

Problems with medicines for bees: current situation and future aspects

Wolfgang Ritter

National and International (OIE) Reference laboratory at CVUA Freiburg/Germany
President of the Standing Commission for bee health in Apimondia



Apimondia
International
Federation of
Beekeepers'
Associations



www.beehealth.info
www.bienengesundheit.info

Basic prinziples

- **Beekeepers opinion:**
„what helps is allowed“
- **Safety profile of medicine**
 - Safe use
 - Acceptable residues
 - Effectiveness
 - Low side effects

User`s Risk

- **Active substance**
- **Application**

Residue situation

- Application of medicaments leads to contamination of bee nest
- Hydrophilic substances
 - Contaminate honey
- Lypophilic substances
 - Accumulate in wax



Accumulation in Wax

- Wax recycling
- Comb foundation



Accumulation in Wax

Recontamination of honey

A. Lipophilic substances (red)
transferred to wax
Hydrophilic substances (blue)
remain in honey

B. Lipophylic substance
recontaminate honey

Application

- **Feeding**

- Food exchange (Trophalaxis)
- Food stored

- Low risk for applicant
- High contamination of food in combs
- Effect against bacteria in brood and endoparasites in adults

Application

- **Trickling**
 - Food exchange (Trophalaxis)
 - Low risk for applicant
 - Less contamination of food in combs
 - Effect against ectoparasite on adults



Application

- **Permanent strips**
 - Low risk for applicant
 - Less contamination of food in combs
 - Effect against ectoparasite on adults and emerging from bee brood (long term)

Application

- **Vaporization and Evaporation**
 - High risk for applicant
 - High contamination of food in combs
 - Effect against ectoparasite on adults and emerging from or in bee brood
 - Effect against bacterial and fungal brood diseases



Application

- **Spraying**
 - High risk for applicant
 - High contamination of food in combs
 - Effect against ectoparasite on adults (additional grooming)
 - Effect against bacterial and fungal brood diseases (additional removing)



Application

- **Dusting**
 - Low risk for applicant
 - High contamination of food in combs
 - Effect against ectoparasite on adults (additional grooming)

Side Effects

- Acute toxic effect
- Sub lethal doses
- Registration:
 - Short-term and longt-term examinations
 - Brood tolerance

Side Effects

- Disinfectant effect of treatment
- Antagonists
 - Bacteria
 - Fungi
 - Antagonistic Substances
- Chalkbrood (*Ascophaera apis*)

Nosemosis

- Antibiotics Fumagillin
- *Nosema apis* replaced by *Nosema ceranae*
- *Nosema ceranae*
 - Multiply quicker at high temperature
 - Die off faster at low temperatures
- Alternative control methods
 - Beekeeping management measures
 - Vegetable active ingredients
 - Anti-coccidian medicines (off label use)

American Foulbrood

- Antibiotics
Streptomycin and Tetracycline
 - Kill vegetative Form of Paenibacillus larvae
not spores
- America/Asia:
Permanent treatment
 - Re-infection from spores in honey
- Europe:
Disinfection, killing, shifting
 - Eradication of spores

European Foulbrood

- Antibiotics
Oxitetracyclin and other
 - Kill the vegetative and durable form of *Melissococcus pluton*
- America: occasional treatment
- Europe: (no Antibiotics allowed)
 - Beekeeping management measures (most countries)
 - Disinfection, Killing, Shifting (some countries like GB, Switzerland)

Small Hive beetle

(*Aethina tumida*)

- Coumaphos (Checkmite)
- Temperate climate:
occasional treatment
- Warm climate:
permanent treatment
- EU regulations:
eradication or treatment
(epidemiological situation)

Tropilaelaps mite

(Tropilaelaps spp.)

- **Difference to Varroa:**
 - Infest brood only not adults
- **Varroazids distributed on combs are effective:**
 - Evaporation, Dusting, ..
- **Varroazids acting via body contact have no or low effect:**
 - Contact (Trickling...)

Varroosis

(Varroa destructor)

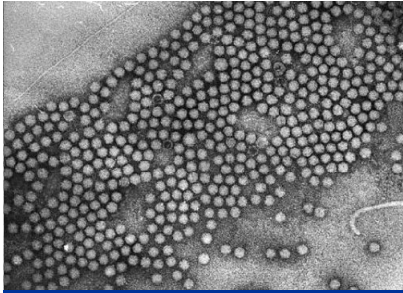
- **Treatment in colonies with brood**
 - Long lasting evaporation
 - Strips present for more than 3 weeks
- **Treatment in colonies without brood**
 - Spraying
 - Trickling (only bees in cluster)
 - Dusting



Varroosis

(Varroa destructor)

- **Resistance with synthetic a.i.**
 - Coumaphos (Italy)
 - Pyrethroids (Flumetrin, Fluvalinat) (worldwide)
 - Amtiraz (Portugal)
- **Uncertain effects with natural a.i.**
 - Climate
 - Error in treatment



