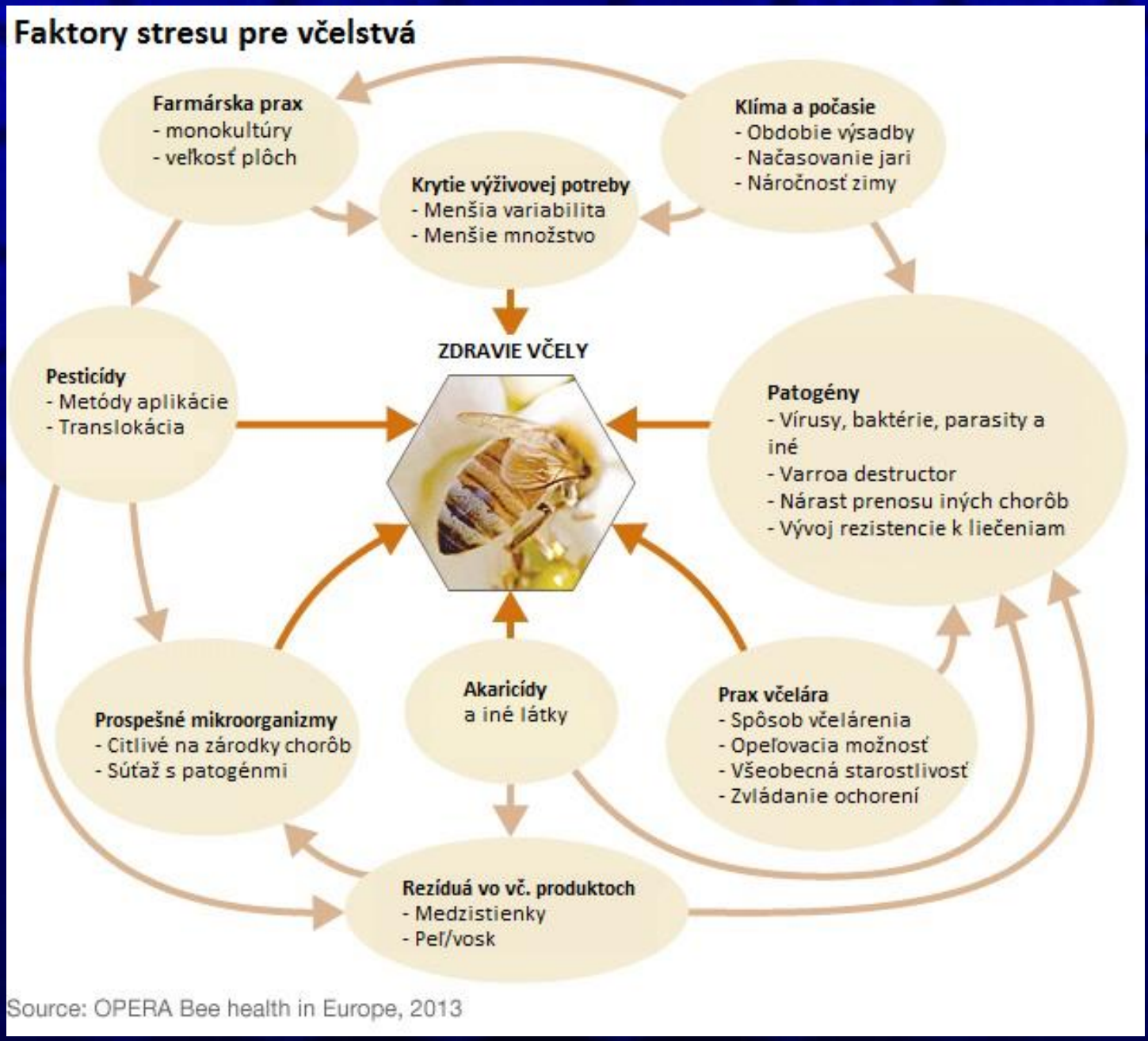
Čo ovplyvňuje zdravie včiel

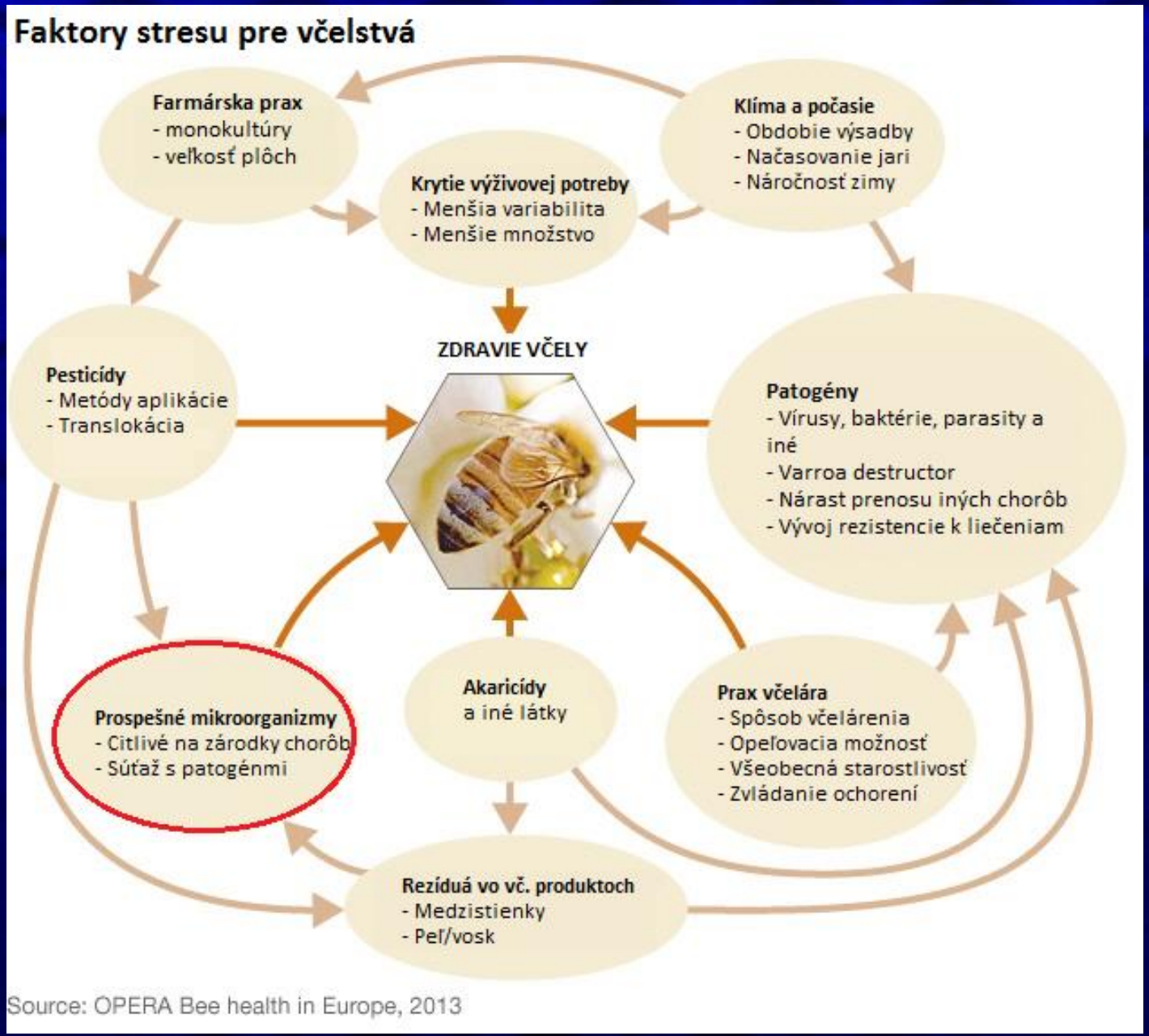
Doc. MVDr. Juraj Toporčák, PhD.
Klinika vtákov, exotických a voľne žijúcich zvierat

