



EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

Anthelmintic resistance in Europe

Cattle, sheep and horses

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EWP member, CBG-MEB

An agency of the European Union





Contents

Overview of the anthelmintic resistance situation in Europe

- Cattle
- Horses
- Sheep



Anthelmintic drug class	Mode of action	Generic drug name	Introduced on the market	Resistance reported	Reference
Heterocyclic compounds	Blocking dopaminergic transmission	Phenothiazine	1940	1957	(Leland et al., 1957)
	Agonist of the inhibitory GABA-receptor	Piperazine	1954	1966	(Drudge et al., 1988)
Benzimidazoles	Inhibiting polymerisation of microtubules	Thiabendazole	1961	1964	(Drudge et al., 1964)
		Cambendazole	1970	1975	(Berger, 1975)
		Oxibendazole	1970	1985	(Drudge et al., 1985)
		Mebendazole	1972	1975	(Berger, 1975)
		Albendazole	1972	1983	(Cawthorne and Whitehead, 1983)
		Fenbendazole	1975	1982	(Boersema and Lewing-van der Wiel, 1982)
		Oxfendazole	1976	1981	(Le Jambre et al., 1981)
		Triclabendazole	1983	1998	(Mitchell et al., 1998)
Imidazothiazoles and Tetrahydropyrimidines	Agonist of nicotinic acetylcholine receptors	Levamisole	1970	1979	(Sangster et al., 1979)
		Pyrantel	1974	1996	(Chapman et al., 1996)
		Oxantel	1976	-	-
		Morantel	1970	1979	(Sangster et al., 1979)
Macrocyclic lactones	Allosteric modulators of the glutamate-gated chloride channels	Abamectin	Late 1970's	2001	(Wooster et al., 2001)
		Ivermectin	1981	1988	(van Wyk and Malan, 1988)
		Moxidectin	1991	1995	(Leathwick, 1995)
		Doramectin	1993	2007	(Borgsteede et al., 2007)
		Eprinomectin	1996	2003	(Loveridge et al., 2003)
		Monepantel	2009	-	-
Amino-acetonitrile derivative	Agonist of nicotinic acetylcholine receptors				
Spiroindole	Antagonist of cation channels	Derquantel	2010	-	-

