EPIDEMIOLOGY OF HONEYBEE PATHOGENS IN THE EU, RECENT STUDIES AND FINDINGS IN HUNGARY

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Beekeeping in Hungary

1925	250 000
1994	650 107
2010	960 207
2011	1 065 860
2012	1 133 100
2013	1 063 066
2014	1 140 101

1 bee colony/11 people

12 bee colonies/sqkm

Cca 15.000 beekeeper

10 % professional

60 % semi-professional

30 % amateur

1/3 stationary

2/3 migratory

Cca. 20.000 tons of honey/year

80-90% is exported

Organisations related to bee health

beekeeper
Hungarian Beekepers' Association, beekeeper advisors, bee health inspector, official veterinarian

National Food Chain Safety Office – Animal Health and Animal Welfare Directorate County Government Offices

National Food Chain Safety Office – Veterinary Diagnostic Directorate, Laboratory of Parasitology, Fish- and Bee Diseases (National Reference Laboratory for Bee Health)

Szent István University Faculty of Veterinary Science Department of Microbiology and Infectious Diseases

Bee health situation

EPILOPBEE

Diagnostic investigations – NRL

Scientific investigations - DMID

EPILOPBEE

2012-13 and 2013-14 pan-European surveillance study (EPILOBEE) about bee health
http://ec.europa.eu/food/animals/live_animals/bees/docs/bee-report_2012_2014_en.pdf

Study year	2012-2013	2013-2014
No. of Member States	17	16
Colonies/apiaries visited	31.813/3284	29.056/2930
Laboratory analyses done	117.000<	49.000<

Hungary: 4000 colonies of 200 apiaries in each study year

3 visits / year

- **Before winter (autumn)**
- **After winter (spring)**
- **During beekeeping season (summer)**

Observation and questionnaire

- **Farming practices**
- **Environment**
- **Clinical manifestations of diseases**

Sampling and laboratory analyses

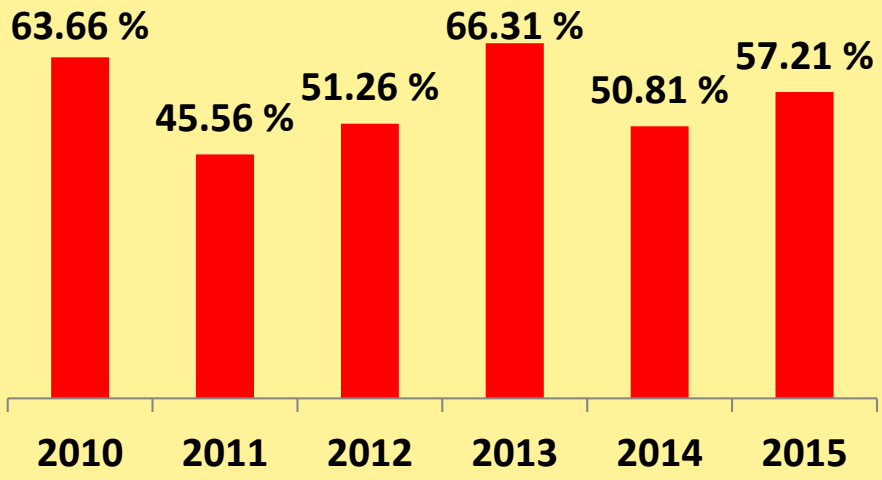
EPILOPBEE

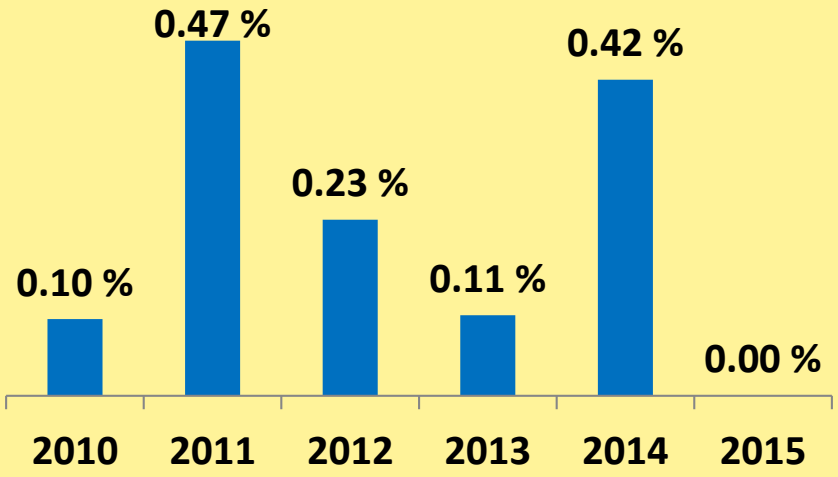
EU/HU	EU		Hungary	
Study year	**2012-2013**	**2013-2014**	**2012-2013**	**2013-2014**
Winter m.	3.5-33.6%	2.4-15.4%	8.8%	4.8%
Seasonal m.	0.3-13.6%	0.04-11.1%	1.9%	1.6%
Yearly m.	3.1-35.9%	2.6-23.4%	9.9%	6.3%
AFB	0-11.6%	0-10.5%	0-1.5%	0-0.5%
EFB	0-7.6%	0-4.4%	0%	0%
Varroosis	0-87.4%	0-16%	0-1%	0-1.1%
Nosemosis	0-55.8%	0-22.6	0.5-12.7	4.9-5.4%
Chr. paralysis	0-2.6%	0-1.5%	0 %	0%
Exotic arthropods	0	0	0	0

