



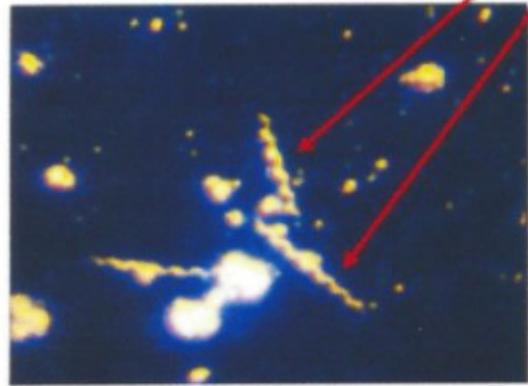
ARTICLE | October 24, 1996  
Borrelia in the Brains of Patients Dying With Dementia  
Harold M. Cohen, MD  
JAMA 1997;278:1511-1512  
doi:10.1001/jama.278.15.1511

Case 1. Spirochetes in subculture

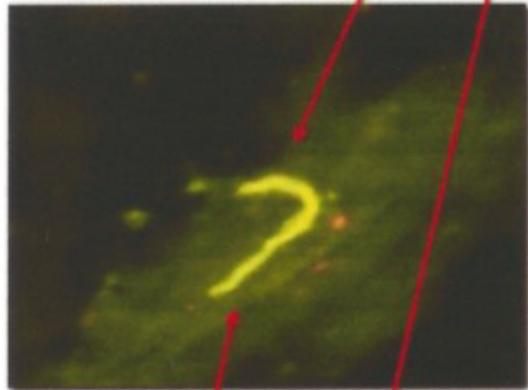


—Case 2. Spirochetes

ALZHEIMER'S DISEASE HIPPOCAMPUS CULTURE  
AUTOPSY BRAIN - BSK MEDIUM - PROLONGED CULTURE  
SPIROCHETES - LATER STAGE - LARGER CALIBER  
AND NOT ATTACHED TO ROUNDED BODIES