Source :De Graeve

Vlaams

Diergeneeskundig

Tijdschrift 2012



Cattle



Resistance

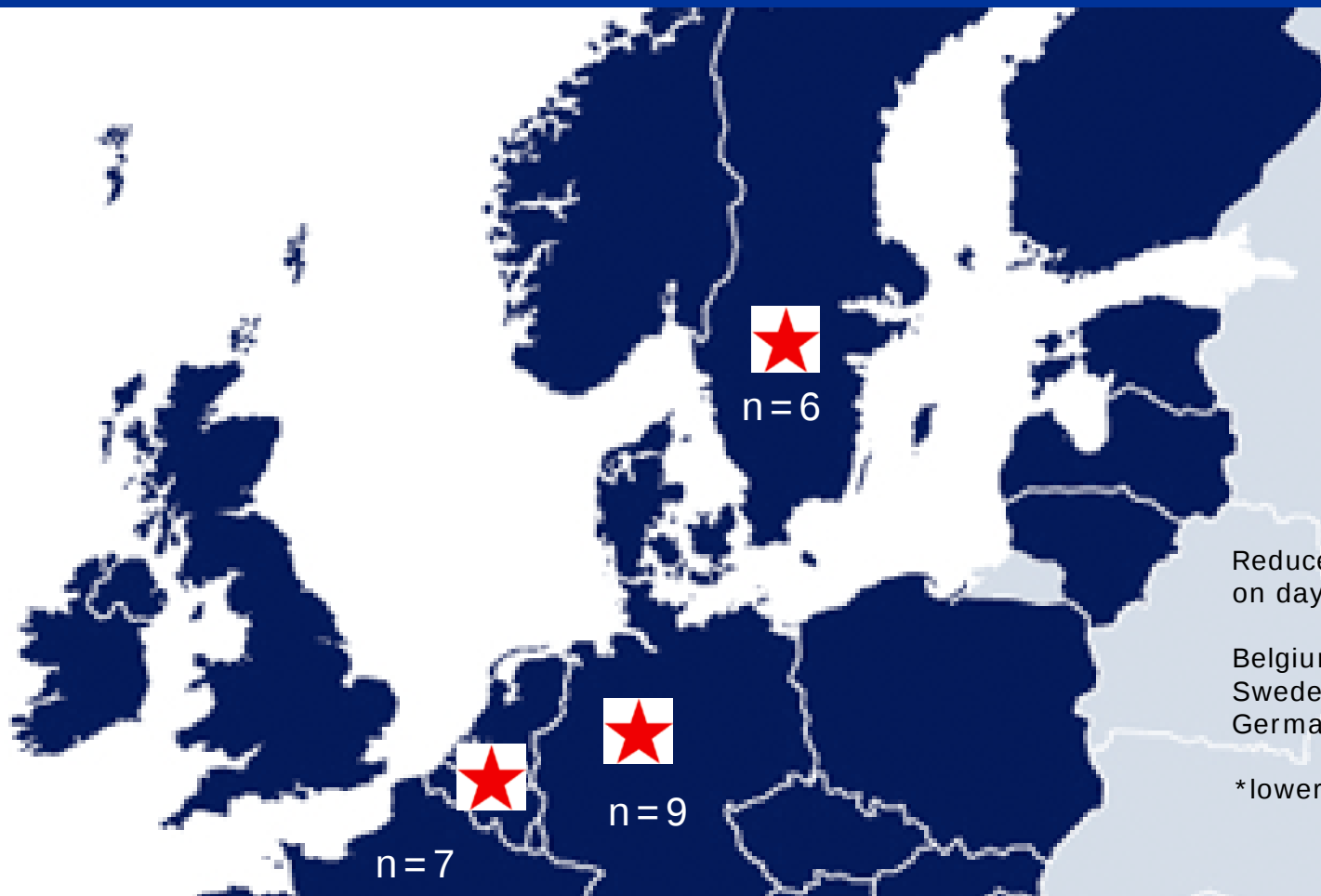
Cooperia oncophora



Ostertagia ostertagi



Typical nodules in
abomasum: hyperplasia
and distention of gastric
glands



Ivermectin resistance
In 2006

Cooperia oncophora
and/or *Ostertagia*

ostertagi source Demeler et al
2008

Reduced efficacy (FECR < 95%
on day 21)

Belgium 5/7 farms*
Sweden 4/5 farms
Germany 5/8 farms*

*lower CI < 90% in all farms



Monitoring resistance development . one farm

Source El Abdellati et al (2010)

FECRT

80%

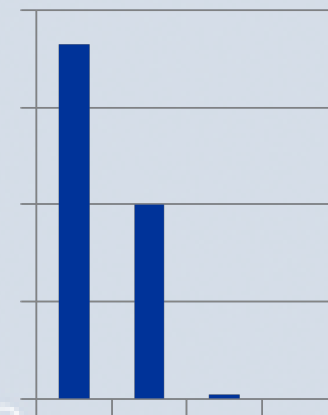
60%

40%

20%

0%

2006
2007
2008



*Cooperia
oncophora*
Ivermectin
resistance



Horses



Resistance in Europe *Parascaris equorum*



- ivermectin (reports throughout Europe)
- moxidectin (reports)

Source: Von Samson-Himmelstjerna, 2011, Nielsen 2014, Matthews 2014

Cyathostominae



- Benzimidazoles frequent
- pyrantel (some reports)
- ivermectin/moxidectin?



Sheep





Resistant helminths

- Teladorsagia spp,
- Haemonchus contortus,
- Trichostrongylus spp
- Fasciola hepatica





Resistance in sheep helminths in Europe

- Benzimidazoles
- Levamisole

Increased resistance to macrocyclic lactones

- Ivermectin (mainly)
 - Doramectin
 - Moxidectin
-
- Multi-drug resistant helminths
-
- Triclabendazole (flukicide)

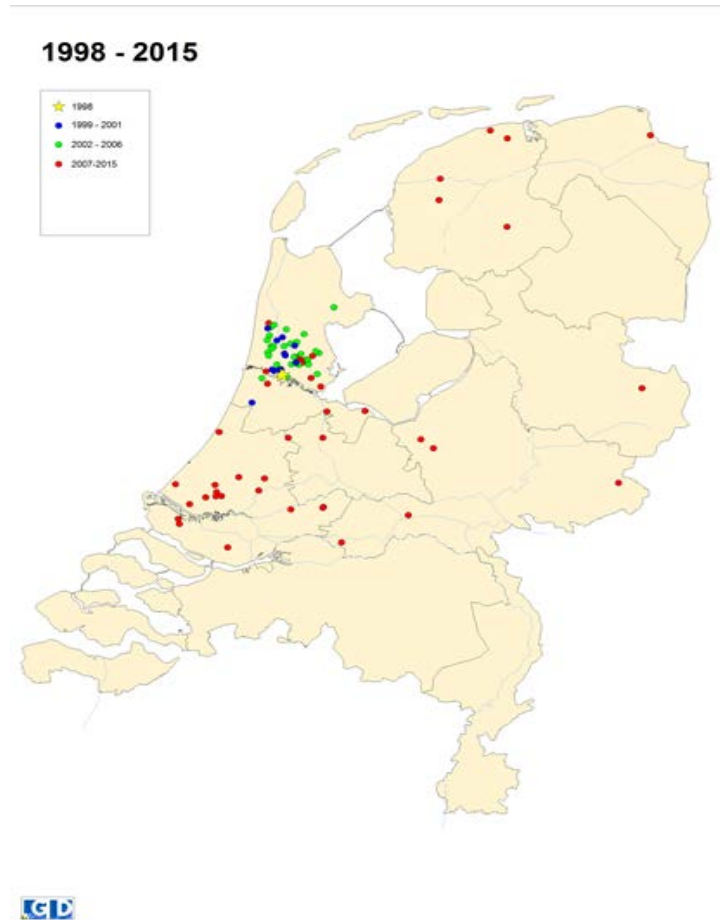
- *Source Papadopoulos 2012*



Triclabendazole resistance in
Fasciola hepatica in the
Netherlands. Based on necropsy
and FECRT

Monitoring is voluntary:
underestimation

Source V.d. Brom, GD Deventer





conclusion

- Resistance can spread very quickly within a wormpopulation
- Reports on resistance situation used small numbers of farms
- Monitoring program in entire Europe?



Thank you for your attention

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