

READER'S OPINION AND DISCUSSION

Are all psittacine birds carriers of *Cryptococcus neoformans*?

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We read with great interest the article entitled “First isolation of *Cryptococcus gattii* molecular type VGII and *Cryptococcus neoformans* molecular type VNI from environmental sources in the city of Belém, Pará, Brazil”. The report describes the most recent observation of the presence of *Cryptococcus* in the normal microbiota of healthy psittacine birds maintained in captivity in Brazil, similarly to the results of Abegg et al. (2006), who identified this yeast in *Aratinga leucophthalmus*, *Aratinga aurea*, *Aratinga jandaya*, *Pionus maximiliani*, *Nymphicus hollandicus*, *Psittacula eupatria*, *Nandayus nenday*, *Amazona festiva*, *Amazona rhodocorytha* and *Amazona farinose*. Lugarini et al. (2008) also found this yeast in *Melopsittacus undulatus* and *Myiopsitta monachus* and Santos et al. (2009) found it in *Aratinga solstitialis* and *Amazona aestiva*. Despite the number of reported species harbouring *Cryptococcus*, Costa et al. (2009) did not report the species of birds in which *Cryptococcus* was isolated. Thus, readers could misinterpret this report and assume that all psittacine birds are carriers of this yeast. In addition, the citation of this article might compromise future surveys. We would like to suggest to the editors that an additional note be published that addresses this matter because the detection of *Cryptococcus* in previously undescribed species has great importance in terms of public health given its potential to cause disease.

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Lugarini C, Goebel CS, Condas LAZ, Muro MD, Farias MR, Ferreira FM, Vainstein MH 2008. *Cryptococcus neoformans* isolated from passerine and psittacine bird excreta in the state of Paraná, Brazil. *Mycopathol* 166: 61-69.

Santos LL, Ferreira FM, Lopes SF, Condas LA, Muro MD, Lugarini C 2009. Pesquisa de *Cryptococcus neoformans* e *Candida* spp em excretas de psitacídeos e passeriformes cativos. *Arq Cienc Vet Zool Unipar* 12: 5-9.

REPLY

In fact, the *C. neoformans* molecular type VNI strain collected from a commercial aviary in the city of Belém by Costa et al. (2009) was isolated from the excreta of caged budgerigars (*M. undulatus*). It is also important to note that *Cryptococcus* was not isolated in the “normal microbiota of psittacine birds maintained in captivity” but just from dried bird excreta (faeces plus urine) that had accumulated on the tray. Thus, the yeast was isolated from the external microenvironment of these bird cages. Actually, there is a mistake in supposing that the pathogenic species of *Cryptococcus* isolated by Abegg et al. (2006), Lugarini et al. (2008) and Santos et al. (2009) were present in the normal microbiota of healthy psittacine birds maintained in captivity. Their yeast isolations were done from the excreta of birds of the listed species kept in captivity. We did not affirm that the caged psittacinae were carriers of *Cryptococcus*, but merely noted the presence of this pathogenic yeast in their excreta exposed to external environmental conditions. It has been widely demonstrated that the contamination of such environments contributes to the aerial dispersion of propagules of *C. neoformans*, thus allowing their transmission to humans and other mammals. Moreover, it is important to note that cryptococcosis is not a zoonotic infection and that humans and other animals may be contaminated, colonised or infected, depending on their susceptibility.

The occurrence of *C. neoformans* in bird excreta is essentially a saprobic phenomenon, without any specificity for a particular bird species. Therefore, the isolation of *C. neoformans* from the excreta of a particular bird species does not necessarily mean that this vertebrate is a host or a carrier of the yeast. Sites shielded from direct sunlight and ultraviolet light in which substrata rich in urea and other nitrogenous sources accumulate, high avian density and poor hygiene are likely to become contaminated microenvironment by *Cryptococcus*. Pigeon habitats in urban environments are the most studied sources of *Cryptococcus* throughout the world (Mitchell et al. 2011). Crop colonisation and mechanical transport through external contamination of pigeon feathers and feet by *C. neoformans* has been reported, but more studies are necessary to determine importance of pigeons in the transmission of these yeasts to humans and other mammals. In addition, the droppings of caged birds [such as *Paroaria dominicana* (red-cowled cardinal), *Serinus canarius*, *Serinus flaviventris* (yellow canary), *Sicalis flaveola* (saffron finch), *Sporophila caeruleascens* (double-collared seedeater)] kept in domestic environments in Rio de Janeiro showed 12.7% positivity

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(10/79) for *C. neoformans* (Passoni et al. 1998). Besides the domestic environments, commercial stores that sell birds are prone to harbour *C. neoformans* due the high frequency of the conditions described above. For instance, in the city of Campo Grande, Mato Grosso do Sul, a study of bird droppings identified *C. neoformans* serotype A in cages of budgerigars in a commercial store (Filiú et al. 2002). The original and natural budgerigar habitats are not necessarily positive for *C. neoformans*. Pigeon excreta are the most common known environmental reservoir of *C. neoformans* VNI and the excreta of captive budgerigars are also a potential source for this molecular type depending on local micro-environmental factors, especially available nutrient sources and physical conditions. Finally, we emphasise that the isolation of *C. neoformans* from bird excreta collected in the environment in which they live, in nature or in captivity, does not mean that a particular bird species has as specific role as a reservoir or that this fungus is part of the natural microbiota of these vertebrates. Furthermore, there is no scientific evidence that the fungus has the ability to grow or survive in the excreta of a specific bird.

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