

Studies on the adaptation of Deformed Wing Virus to mite-vector borne transmission

DVM Benjamin Lamp, Ph.D.
Institute of Virology, University of Veterinary Medicine
Veterinaerplatz 1, 1210 Vienna, Austria

Losses of about 10% of bee colonies during overwintering were considered normal, but during the last decade increased mortality exceeding 20% has been observed. The decline of honey bee populations in Europe and North America has been mainly attributed to the mite "*Varroa destructor*", together with the presence of Deformed wing virus (DWV).

DWV is a non-enveloped, single-stranded, positive-sense RNA virus belonging to the family Iflaviridae. Multiple variants of DWV exist, currently grouped as DWV type A, type B, and type C. There is strong evidence for DWV-A replication in *Varroa* mites and involvement in colony losses. DWV-B was originally isolated from *Varroa* mites and termed "*Varroa destructor virus* (VDV)". DWV-B also affects honey bees but there is conflicting evidence about its relevance for colony losses. DWV-C was found in collapsed colonies after efficient treatment against *Varroa* mites. The current hypothesis says that transmission of DWV by *Varroa* mites resulted in a selection of adapted DWV strains with increased mortality. This raises the question how a bee specific virus adapted to a mite? Mites and insects separated in evolution hundreds of millions of years ago. We aim at investigating the genetic changes within the DWV genome that allows infection of the novel host. The *Varroa* mite is reportedly absent from Newfoundland bees. There is a good chance to find DWV strains in Newfoundland bees that are not adapted to *Varroa* and, hence, allows isolation of the ancestral DWV strains. We expect deeper insights into the biology of DWV as a basis for control and prevention of bee colony losses. The collaboration with the Newfoundland and Labrador Beekeeping Association (NLBKA) is highly appreciated.

Beekeepers are welcome to participate in this study by collecting samples of dead or crippled bees as outlined below. Sampling is uncomplicated as the virus is very stable in dead bee samples.



A photo of honey bees in a *Varroa* infested and DWV affected colony. *Varroa* mites are clearly visible on four of these honey bees. The one in the lower centre has deformed wings (photo courtesy Benjamin Lamp).

Sample collection protocol:

A. Collect 20 or more dead bees (with deformed wings or not) from each hive. Collect from the bottom entrance. Do not collect dead bees off the snow around the hive(s). Collect dead bees that are intact (head, thorax, abdomen), dry, and clean (not covered with wax capping debris, etc.)

B. Put each group of dead bees (from each hive) in a small plastic bag with some tissue paper to keep them dry. Do not mix bees from different hives in the same bag. Label each bag with beekeeper name, name or code number of hive (e.g., "hive #1, hive #2, etc."), and date of collection [time, origin of queen, and other variables are not relevant]

C. Place plastic bags in freezer until ready for shipping. Do not squish the bees.

D. Transmit to Gerard Smith ASAP. If possible keep bee samples cool/frozen with a freezer pack to avoid bacterial growth.