Prevalence of Anthelmintic Resistance (AR) - the UK Situation

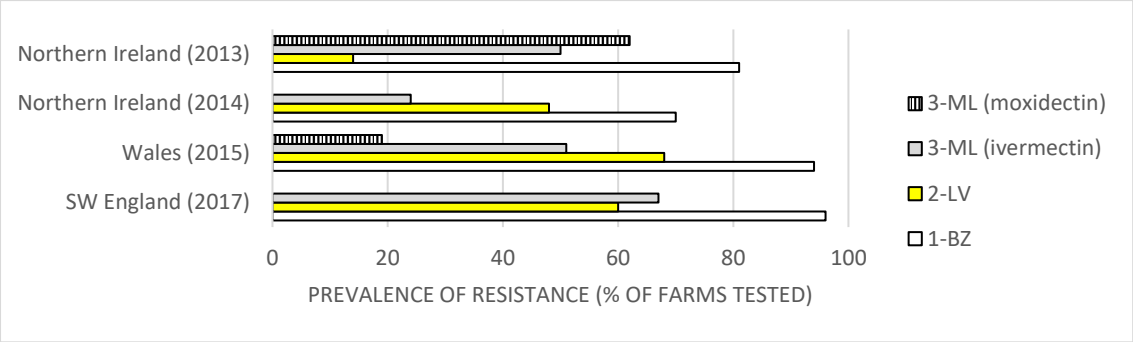
Since the introduction of the different broad-spectrum class in the UK and across all other major sheep producing countries of the world, anthelmintic resistance has been detected. The speed at which AR is developing is increasing. This may partly be due to better awareness of anthelmintic resistance and improved reporting of suspected cases. Dual purpose of the injectable 3-ML group has caused additional resistance pressures in this group, due to being used widely in the control of sheep scab.

Table 1. In chronological order of introduction: Anthelmintic classes and the first reported cases of anthelmintic resistance in the UK in sheep

Class		*Date of introduction in UK*	*Date of first case of resistance reported in UK*
1-BZ		*1960s*	*1984*
2-LV		*1970s*	*1996*
3-ML	ivermectin	*1980s*	*2001*
3-ML	moxidectin	*1990s*	*2007*
4-AD		*2010*	*2018*
5-SI		*2012*	*Unreported so far*

Based on surveys conducted in Great Britain since 2000, a large proportion of lowland farms have Benzimidazole (1-BZ) resistance and a smaller, but a significant proportion have Levamisole (2-LV) resistance (Figure 1 below). The prevalence amongst hill farms may be lower than lowland farms. 3-ML (ivermectin and moxidectin) resistance is now being reported in many parts of Great Britain, and further emphasizes the importance of exercising some control over its development and spread between flocks, before it becomes widespread throughout the country. 4-AD resistance is emerging in the UK.

Figure 1. A recent prevalence survey report demonstrates anthelmintic resistance from across the UK.



Anthelmintic resistance has been detected in a number of species of sheep roundworms. This demonstrates the relative pathogenicity and likelihood of resistance development in different roundworm species seen in the UK.

Figure 2. The relative pathogenicity and likelihood of resistance development in different UK roundworm species.

Relative pathogenicity	Genus (common-name)	Relative likelihood to develop resistance
	Haemonchus (barber's pole worm)	
	Teladorsagia (Brown stomach worm)	
	Trichostrongylus (Scour worm)	
	Nematodirus (thread-necked worm)	
	Cooperia	
	Large bowel worms	

Figure 2. Red denotes high pathogenicity and high likelihood of anthelmintic resistance development; green denotes low pathogenicity and low likelihood of anthelmintic resistance development with amber in between.

1-BZ Benzimidazole (1-BZ) resistance has been reported in *Teladorsagia circumcincta, Haemonchus contortus, Cooperia curticei* and *Trichostrongylus* spp.

Additionally 1-BZ resistant *Nematodirus battus* has been detected in a small number of flocks across the UK. A survey showed that the genes for resistance were found in around 1 in 4 flocks but generally at very low levels (e.g., on 2% of the individual parasites examined but may be at higher prevalence on some farms).

2-LV Levamisole (2-LV) resistance has been reported in *T. circumcincta, C. curticei* and *Trichostrongylus* spp.

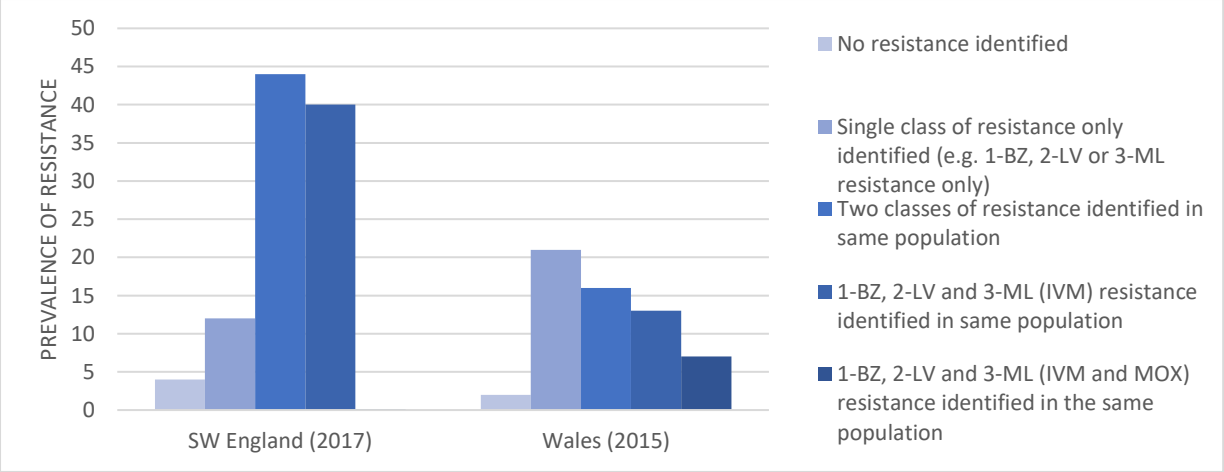
3-ML Ivermectin (IVM) (3-ML) resistance has been reported in *T. circumcincta* and *Trichostrongylus* species in a number of sheep flocks in parts of Great Britain. There have also been reports of moxidectin (MOX) resistance. In the early stages of selection this usually manifest as a reduced period of persistency.

4-AD Monepantel resistance has been reported in *T. circumcincta, Trichostrongylus vitrinus and Oesophagostomum* on three farms in the UK.

5-SI Resistance has not currently been reported to 5-SI.

Multiple Resistance - The emergence of 'triple' resistance' is becoming greater with the majority of surveyed farms hosting parasite populations that are resistant to more than one anthelmintic class. These populations are a cause for concern and presents further challenges in terms of correct advice and management.

Figure 3. Findings of resistance to more than one class of anthelmintic in the same population



Advice to maintain effective control and how best to manage resistance depends on the current knowledge of the resistance status to the different anthelmintic groups, the worm species involved and at what stage in the season advice is being given. Spread of anthelmintic resistance between farms.

Undoubtedly livestock movements between farms have contributed significantly to the spread of AR between farms. It has also led to the introduction of AR worms on many UK farms, as well as those worldwide. Frequent importations of sheep, often from multiple sources and usually without effective quarantine treatments on arrival are a major risk factor. Effective quarantine and treatment of all new and/or returning sheep is essential to minimize the risk of importing resistant parasites. In addition, it prevents the introduction of novel parasites to the holding such as *Haemonchus contortus,* sheep scab or liver fluke. See chapter 2. SCOPS Principles, section 2.3. Quarantine

References

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