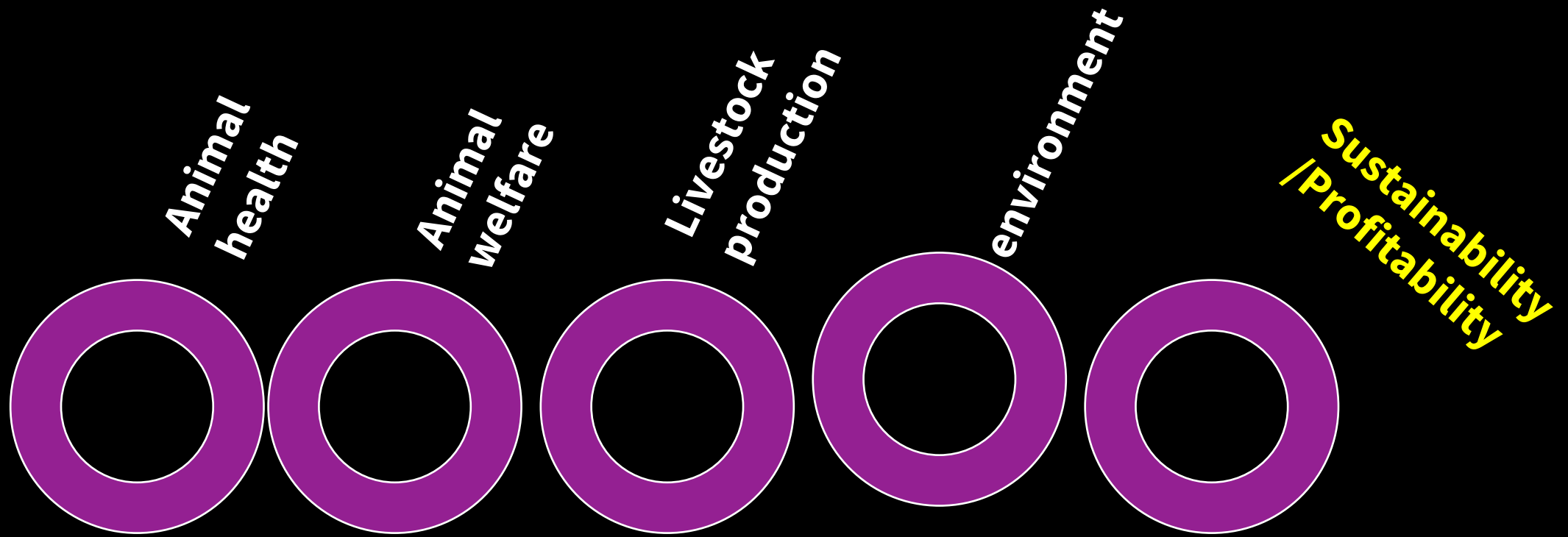




Prevalence and Economic Impact of Antiparasitic Resistance in Europe



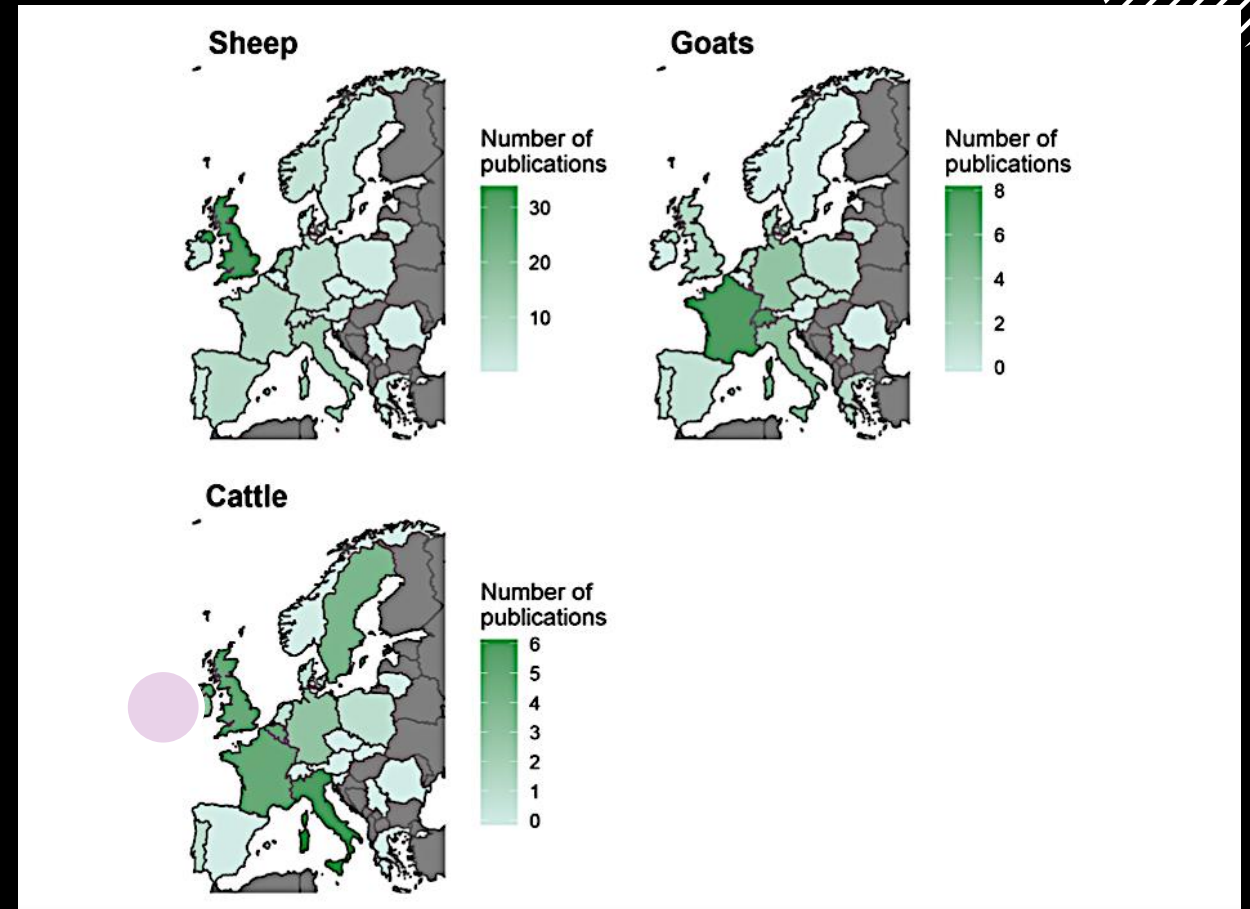
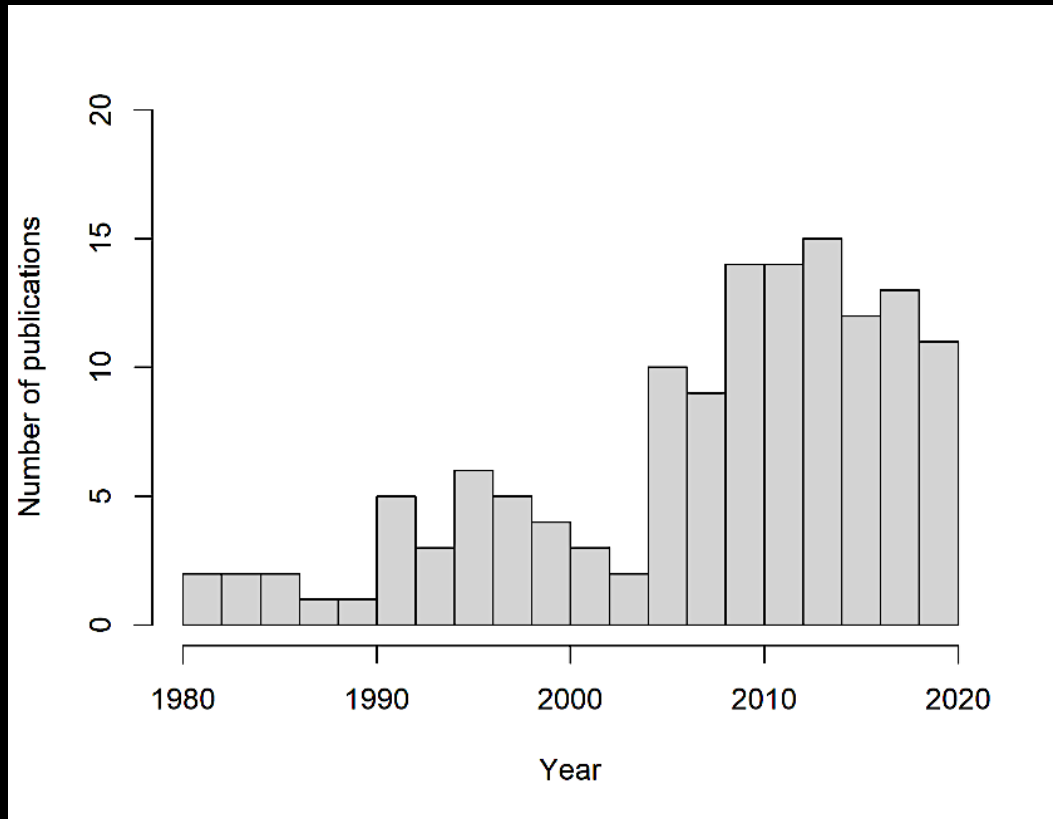
Smaro Sotiraki
