

An unusual discovery

The first discovery was in Mexico in 1964, when a dead codling moth larva was found showing strange symptoms: Its body had darkened and seemed to have liquefied. The cause of the symptoms turned out to be an infection with a virus which was identified as *Cydia pomonella* granulovirus and named CpGV-M (for Mexico).



Unique mode of action

It soon emerged, that the microscopic viral particles were highly infectious to codling moth larvae. Their ability to multiply in their host made them deadly to the larvae, even in tiny amounts. Viruses are dependent on their host in order to multiply – a property which makes them highly interesting for use as plant protection agents.



From larva to plant protection agent

It was a huge challenge to multiply these viruses on living host larvae and to formulate them in high concentrations in such a way as to produce a stable, high-quality product. The attempts, however, succeeded and Madex, the first insecticide based on CpGV-M, was registered in Switzerland in 1988 by Andermatt Biocontrol.



Advent of organic pome fruit growing

Madex arrived not a moment too soon, and coincided with the dawn of organic farming. At that time for organic pome fruit producers, CpGV products were the only tool for codling moth management.



CpGV goes global

The first marketing authorisation in Switzerland was soon joined by others in Europe. Demand grew and within a few years, CpGV products were hugely sought after in the major apple growing regions worldwide.



From organic novelty to integrated production tool

The codling moth is a highly adaptable pest and resistance to conventional active ingredients spreads quickly in intensive fruit growing. As a consequence, CpGV products gain ground among resistance management strategies due to their unique mode of action. The virus not only controls larvae that are already showing resistance to certain active substances but also extends the lifespan of conventional insecticides.



Making use of beneficial organisms

Producers in conventional systems are increasingly having to deal with persistent secondary pests. On the other hand, organic orchards using more specific agents such as CpGV are able to achieve a much more stable, natural balance.



CpGV resistance in Europe: shock and opportunity

In 2004, several dozen organic orchards in Europe reported reduced sensitivity to CpGV-M. Science, industry and practice came together in the SustainCpGV project to find solutions for orchards with resistant populations. With the development of several resistance breaking isolates it is possible to safeguard the long term use of CpGV based products.



The eventful history of *Cydia pomonella* granuloviruses

Hardly any other active substances are as fascinating as those based on baculoviruses. The *Cydia pomonella* granuloviruses (CpGV) are a particularly notable member of this group, with a success story that began more than 50 years ago which has been far from straightforward.



Gisela Brand
Andermatt Biocontrol

A by-product is premiered

The extensive know-how gained through the selection of resistance-breaking CpGV isolates spurred our researchers on to further developments. In 2010, Madex Twin was developed. It was the first CpGV that was not only highly effective against codling moth but also worked on peach moth larvae (*Grapholita molesta*).



Resistance management is optimized

In the meantime, several different types of CpGV resistance have been studied. Resistance-breaking virus preparations are available for all known types. The situation around CpGV resistance has therefore been relaxed, while in the background research continues unabated. In the event that CpGV resistance will assume practical relevance again in the future, we are now armed to deal with such situations with much more expertise and more precise molecular methods.



Residues are targeted

Awareness of residues on crops is growing and many export-oriented production countries follow the strict residue requirements of major distributors in high-price markets. The combined use of CpGV and pheromone-based mating disruption technology opens up new possibilities for residue-free pome fruit production.



Looking to the future

Global warming is furthering the spread of the codling moth and increasing the number of generations. The astonishing, roller-coaster success story of CpGV does not yet seem to have come to an end. Fascination for the tiny particles that have revolutionised codling moth management remains undiminished among the staff of Andermatt Biocontrol.