Diagnostic investigations – NRL

4-9000 samples each year (about 0.5-1‰ of colonies) – colonies with clinical symptoms!

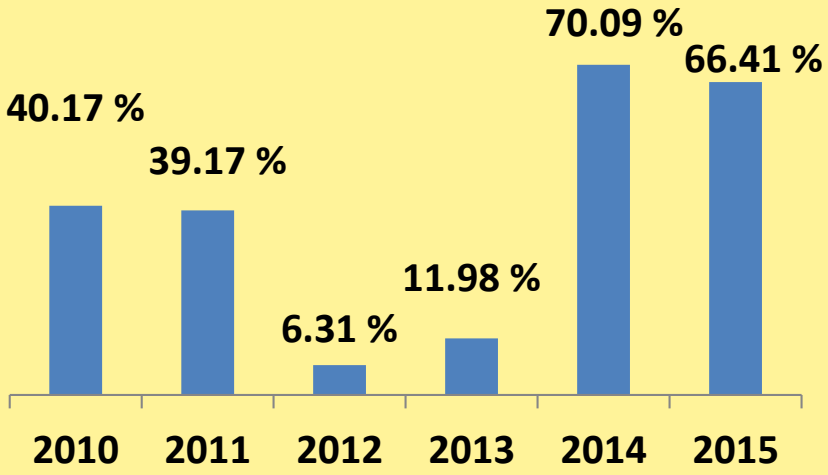
Year	2010	2011	2012	2013	2014	2015
AFB %	63.66	45.56	51.26	66.31	50.81	57.21
EFB %	0.10	0.47	0.23	0.11	0.42	0.00

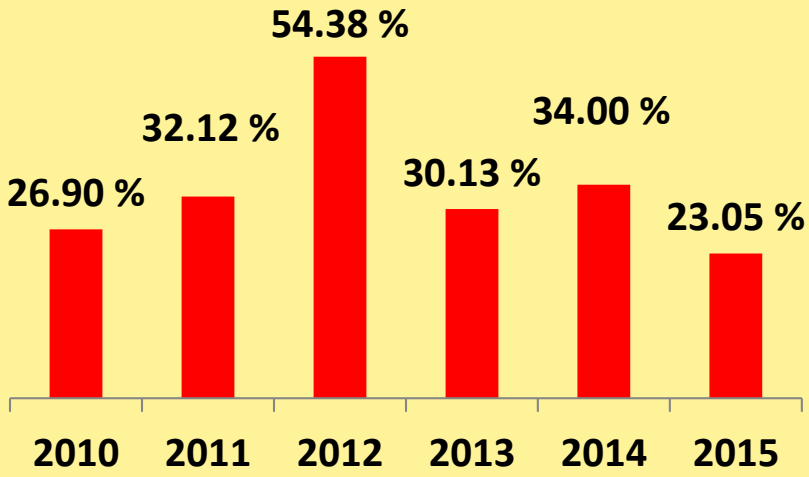




Diagnostic investigations – NRL

Year	2010	2011	2012	2013	2014	2015
Sample	580	411	4261	4431	856	256
Nosema %	40.17	39.17	6.31	11.98	70.09	66.41
Varroa %	26.90	32.12	54.38	30.13	34.00	23.05





Official surveys - conclusions

Bee-health situation: “average”

Mortality: several reasons; infectious diseases, environmental conditions, high density (12 colonies/sqkm), technological problems, pesticides, production of mostly monofloral honey

AFB: high detection ratio in clinically ill colonies, but the overall prevalence in correlation with the total number of colonies is about 0.23-0.38% (same result as in EPILOPBEE)

EFB: low detection ratio even in clinically manifested cases, 1-5 apiaries are affected/year

Nosemosis: detected in both apparently healthy and ill colonies, dominance of *N. ceranae*

Varroosis: weakening effect + viruses!

