

# Nosema ceranae in Ukraine

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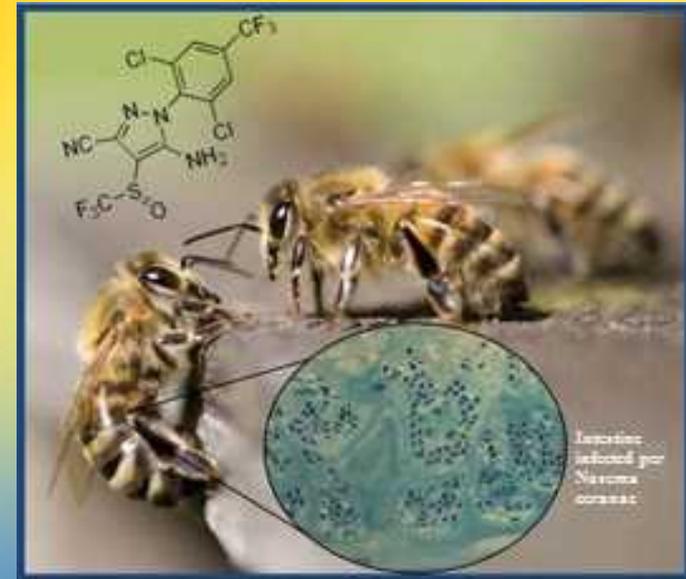
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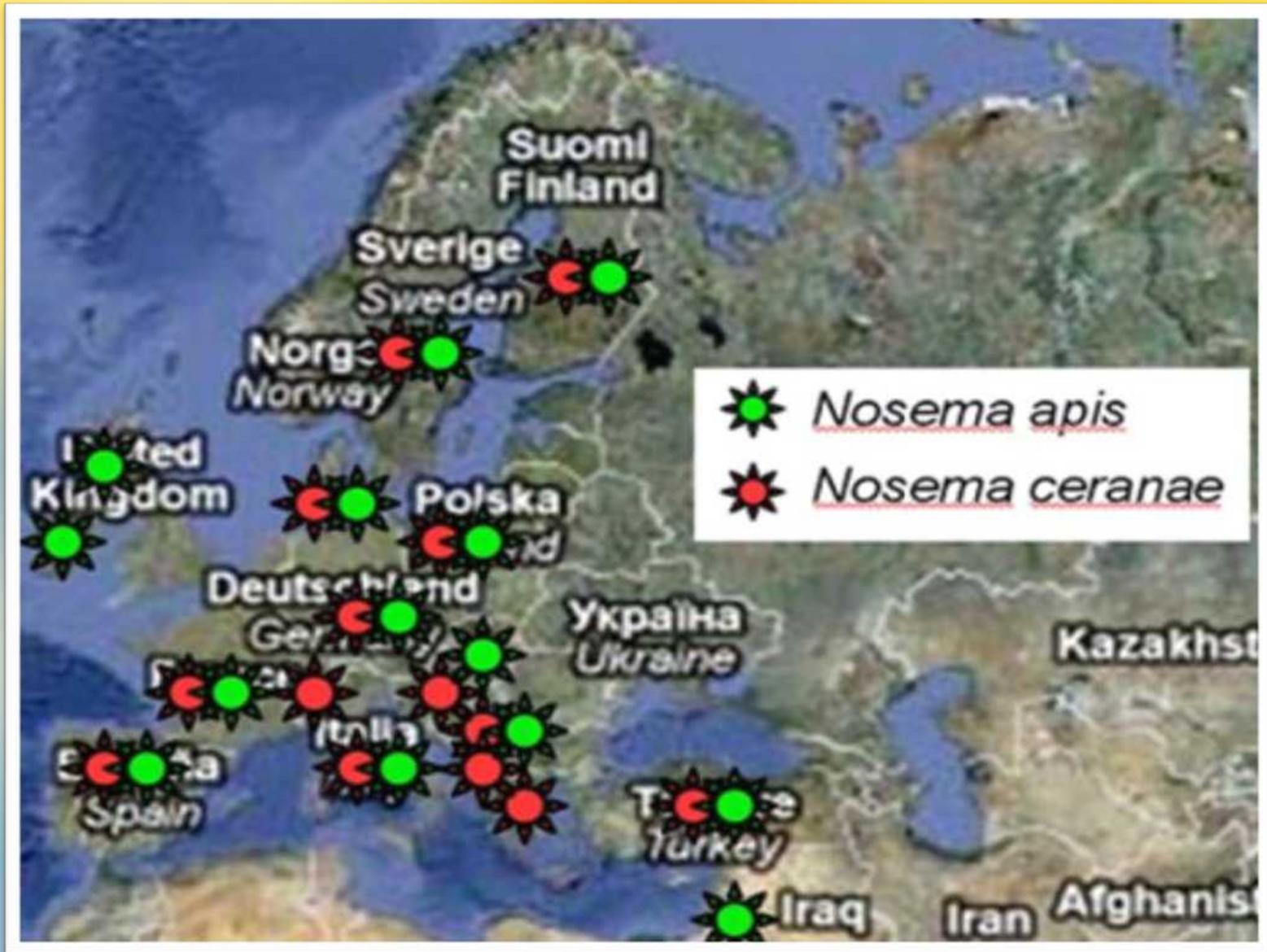
• **Nosematosis** is a widespread disease of the European honey bee *Apis mellifera* L., periodically causing mass death of bee families on apiaries (Grobov, etc., 1987; Bourgeois et al., 2009).



