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Global Prevalence of *Nosema ceranae*

A new study published in Apidologie has estimated the global and regional prevalence of Nosema ceranae by analyzing existing studies on this pathogen

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Nosema ceranae (or *Vairiormorpha ceranae*, according to another classification) is an important bee pathogen that can cause colony losses and several adverse physiological effects in worker bees, including immunosuppression and energy stress.



A European honey bee comb. Photos by Matteo Giusti - Apimondia

Originally associated with the Asian honey bee (*Apis cerana*), it has spread to most countries where this species is kept for beekeeping, since its identification in the European honey bee (*Apis mellifera*) in the mid-2000s.

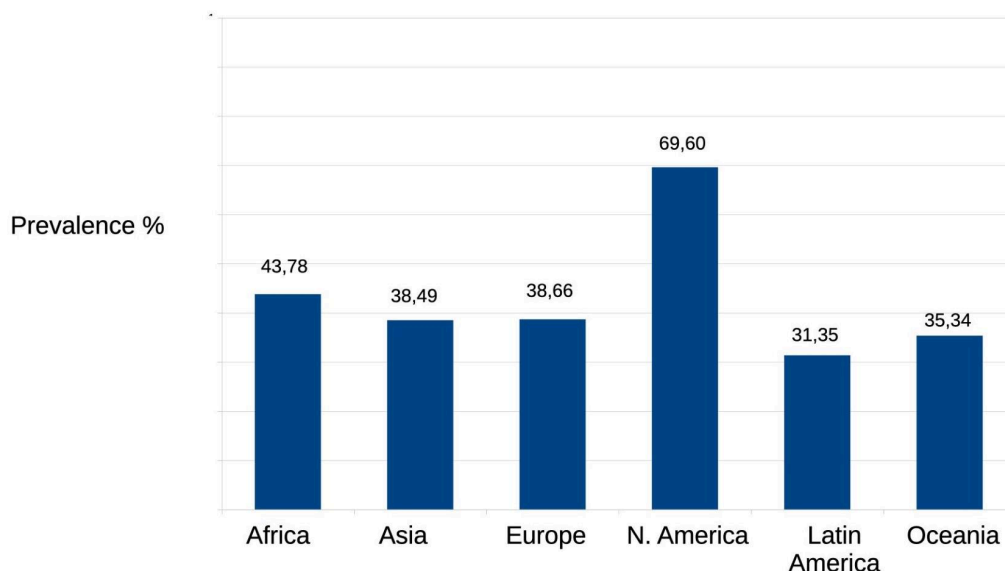
But what is its prevalence in the world?

Until now, studies on the prevalence have largely limited to country-level estimates, mainly in European countries, possibly due to the negative impact observed at the colony level, but there are no global or regional estimates of its prevalence, either at the colony or apiary level.

To address these knowledge gaps, a new study, published in *Apidologie*, conducted a systematic review and meta-analysis to estimate the global, regional, and country-level prevalence of *Nosema ceranae* in European honey bee colonies and apiaries and to investigate associated risk factors.

The review selected 48 articles containing data suitable for analysis and the results of the study indicated that 39,52% of honey bee colonies and more than one-third of apiaries worldwide (34,95%) were affected by *Nosema ceranae*.

Nosema ceranae Prevalence – Colony Level

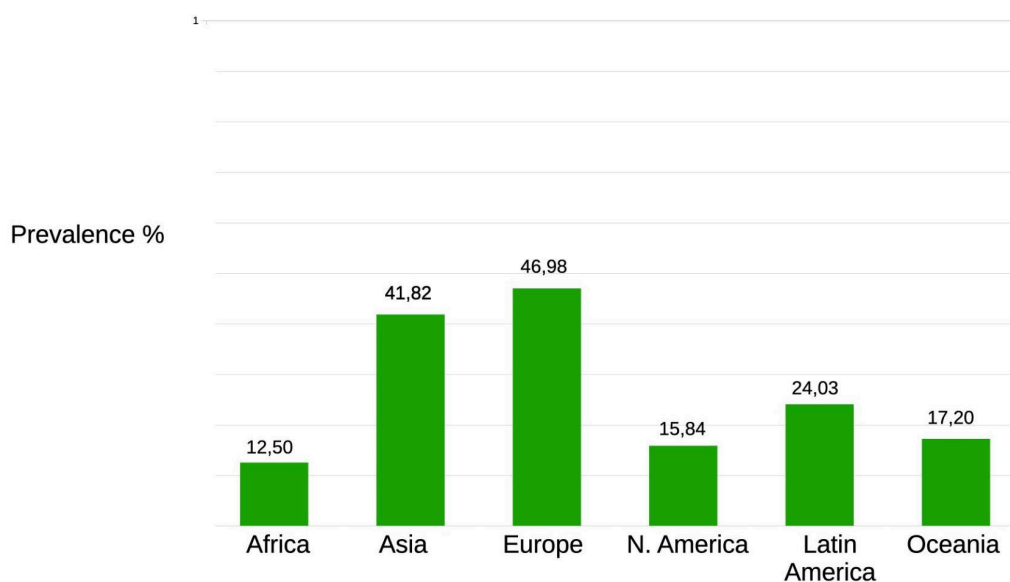


Northern America had the highest prevalence at the colony level (how many colonies are infected out of the total number of colonies), while Europe and Asia showed the highest prevalence at the apiary level (how many apiaries are infected out of the total number of apiaries). At the country level, Vietnam and Thailand reported the highest proportions of infected colonies, whereas Portugal, Spain, and Italy exhibited the highest prevalence of infected apiaries. Substantial heterogeneity was observed across most geographical comparisons, highlighting the complexity of the parasite's epidemiology.

There is also a considerable geographical variation in *Nosema ceranae* prevalence. Infection rates can exceed 60% in tropical regions, whereas they remain below 1% in colder areas, such as Sweden. Seasonal fluctuations have also been reported, suggesting that environmental conditions influence infection dynamics. However, other factors,

including honey bee worker age, competition with *Nosema apis*, and differences among honey bee subspecies, hybrids, and evolutionary lineages, may also contribute to this variability, but their relative importance as risk factors remains unclear.

Nosema ceranae Prevalence – Apiary Level



Among the factors examined, climate type emerged as the most consistent influence on prevalence. At the colony level, tropical climates were associated with higher infection rates, suggesting that environmental conditions may favor spore viability, infectivity, and transmission within colonies. At the apiary level, temperate climates were associated with the highest prevalence, potentially reflecting the widespread distribution of the parasite and the influence of environmental conditions and beekeeping practices on transmission between apiaries. Arid climates were also associated with elevated apiary-level prevalence in some analyses.

Sampling season was significant in certain subgroup analyses but was not consistently retained as a predictor in meta-regression analyses. This inconsistency may reflect differences in sampling periods, regional climatic conditions, and biological or management-related factors that complicate comparisons between studies.

Overall, the findings provide the first comprehensive epidemiological assessment of global and regional *Nosema ceranae* prevalence at both colony and apiary levels. These results demonstrate that climate type is an important risk factor, although its effects differ according to the epidemiological unit examined. The results also establish a foundation for developing targeted surveillance and management strategies to protect honey bee health. Nevertheless, the findings should be interpreted in the context of climate change, which may alter temperature and weather patterns and consequently affect the geographical distribution and prevalence of the parasite.

References

Barriento-Espinosa K.G, Monti G., Carrillo R., Basoalto E. (2026) – [Global and regional prevalence of *Nosema ceranae* infections in colonies and apiaries of European honeybee *Apis mellifera*: a systematic review and meta-analysis](#) – Apidologie (2026) 57:13