Faktory stresu pre včelstvá



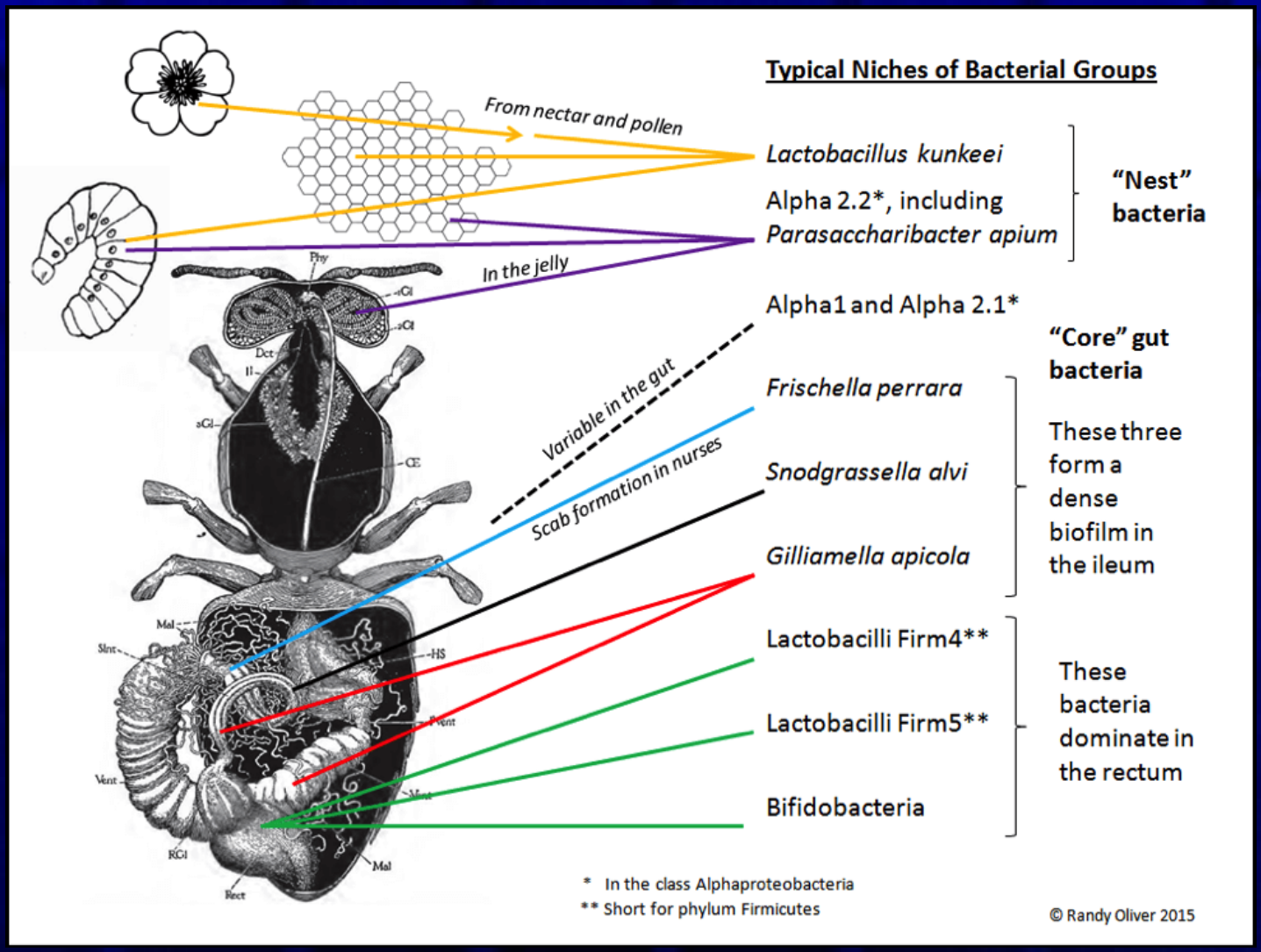
Source: OPERA Bee health in Europe, 2013

Faktory stresu pre včelstvá

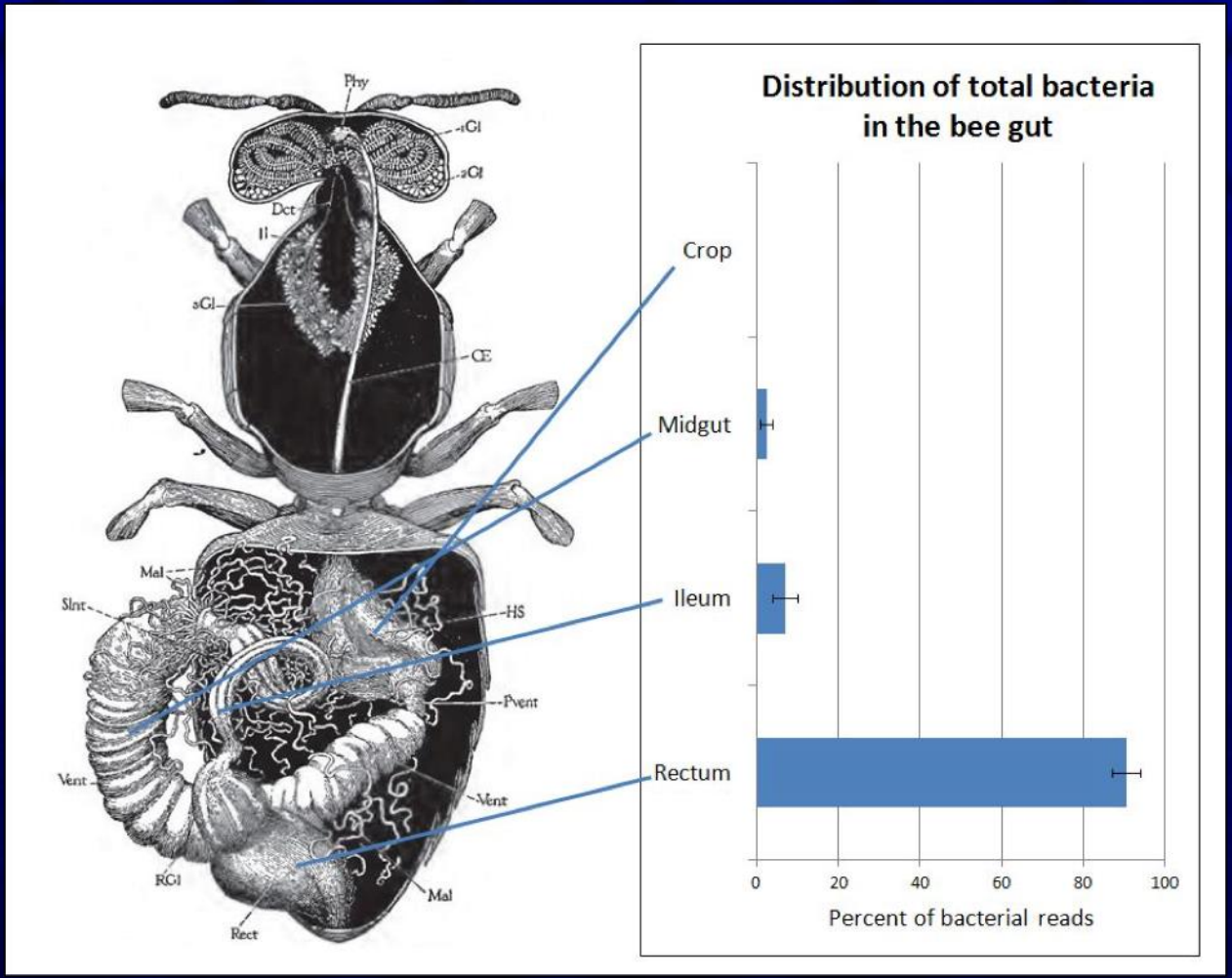


Source: OPERA Bee health in Europe, 2013

Rozšírenie baktérií v tráviacom trakte včiel



Rozšírenie baktérií v tráviacom trakte včiel



AKO MIKROORGANIZMY PRACUJÚ PRE VČELY

Baktérie mliečneho kvasenia v žalúdku včely

Baktérie mliečneho kvasenia zo žalúdka včiel je prvý krok v spracovaní peľu (fermentáciou a pH) a nektáru (ochrana proti fermentácii)