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• Recent studies, however, showed a wide spread all over the world of another parasite, **Nosema ceranae** (Fries, Feng, da Silva, Slemenda, Pieniasek 1996; Martin-Hernandez et al., 2007), the causative agent of so-called "**Asian**" nosema.

- In **Europe**, bees' microsporidia infection is investigated in the majority of the EU countries (*Klee et al., 2007; Topolska, Kasprzak, 2007; Bacandritsos et al., 2010; Stefanovic et al., 2010*).



- However, there remains a vast unexplored territory, stretching to the East and including the countries of **Baltic states, Ukraine, Belorussia**, the majority of **Russia, Moldova**, the countries of **Southern Caucasus, Kazakhstan, Uzbekistan, Kyrgyzstan**, etc. regions.

- For today it remains **under-researched, including** a number of other **issues:**

- (1) *how long* microsporidia *N. ceranae* became *widespread* in the world as the parasite of *A. mellifera*;

- (2) what *conditions are favorable for development* of the nosematosis caused by *N. ceranae*;

- (3) *the mutual relations* between *N. ceranae* and *N. apis* at the joint infection of bees;

- (4) whether nosematosis caused by *N. ceranae* is *a threat to the bee-keeping*, etc.

- In connection with foregoing, an important theoretical and practical value is presented by researches on the **study of prevalence of *N. ceranae* on apiaries in Ukraine.**



- The aim of our researches was:  
to study - whether there is present  
microsporidia *N. ceranae* in Ukraine.

\* Researches became possible thanks to the contract about the creative **collaboration** between the *Laboratory of Bee Pathology NSC "Institute of beekeeping them. P. I. Prokopovich"* (Kyiv, Ukraine) and the *Microbiomethod laboratory of All-Russia Institute of Plant Protection* (St-Petersburg, Russia), supported by a grant of Russian Foundation for Basic Research (RFBR) №07-04-00269. The research of the Ukrainian group conducted exceptionally on the enthusiasm and scientific initiative.



• The task of our research included:

- 1) Select samples of live and dead bees with symptoms and without nosematosis symptoms from apiaries of geographically distant areas of Ukraine.
- 2) To receive detailed information about the peculiarities of bees ' cultivation, apiary history, the condition of bee families, clinical symptoms of the nosematosis, held events for prevention and treatment of this disease (*the Laboratory of Bee Pathology of Ukraine*).
- 3) To perform microscopic and molecular diagnostics of the selected samples of bees about their infection with microsporidia *N. ceranae* (*the Microbiomethod laboratory of Russia*).

\*\* Besides, the Laboratory of Bee Pathology (Ukraine) made an experiment on studying of the influence of doses of infection by spores of *N. ceranae* on longevity of bees.