Vet Res Institute HAO-DEMETER,
Vice Chair COMBAR COST Action



worm control matters

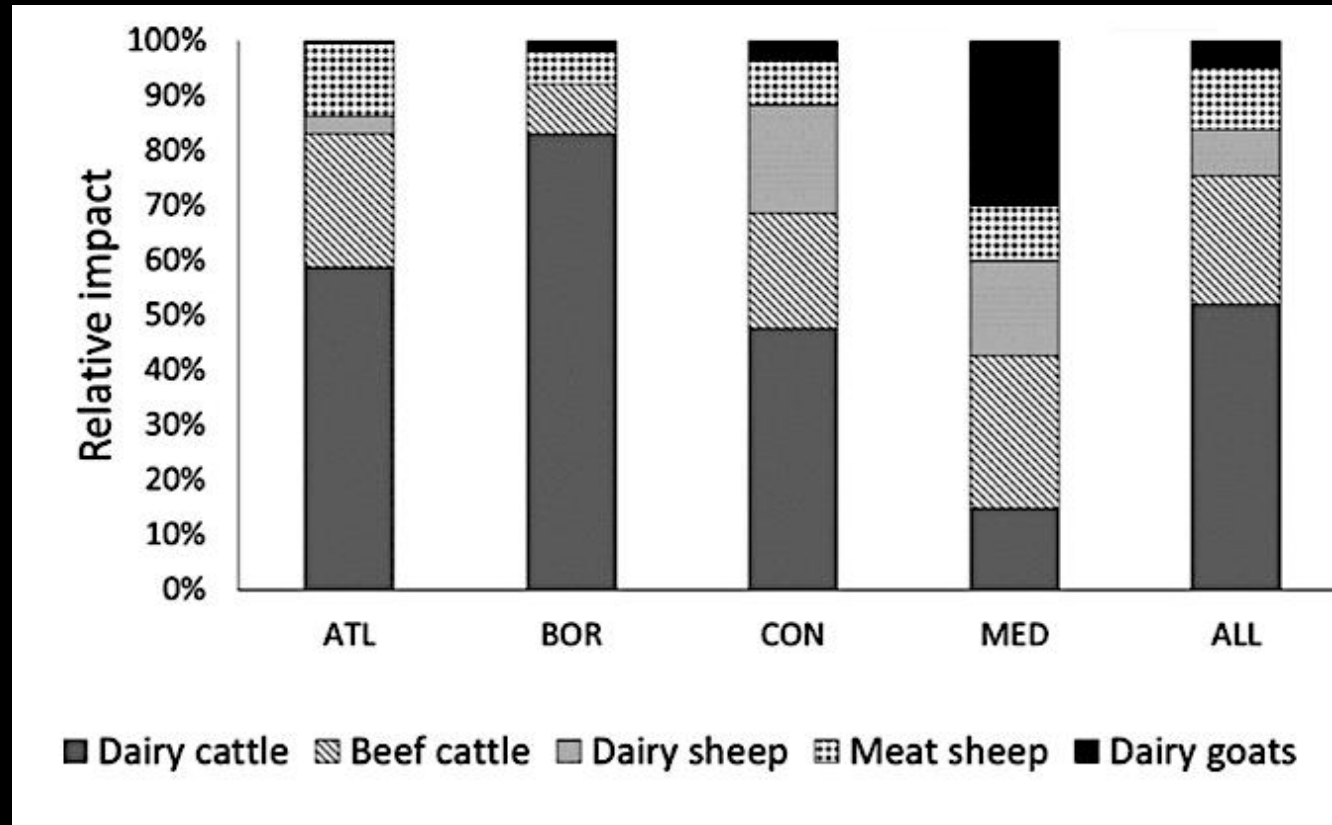
**Anthelmintic Resistance in parasites is
widespread throughout Europe**