peľ

nektár

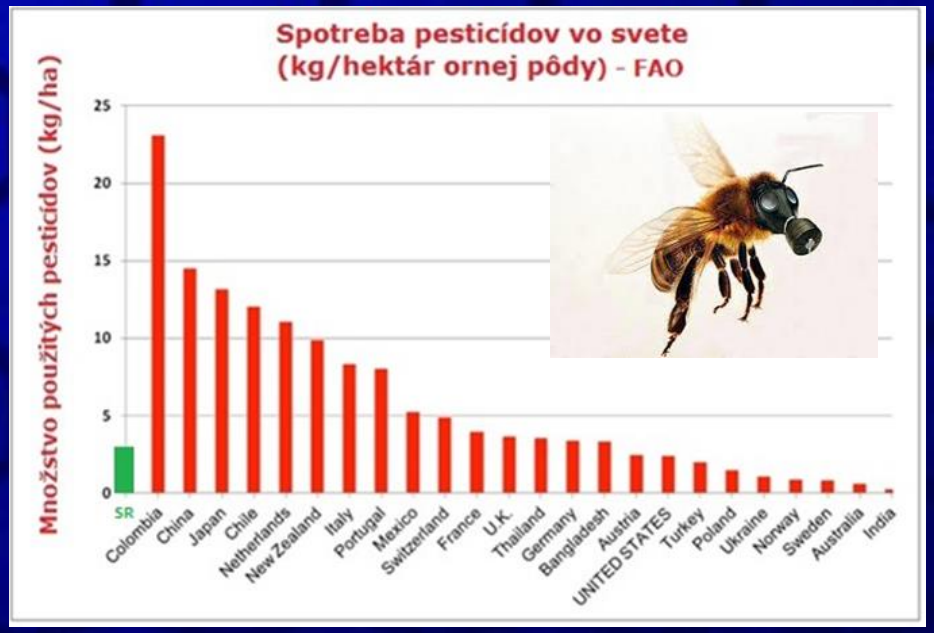
Mikroorganizmy z kvetov

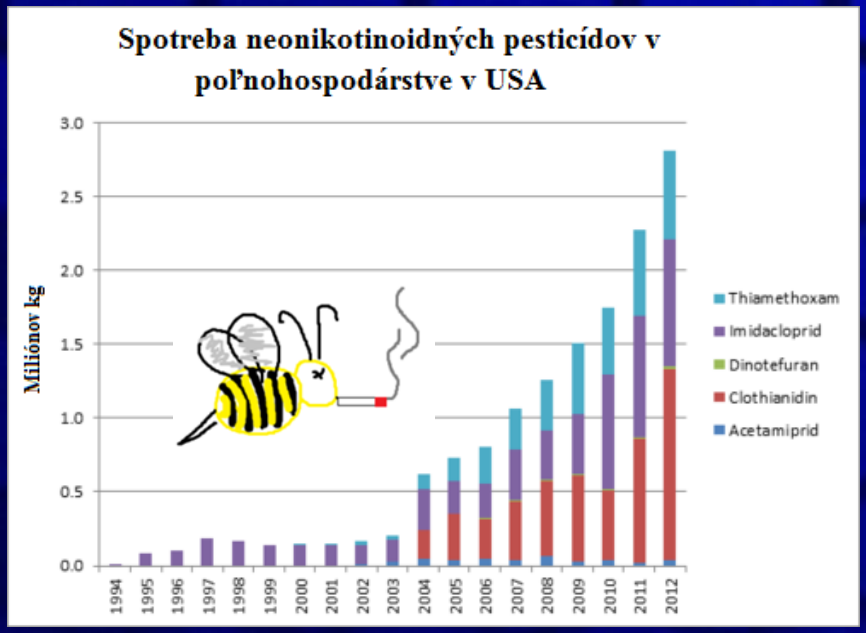
Ostatné huby, kvasinky, baktérie pomáhajú produkovať enzými, vitamíny, antimikrobiálne látky a iné

Gilliam, M. 1997. Identification and roles of non-pathogenic microflora associated with honey bees. FEMS Microb. Lettrs. 155: 1-10.

Olofsson, T.C. and Vásquez, A. (2008) Detection and identification of a novel lactic acid bacterial flora within the honey stomach of the honeybee *Apis mellifera*. Curr Microbiol. 57:356–363.

Schematic by D. Sammataro

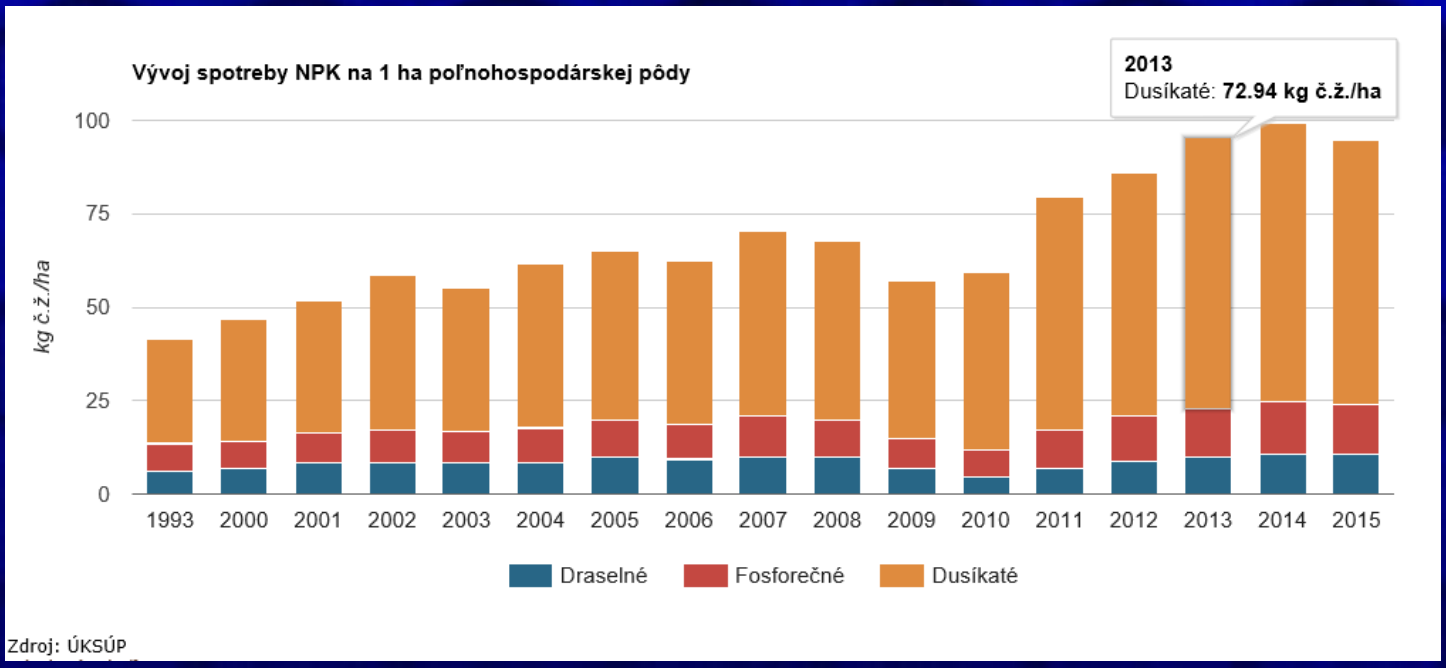




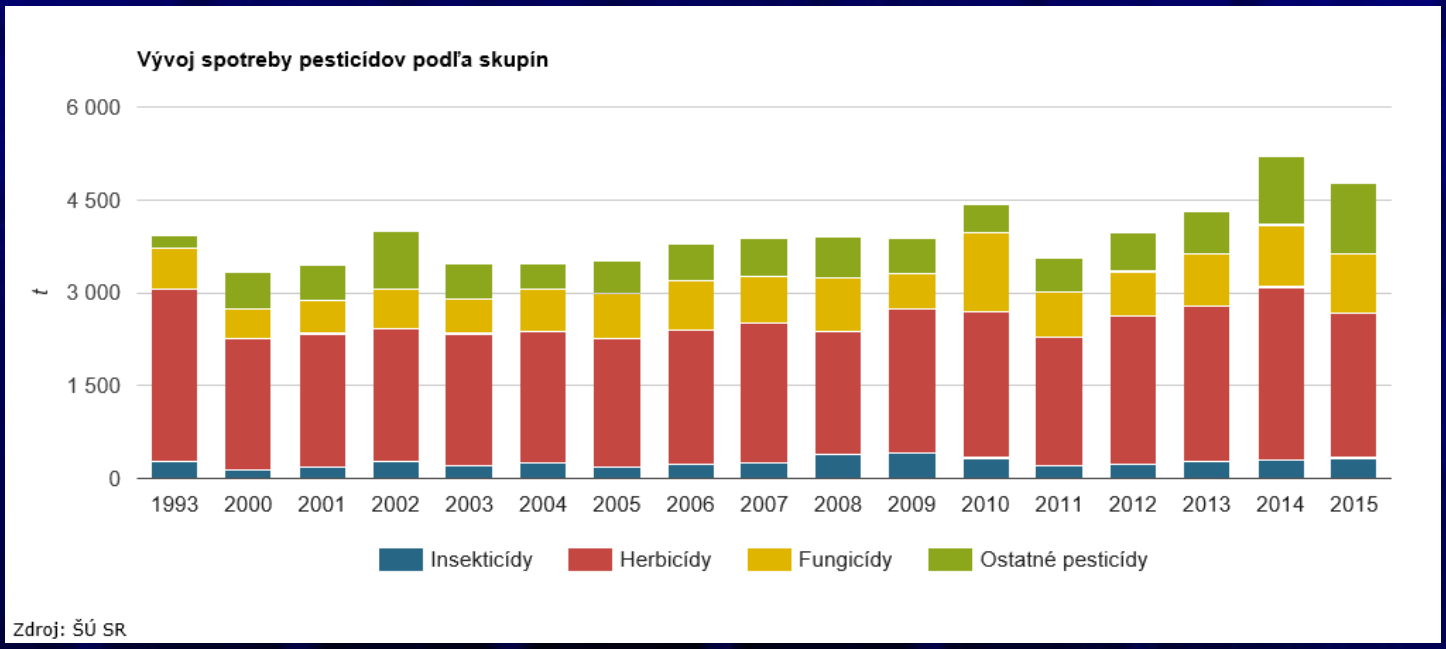
Pesticides: Toxicité / abeilles (LD_{50} ng/ab)

Pesticide	®	Use	Dose g/ha	LD_{50} ng/ab	Tox/DDT
DDT	Dinocide	Insecticide	200 - 600	27,000.0	1
Thiaclopride	Proteus	Insecticide	62.5	12,600.0	2.1
Amitraze	Apivar	Acaricide	-	12,000.0	2.3
Acetamiprid	Supreme	Insecticide	30 - 150	7,100.0	3.8
Coumaphos	Perizin	Acaricide	-	3,000.0	9
Methiocarb	Mesurol	Insecticide	150 – 2,200	230.0	117
Tau-fluvalinate	Apistan	Acaricide	-	200.0	135
Carbofuran	Curater	Insecticide	600	160.0	169
λ-cyhalothrine	Karate	Insecticide	150	38.0	711
Thiamethoxam	Cruiser	Insecticide	69	5.0	5,400
Fipronil	Regent	Insecticide	50	4.2	6,475
Imidacloprid	Gaucho	Insecticide	75	3.7	7,297
Clothianidin	Poncho	Insecticide	50	2.5	10,800
Deltamethrin	Décis	Insecticide	7.5	2.5	10,800