Viruses transferred by Varroa

Acute Bee Paralysis Virus (ABPV)

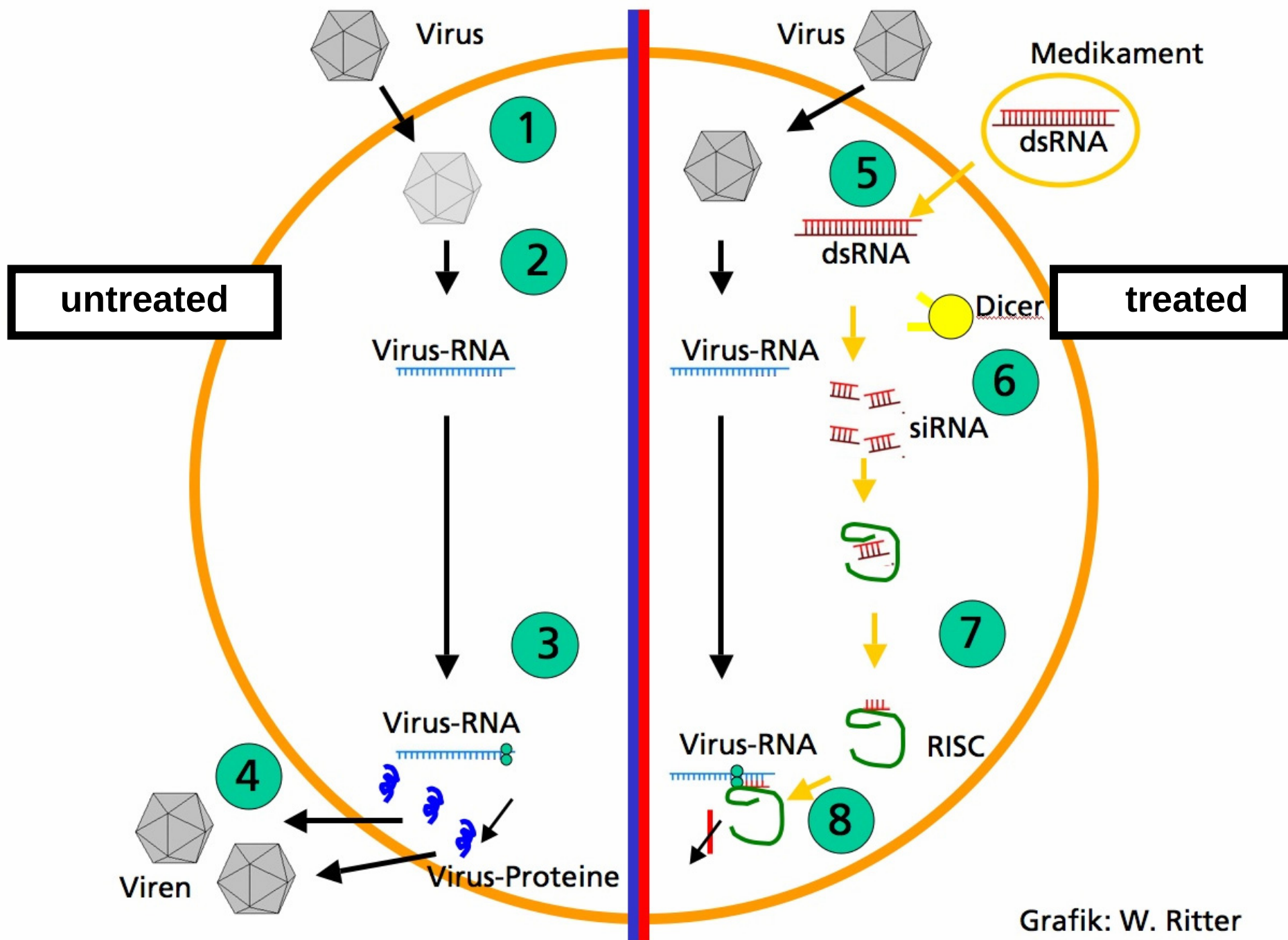
Slow Paralysis Virus (SPV)

Deformed Wing Virus (DWV)

Kashmir Bee Virus (KBV)

Genetic Therapy

- **Gene silencing** (Fire and Mellow)
- **Principle**
 - Medicament contains double strain RNA (dsRNA)
 - ds RNA portioned by Enzyme (Dicer)
 - short interfering RNA (siRNA)
 - Form silencing complex (RISC)
 - RISC become specific by srRNA
 - RISC indentify complementary Virus RNA
 - Block synthesis of proteins



Grafik: W. Ritter

Prophylactic Vaccination

- **Basis efficient immune defence system of bees**
- **Force bees to produce body`s own peptides**
- **Bees prepared to kill pathogens and parasites**

Conclusions

- **Flexibility in applying treatment regulations of registered products**
- **Harmonisation of registration**
- **Easier registration of medicines**
 - especially from annex II (EU-reg.)
- **Innovative developments of treatments necessary**