- Materials:

- Wishing to find out whether *N. ceranae* is present in samples of bees in *apiaries of Ukraine*, last spring we sampled **podmore bees** in a large extent affected by nosematosis, from **three regions of Ukraine** - *Kiev* (average sample of bees from three apiaries of the **suburb of Kiev**), *Poltava* (average sample of two apiaries of **Gadyach**) and *Zaporozhya* (average sample of bees from the apiary of the suburb of **Melitopol**).

- **Methods:**

- - **microscopic analysis** (spores were isolated and purified by standard techniques for laboratory researches);
- - **morphometric analysis** (spores of the parasite was carried out by microscoping of the drop of suspension of spores in the bright field of the light microscope *Carl Zeiss Axio 10 Imager M1 in appendix of Carl Zeiss AxioVision Rel. 4.6.*).
- \*\*\* As a standard it used samples of spores of *N. apis* and *N. ceranae*, specifically which is set by the methods of the light microscopy and molecular phylogeny (Tokarev et al., 2010; Zinatullina et al., 2011; Ignatieva et al., 2012).

- **The research results**

- In all analyzed samples of bees from the three regions of Ukraine (central - Kyiv and Poltava, and south - Zaporozhya) ***were found spores*** of microsporidia from **10 to 500 spores per field of the view** (at a magnification of 400 times). The morphometric analysis showed the accordance of size characteristics of identified spores (length, width, length-to-width and shape) to the indicators specific to *N. ceranae*.

- Infected regions of Ukraine by the spores of *N. ceranae*.



## • Discussion

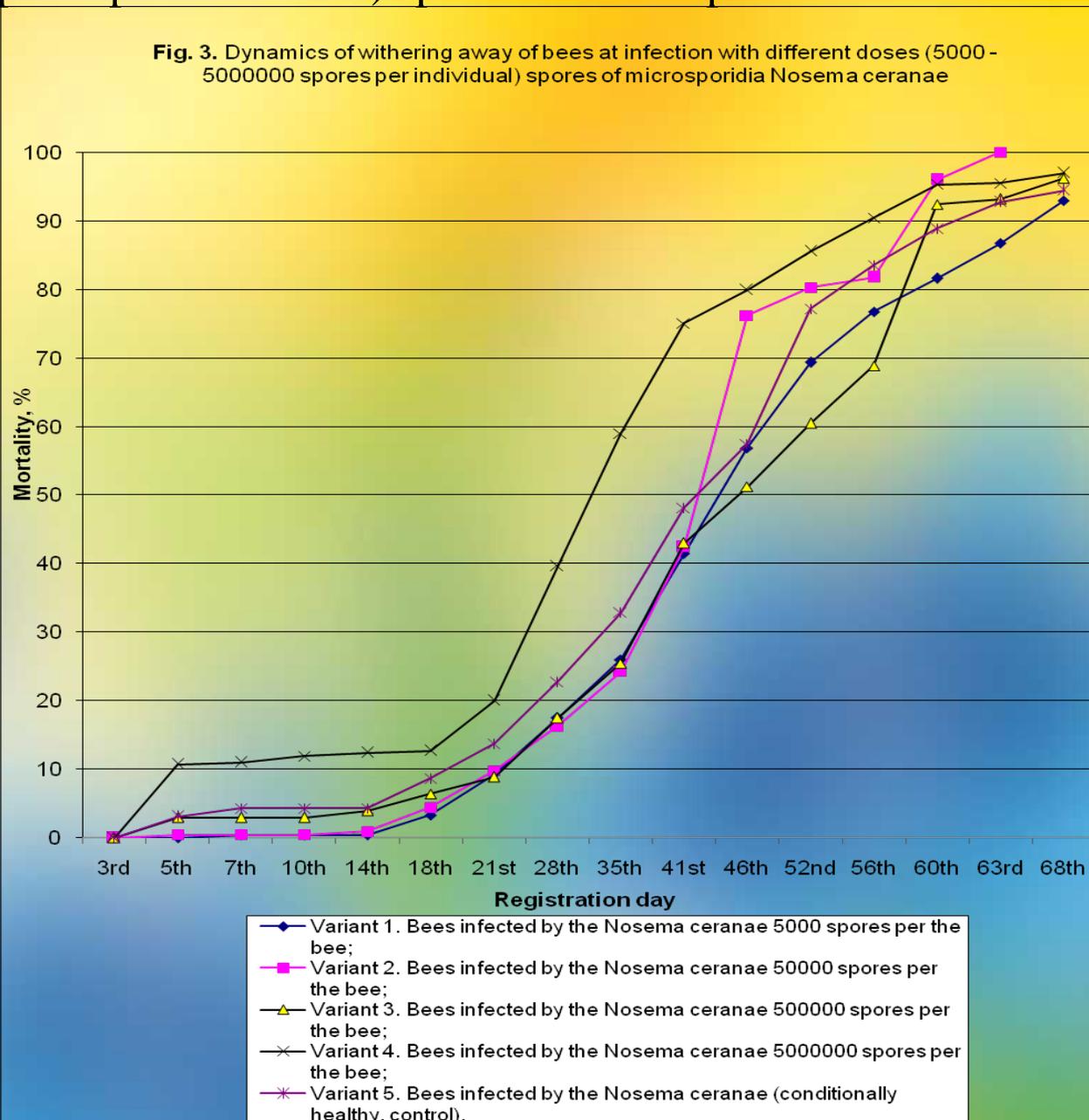
- Considering, that there were spores of *N. ceranae* in the analyzed samples of bees, it is possible to assume that **this parasite is widespread on apiaries in Ukraine, irrespective of a climatic zone.**
- \*\*\*\* It should be noted that the flow of the nosematosis on apiaries, where samples were taken, was classic, namely weak development of families in the spring, in some families - is a presence of tracks of diarrhoea.

