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PRACTICAL ASPECTS OF ANTHELMINTIC THERAPY IN SMALL RUMINANTS

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The impact of parasitism on productivity of farm animals is quite severe contributing to the heavy economic loses. Loses in the animal production system in terms of reduced body weight gain, reduced FCR, inefficient production, decreased fertility is primarily linked with parasitic infections. A common feature of all infestations is reduced efficiency of food utilization through reduction in food intake, increase in nutrient requirement as a result of damage to or loss of host tissue. In order to curtail any economic loss, susceptibility of farm animals to the effects of parasitism could be minimized by adopting certain strategies to reduce its widespread impact on production. These include chemical (use of drugs) and non-chemical (management aspects, proper nutrition) strategies. The control strategy adopted is a dynamic process that requires regular periodic review and updating of management practices.

The best strategy to control parasitism is by avoiding exposure of animals to parasites and their larvae which can achieved through management of animals as well as of pasture. It has been reported that even after regular dosing the growth of exposed lambs never approached to those that were never exposed to parasites in the first place. However, this is not practically possible in settings where our livestock is reared. In Kashmir valley, the main strategy to control parasitism is the use of antiparasitic drugs (table 1). However, the non-judicious use of these drugs results in failure to control parasitism, wastage of money and importantly development of resistance.

Prevalence of parasites depends on the geographical location and various eco-geographical variables like climate, altitude, mean temperature, precipitation etc. Therefore, before framing any antiparasitic drug schedule, the fecal samples should be sent for testing to determine which parasites are predominant in that particular area at that particular point of time. This will enable to select appropriate drug to be used. Infact, the pattern of parasitic infections is one of main tools to determine suitable drugs to be used in that region. For example, in the UK, the pattern of parasitic infections seen is shown in Fig. 1.

While considering dosing of livestock, it is essential is to determine which group of sheep/goats is most susceptible and must be treated on priority. The following groups of sheep are susceptible to the effects of gastrointestinal nematode parasitism and should routinely be included in any control programme:

a) Lambs/kids during their first grazing season.
b) Naïve adult animals being moved from extensive 'worm-free' grazing to contaminated low ground pasture.
c) Rams/Bucks.
d) Sheep/goats with compromised immunity, for example due to poor body condition, undernutrition, concurrent disease and lactation.
e) Pregnant animals are mostly ignored in formulating any dosing programme and are the ones mostly affected. One major

source of pasture larval contamination derives from the periparturient rise in faecal egg output of the ewes. This normally persists for about 6 weeks after lambing, associated with peak lactation, although ewes probably contribute to pasture larval contamination until weaning.

Another important factor in controlling parasitism involves selective treatment of animals that require dosing. Nematode infections are not distributed evenly in an animal population; only approximately 30% to 35% of the animals harbor a majority of the nematodes. Thus nematode eggs shed in the feces of those animals constitute the vast majority of pasture contamination. This has been now used in *targeted selective treatment* (TST) approach of parasite control replacing the traditional approaches of deworming all of the animals in the herd or flock. This way only those animals are treated that are in need. Also, this ensures that a portion of the worm population that is not selected by anthelmintic treatment of susceptible nematode larvae (from non-treated animals), known as *refugium,* is maintained on the pasture, to help dilute out resistant genes from resistant nematodes that survived treatment. This has been used successfully in settings in which *H. contortus*is the primary nematode. This success was made possible by using the FAMACHA system to identify the anemic animals needing dewormng, thereby leaving the non-anemic animals to provide the refugium. In areas in which other nematode species are predominant, FAMACHA is of little use, and Faecal egg count (FECs) and body condition scoring should be used to identify the animals with heaviest infections. Another field method that has been used in young growing animals to identify the more highly parasitized of the group is evaluation for reduced weight gain (an indicator of the effect of parasites on production). This strategy requires regular weighing of all animals in the group, those that do not meet the desired weight gain threshold are separated and dewormed. An exception to the recommendation for using TST is with lambs or kids to be sold for fattening or slaughter. Because these animals will be moved to confinement pens and then slaughtered, deworming them all before shipping will help put them in better condition without risk of contaminating pastures with resistant worms.

The main problem in the field is the dose of anthelmintic given. Most of the sheep rearers have remembered some age old dosage and follow same for all the drugs. Proper awareness regarding determination of dose on the basis of an accurate body weight has to be conveyed and followed. Also, sheep and goats metabolize anthelmintics at different rates, goats usually require higher dosages of most of them than sheep. The dosings should start from the age of 2 to 3 months. If the drug is to be administered orally, withholding food (not water) for 24 hours prior to treatment improves efficacy by slowing the transit of digesta and increasing the contact time of the drug with the parasite. This is not recommended for dairy or pregnant animals. This strategy works most efficiently for the benzimidazole class but may have some benefit for improved efficacy for other drug classes. It has been observed that there is a substantial improvement in efficacy by dosing a second time 12 hours after the first dose, as the contact time between the drug and the parasite is increased. For oral administration, administer over the tongue (place the deworming applicator toward the back of the mouth, over the tongue, to maximize the full dose that reaches the rumen. Deworming during handling for other procedures (e.g., castration, vaccination, shearing), known as opportunistic deworming, though convenient is not conducive to long-term productivity. Some breeders continue to deworm the animals at 3-week interval without any plan affecting the economics of the farm, meagre benefits and leading to increase in resistant worm burden. Also, the guidelines regarding withdrawal times are hardly taken into account while performing deworming.

