

## COMBAR Final Conference

**“Combatting anthelmintic resistance in ruminants: options for the future”**

**7-9 March, Athens, Greece**



### Welcome to the final COMBAR meeting

Cattle, sheep and goats are parasitised by various helminth species. These pathogens are important production-limiting diseases of grazing ruminants in Europe and are mainly controlled through grazing management and the strategic use of anthelmintics. Today, anthelmintic resistance (AR) has become a global threat for effective parasite control and rentable livestock farming. **The COST Action COMBAR aimed at coordinating research at the European level to find solutions for the AR problem.** The action works in a structure of 3 working groups: (1) Diagnosis; (2) Socio-economic aspects and (3) Integrated control.

After 4 successful joint Working Group meetings in Warsaw and León, Ghent and an online meeting, COMBAR is already approaching its final conference. During this conference we want to look back on what we have achieved and summarize the current knowledge. But above all, we want to look forward and investigate what are the options for the future to achieve sustainable helminth control and how we can maintain the established network and critical mass. As before, we will do this alongside the themes of the 3 workings groups and hope to achieve a broad and general discussion with the actors involved: farming organisations, veterinarians, medicines industry, researchers and decision makers.

Given the ongoing COVID effects on travel and international meetings, we are hoping to have at least 50 participants in person and are also aiming to provide some (but not full) online participation options. COMBAR Final Conference aims to reinstall the physical connect between all who care for sustainable worm control and want to contribute to future activities in this field.

Hoping to meet you soon,

Dr. Johannes Charlier  
Chair

Dr. Smaro Sotiraki  
Vice-chair and Local organiser

PASTEUR INSTITUTE  
Athens, Greece

**COMBAR**  
combatting anthelmintic  
resistance in ruminants

7-9 MARCH  
2022  
COST Action CA16230

After 4.5 successful years COMBAR is coming to an end, and we are happy to organise our Final Conference.

By organising this Conference as a physical meeting, we aim to reinstall the physical connect between all who care for sustainable worm control and want to contribute to future activities in this field.

Looking forward meeting you all in Greece.

Welcome to our  
FINAL COMBAR CONFERENCE  
Combatting anthelmintic resistance  
in ruminants: **options for the future**


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## Programme


Monday 07/Mar

12:00-13:00	Registration	
13:00-14:00	Lunch	
14:00-14:10	Welcome by local organiser	Smaro Sotiraki
14:10-14:40	COMBAR – from past to present	Johannes Charlier
14:40-15:00	Poster introduction (1 min per poster)	
15:00-15:30	<b>Keynote: Preparing future veterinarians to implement integrated gastrointestinal nematode control in small ruminant farms</b>	Felipe Torres-Acosta
15:30-16:00	Coffee break/Poster session	
16:00-17:30	Oral presentations (8 mins + 2mins discussion)	
	- Increasing importance of anthelmintic resistance in European livestock: creation and meta-analysis of an open database	Hannah Rose Vineer
	- Validation of the image-based FECPAKG2 system for counting sheep nematode eggs with a sensitivity of 5 EPG	Claire Reigate
	- Eprinomectin-resistant <i>Haemonchus contortus</i> strains in French dairy sheep farms: can we balance pastoral traditions and control of gastro-intestinal nematodes?	Sophie Jouffroy
	- Exposure to <i>Ostertagia ostertagi</i> in Austrian dairy cattle: Preliminary results	Pena Espinoza Miguel Angel
	- A novel benzimidazole derivative shows in vivo anthelmintic activity against <i>Haemonchus contortus</i> in gerbils and sheep	Martinez Valladares
	- High endoparasitic burden in cattle grazed on alpine pastures	Barbara Hinney
	- Geographical and temporal diversity of parasite prevalence revealed by computer modelling	Tong Wang