Dr.JM Bonmatin (CNRS) France



Zdroj: ÚKSÚP



Zdroj: ŠÚ SR

Bee Pesticide*	Class#	Detects	Samples	%	Detections (ppb)							
			Analyzed		High	Low	Median	90%tile	95%tile	Mean§	SEM§	LOD†
Fluvalinate	PYR	117	140	83.6	5860.0	1.1	53.0	610.8	1710.0	357.7	94.5	1.0
Coumaphos	OP	84	140	60.0	762.0	1.0	8.0	118.7	156.2	50.4	13.5	1.0
Chlorpyrifos	OP	12	140	8.6	10.7	1.0	2.2	8.5	9.7	3.4	0.9	0.1
Chlorothalonil	FUNG	10	140	7.1	878.0	1.5	7.2	121.1	499.5	100.2	86.5	1.0
Cypermethrin	PYR	9	140	6.4	25.8	2.0	3.5	22.0	23.9	10.1	3.2	1.0
Permethrin	PYR	8	140	5.7	19600.0	12.0	35.8	5919.2	12759.6	2478.1	2446.0	10.0
DMPF (amitraz)	FORM	8	125	6.4	9040.0	6.0	117.5	3015.8	6027.9	1249.1	1114.1	4.0
Esfenvalerate	PYR	8	140	5.7	9.3	1.0	3.5	8.5	8.9	4.3	1.2	0.5
Methidathion	OP	7	140	5.0	32.0	6.5	12.0	28.4	30.2	16.2	3.6	1.0
Deltamethrin	PYR	6	140	4.3	39.0	23.0	26.5	38.5	38.8	29.3	3.0	20.0
Pendimethalin	HERB	6	140	4.3	27.6	6.5	14.0	26.4	27.0	15.9	3.8	1.0
Cyfluthrin	PYR	5	140	3.6	14.0	2.0	10.0	13.2	13.6	8.2	2.4	1.0
Dicofol	OC	5	140	3.6	3.8	1.0	1.4	3.6	3.7	2.1	0.6	0.4
Fenpropathrin	PYR	4	140	2.9	37.0	2.8	14.2	32.8	34.9	17.1	8.0	0.4
Azinphos methyl	OP	4	140	2.9	22.0	4.8	13.1	20.5	21.3	13.3	3.9	3.0
Cyprodinil	S FUNG	4	140	2.9	19.0	9.2	11.0	16.6	17.8	12.6	2.2	5.0
THPI (captan)	PS FUNG	3	125	2.4	43.4	37.7	39.5	42.6	43.0	40.2	1.7	30.0
Allethrin	PYR	3	140	2.1	24.0	6.7	19.0	23.0	23.5	16.6	5.1	1.0
Tetramethrin	PYR	3	140	2.1	23.0	18.0	23.0	23.0	23.0	21.3	1.7	6.0
Methoxyfenozide	IGR	3	140	2.1	21.0	1.5	3.4	17.5	19.2	8.6	6.2	0.4
Endosulfan I	CYC	3	140	2.1	6.1	1.3	1.6	5.2	5.7	3.0	1.6	0.1
Endosulfan sulfate	CYC	3	140	2.1	3.0	1.6	2.7	2.9	3.0	2.4	0.4	0.1
Endosulfan II	CYC	3	140	2.1	2.4	1.4	1.9	2.3	2.4	1.9	0.3	0.1
Parathion methyl	OP	3	140	2.1	2.0	1.5	1.8	2.0	2.0	1.8	0.1	1.0
Cyhalothrin	PYR	3	140	2.1	1.8	1.1	1.7	1.8	1.8	1.5	0.2	0.1
DMA (amitraz)	FORM	2	125	1.6	4740.0	275.0	2507.5	4293.5	4516.8	2507.5	2232.5	50.0
Fipronil	INS	2	140	1.4	3060.0	9.9	1535.0	2755.0	2907.5	1535.0	1525.1	1.0
Bifenthrin	PYR	2	140	1.4	12.3	2.9	7.6	11.4	11.8	7.6	4.7	0.4
Dieldrin	CYC	2	140	1.4	12.0	10.0	11.0	11.8	11.9	11.0	1.0	4.0
Prallethrin	PYR	2	140	1.4	8.6	6.2	7.4	8.4	8.5	7.4	1.2	4.0
Coumaphos oxon	OP	2	140	1.4	6.8	2.1	4.5	6.3	6.6	4.5	2.4	5.0
Oxyfluorfen	HERB	2	140	1.4	4.8	3.8	4.3	4.7	4.8	4.3	0.5	0.5
Chlorfenapyr	PS MITI	2	140	1.4	2.7	1.8	2.3	2.6	2.7	2.3	0.5	1.0
Carbaryl	PS CARB	1	140	0.7	588.0	588.0	588.0	588.0	588.0	588.0	---	5.0
1-Naphthol (carbaryl)	S CARB	1	140	0.7	238.0	238.0	238.0	238.0	238.0	238.0	---	2.0
Dimethomorph	S FUNG	1	125	0.8	56.0	56.0	56.0	56.0	56.0	56.0	---	15.0
Tebuconazole	S FUNG	1	140	0.7	34.0	34.0	34.0	34.0	34.0	34.0	---	3.0
Chlorferone (coumaphos)	OP	1	125	0.8	25.0	25.0	25.0	25.0	25.0	25.0	---	25.0
Tebufenozide	IGR	1	140	0.7	23.0	23.0	23.0	23.0	23.0	23.0	---	2.0
Fenoxaprop-ethyl	S HERB	1	140	0.7	15.4	15.4	15.4	15.4	15.4	15.4	---	6.0
Atrazine	S HERB	1	140	0.7	15.0	15.0	15.0	15.0	15.0	15.0	---	1.0
Carbendazim	S FUNG	1	140	0.7	14.3	14.3	14.3	14.3	14.3	14.3	---	1.0
Pyraclostrobin	FUNG	1	140	0.7	8.6	8.6	8.6	8.6	8.6	8.6	---	1.0
DDE p,p'	OC	1	140	0.7	6.6	6.6	6.6	6.6	6.6	6.6	---	3.0
Fluridone	S HERB	1	140	0.7	6.5	6.5	6.5	6.5	6.5	6.5	---	5.0
Pronamide	S HERB	1	140	0.7	2.2	2.2	2.2	2.2	2.2	2.2	---	1.0

*Carbendazim is also a degradate of benomyl; Thiabendazole is a degradate of thiophanate methyl.
#Class: CAR = carbamate, CYC = cyclodiene, FORM = formamidine, FUNG = fungicide, HERB = herbicide, IGR = insect growth regulator, INS = misc. insecticide, MITI = miticide, NEO = neonicotinoid, OC = organochlorine, OP = organophosphate, PS = partial systemic, PYR = pyrethroid, S = systemic.
§Mean and SEM for detections > LOD.
†LOD = limit of detection (ppb).
doi:10.1371/journal.pone.0009754.t003

Pollen Pesticide*	Class#	Detects	Samples	%	Detections (ppb)							
					High	Low	Median	90%tile	95%tile	Mean§	SEM§	LOD
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Wax Pesticide*	Class#	Detects	Samples	%	Detections (ppb)							
			Analyzed		High	Low	Median	90%tile	95%tile	Mean§	SEM§	LOD†
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

PESTICÍDY NÁJDENÉ VO VČELÁCH a PEĽU a VOSKU

350 VZORIEK PEĽU

98 pesticides (and metabolites)
Avg 7.1 different pesticides each
Up to 31 pesticides in one sample
99% with residues

259 VZORIEK VOSKU

87 pesticides (and metabolites)
Avg 8 different pesticides each
Up to 39 pesticides in one sample
100% with residues

140 VZORIEK VČIEL

46 pesticides (and metabolites)
Avg 2.5 different pesticides each
Up to 25 pesticides in one sample
92% with residues

Source: Mullin et al. (2010) *PLoS ONE*

Country	Date sampled	Location	Neonicotinoid insecticides (µg/kg pollen)				
			Imidacloprid	Clothianidin	Thiamethoxam	Thiacloprid	Acetamiprid
Austria	09.05.2013	Styria, Fürstenfeld		4.7			
	09.05.2013	Styria, Fürstenfeld					
	May 2013	Grieskirchen, Rottenbach, Upper Austria				24	
France	14.04.2013	Rhöne-Alpes SE France (near Lyon)					
	24.04.2013	Midi-Pyrénées SW France (near Toulouse)					
	24.04.2013	Midi-Pyrénées SW France (near Toulouse)					
	19.06.2013	Ain-East Center France, north from the Alps					
	26.06.2013	Ain-East Center France, north from the Alps					
	03.08.2013	SW France, bet.Bordeaux & Toulouse, "Lot-et-Garonne"					
	31.07.2013	Midi-Pyrénais, SW France, near Toulouse					
	31.07.2013	Midi-Pyrénais, SW France, near Toulouse					
	01.08.2013	Pyrenees, S France					
	28.08.2013	Midi-Pyrénais, SW France, near Toulouse					
	03.08.2013	SW France, bet.Bordeaux & Toulouse, "Lot-et-Garonne"					
	End of July	Ain-East Center France, north from the Alps					
Germany	22.05.2013	Rheinberg				76	
	11.06.2013	21521 Dassendorf				250	
	30/31.05.2013	21465 Wentorf				18	
	15.05.2013	Sachsen, OT Großbardan, botanical reserve Totenberg					
	28.05.2013	23847 Pölitz				85	
	20.05.2013	Baden-Württemberg, 88521 Ertingen				53	
	15/16.05.2013	Lower Saxony, 31241 Kleine Ilsede					
	22.05.2013	Baden Württemberg, 68809 Neulaßheim				106	
	29.05.2013	Baden-Württemberg, 71717 Beilstein				220	
	19.05.2013	Nordrhein Westfalen, 48324 Sendenhorst					
	21.05.2013	Saxony, 09123 Chemnitz				10	
	02.06.2013	Baden Württemberg, 72348 Rosenfeld					
	15.05.2013	Baden Württemberg, 74626 Bretzfeld					
	15/16.05.2013	Saxony, 01683 Nossen					
	06.06.2013	Schleswig Holstein, 25899 Herrenkrog					

