# Haemolymph Proteomics: A New Approach to Monitoring Bee Health

**A technology used in molecular medicine for protein biomarker identification: perspectives for pathology research and health monitoring in bee models**

In health care (animal and human), modern approaches in the discovery of protein biomarkers have hugely contributed to improve the prognosis and diagnosis of diseases by veterinarians and doctors. The discovery of blood protein biomarkers through proteomics is one of the existing tools.

Biomarker discovery research based on proteomics is advanced in different human and animal diseases such as infections, cancer, cardiovascular disorders, while providing opportunities to work with limited to non-invasive methods by the use of blood samples. Blood analysis can indicate if certain elements circulating in the blood stream are, or are not in a normal range, enabling the prediction and detection of pathologies.

**How to get a protein marker ? Modern proteomics applied to blood samples is a recognised method**

The diagram below shows a conventional workflow for protein biomarker discovery, which bridges the gap between visual examination and targeted molecular analyses**.**


**From haemolymph proteomics to bee health monitoring using individual "blood tests"**

This six-step workflow can be applied to bee health, taking advantage of the biomarker discovery research principles. Haemolymph is directly collected by the beekeeper and sent off for processing and analysis.


**A modern approach of protein biomarker discovery demonstrated on bee haemolymph experimentally infected with microbes**

The monitoring report is based on the molecular results observed by color intensity evaluation (color intensity being related to the activity level)/antigenic tests: one band (see "C" figure above) is a negative test, an additional band at T (see fig. above) reflects the presence of the antigen as for a CoVid test. The report can be interpreted by the beekeeper or bee veterinary services, who can integrate it with complementary analytical measurements (detection of viruses, residues of chemicals, etc.) and field observations of bee hive health.

Compared to other molecular approaches looking at gene expression in bees, colorimetric kits and strip-based lateral flow assays (i) have cost-effective advantages, (ii) can be user-friendly and applicable from laboratories to the real-world for prognosis and diagnosis of health problems, (iii) are already available for beekeepers for AFB & EFB monitoring, and (iv) when appropriate, can be developed for transportable devices interfaced with smartphone applications for in field monitoring.

**Sources:**

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