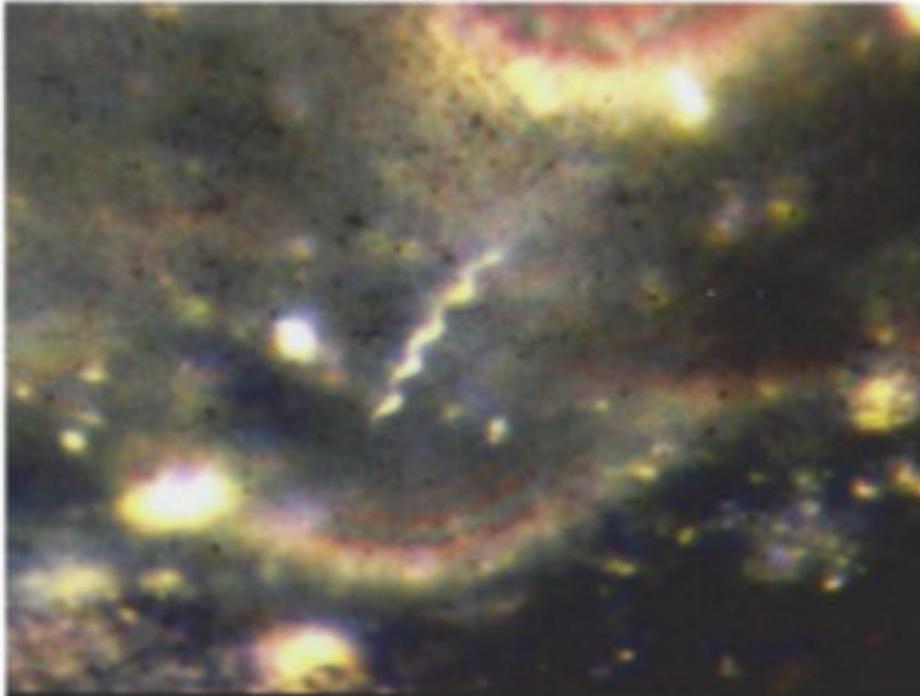
SPIROCHETES RECOVERED FROM ALZHEIMER HIPPOCAMPUS  
CULTURE - YEAR 1986 -



MONOCLONAL AB -  
H9724



WARTHIN STARRY SILVER  
STAIN  
ALZHEIMER HIPPOCAMPUS  
CULTURE

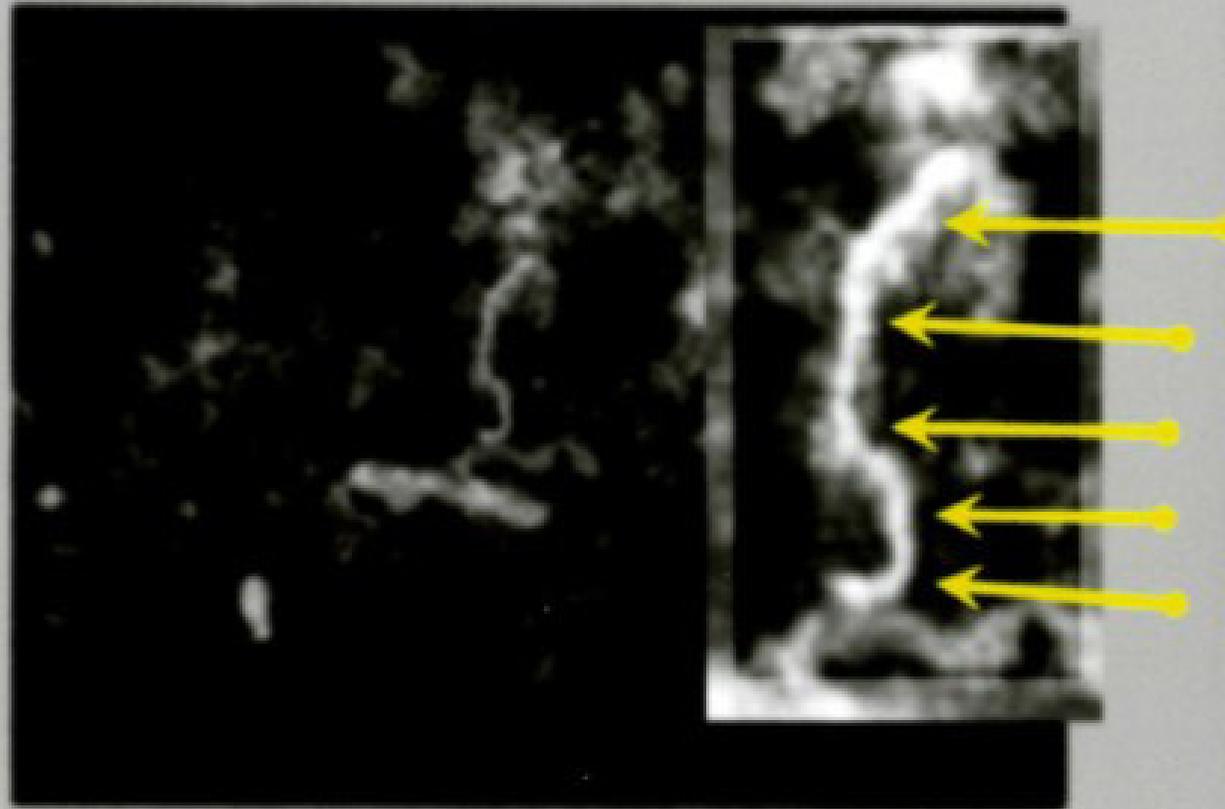


Darkfield Microscopy  
image 400x magnification

Alan B. MacDonald, MD  
FCAP, FASCP

*Borrelia burgdorferi*  
*spirochete*  
*grown in BSK culture*  
*from Frozen Alzheimer*  
*Hippocampus*  
*Year 1986*  
*Reference:*

