**Etiology and Difficulty of Treatment**

The first step in being able to treat any disease is to learn the cause (etiologies) of that disease. Once the cause of Lyme disease was known, it would seem that a treatment modality would soon follow and the problem would be solved. Unfortunately, as history has shown, this was not to be the case. As more was learned about the causative agent, namely, the spirochete *Borrelia burgdorferi*, it became obvious that this organism was unlike any that had been previously studied. It is one of the largest of spirochetes (0.25 x 25 μ) Spirochetes in general are difficult to treat for several reasons; they have the ability to burrow into or between cells and hide, gaining protection from the immune system. Both Bb and *Treponema pallidum*, the causative agent for syphilis, have highly unusual outer membranes and the molecular architecture of these membranes is responsible for their ability to cause persistent infection.

Bb also has a three-layer cell wall, helping to determine the spiral shape of the spirochete. This distinctive cell wall resembles those of Gram-negative bacteria, although Bb does not stain Gram-negative but is stained by silver stains (containing silver nitrate). This characteristic may be related to the purported treatment of Lyme disease by colloidal silver. (33)

Another unusual structural feature is a single flagella, attached to each end of the spirochete, running the length of the organism and surrounded by it. This feature is significant in relation to immune protection since most bacterial flagella are highly antigenic. Still another difference in Bb structural architecture is a clear gel-like coating surrounding the bacteria, giving it protection from the immune system. (31) See Photo 1.

![Spirochete Chart](chart7.png)