evidence

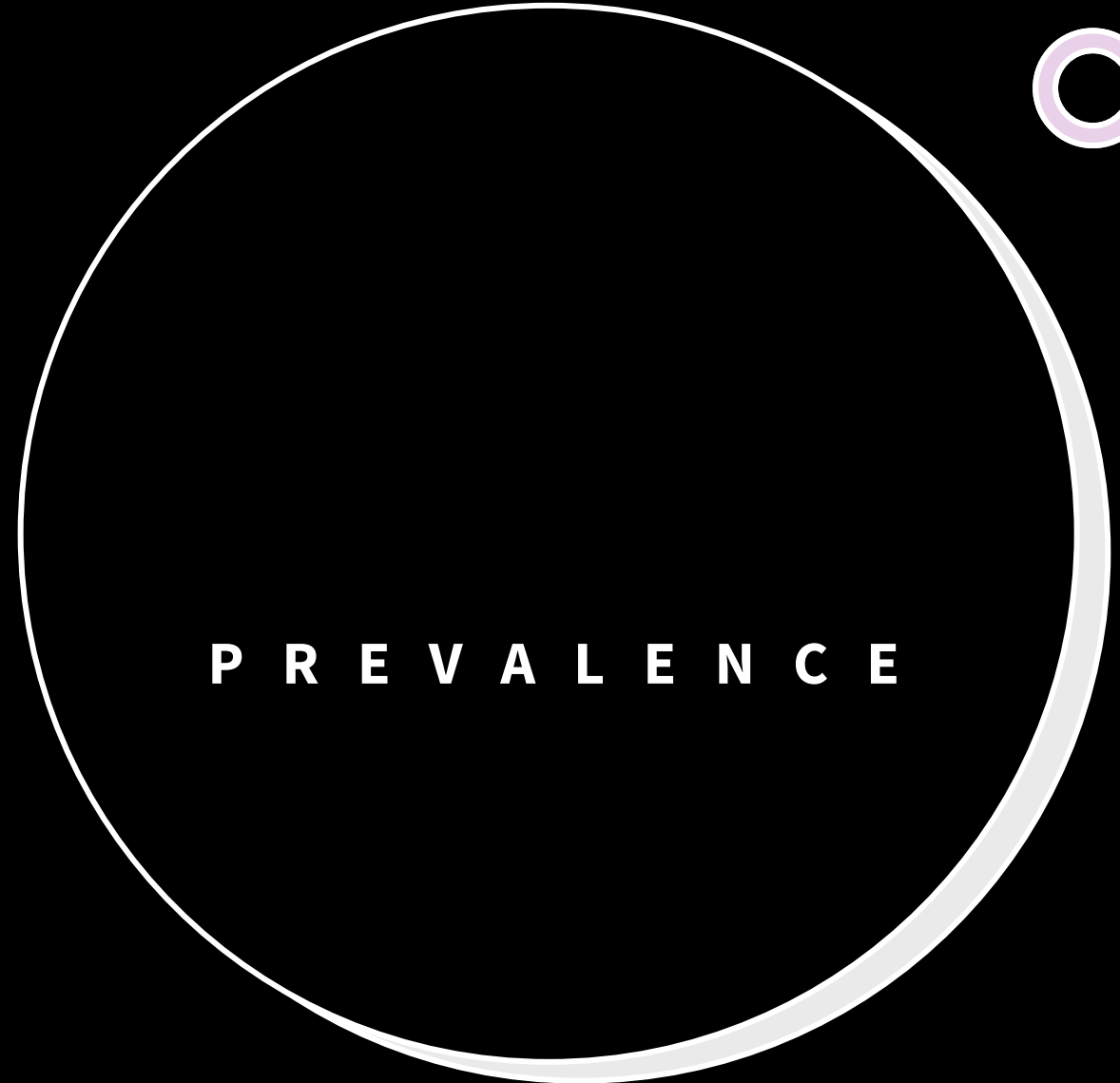


Impact

- Budgets of all known national and European research projects on the topic in Europe over 10 year period
 - € 2.7 M / year
- Annual investment / Annual cost:
 - 0.15%



to Fig. 1): ATL = Atlantic (BE, FR, UK, IE, NL), BOR = Boreal (NO, SE), CON = Continental (AT, DE, LT, MK, PL, RO), MED = Mediterranean (ES, IL, IT, PT, TU), ALL = all combined.