19:30: Social dinner offered by 

Tuesday 08/Mar

9:00-9:30	<b>Keynote: The drivers of change in animal farming management decisions: A systems- based approach</b>	Constantine Iliopoulos & Irini Theodorakopoulou
09:30-10:30	<b>WG 1: Diagnosing – Achievements and prospects</b>	Laura Rinaldi, Georg von Samson-Himmelstjerna
10:30-11:30	Oral presentations (8 min + 2 min discussion)	
	- Genome-wide analysis of the response to ivermectin treatment by a Swedish field population of <i>Haemonchus contortus</i>	Paulius Baltrusis
	- Occurrence of benzimidazole resistant <i>Haemonchus contortus</i> in Norwegian sheep, detected by droplet digital PCR	Maiken Gravdal
	- Detection, confirmation and characterisation of fenbendazole resistance in <i>Ostertagia ostertagi</i> in clinically affected grazing dairy calves in Great Britain	Natalie Jewell
	- Delineating the species-specific impact of four anthelmintic classes on gastrointestinal nematodes on 52 Welsh sheep farms	Paul Airs
11:30-12:00	Coffee break/Poster session	
12:30-13:00	<b>WG2: Socio-economic aspects – Achievements and prospects</b>	Edwin Claerebout
13:00-13:30	Oral presentations (8 min + 2 min discussion)	
	- The veterinarians' perspective regarding pasture parasites in Norwegian sheep and cattle, a questionnaire study (tbc)	Caroline Nedreld
	- Sustainable gastrointestinal parasite control in dairy cattle: educational tools for veterinarians and farmers	Damien Achard
	- Sheep deworming strategies and AR in Sweden - insights from a national survey and wildlife nemabiome analysis	Peter Halvarsson
13:30-14:30	Lunch/Poster session + group picture	
14:30-15:00	<b>Keynote: The presence of veterinary drugs in agricultural soils and their interactions with the soil microbiota: toxicity, microbial degradation and bioaugmentation approaches to avert environmental pollution</b>	Dimitrios Karpouzias
15:00-16:00	<b>WG3: Integrated control – Achievements and prospects</b>	Eric Morgan, Herve Hoste
16:00-16:30	Oral presentations (8 min + 2 min discussion)	
	- Essential oil as natural anthelmintic for combating sheep gastrointestinal nematodes	Mohamed Helal
	- Plant supplementation combined with Targeted Selective Treatment in goat farmers from Botswana: a survival analysis approach	Javier Ventura-Cordero
	- In vitro and in vivo anthelmintic efficacy of essential oil of <i>Satureja montana</i> (L.) against gastrointestinal nematodes of sheep	Filip Štrbac
16:30-18:30	Management committee	MC members only

19:30: Social dinner offered by 

Wednesday 09/Mar

9:00-9:30	<b>Keynote: DISARM – a Thematic Network on Disseminating Innovative Solutions for Antibiotic Resistance Management: achievements and reflections</b>	Erwin Wauters
9:30-10:30	Overall discussion: "We can't stop now"	Moderator: Smaro Sotiraki; Panel members: WG leaders
10:30-11:00	Oral presentations (8 min + 2 min discussion)	
	- Investigation of eprinomectin resistance in gastrointestinal strongyles on a dairy goat farm in Northern Serbia	Stanislav Simin
	- Improving burden estimation of gastro-intestinal strongyles to target whole-group treatments and to preserve anthelmintic efficacy in small ruminants in Italy	Anna Maurizio
	- STAR-IDAZ International Research Consortium: Global coordination of animal disease research	Madeline Newman
11:00-11:30	Going beyond COMBAR	Johannes Charlier
12:00	Lunch and coffee	

 @COMBARCOST #COMBAR

## COMBAR Final Conference

7-9 March 2022  
Hybrid event - Greece

Presenter: Filip Štrbac

Affiliation: University of Novi Sad, Serbia

Email: strbac.filip@gmail.com

COMBAR Working Group (1, 2 or 3): WG3

Preferred format

Oral:

Poster:

### IN VITRO AND IN VIVO ANTHELMINTIC EFFICACY OF ESSENTIAL OIL OF SATUREJA MONTANA (L.) AGAINST GASTROINTESTINAL NEMATODES OF SHEEP

Filip Štrbac<sup>1</sup>, Antonio Bosco<sup>2</sup>, Dragica Stojanović<sup>1</sup>, Nataša Simin<sup>3</sup>, Dejan Orčić<sup>3</sup>, Radomir Ratajac<sup>4</sup>, Kosta Petrović<sup>1</sup>, Giuseppe Cringoli<sup>2</sup>, Laura Rinaldi<sup>2</sup>

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The development of anthelmintic resistance in gastrointestinal nematodes (GINs) requires the search for alternative strategies. The aim of this study was to examine *in vitro* and *in vivo* anthelmintic efficacy of essential oil (EO) of *Satureja montana* (L.) against GIN of sheep, as well as toxic effects in sheep, in order to evaluate the possibility of its use in the veterinary practice. *In vitro* Egg Hatch Test (EHT) was conducted at eight different concentration (50, 12.5, 3.125, 0.781, 0.195, 0.049, 0.025 and 0.0125 mg/mL) of EO. In addition, for the *in vivo* Faecal Egg Count Reduction Test (FECRT), *S. montana* EO was administered orally to sheep of two different farms in southern Italy at the mean dose of 150 mg/kg. The chemical composition of EO was determined by GC-MS. In the EHT, *S. montana* EO showed ovicidal potential against sheep GINs with inhibition of egg hatchability that varied from 17.3-83.0% depending on the used concentration. The EO also showed *in vivo* anthelmintic potential with the total reduction of FEC of 15.7% and 33.0% at days 7 and 14 after treatment, respectively. No toxic effects were observed during clinical evaluation, blood count and liver function tests of sheep. The main represented compounds of EO were p-cymene (42.8%), carvacrol (28.1%) and  $\gamma$ -terpinene (14.6%). The obtained results suggest that *S. montana* EO may be used in the sustainable future management of GIN infections in sheep as a complementary and sustainable method to reduce the use of chemicals and to counteract anthelmintic resistance.