



SHORT REPORT

The COST COMBAR meeting in León as experienced by a young researcher in veterinary parasitology

As a young researcher in veterinary parasitology, my research work focuses on the development and assessment of targeted-selective anthelmintic treatment strategies in dairy herds. I was lucky enough to join the EU COST Action CA16230 COMBAR – “Combating anthelmintic resistance in ruminants” from the start, as I was still working on my post-doc project devoted to the development of a stepwise decision making strategy to rationalize anthelmintic treatment of dairy cows.

Becoming a member of the COST Action COMBAR is a great opportunity for a young researcher. Indeed, joining such a research network facilitates contacts with scientific leaders and young researchers from across Europe working in the field of anthelmintic resistance. Then it becomes possible to: (i) present and discuss recent research results and obtain constructive and experienced criticism in return, (ii) build collaborations for the present and the future (I am currently involved in a COST collaboration with a German team), (iii) be part of discussions for a coordinated approach towards solutions for anthelmintic resistance and be entrusted with new responsibilities in this joined effort, (iv) take part in and/or set up training schools and short term scientific missions.

Once a young scientist has joined a Cost Action COMBAR, he has the opportunity to attend the working group meetings. The last one was in León (Spain) on the 26-27th of September 2018: a two-day conference entitled “Anthelmintic resistance: past, present and future” where young European researchers as well as eminent researchers from all continents presented diversified recent research results and their views on knowledge consolidation as well as thoughts on how to move forward. The conference was divided into three parts in keeping with the three Working Groups of the Cost Action COMBAR (WG1: Improving diagnosis, WG2: Understanding the socio-economic aspects, WG3: Innovative, sustainable control methods). Dr. Gerald Coles introduced the conference by sharing his enlightening “three-dimensional” vision of the situation of anthelmintic resistance. First dimension – The past: he first highlighted different aspects of the anthelmintic use history that led to the emergence of anthelmintic resistance (the dose and move recommendation of veterinary parasitologists, the official authorization to use anthelmintics without diagnosis, the failure to apply quarantine dosing...). Second dimension – The present: he showed some discrepancies that can exist between some high-tech diagnostic tools and the fact that we still “*need information on how to persuade farmers to adopt recommendations to slow the development and spread of resistance*”. Third dimension – The future: Dr. Gerald Coles finally showed different ways to overcome anthelmintic resistance “A) *‘Farmers eye’ a no cost method of practising TST? B) Breeding of resistant or resilient sheep and cattle, C) Modified natural products, D) Possible use of ozone in solution? E) Novel vaccines*”.

Speaking of targeted-selective treatment (TST) approaches, Dr. Andy Greer also offered his experienced overview with a communication entitled “Targeted Selective Treatments: Lessons learnt and future considerations”. Focusing on the evaluation of liveweight gain based TSTs in young growing animals, he pointed out 5 key lessons which have been learnt and that can assist in developing appropriate TST regimes in growing livestock. I particularly appreciated this presentation, noting how these lessons could be easily extrapolated and used for other categories of animals, especially grazing adult dairy cows infected by gastrointestinal nematodes. “*Lesson 1: Not all animals*



require treatment at all times, with the timing and frequency of treatments to individuals showing considerable variability within and between mobs.” Exactly the same thing could be written about dairy cows. In adult dairy cows, the requirement of treatment is usually assessed indirectly by quantifying the milk production response to anthelmintic treatment: this response is highly variable between herds and between cows within herds. *“Lesson 2: Parasitological measures (primarily faecal egg counts) are frequently poorly correlated with animal performance, reflecting either resilience or inadequacy of these measures to predict those which are suffering from parasitism.”* This is also true for dairy cows: none of the routine parasitological measures are unequivocally associated with the post-treatment milk production response. *“Lesson 3: setting appropriate liveweight gain targets can be a challenge, particularly when dealing with variation in expected performance between animals, mobs and seasons.”* Of course, liveweight gain targets are not adapted to TST in dairy cows, but we can encounter similar challenges when developing TST based on production-based indicators like parity, days in milk, body condition score, level of production: we should work with flexible thresholds adapted to each herd. *“Lesson 4: There is still room for improvement and refinement, particularly when utilising relatively crude indicators which can be influenced by factors other than parasites and in light of the recent availability of advanced grazing sensors.”* This is also true for dairy cows. Refinement could come from the combination of several crude indicators which would define a profile. But we should not endlessly expect to find the perfect profile which could flawlessly distinguish cows suffering from parasitism from the others. A more reasonable approach would be to define more or less specific profiles associated with an increasing probability of milk production response. *“Lesson 5: The potential benefits of TST regime extends beyond simply providing refugia, particularly in the context of utilising information on the number of treatments received to assist with genetic selection and providing marketing-based information on the responsible use of chemicals in food producing animals.”* This last lesson is true for all categories of livestock.

Another fascinating communication was the one by Dr. Laura Peachey : *“Novel options for worm control; exploiting helminth-microbiota interactions in gastrointestinal helminth infections in livestock”*. She presented how a network of interactions between gastrointestinal parasites and the gut commensal bacteria could be exploited by using supplementation with (i) targeted prebiotics to avoid the negative impact of infection on gastrointestinal microbial metabolism, and (ii) probiotics which improve host immune responses to gastrointestinal helminth parasites. She also explained that bioactive forages could interfere in this network of interactions: *“there is evidence that bioactive feeds containing high levels of fructan may exert some anthelmintic effect via a prebiotic effect on the host gastrointestinal microbiota”*. And as Dr. S. Sotiraki showed in her presentation that interactions between condensed tannins and ivermectin may occur, it is clear that this complex network of interferences between gastrointestinal helminth parasites, gut commensal bacteria, bioactive forages and drugs form an area for further investigation, which can be particularly useful for the integrated control of gastrointestinal nematode infections. By the way, *“Are we ready to enter a post-anthelmintic era?”* questioned Dr. Jan Felipe Torres Acosta. Ready or not, he said that some farms, with multiple anthelmintic resistance, are already in this post-anthelmintic era in Latin America, before he compiled several favourable results for the non-anthelmintic sustainable control of gastrointestinal helminth infections: nutritional supplementation, good body condition scores and their maintenance, plants affecting the biological cycle of parasite populations inside their hosts, copper oxide wire particles, Barbervax® vaccine. In conclusion he delivered an optimistic message to face partial or total anthelmintic failure *“The building blocks of a sustainable gastrointestinal nematode control are present, but the construction still requires trained staff (vets) with knowledge and ability to be the architects and engineers building solid strategies for each farm”*.



So I left this 2nd COMBAR meeting with the enthusiastic feeling that there are certainly plenty of things to do in research, but also in the field. And the next time I have to go to the field to implement trials or to conduct trainings to inform, educate, and persuade veterinarians and farmers to implement sustainable practices, I will try to keep in mind the explanations given in the presentation of Dr. Olivia Maria Dourado Martins on the three types of behaviours regarding conscious decision-making : *“i) compulsory behaviour based on regulation, ii) incentive-driven behaviour based on economic rationality and iii) voluntary behaviour driven by socio-psychological factors”*.

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