Pesticídy v perge v krajinách EÚ

Country	Date sampled	Location	Neonicotinoid insecticides (µg/kg pollen)				
			Imidacloprid	Clothianidin	Thiamethoxam	Thiacloprid	Acetamiprid
Greece	27.06.2013	Trikala / Thessalia					
	28.06.2013	Voiotia					
	28.06.2013	Voiotia					
	01.07.2013	Arta/ Epiros					
	28.06.2013	Halkidiki					
	28.06.2013	Halkidiki					
	16.07.2013	Soufli, Evros					
	28.06.2013	Redestos, Thessaloniki					
	28.06.2013	Redestos, Thessaloniki					
	19.07.2013	Lagadas, Thessaloniki					
Hungary	28.05.2013	Kisbodak				30	
	10.07.2013	Siófok				22	
	28.05.2013	Nagykónyi					
	10.07.2013	Nagykónyi					
	28.05.2013	Siófok				33	
	10.07.2013	Egyházaskozàr					
	10.07.2013	Tab					
Italy	15.05.2013	Ponte in Valtellina - Loc. S.Rocco	11				16
	02.06.2013	Corte Franca (Brescia)					
	07.06.2013	Corte Franca (Brescia)					
	13.06.2013	Corte Franca (Brescia)					
	19.06.2013	Corte Franca (Brescia)					
	23.06.2013	Montebelluna - via Bonulovanni 92					
	26.06.2013	Montebelluna					
	27.06.2013	Montebelluna					
	16.06.2013	Cisterna d'Asti, Valle San Matteo	1.7				
	23.06.2013	Cisterna d'Asti, Valle San Matteo					
	30.06.2013	Cisterna d'Asti, Valle San Matteo					
	07.07.2013	Cisterna d'Asti, Valle San Matteo					
Luxembourg	04.06.2013	Municipality of Biwer, E Lux					
	01.06.2013	Municipality of Manternach					
	03.06.2013	Municipality of Clemency					
	28.05.2013	Municipality of Clemency					
	04.06.2013	Municipality of Linger					

Country	Date sampled	Location	Neonicotinoid insecticides (µg/kg pollen)				
			Imidacloprid	Clothianidin	Thiamethoxam	Thiacloprid	Acetamiprid
Poland	28.05.2013	GA,Siorowo, Oziatdowo County Warminsko-Mazurskie					45
	28.05.2013	Jankowice, Dziatdowo county, Warminsko					17
	14.06.2013	Miedzna slaskie					29
	12.06.2013	Sinki				147	
	16.06.2013	Stawiec					
	28.05.2013	Matujowice					
	30.05.2013	Matujowice Koto Brzegu					
Romania	16.06.2013	Daia Română (Alba County)					
	25.06.2013	Hârșești (Argeș County)					
	26.06.2013	Pașcani (Iași County)					
	28.06.2013	Șuștra (Timiș County)					
	29.07.2013	Drogu-Udrești (Brăila County)					
	30.07.2013	Cilibia (Buzău County)					
	02.08.2013	Făcăieni (Ialomița County)					
	07.08.2013	Gostinu (Giurgiu County)					
	07.08.2013	Badeana (Vaslui County)					
	20.08.2013	Moara Vlasiei (Ilfov County)					
Spain	28.07.2013	La Santa Espina (Castromonte) en Valladolid					
	28.07.2013	La Santa Espina (Castromonte) en Valladolid					
	20-21.08.2013	Hombrados (Guadalajara)					
	30.07.2013	Argamasilla de Alba (Ciudad Real)	7.6				
	30.07.2013	Argamasilla de Alba (Ciudad Real)	17.9				
	30.07.2013	Llanos de Caudillo (Ciudad Real)	30.4				
	29.07.2013	Cádiz					
	12.08.2013	Alcázar del Rey (Cuenca)					
	13.08.2013	Bocairent (Valencia)					
	05.08.2013	Cabezas de San Juan (Sevilla)	148.5				
	17.07.2013	Córdoba (no entiendo el municipio)					
	19.08.2013	Montoro (Sevilla)					52
	08.08.2013	Tarazona de la Guareña (Salamanca)					
	25.08.2013	Plana de Alcañiz (Teruel)					
Sweden	05.07.2013	Vikbolandet					
	03.07.2013	Vikbolandet		1.8			

Country	Date sampled	Location	Neonicotinoid insecticides (µg/kg pollen)				
			Imidacloprid	Clothianidin	Thiamethoxam	Thiacloprid	Acetamiprid
Switzerland	06.05.2013	Laupersdorf				31	
	08.05.2013	Ogens					
	13.05.2013	Ecublens					
	07.05.2013	Brent					
	21.05.2013	Wabern bei Bern					
	23.05.2013	Melchnau					
	01.06.2013	Melchnau					
	18.08.2013	Laupersdorf					
	15.04.2013	Attiswil					
	02.09.2013	Attiswil					

Väčšina škodlivých pesticídov sa našla v 75% medu na celom svete

Stopy pesticídov, ktoré pôsobia ako nervové činidlá na včely, sa našli v 75% medu na celom svete

34 percent vzoriek medu bolo kontaminovaných koncentráciami neonikotinoidov, o ktorých je známe, že sú škodlivé pre včely, a varoval, že chronická expozícia je hrozbou pre prežitie včiel

Celkovo 75 percent všetkých vzoriek medu obsahuje aspoň jeden neonikotinoid

Z kontaminovaných vzoriek medu obsahovalo 30 percent jediný neonicotinoid, 45 percent obsahovalo dve alebo viac a 10 percent obsahovalo štyri alebo päť

Frekvencia kontaminácie bola najvyššia v severoamerických vzorkách (86 %), nasledovalo Ázia (80 %), Európa (79 %) a 57 % percent v Južnej Amerike

„Science“ this issue p. 109; see also p. 38

Včely medonosné majú v porovnaní s ostatnými druhmi hmyzu len približne jednu tretinu detoxikačných enzýmov

Moderné poľnohospodárstvo je čoraz viac závislé od pesticídov = nárast úrody

- insekticídy môžu lietavky včelstiev pri expozícii priamo zabiť
- herbicídy redukujú rôznorodosť potravinových zdrojov
- objavujú sa subletálne otravy, prejavujúce sa
    - paralýzou
    - dezorientáciou
    - zmenami správania sa včiel

Pettis (2012) subletálne dávky imidaclopridu = signifikantne narástla nozematóza vo včelách + malo to vplyv na dlhovekosť a schopnosť lietania u dosp. včiel

Rezíduá cudzorodých látok vo výžive včiel ako ovplyvňujú zdravie včiel?

Subletálne pôsobenie pesticídov - negatívne sa môže prejaviť u jednotlivých vývojových štádií včely na úrovni imunitného systému jednotlivých včiel ale aj včelstva ako celku, ovplyvňujúc schopnosti komunikácie, správania a učenia sa

V úľovom prostredí bolo detekovaných viac ako 160 rôznych druhov pesticídov

- za najväčšie riziko pre včely
  - tri neonikotinoidy (thiamethoxam, imidacloprid a clothianidin)
  - dva organofosfáty (phosmet a chlorpyrifos)

Náhradou za neonikotinoidy sa pravdepodobne stanú **sulfoximíny** - Sulfoxaflor

Country	Sampling period in 2013	Number of samples	Pesticides (Number of samples in which found) [Concentration range in µg/kg]
Austria	May & Sep	5	tau-Fluvalinate (1) [76], DEET (1) [17]
France	Mar	3	Amitraz (1) [503], Dimethomorph (1) [37], Pentachloroanisole* (1) [10], Folpet (1) [92], tau-Fluvalinate (1) [93]
Germany	Mar & Jun	3	Fludioxonil (1) [17], Cyprodinil (1) [18], Fenhexamid (1) [13]
Hungary	Apr	3	tau-Fluvalinate (1) [98], Coumaphos (1) [148], Carbendazim (1) [14], Tebuconazole (1) [27]
Poland	Mar-Apr	3	Fludioxonil (1) [129], Cyprodinil (1) [64], Amitraz (1) [137], Boscalid (1) [12], Chlorpyrifos (-ethyl) (1) [13]
Spain	Mar-Apr	3	Chlorpyrifos (-ethyl) (1) [99], tau-Fluvalinate (3) [11-13], Coumaphos (2) [204-12073], Carbendazim (1) [153], Pirimicarb (1) [16], Buprofezin (1) [10], Propargite (1) [26], Acrinathrin (1) [22]
Switzerland	Apr	5	Amitraz (4) [31-177]