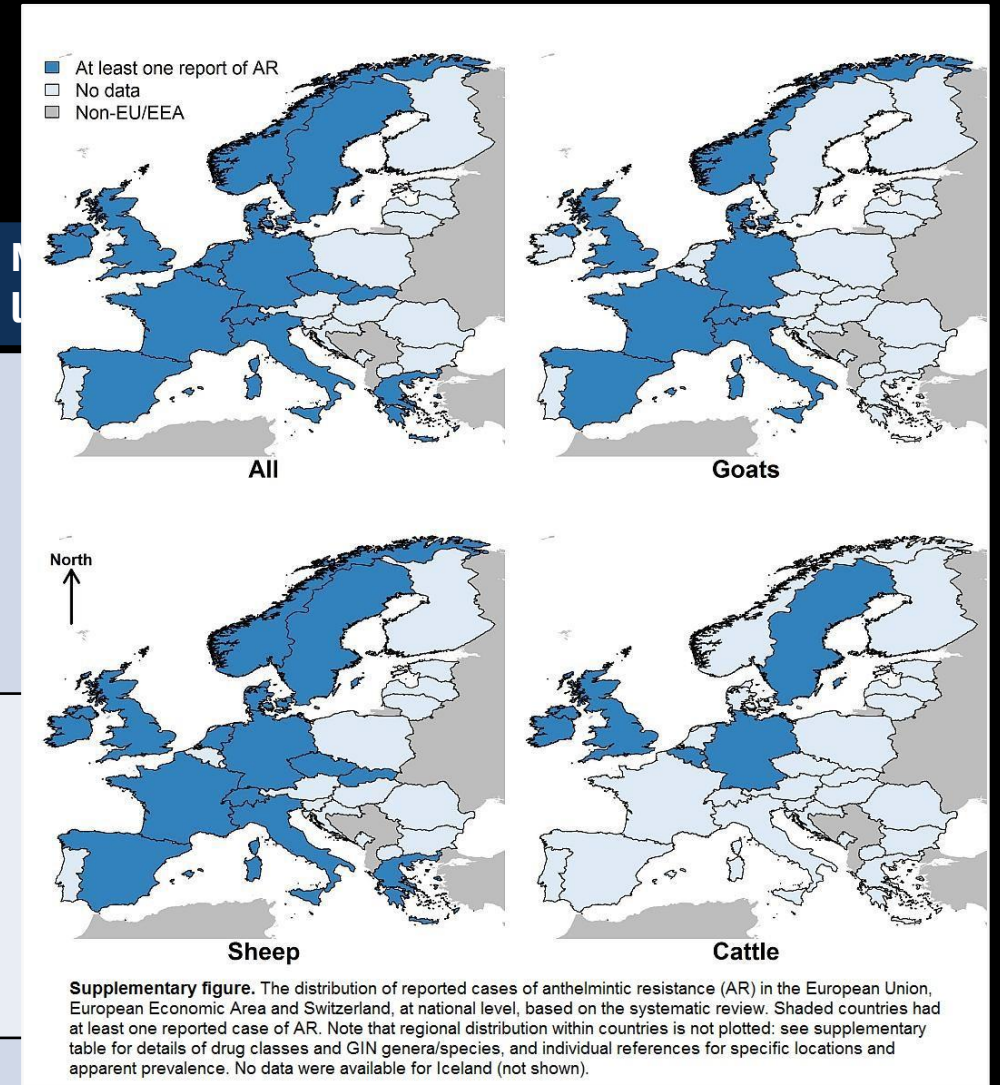


P R E V A L E N C E



The problem of AR

Host	Species	Benzimidazoles	Levamisole	M	U
Cattle	<i>Cooperia spp.</i>	X			
	<i>Haemonchus placei</i>	X	X		
	<i>Ostertagia ostertagi</i>	X	X		
	<i>Trichostrongylus axei</i>	X			
	<i>Fasciola hepatica</i>	X			
Sheep & Goats	<i>Haemonchus contortus</i>	X	X		
	<i>Teladorsagia spp.</i>	X	X		
	<i>Trichostrongylus spp.</i>	X	X		
	<i>Nematodirus spp.</i>	X			
	<i>Fasciola hepatica</i>	X			
Horses	Cyathostominae	X			
	<i>Parascaris equorum</i>				
Pigs	<i>Oesophagostomum spp.</i>	x	x		