Since we have a harsh winter in the valley, it presents us with the opportunity to control the worm population of next year. In most sheep-rearing areas, only approximately 5 percent of the worm population survives on the pasture during the winter months. Thus, the remainder of the spring's worm population is in the sheep in the form of hypobiotic (arrested) larvae that are encysted in the tissues. Once the sheep gain access to the pasture during favorable weather conditions, the ratio reverses, with 95 percent of the worm population in the grass and 5 percent in the sheep. It is possible to worm the sheep but impossible to worm the pasture. Thus, the most opportune/appropriate time to deal a severe blow to the new season's worm population is before the sheep begin grazing the pasture, so they cannot transfer or "seed" the pasture with a new worm population. The sheep should be wormed 2 or 3 days before turning out on pasture so that the eggs are left in the feces in the barn or lot, where the larvae cannot survive. The macrocylic lactones have the best efficacy in killing hypobiotic larvae, but some of the benzimidazoles may be partially effective. Unfortunately, most of the breeders do not deworm their animals in winter months. Also, drought conditions followed by rain

can result in devastatingly high rates of pasture contamination as larvae that have remained in the feces are released. So, the animals must be treated 10 to 14 days after a long heavy period of rain, particularly following a drought.We have limited studies on the resistance of parasites to commonly used drugs in the valley. To determine whether the worm is becoming resistant to the drug, an egg count must be done. If egg counts are done just before and then 1 week after administration of the correct dose of a dewormer and the decrease in the number of eggs is less than 80 percent, the presence of anthelmintic-resistant parasites must be strongly suspected. In case of areas with some resistance, repeated dosage within 12 hours for benzimidazoles and macrocyclic lactoneswill improve the efficacy. Using two different classes of dewormers together will alos overcome the problem of resistance More frequent rotation of anthelmintics between classes can hasten resistance and should be avoided whenever possible. Benzimidazole efficacy can be improved somewhat by increasing dosages, dividing dosages into two treatments administered at 12-hour intervals, and instituting pretreatment fasting. When using combined anthelmintics, full therapeutic dosage of each must be administered. Increasing dietary protein, specifically of the types with greater rumen bypass ability (e.g., fish meal), appears to maximize both resistance and resilience of animals to parasitism. Culling heavily infected animals, identified by FEC, PCV, FAMACHA, or similar assessment, would eliminate the susceptibility genes carried by those animals; the more resistant genetics would then increase with each generation for which this culling strategy was used. Considering the widespread impact of parasitism and the non-judicious use of antiparasitic drugs, the production of small ruminants continues to suffer reducing the profits of small ruminant enterprise. For proper control of parasitism,a holistic approach needs to be adopted wherein besides using anthemintic drugs, focus is given to management aspects like pasture management, balanced nutrition, rotational grazing etc. The use of drugs must be strictly followed as per the recommendations of the Veterinarian. Mass awareness needs to be done to educate the farmers regarding control of parasitism and judicious use of drugs. Furthermore, more diagnostic labs must come up to study the pattern of parasitic infections, dominance of parasitic species and resistance levels.

Table 1.: Commonly used anthelmintics in Kashmir valley

S. No.	Drug	Dose	Spectrum
	Albendazole	Sheep 5-7.5 mg/kg	Tapeworms, Nematodes, lung worms & Flukes
	Fenbendazole	Sheep 5-7.5 mg/kg Goats 5-7.5 mg/kg	Tapeworms, Nematodes, lung worms & Flukes
	Morentel	Sheep 10 mg/kg	Nematodes
	Oxyclozanide	Sheep 15 mg/kg Goats 15 mg/kg	Flukes & tapeworms
	Closantel	Sheep 10 mg/kg	Flukes >6 weeks *H. contortus*, ectoparasites, nasal bots
	Levamisole	Sheep 8 mg/kg Goats 8 mg/kg	Nematodes & lung worms
	Triclabendazole	Sheep 10 mg/kg Goats 15 mg/kg	Fasciola, lung flukes
	Ivermectin	Sheep 0.2 mg/kg Goats 0.2 mg/kg	Nematodes, Insects, Acarines &lungworms
	Rafoxanide	Sheep 10-15 mg/kg Goats 10-15mg/kg	Flukes >4 weeks (Repeat after 21 days) *H. contortus, Bunostomum*, nasal bots

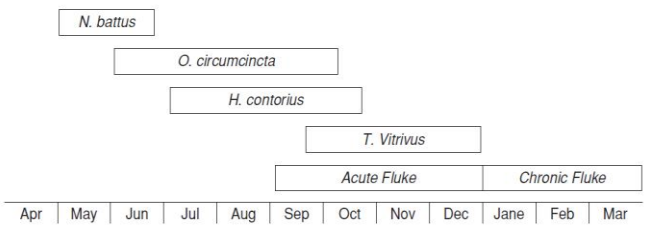

Fig.1. Parasitic patterns in United Kingdom