Perga

Proteíny - Bielkoviny

2. VÝŽIVA

- **včely, ak sa dostávajú pod veľký stres, tak si vyžadujú nadmerný prívod peľu so stráviteľnými dusíkatými látkami v množstve viac ako 20 %**
- **čím vyšší je stres, tým väčšia je ich bielkovinová potreba**

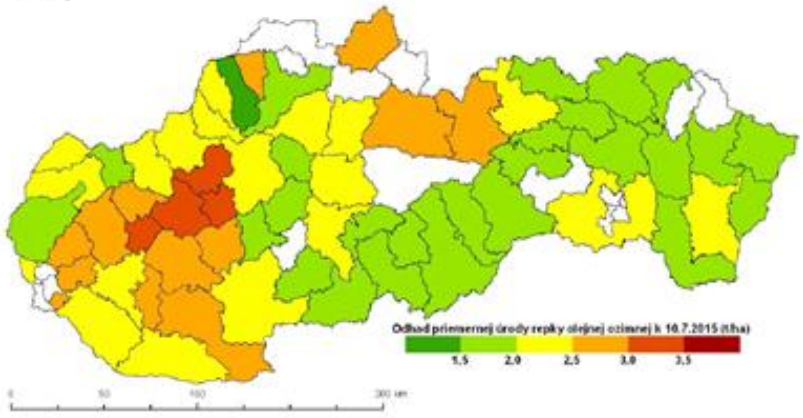
Tukové bunky (biele), zredukované u lietaviek (vľavo), úplne vyvinuté u "zimných včiel" (vpravo)

Photo credit (by permission): Keller, I P Fluri, A Imdorf (2005) Pollen nutrition and colony development in honey bees: Part 1. Bee World 86(1): 3-10

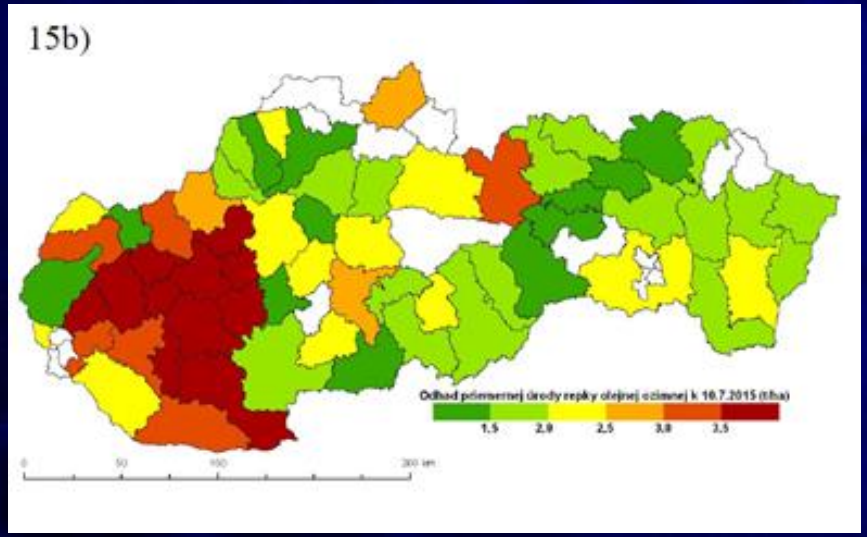
PASTVA

Odhadované úrody repky olejnej ozimnej k 15.7.2015 interpretované na úrovni okresov: metóda integrovaného odhadu (15a); metóda DPZ (15b).

15a)

