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Salmonella in Denmark

To the Editor: In the large study by Evans and Wegener recently published in *Emerging Infectious Diseases* (1), salmonellae in broiler chickens and pigs significantly decreased after routine in-feed antimicrobial drug use for growth promotion was terminated in Denmark. Avoparcin was a frequently used growth promoter in poultry until its ban in Denmark in 1995 because of its association with the development and spread of vancomycin-resistant enterococci. On examining Evans and Wegener's data, I noticed that a precipitous drop in salmonellae in broiler chickens appeared to have occurred in early 1996. Do the authors think this drop was due to the withdrawal of avoparcin? As the authors note, avoparcin has been associated with increased shedding of salmonellae (including a dose-response effect) in a number of studies (2,3). If the large drop (from approximately 25% positive samples in 1995 to approximately 10% in 1996) is not due to withdrawal of avoparcin, what do the authors suggest could have caused it?

Do the authors have sufficient numbers of samples to reanalyze their data in broiler chickens for three periods instead of just two (i.e., use the periods January 1995–December 1995, January 1996–December 1997, and January 1998–December 2000)? This change would take into account the potential effect of avoparcin withdrawal in 1995.

Also, the most important reason for decreasing food animals' carriage of salmonellae is to protect people from becoming ill with *Salmonella*. Do the authors have any figures on domestically acquired human infections with salmonellae in Denmark since early 1995? Is there any temporal association with the withdrawal of growth promoters?

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In Reply: The drop in *Salmonella* organisms in broiler chickens becomes evident in September 1995. The ban on avoparcin occurred in May 1995. These two facts suggest

that the first flocks of broiler chickens produced without avoparcin were slaughtered in August 1995. Thus, the temporal relationship is evident. We have reanalyzed the data for the three strata January 1994–December 1995, January 1996–December 1997, and January 1998–December 2000. Each stratum is significantly different from the two others ($p < 0.0001$).

Arguing in favor of a causal relationship, apart from the temporal relationship, one would say that no changes in the *Salmonella* control program in this period could explain this reduction. Arguing against a causal relationship, one would say that the levels momentarily bounced back to nearly the pre-ban level in 1997, despite the avoparcin ban. The subsequent drop and consistent low level could be explained by changes in the control program (introduction of serologic *Salmonella* monitoring in 1997 to 1998). On the basis of our data, drawing a conclusion one or the other is not possible.

There is a clear temporal association between reduction in *Salmonella* in broiler chickens and reduced incidence of domestically acquired *Salmonella* infections that can be attributed to domestically produced broilers. This finding was recently reported in this journal (1).

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