Virological investigations – DMID

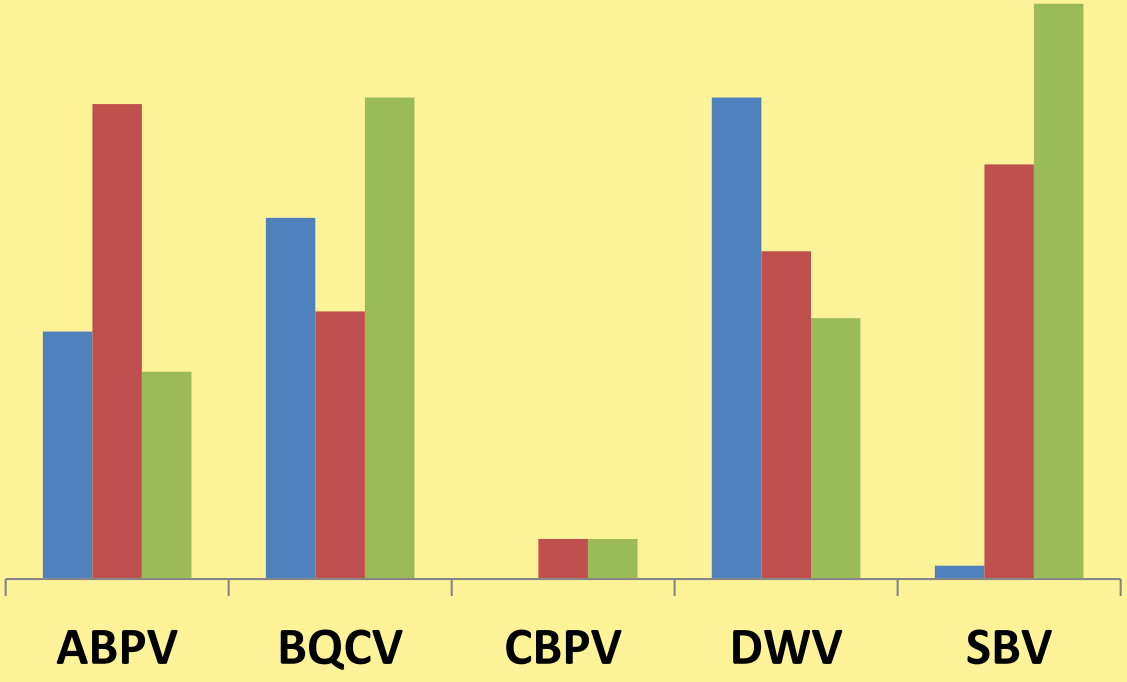
Surveys 2000-2002
2007
2014-2015

Viruses ABPV
BQCV
CBPV
DWV
SBV

Samples Honeybee
Wasp species

Viruses

	Hungary 2000-2002	France 2002	Austria 2006	Hungary 2007	Denmark 2008	Hungary 2014-2015
ABPV	37%	58%	68%	71%	11%	31%
BQCV	54%	86%	30%	40%	1%	72%
CBPV	0%	28%	10%	6%	4%	6%
DWV	72%	97%	91%	49%	57%	39%
SBV	2%	86%	49%	62%	81%	86%



Multiple infections

Virus incidence/colony:

