

## Lyme Borreliosis is not Sexually Transmitted

Although the report by M.J. Middleveen et al. (1), suggests that Lyme disease may be a sexually transmitted infection, it relies solely on the detection of *Borrelia* in the semen and vaginal secretions of a small number of people; there is no evidence to date indicating that borreliosis can be transmitted in this manner. Based on little more than these preliminary and unconfirmed observations, Stricker and Middleveen (2), nevertheless, have proposed that their results “might create a paradigm shift that would transform Lyme disease from a tick-borne illness into a sexually transmitted infection”. This is nonsense to say the least.

Because *Borrelia burgdorferi* has been reported to elicit a generalized disseminated infection in several well-characterized animal models of borreliosis, it is not surprising that spirochetes have been isolated from the spleen, eyes, kidneys, liver, testes and the brain of infected animals, several days after infection (3, 4). However, the concept that borreliosis can be transmitted by direct contact or sexually was refuted several years ago by the well-designed, peer-reviewed published studies of Moody and Barthold (5), as well as Woodrum and Oliver (6), internationally known experts on Lyme disease. These investigators used well-characterized animal models of borreliosis in which infection is much more disseminated and profound than it is in humans. It should be noted that, in the United States, Lyme borreliosis has historically been defined as a tick borne infection caused by *Borrelia burgdorferi sensu lato* (7).

To determine if borreliosis can be transmitted by direct contact, Moody and Barthold (5) housed three-day-old (or three-week-old) Lewis rats, deliberately infected with *B. burgdorferi*, with normal, uninfected rats for 30 days. As expected, all deliberately infected rats continued to be actively infected, 30 days later; however, none of the uninfected rats acquired infection after 30 days of intimate direct contact with their infected cage mates.

In other experiments, Moody and Barthold (5) were unable to demonstrate venereal transmission of borreliosis from seven infected females - or six infected males - to uninfected rats of the opposite sex. In the work of Woodrum and Oliver (6), six female Syrian hamsters infected with *B. burgdorferi* were mated with six uninfected males; conversely, three infected males were mated with six uninfected females. None of the uninfected hamsters became infected after mating with an infected partner of the opposite sex, indicating that borreliosis is not sexually transmitted. Obviously, the mere presence of borrelia in genital tissues does not mean that infection can be transmitted sexually. It should be noted that epidemiological data do not support the view that Lyme disease is sexually transmitted. Extensive data collected by the CDC indicate that 96% of all reported cases of Lyme disease occur in 14 States (<http://www.cdc.gov/lyme/stats/index.html>), a pattern that is strikingly different from that for sexually transmitted diseases. Woodrum and Oliver (6) likewise failed to demonstrate contact transmission of *B. burgdorferi* between infected female - or male - hamsters and uninfected hamsters of the opposite sex. It was not possible to transmit borreliosis to uninfected hamsters with urine or feces from infected hamsters.

Sadly, the observations of Middleveen et al.(1) have already generated an inordinate amount of fear and anxiety within the lay community due to sensationalized reports of their unconfirmed findings by an uncritical - and often naïve - press. This has already caused much harm, as evidenced by the fact that I have received numerous inquiries from distraught individuals, wondering if they now should even

consider marrying their previously diagnosed and treated spouse-to-be for fear of getting Lyme disease and/or risking the possibility of giving birth to an infected or congenitally deformed child.

To examine the issue of *in utero* transmission of boreliosis, Moody and Barthold (5) inoculated pregnant female Lewis rats with viable *B. burgdorferi*, at four days of gestation. All of the inoculated pregnant females became seropositive as expected, and *B. burgdorferi* could be cultured from their spleens at 20 days of gestation; however, their placentas and fetuses were culture negative, indicting the lack of *in utero* transmission. Moody and Barthold (5) used two different experimental protocols to determine if transplacental transmission of *B. burgdorferi* occurs. One protocol involved six non-pregnant infected females that were subsequently mated and became pregnant. Three of the females were allowed to carry to full term, whereas the remaining three were sacrificed just prior to parturition. All offspring and offspring-to-be were found to be culture negative for *B. burgdorferi*, as well as seronegative for antibody specific for *B. burgdorferi*, indicating that transplacental transmission of infection does not occur. In the second protocol, six females were infected via tick bite after becoming pregnant, and were allowed to carry their fetuses to birth; all were negative for infection. The results of these studies likewise failed to provide evidence for the transplacental transmission of naturally acquired borreliosis.

Other investigators examined the possibility of congenital birth defects in humans with Lyme disease by doing a rather large comparative study involving 5,000 infants, half from an area in which Lyme disease was endemic and half as controls from an area without Lyme disease (8). They found no significant differences in the overall incidence of congenital malformations between the two groups.

In another study, involving 1,500 subjects including controls, no increased risk of giving birth to a child with a congenital heart defect was noted in women who had either been bitten by a tick or had been treated for Lyme disease during or before pregnancy (9). Finally, an extensive analysis of the world literature revealed “that an adverse outcome due to maternal infection with *B. burgdorferi* at any point during pregnancy in humans is at most extremely rare” (10).

Phillip J. Baker, Ph.D.  
Executive Director  
American Lyme Disease Foundation  
P.O. Box 466  
Lyme, CT 06371  
Executivedir@aldf.com

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