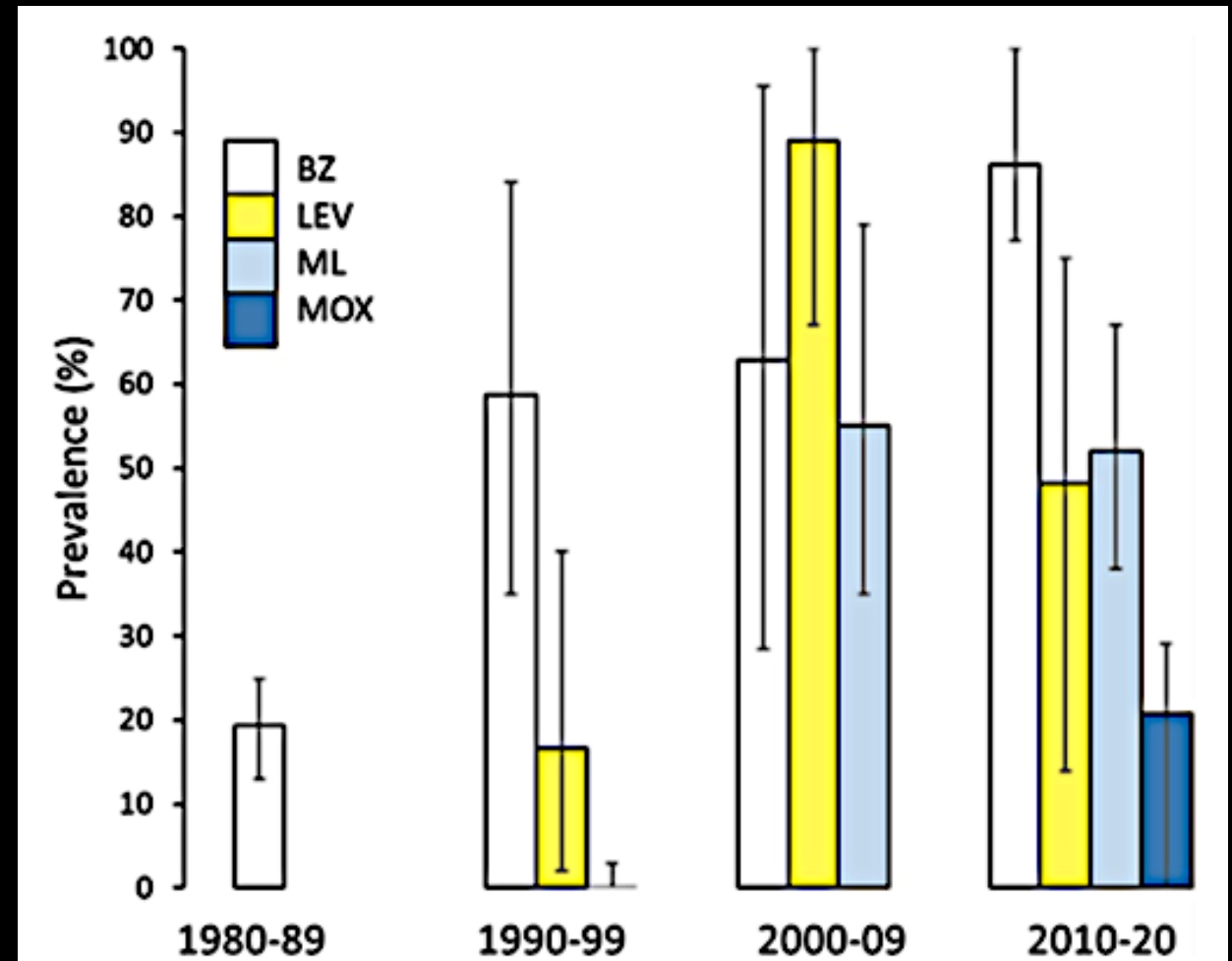


X

X

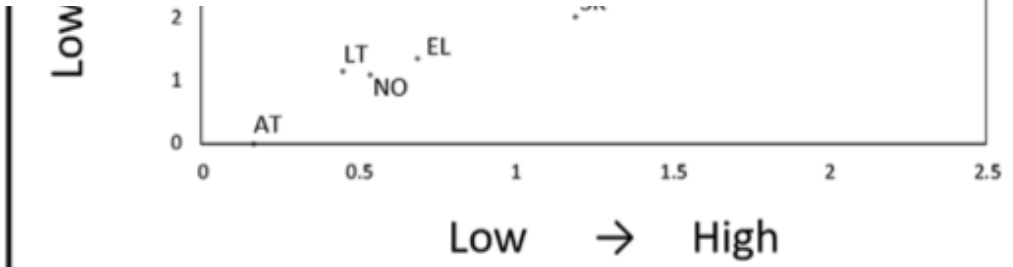
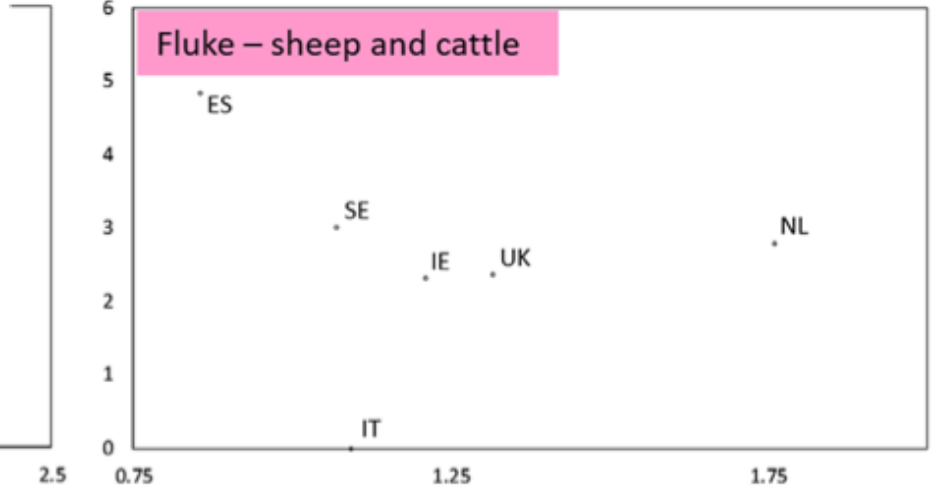
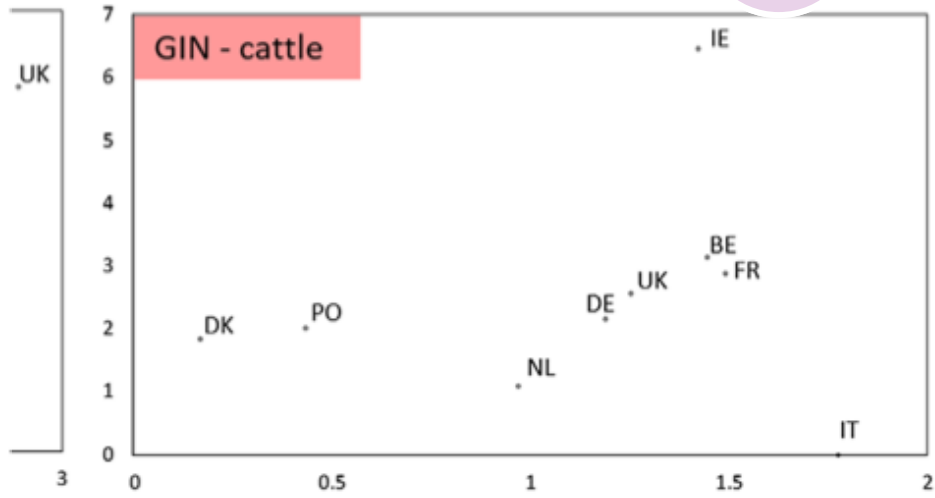
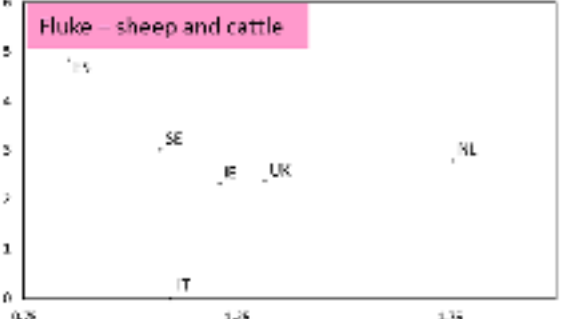
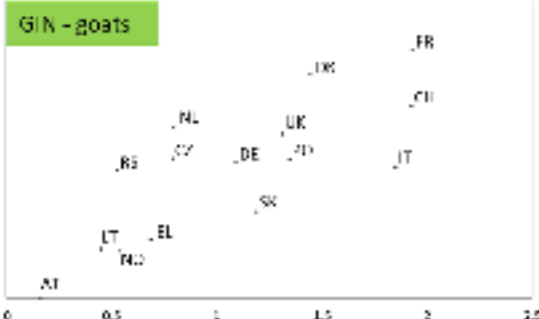
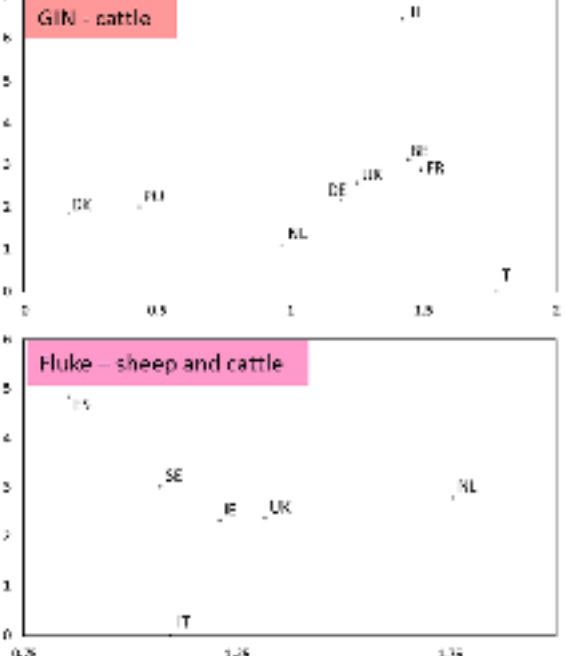
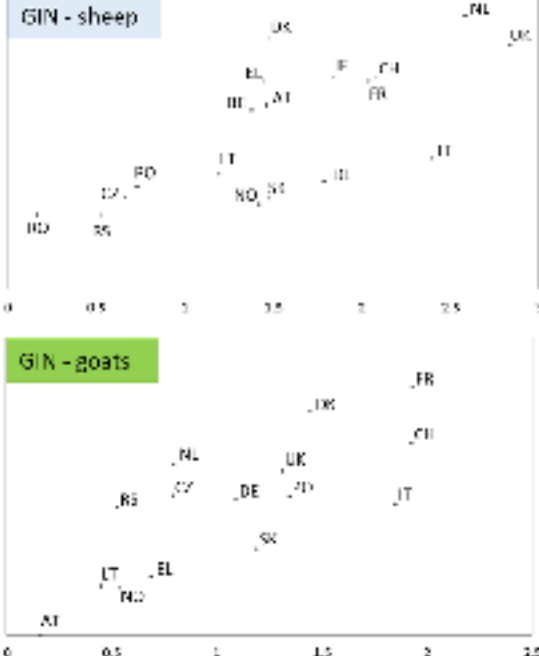
AR – an increasing problem

Anthelmintic	Host	Prevalence (all)	Studies (all)
BZ	Sheep	0.48 (0.12)	123 (94)
	Cattle	0.08 (0.04)	15 (12)
	Goats	0.51 (0.17)	31 (29)
LEV	Sheep	0.32 (0.06)	43 (40)
	Cattle	0.12 (0.01)	4 (4)
	Goats	0.20 (0.04)	11 (11)
ML	Sheep	0.29 (0.07)	85 (61)
	Cattle	0.32 (0.10)	31 (24)
	Goats	0.44 (0.18)	27 (24)
MOX	Sheep	0.17 (0.03)	36 (35)
	Cattle	0.27 (0.10)	9 (6)
	Goats	0.01 (0.01)	7 (7)





Level of treatment failure
↑
High
Low



Research effort / Confidence



E C O N O M I C
I M P A C T



Considerations

Cost of disease is function of:

Disease frequency

Infection intensity

Effects of disease on mortality and productivity

Efforts to respond to the disease

Access to pasture

- Reduced efficacy
 - Production losses
 - Treatment cost

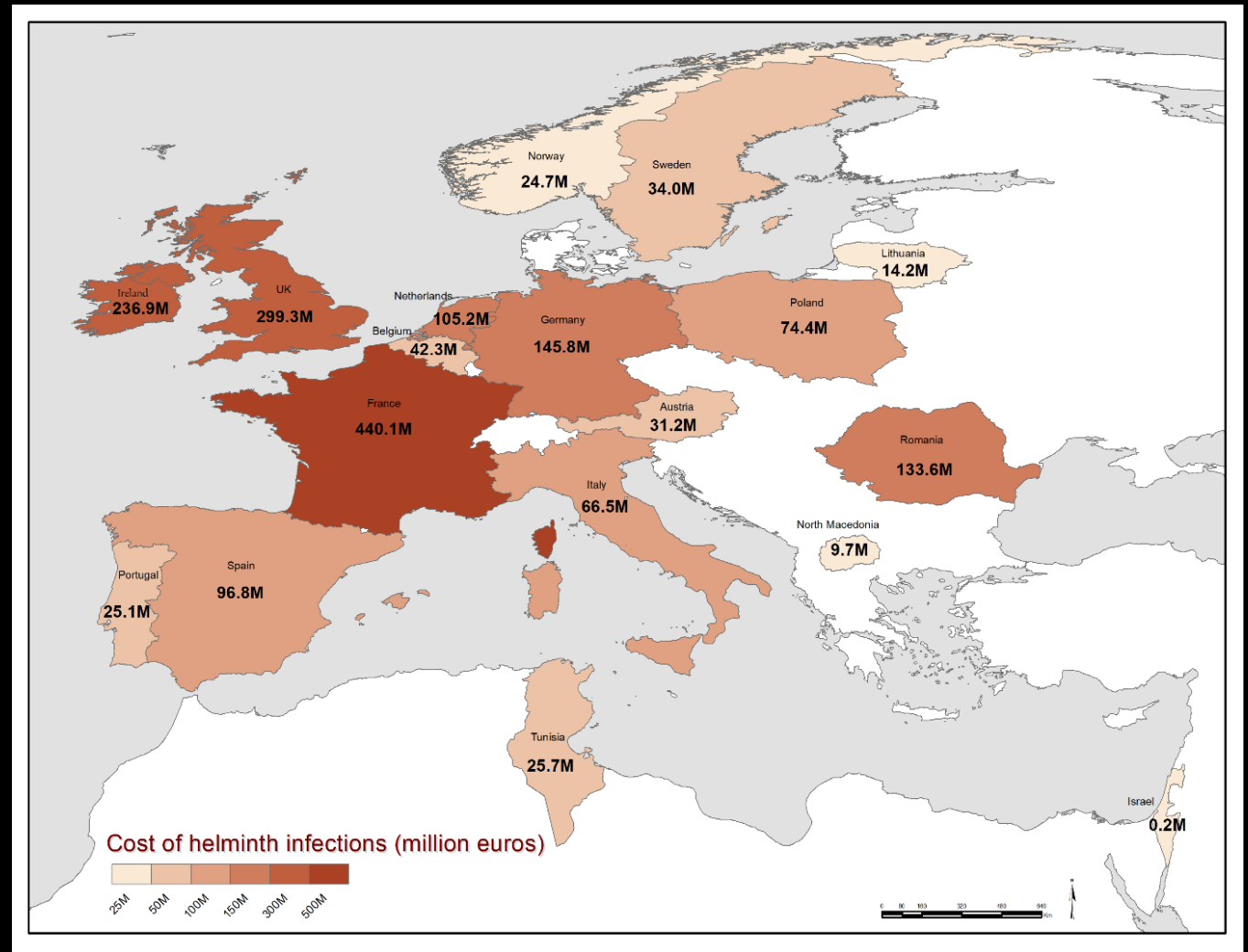
Effects of anthelmintic resistance

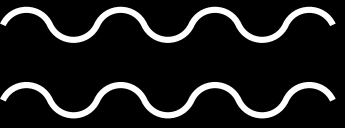
15%

- Disaggregation from overall costs of infection

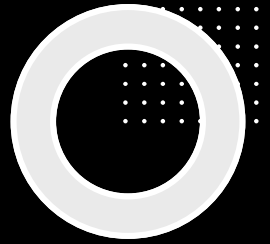
Cost of infection – EU-18

- Total - € 1.8 billion
 - Production losses: 81%
 - Treatment costs: 19%
- By helminth species
 - GIN: € 686 million
 - *F. hepatica*: € 635 million
 - *D. viviparus*: € 139 million





losses infection



dairy cattle
€ 941 million



beef cattle
€ 423 million



dairy sheep
€ 151million



meat sheep
€ 206 million



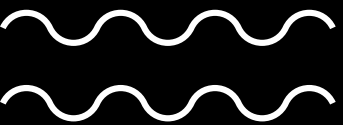
dairy goats
€ 86 million



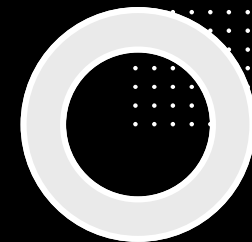
losses AR

Estimated costs (€) of anthelmintic resistant gastrointestinal nematodes, resulting from lost productivity and the cost of partially ineffective anthelmintic drugs.

