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Is hydrogen peroxide production a false lead in selecting vaginal lactobacilli for probiotic development

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Abstract

Women whose vaginal lactobacilli are hydrogen peroxide (H_2O_2) producers are at less risk of reproductive tract infections than women whose lactobacilli are non-producers. This epidemiological correlation, together with in vitro observations of H_2O_2 producers inactivating pathogens, has made H_2O_2 production a prime criterion for selecting lactobacilli strains to be developed as vaginal probiotics.

However, epidemiological correlation does not imply causation, and the in vitro observations of pathogen inactivation were made under aerobic conditions, in the absence of antioxidants, and disregarded activation of lactobacilli themselves. Whereas in vivo:

1) Lactobacilli do not produce H_2O_2 under the hypoxic (low oxygen) conditions that usually prevail in the vagina. 2) The high antioxidant capacity of cervicovaginal fluid (CVF) means that little H_2O_2 accumulates even under aerobic conditions. The low concentration of H_2O_2 that does accumulate in CVF does not inactivate pathogens. 3) When enough exogenous H_2O_2 is supplied to inactivate pathogens, vaginal lactobacilli are also inactivated.

We conclude that H_2O_2 production by vaginal lactobacilli is implausible as a mechanism of protection against reproductive tract infections, and therefore an unsound basis for probiotic selection. We hypothesize, instead, that H_2O_2 production correlates with another characteristic that does provide in vivo protection. Alternatively, H_2O_2 producers may be more sensitive to the presence of some pathogens; in this case, H_2O_2 producers would correlate with the absence of these pathogens, without implying that H_2O_2 producers protect against those pathogens.

Biography:

Deirdre Elizabeth O'Hanlon is from the Republic of Ireland. She received her B.S. in biochemistry from Wells College, Aurora NY, and her Ph.D. in biology from Johns Hopkins University, Baltimore MD in the United States. Her doctoral research focused on the different parameters for pathogen inactivation by vaginal lactobacilli *in vivo* versus *in vitro*. She is currently continuing her research in the university's Department of Biophysics, looking at probiotic development and other means of supplementing women's mucosal and microbiotal protection against reproductive tract infections. She is the author or co-author of four peer reviewed articles publishing her findings.

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