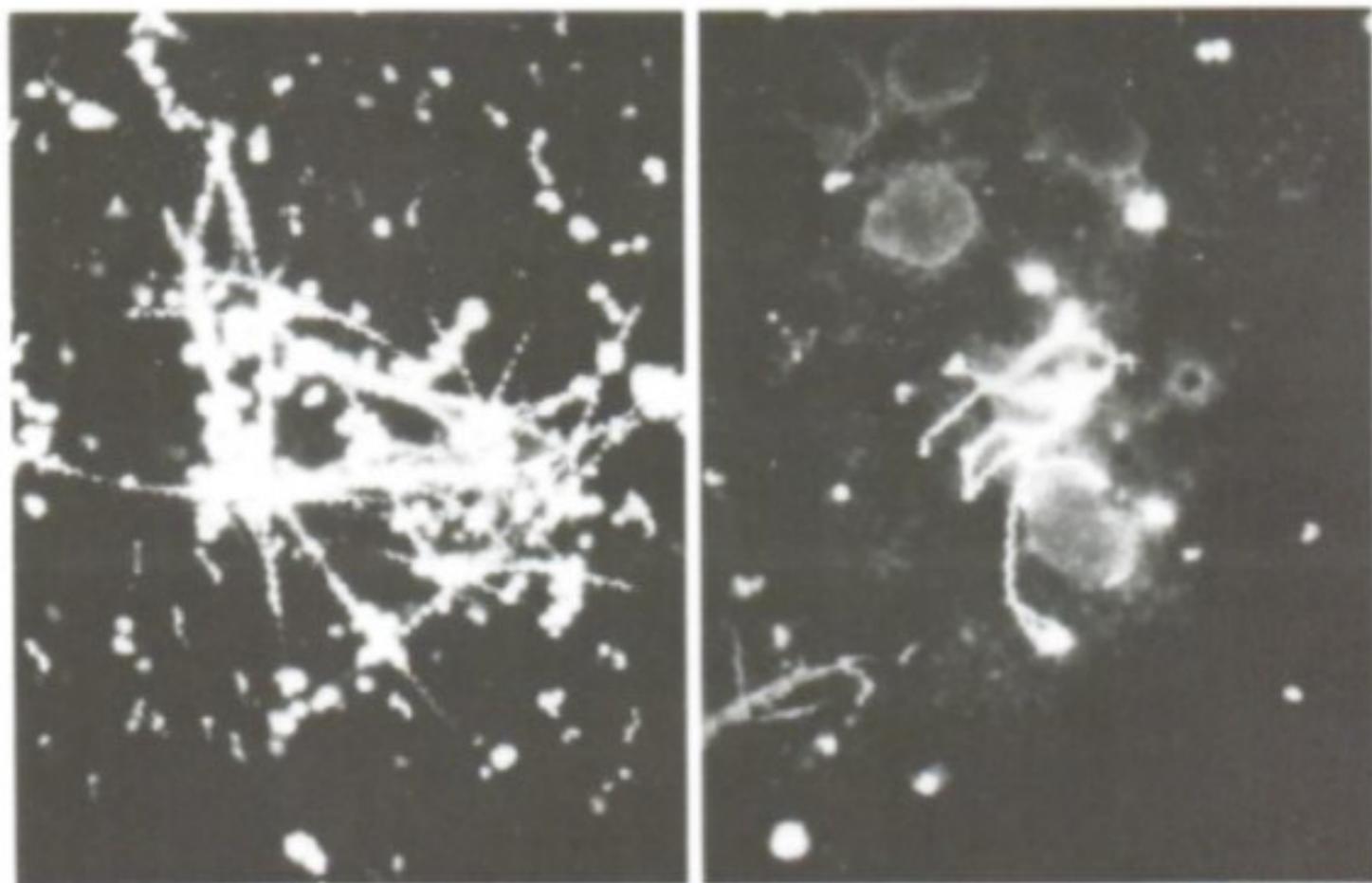
*Journal of the American*  
*Medical Association*  
*"Borrelia in the Brains*  
*of Patients Dying with*  
*Dementia"*