Country	Dairy cattle	Beef cattle	Dairy sheep	Meat sheep	Dairy goats	Total
Austria	391,809	54,913	10,163	21,576	155,826	634,288
Belgium	200,126	233,931	1,065	25,304	20,021	480,447
France	4,373,931	844,473	786,719	2,150,462	21,966	8,177,552
Germany	657,732	364,678	2,699	318,601	158,209	1,501,918
Ireland	4,911,750	2,731,982	0	804,002	0	8,447,734
Israel	0	1,164	0	142	5	1,311
Italy	381,714	653,922	29,486	17,373	7,633	1,090,128
Lithuania	31,286	10,984	381	3,790	6,376	52,817
Netherlands	741,876	109,517	8,297	209,963	235,000	1,304,653
Norway	60,772	57,365	48	80,740	22,603	221,528
Poland	1,228,492	185,286	17,996	10,154	20,138	1,462,066
Portugal	151,540	154,763	35,286	45,892	25,421	412,903
Republic of Macedonia	86,080	9,552	54,046	32,708	30,144	212,530
Romania	914,636	111,778	1,240,305	425,410	0	2,692,129
Spain	377,539	2,100,836	235,942	0	404,151	3,118,468
Sweden	145,007	83,246	0	12,110	0	240,364
Tunisia	177,951	57,371	38,310	254,177	30,226	558,035
United Kingdom	2,323,478	1,540,352	0	3,584,824	0	7,448,654
TOTAL	17,155,720	9,306,113	2,460,742	7,997,228	1,137,720	38,057,523



losses AR



dairy cattle

€ 17 million



beef cattle

€ 9 million



dairy sheep

€ 8 million



meat sheep

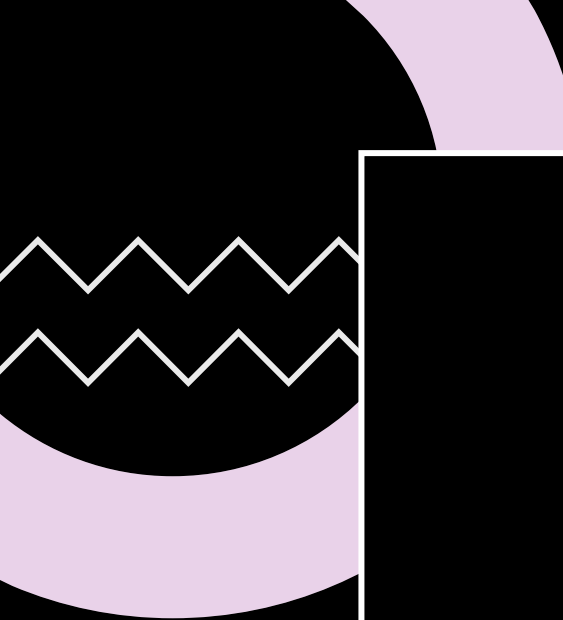
€ 3 million



dairy goats

€ 1 million





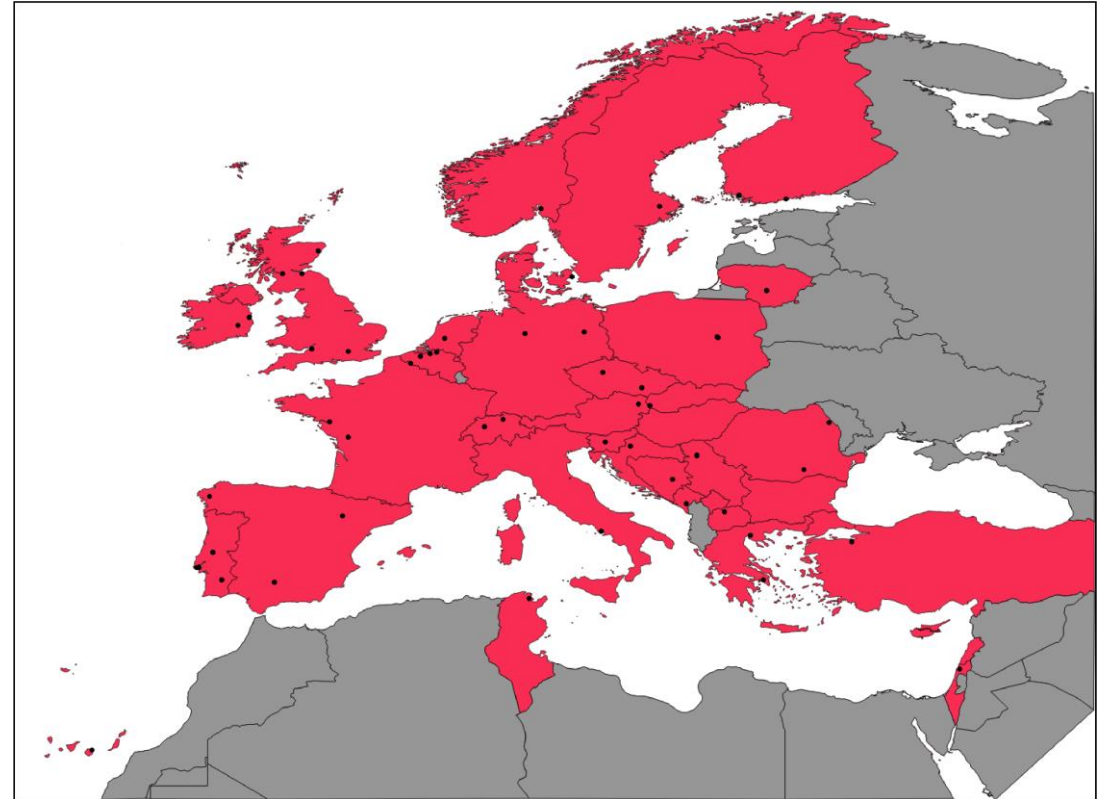
**overall costs were
estimated at
€ 38 million annually**



**(6 % of the production
cost of GIN)**

COMBAR

combating anthelmintic
resistance in ruminants




EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY



Initial assessment of the economic burden of major parasitic helminth infections to the ruminant livestock industry in Europe

Parasite 27, 49 (2020)
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<https://doi.org/10.1051/parasite/2020062>


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Increasing importance of anthelmintic resistance in European livestock: creation and meta-analysis of an open database

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**THANK
YOU**

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