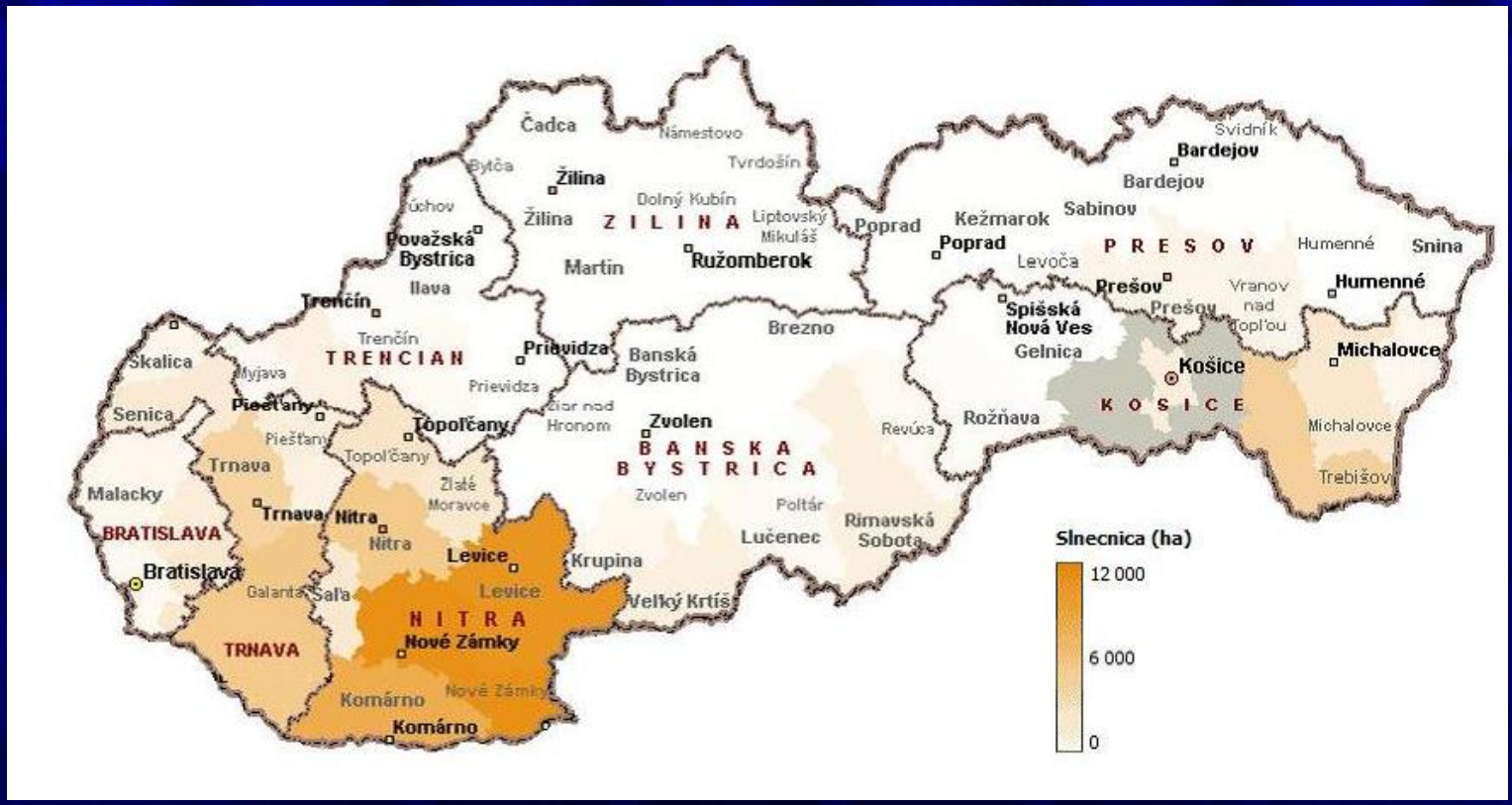


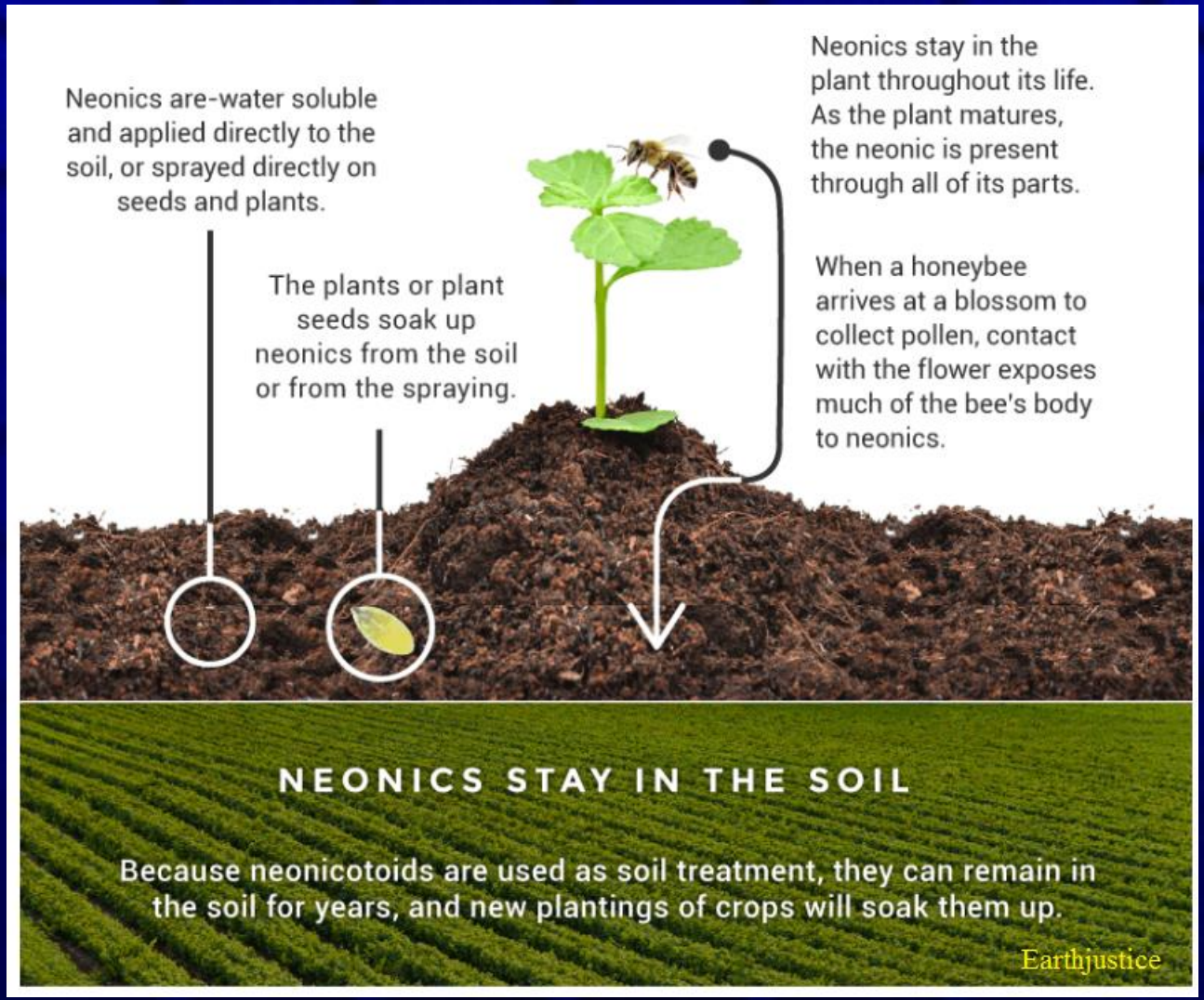
15b)



PASTVA

Slnečnica



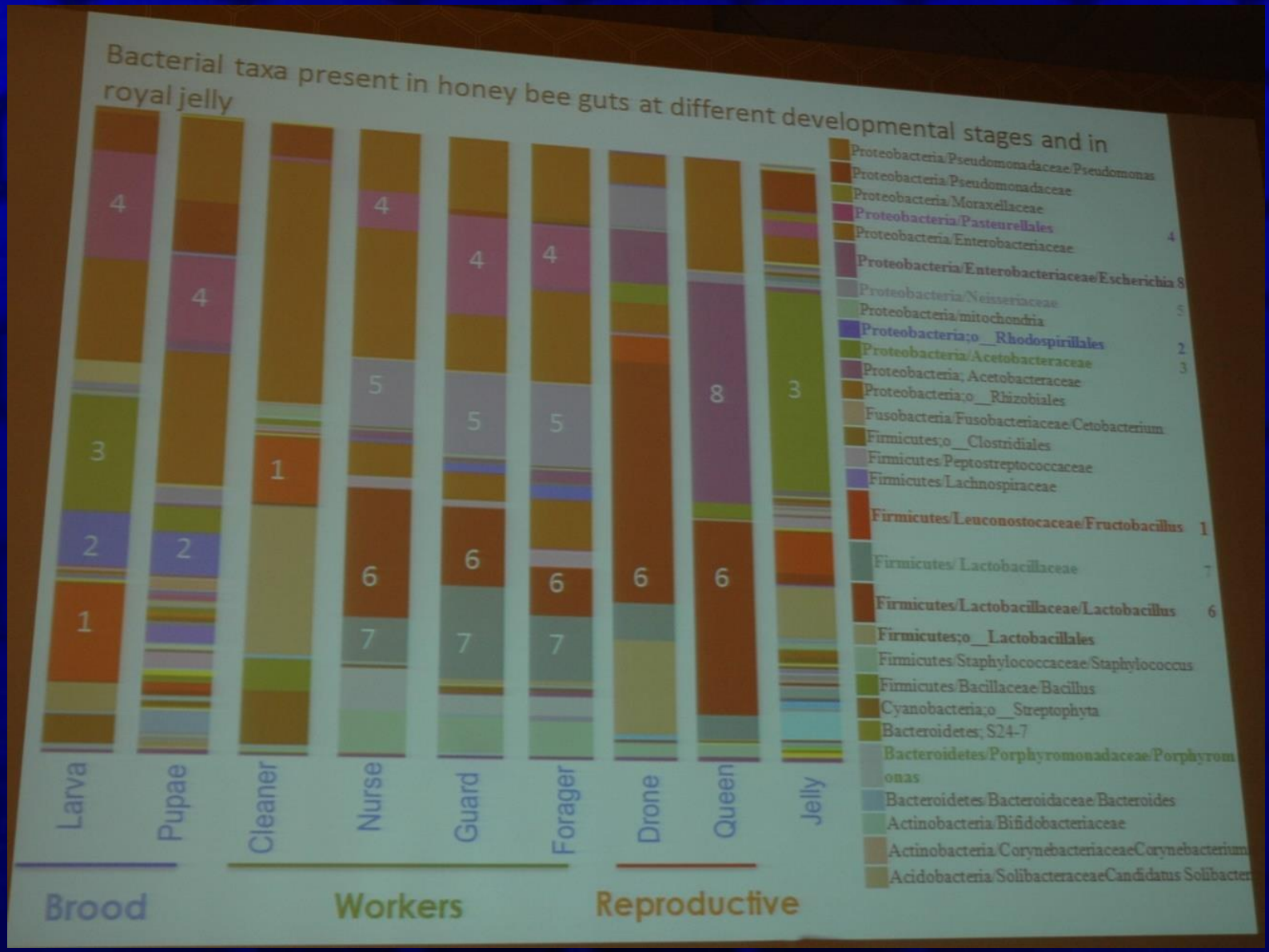

Neonics are-water soluble and applied directly to the soil, or sprayed directly on seeds and plants.
The plants or plant seeds soak up neonics from the soil or from the spraying.
Neonics stay in the plant throughout its life. As the plant matures, the neonic is present through all of its parts.
When a honeybee arrives at a blossom to collect pollen, contact with the flower exposes much of the bee's body to neonics.
NEONICS STAY IN THE SOIL
Because neonicotoids are used as soil treatment, they can remain in the soil for years, and new plantings of crops will soak them up.
Earthjustice

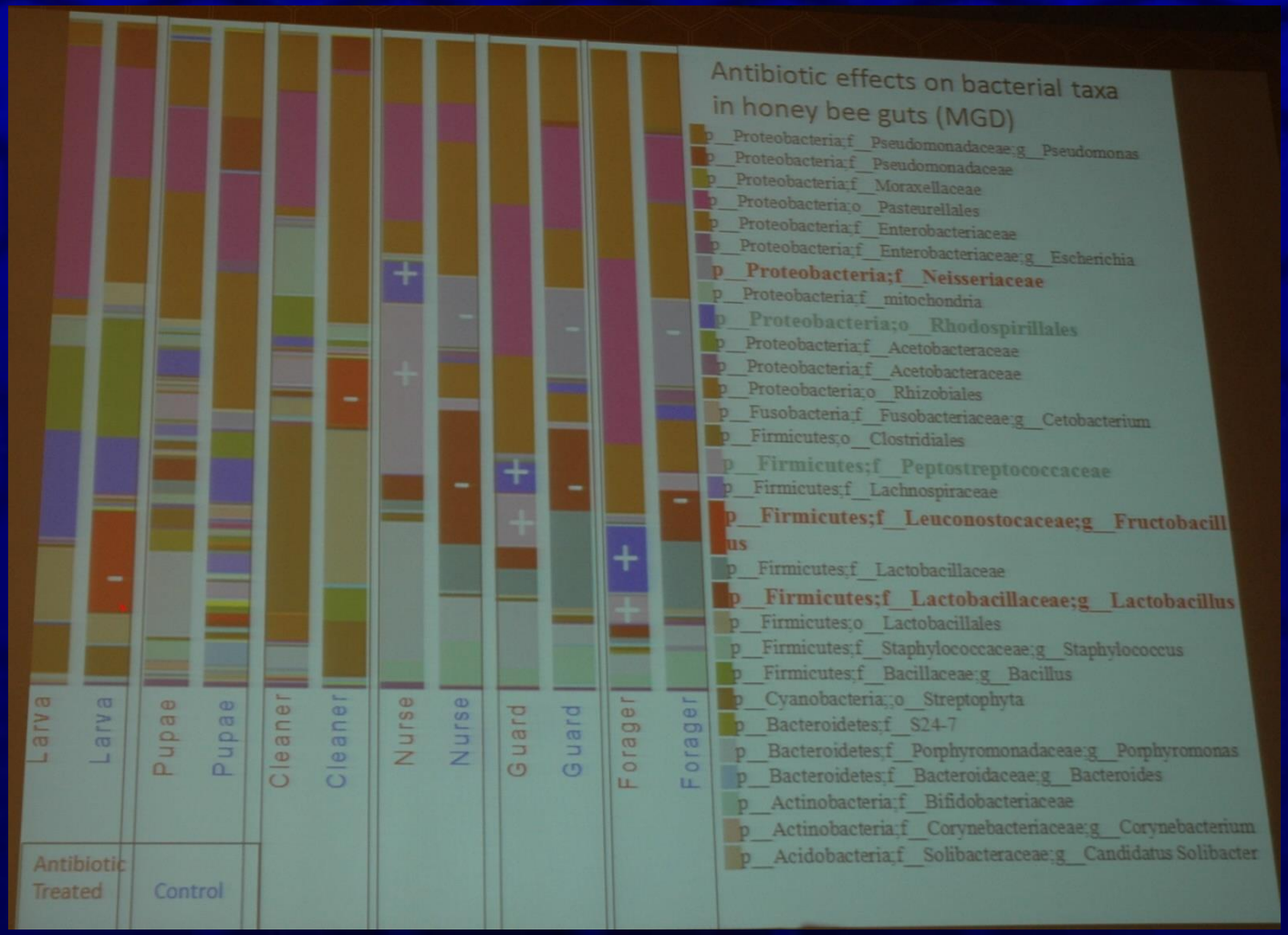
Rezíduá cudzorodých látok vo výžive včiel ako ovplyvňujú zdravie včiel?