2000-2002: 1.69

2007: 2.25

2014-2015: 2.53

Viruses in bees and wasps

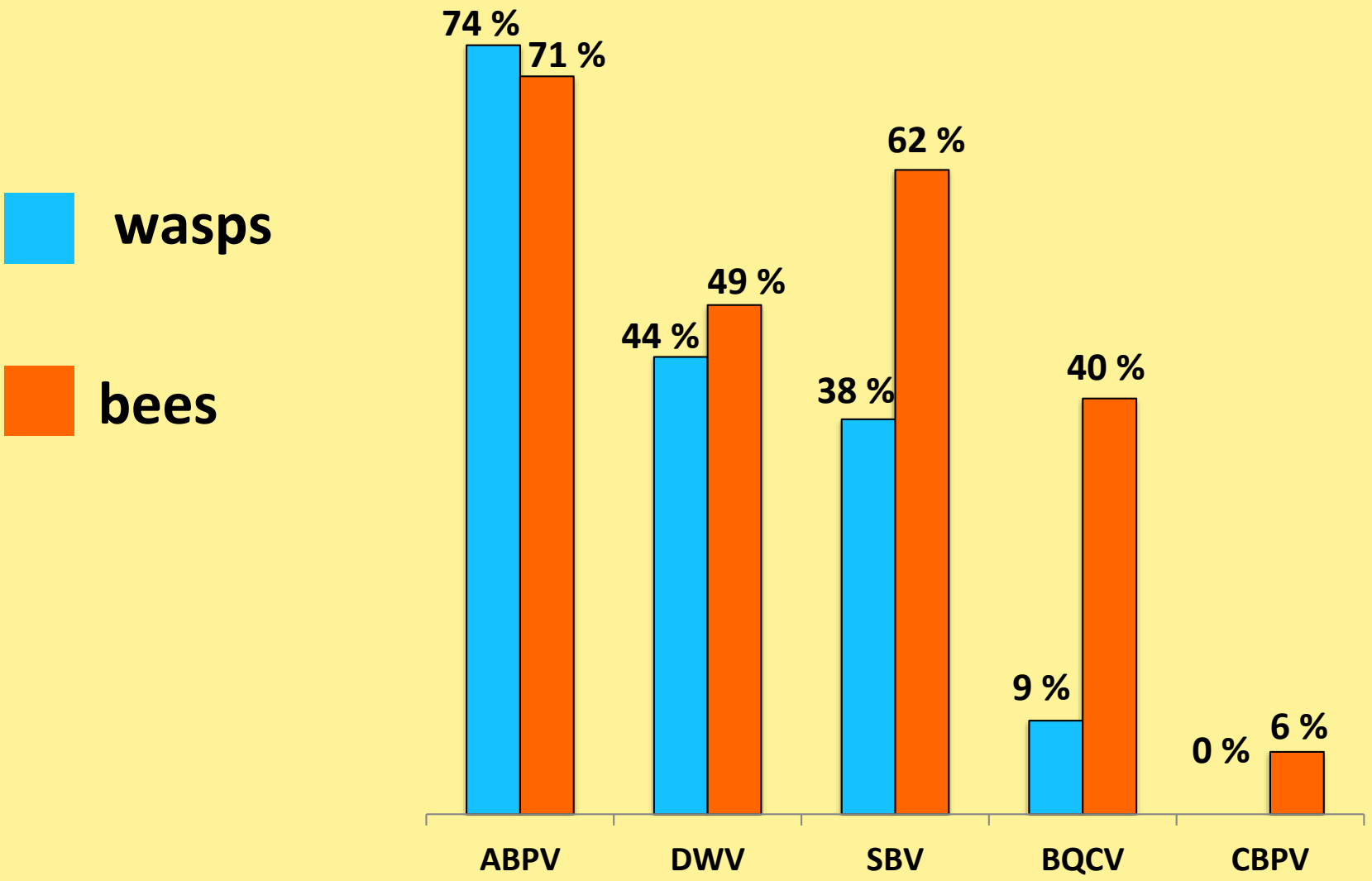
Wasps: frequent contact with bees; similar cells (?)
Epidemiological connection?
ABPV – *Bombus* spp. – other viruses in other wasp species?
Genetic similarities of viruses detected in bees and wasps?

