



Other Diagnostic methods – alternatives to FECs

Immunological methods

A potential alternative to using FECs is the use of ELISA-based methods, either to assess the immune response in an infected animal (indirect) or to detect parasite antigens (direct). These can be carried out on blood (serum ELISAs for *H. contortus*, *T. circumcincta*, *Trichostrongylus* and *Oesophagostomum*), faeces (copro-antigen ELISA for detection of *T. circumcincta*) and milk (individual and bulk milk ELISA for *T. circumcincta*). The indirect methods can be very useful for epidemiological studies, but they cannot differentiate between current and past infection.

The results from direct methods are positively correlated with adult worm burdens but are more prone to cross-reactivity with other nematode species (lower specificity). Both serum- and saliva-based ELISA tests for *T. circumcincta* have been developed. These measure antibodies (IgA) levels and are based on the fact that high IgA levels are correlated to reduced egg counts and maintenance of growth despite worm challenge. These tests are still being evaluated in the selection of animals that are resilient to *Teladorsagia* for breeding purposes.

Faecal Occult Blood (FOB)

H. contortus feeding activity results on the presence of blood in the host faeces. This can be detected by the test approximately 7 days before there is a significant rise in epg. Three FOB tests have been developed (Hexagon, Hematest® and Multistix®) for early detection and predictive severity indicator of haemonchosis in sheep.

Molecular methods

In common with tests for the detection of AR, molecular methods are gaining increasing popularity as a powerful alternative to FECs within research laboratories. These molecular methods are not yet commercially available. Currently these techniques are less specific but are usually more accurate and sensitive. Species-specific molecular probes have been developed for *H. contortus*, *T. circumcincta*, *Trichostrongylus*, *Nematodirus*, *Cooperia* and *Bunostomum* and provide a rapid, cost-effective and reliable diagnostic method for quantification and species identification. A pen-side test for nematode infection is under development based on the possibility of coupling isothermal amplification technique (e.g. LAMP) with low-cost diagnostic platforms (e.g. paper-based microfluidics).