Ak kontaminanty (rezíduá) z úľa zabraňujú nárastu prospešných mikroorganizmov – môžu spôsobiť nutričné nedostatky

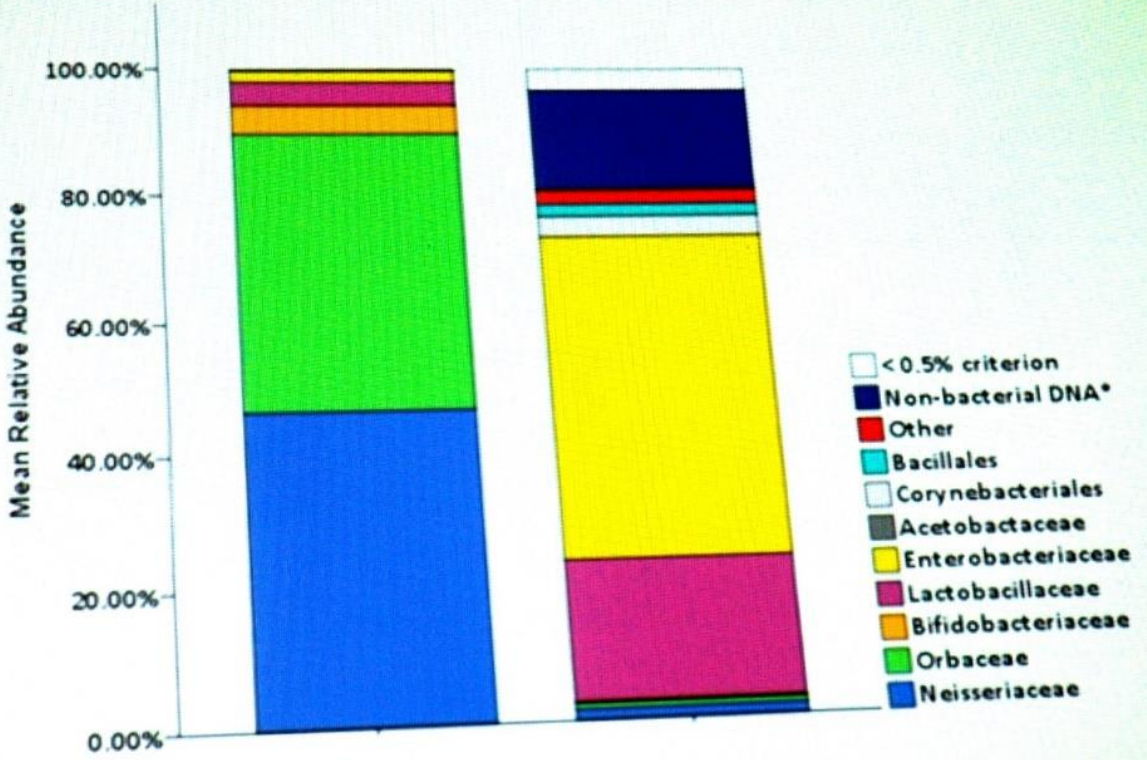
Vyusťujúce do:

- **zvýšenia výskytu ochorení**
- **výmeny starej alebo chorej včelej kráľovny za novú**
- **spomalenie rastu včelstva**

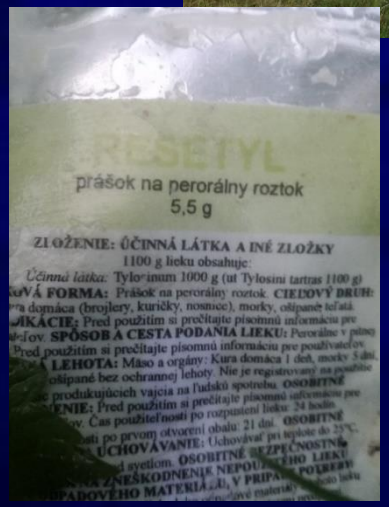

Bacterial taxa present in honey bee guts at different developmental stages and in royal jelly
Larva
Pupae
Cleaner
Nurse
Guard
Forager
Drone
Queen
Jelly
Brood
Workers
Reproductive
Proteobacteria/Pseudomonadaceae/Pseudomonas
Proteobacteria/Pseudomonadaceae
Proteobacteria/Moraxellaceae
Proteobacteria/Pasteurellales
Proteobacteria/Enterobacteriaceae 4
Proteobacteria/Enterobacteriaceae/Escherichia 8
Proteobacteria/Neisseriaceae 5
Proteobacteria/mitochondria
Proteobacteria;o__Rhodospirillales 2
Proteobacteria/Acetobacteraceae 3
Proteobacteria; Acetobacteraceae
Proteobacteria;o__Rhizobiales
Fusobacteria/Fusobacteriaceae/Cetobacterium
Firmicutes;o__Clostridiales
Firmicutes/Peptostreptococcaceae
Firmicutes/Lachnospiraceae
Firmicutes/Leuconostocaceae/Fructobacillus 1
Firmicutes/ Lactobacillaceae 7
Firmicutes/Lactobacillaceae/Lactobacillus 6
Firmicutes;o__Lactobacillales
Firmicutes/Staphylococcaceae/Staphylococcus
Firmicutes/Bacillaceae/Bacillus
Cyanobacteria;o__Streptophyta
Bacteroidetes; S24-7
Bacteroidetes/Porphyromonadaceae/Porphyromonas
Bacteroidetes/Bacteroidaceae/Bacteroides
Actinobacteria/Bifidobacteriaceae
Actinobacteria/CorynebacteriaceaeCorynebacterium
Acidobacteria/SolibacteraceaeCandidatus Solibacter


Antibiotic effects on bacterial taxa in honey bee guts (MGD)
p__Proteobacteria;f__Pseudomonadaceae;g__Pseudomonas
p__Proteobacteria;f__Pseudomonadaceae
p__Proteobacteria;f__Moraxellaceae
p__Proteobacteria;o__Pasteurellales
p__Proteobacteria;f__Enterobacteriaceae
p__Proteobacteria;f__Enterobacteriaceae;g__Escherichia
p__Proteobacteria;f__Neisseriaceae
p__Proteobacteria;f__mitochondria
p__Proteobacteria;o__Rhodospirillales
p__Proteobacteria;f__Acetobacteraceae
p__Proteobacteria;f__Acetobacteraceae
p__Proteobacteria;o__Rhizobiales
p__Fusobacteria;f__Fusobacteriaceae;g__Cetobacterium
p__Firmicutes;o__Clostridiales
p__Firmicutes;f__Peptostreptococcaceae
p__Firmicutes;f__Lachnospiraceae
p__Firmicutes;f__Leuconostocaceae;g__Fructobacillus
p__Firmicutes;f__Lactobacillaceae
p__Firmicutes;f__Lactobacillaceae;g__Lactobacillus
p__Firmicutes;o__Lactobacillales
p__Firmicutes;f__Staphylococcaceae;g__Staphylococcus
p__Firmicutes;f__Bacillaceae;g__Bacillus
p__Cyanobacteria;;o__Streptophyta
p__Bacteroidetes;f__S24-7
p__Bacteroidetes;f__Porphyromonadaceae;g__Porphyromonas
p__Bacteroidetes;f__Bacteroidaceae;g__Bacteroides
p__Actinobacteria;f__Bifidobacteriaceae
p__Actinobacteria;f__Corynebacteriaceae;g__Corynebacterium
p__Acidobacteria;f__Solibacteraceae;g__Candidatus Solibacter
Larva
Larva
Pupae
Pupae
Cleaner
Cleaner
Nurse
Nurse
Guard
Guard
Forager
Forager
Antibiotic Treated
Control

Gut microbial communities in adults and larvae



KOČOVANIE



- Národny program eradikácie moru včelieho plodu na roky 2016-2017
- Plán veterinárnej prevencie a ochrany štátneho územia SR na rok 2017
- Kočovný poriadok
- Všeobecné záväzné nariadenie obce o chove zvierat

ĎAKUJEM ZA POZORNOSŤ