Hungary: 34 samples of 6 different wasp species

Germany: 13 apiaries, wasp and bee samples

VS

Viruses in bees and wasps - samples collected in Hungary



Viruses in bees and wasps - samples collected in Germany

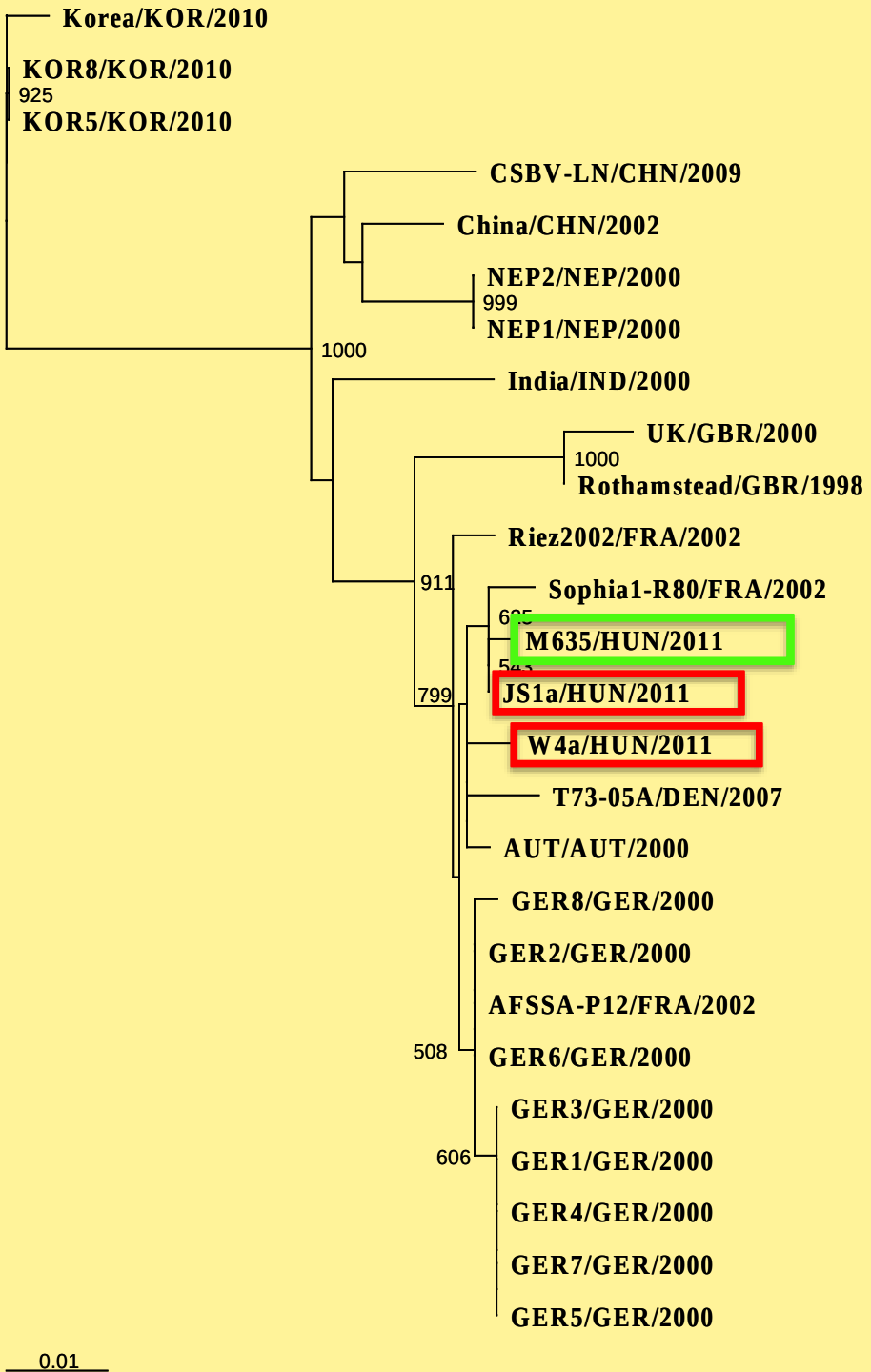
	ABPV	BQCV	CBPV	DWV	SBV
Bee	+/-	-	-	-	-
Vespula germanica	+	-	-	-	-
Bee	+	+	-	-	+
Vespula vulgaris	+/-	-	-	-	-
Bee	+	+	-	+	-
Vespula germanica	++	+	-	-	+
Bee	+++	-	+	+	-
Vespula vulgaris	+++	-	+	-	-
Bee	+++	-	+	-	-
Vespula germanica	+++	+	+	-	+
Bee	++	+	-	-	-
Vespula vulgaris	+++	+	-	-	-
Bee	+/-	+	-	+	-
Vespula vulgaris	+	+	-	-	-

ABPV – capsid – 399 nt
97-98 % similarity
(2 aa mutations)

BQCV – helicase – 516 nt
88-96 % similarity
(3-4 aa mutations)

DWV – capsid – 425 nt
97-99 % similarity
(0-4 aa mutations)

SBV – capsid – 446 nt
99 % similarity
(1-2 aa mutations)



Viruses in bees and wasps - conclusions

- **Honeybee viruses were detected in six wasp species**
- **Frequency pattern of honeybee viruses detected in wasps are similar to those detected in honeybees**
- **In simultaneous samples similar viruses are detected**
- **Genetic similarity to bee-origin strains**

→Indication of an epidemiological connection between honeybees and wasps

Further investigations are needed

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