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## **An update on connections between Coccidioidomycosis incidence and climatic fluctuations**

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Coccidioidomycosis (valley fever) is a fungal infection found in the southwestern US, northern Mexico, and some places in Central and South America. The fungi which cause it (*Coccidioides immitis* and *Coccidioides posadasii*) are normally soil-dwelling but, if disturbed, become airborne and infect the host when their spores are inhaled. It is thus natural to surmise that weather conditions which foster the growth and dispersal of *Coccidioides* must have an effect on the rate of infection of humans in the endemic areas. Our work so far has attempted to quantify this relationship in Kern County, California (where *C. immitis* is endemic). We have examined the effect on incidence fluctuations (about a seasonally-varying background) resulting from the following weather parameters: precipitation, surface temperature, and wind speed. We have performed several studies by means of a simple linear correlation analysis,<sup>1</sup> and by a generalized auto regressive moving average model.<sup>2</sup> Our first analysis suggests that linear correlations between climatic parameters and incidence are weak; our second analysis indicates that incidence can be predicted largely by considering only the previous history of incidence in the county – the inclusion of climate- or weather-related time sequences improves the model only to a relatively minor extent. Our last analysis, which includes concentrations of particular matter of size 10 micrometers or less (PM<sub>10</sub>), in addition to weather parameters, yields somewhat inconsistent results. We suggest that, in accordance with our prior surmise,<sup>3</sup> a coherent, self-consistent picture of the dynamics of the disease can only be achieved by including in the model effects which are not yet well-characterized and are not related to weather. Specifically, the effects we have in mind are i) anthropogenic activities such as new construction resulting in the disturbance of previously-pristine environments where the fungus may be found, and ii) fluctuations in the immunity levels of the population exposed to *Coccidioides* spores. These immunity variations may result for a number of reasons, such as migration of populations with different susceptibilities, changes in the exposure levels of the population as urban areas grow, and possible effects of atmospheric pollution on the immune response.

## References

- <sup>1</sup> Zender CS and J Talamantes (2006) *Climate controls on valley fever incidence in Kern County, California*, International Journal of Biometeorology 50: 174-182.
- <sup>2</sup> Talamantes J, S Behseta and CS Zender (2007) *Statistical modeling of valley fever data in Kern County, California*, International Journal of Biometeorology 51: 307-315.
- <sup>3</sup> Talamantes J, S Behseta and CS Zender (2007) *Fluctuations in Climate and Incidence of Coccidioidomycosis in Kern County, California: a review*, in print in Annals of the New York Academy of Sciences.