- We pay attention to the fact that *the presence of traces of diarrhea is not always a characteristic feature of nosematosis* as at parasitizing by *N. apis* (observations of 20 years ago), SO at parasitizing by *N. ceranae* (observing the last 10 years).



\*\*\*\*\* The clinical signs of this disease first of all depends on the dose of infection of bees by the spores of parasite, whether it is a microsporidia *N. apis* or *N. ceranae*. Low doses (up to  $10^5$  spores on the bee) prolong the life of the bee and high doses ( $10^6$ -  $10^7$  spores on the bee), vice versa, reduce it.

• Dynamics of withering away of bees at infection with different doses (5000 – 5000000 spores per individual) spores of microsporidia *Nosema ceranae*.



- **Medical and prophylactic measures at bees nosematosis:**
- Antibiotics are forbidden for the use in the countries of Europe and in Ukraine. And it is quite justified.
- That is why the *Laboratory of Bee Pathology NSC "Institute of beekeeping them. P. I. Prokopovich"* for **over 10 years** worked under the selection of plants, extracts from which have **antiseptic and antiparasitic effect** and in no way inferior to the effectiveness of fumagillin or other antibiotics.
- **We recommend** a number of plant extracts for the additional fertilizing of bees in autumn and also in the spring.
- \*\*\*\*\* In particular, high efficiency was obtained when feeding 0,1% of an extract (by the dry substance) of the wormwood *Artemisia absinthium* L. (no less than 30% of a medical forage from the general stock of forages for the winter).

• In **summary**, I wish to underline that no matter how long ago did not work out the host-parasite relationship between the honey bee and microsporidia *N. ceranae* or *N. apis*, this relationship is only at the first sight might seem to be “**peaceful**”, because any stress factor like infection of bee pathogens of the other nature, a high degree of bees invasion by the mite *Varroa destructor*, feed with the admixture of honeydew, the toxic load on bees from pesticides, weak families, unable to support the microclimate of the beehive, late feeding to bees of sugar syrup can easily shift this balance and cause mass death of bees.

• For this reason it is so important to **take this disease seriously.**

- We consider a necessity to continue studies of the distribution of microsporidia of *N. ceranae* on the territory of **Ukraine** and its harmfulness for beekeeping.



The diorama from the Museum of the “**Institute of beekeeping them. P. I. Prokopovich**”

**Thank you for your  
attention**

**!!!**

