredient included in the vaccine
- Focus on Saponin and aluminium as adjuvants was made
- Difference between adjuvants for veterinary vaccine and human vaccine comes from the legislation. In veterinary medicine, the adjuvant is considered to be an excipient.

For more details, please refer to the presentations.

3.5. Markers of vaccine efficacy, immune-monitoring, the use of “omics” in vet vaccinology

The fifth presentation was made by Artur Summerfield from Bern University regarding the correlates of protection and the use of “omics” in the veterinary vaccinology field.
The main points were:

- Correlates of protection (CoPs) are markers which statistically correlate with vaccine efficacy and are used to predict the protective value of a vaccine.
- CoPs are antibody-based assays in most cases.
- T-cell responses are used as CoPs in the case of Tuberculosis and Zoster virus in human. T cell receptors are more cross-reactive than antibodies. In some cases, T cell responses are detrimental to protection. Difficulties to measure T cell responses in blood: transient detection (recirculation), interfering cell types (NK, γ/δ T cell, suppressor cells).
- COPs can change with time post vaccination and are age-dependent
- Systems vaccinology can be used for identifying early biomarkers of vaccine efficacy, refer to Bali Pulendran's work, still in infancy in veterinary vaccinology.

For more details, please refer to the presentations.

3.6. Challenges of developing effective vaccines for multicellular parasites

The last presentation of this workshop was made by Jacqui Matthews (TMI) on the challenges to the development of multicellular parasites vaccines.
Major points of the presentation are the following ones:

- Multicellular parasites are a major threat to animal health and welfare with impacts on food quality and profitability for farmers.
- Different way of thinking compared to the development of vaccines against viruses and bacteria.
- The major aim of the vaccine would be to limit/ kill eggs of the parasite rather than eradicate the parasite.
- For nematodes, drugs are used and resistance is increasing. The development of a vaccine may help limit the development of resistance.
- Several approaches have been taken: attenuated vaccines, fractionated native antigens, recombinant vaccines *etc*.
- Difficulties to convince farmers to use vaccines in general and more specifically for parasites
- Further research is needed on mechanisms behind the variation in responsiveness

For more details, please refer to the presentations.

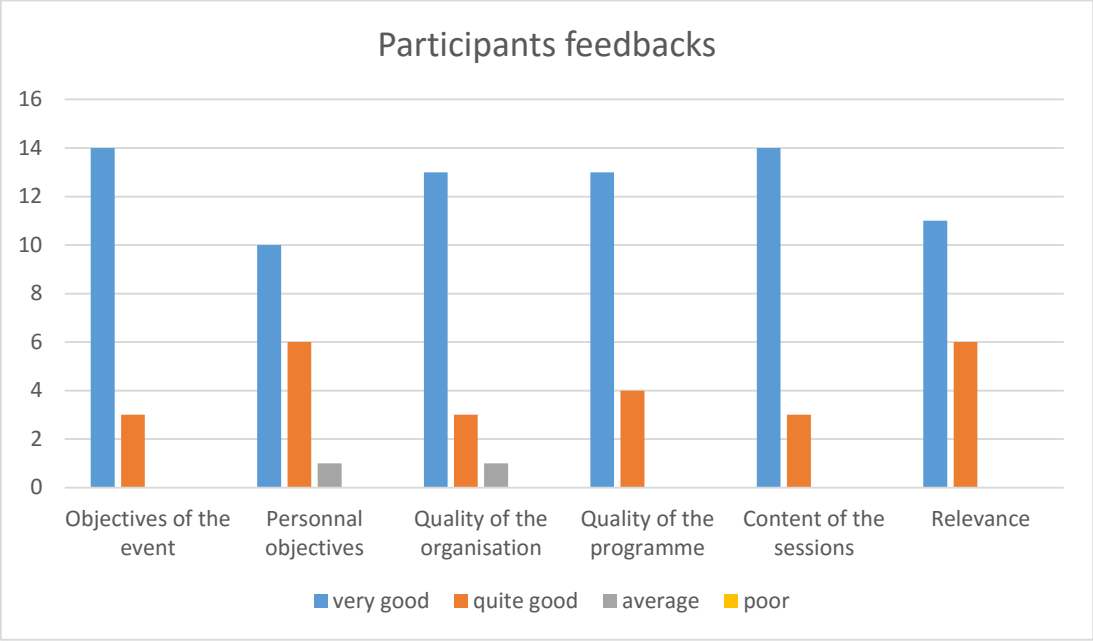
3.7. Conclusion and discussion of this workshop

- Developing a vaccine is a complex process involving several skills and functions
- Business part of the development process is as important as the scientific part
- A lot of vaccines exist on the market but there is not a lot of innovation/ changes in the commercial vaccines
- Innovation is expected in the markets especially in the innate system
- Innovation is also expected for the adjuvant part of the vaccines, new ideas are being developed
- There is a huge pressure / demand from the field / farmers to have multivalent vaccines at the early stage

A lot of dynamic and fruitful discussions between the attendees, the invited experts and the challenger (Bruno Goddeeris) emphasized that research in several dimensions is needed to achieve successful veterinary vaccine development. The research tracks include the understanding of clues behind farmers' decision to use or not vaccines, the development of easy-to-use vaccines such as needle-less vaccines, the cost assessment of endemic animal diseases which is key to rise proportionate financial supports, and the need to take into account increasingly heavy regulatory constraints while promoting the development of well controlled marker and vector vaccines. New veterinary vaccine solutions are tightly related to cost-benefit analyses, at the social, economic and safety level.

4. Evaluation Feedbacks

Participants of the workshop were invited to fill in an evaluation form in order to provide feedbacks to the speakers and organisers. Main results and feedbacks are presented in the graph below.



From a general point of view, participants were satisfied by the organisation and the content of the workshop. Some feedbacks received:

- *"Topics developed are very interesting, I appreciated a lot the interruption of Bruno Goddeeris, the debate and the final round table"*
- *"Excellent meeting, very interactive and great discussions, great to interact with industry"*
- *"Debate between leaders was good, nice to hear the differences of opinion and it was very helpful"*
- *"Valuable discussions, stimulating atmosphere bringing people together from different background and experience, good balanced early career and experienced"*

In terms of improvement, the main point to be taken into account for next event would be to shorten the number of presentation per day or reduce the time dedicated to one session. Some feedback received:

- *"Have a little more time for questions and discussion after each session"*
- *"1h talks would be easier"*
- *"Sessions were too long and too many talks on day 1, so although the content was great, the final session were tiring and not as productive as they could be"*
- *"Possibly reduce speakers sessions to 1h30"*
- *"Shorter presentations, more room for discussion"*
- *"Put notebook or paper to write in the participant folder and have refreshments in the room, shorter talks (only 1h), more microphones to keep discussion going, split the talks into 2 whole days instead of 1 and a half"*
- *"Too short, want more talks and time"*