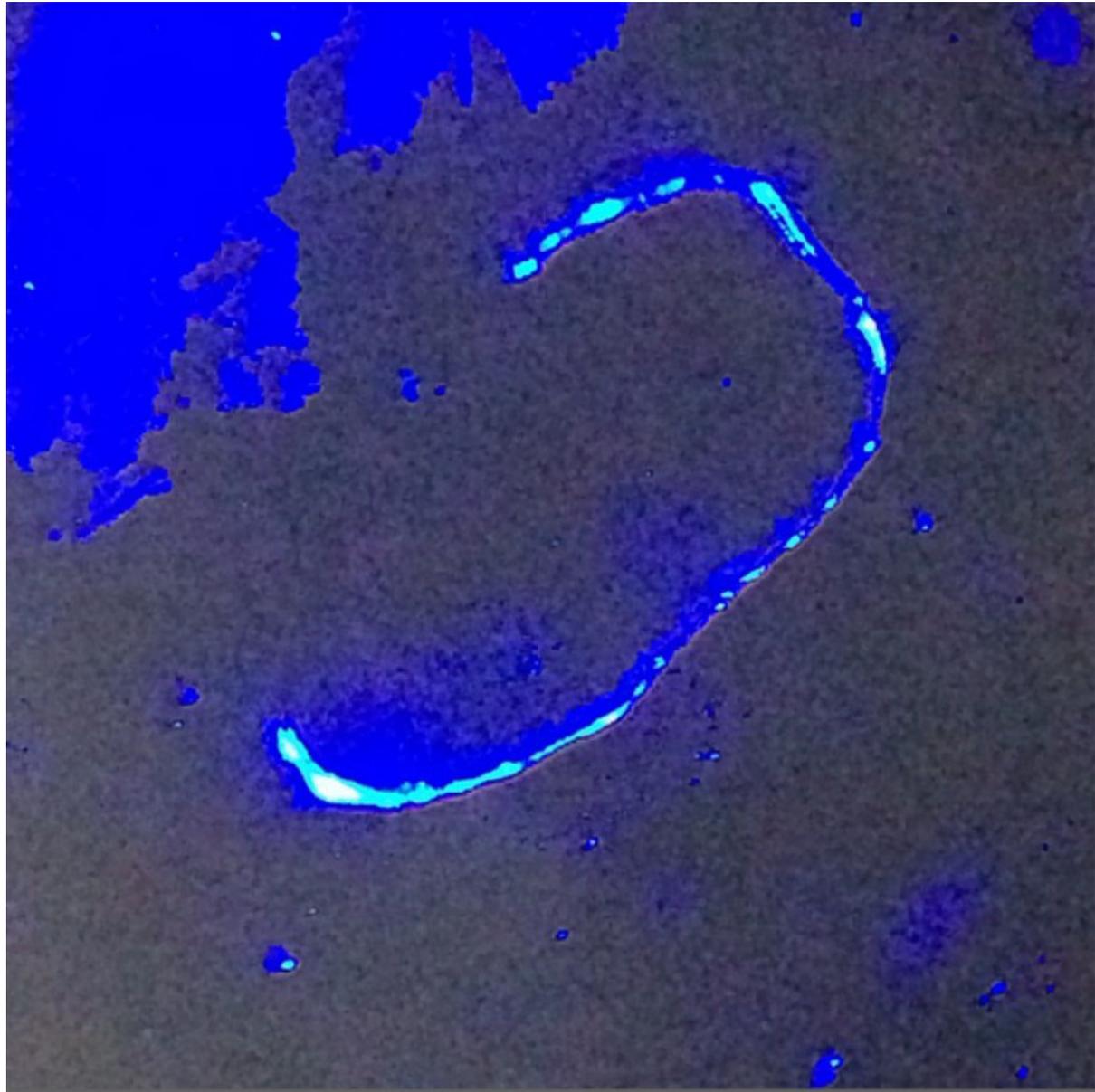
**FIGURE 1.** *Borrelia spirochete* in imprint of calyxed frontal lobe of brain, revealed using murine monoclonal antibody H5112 for outer surface membrane of *Borrelia burgdorferi*. Magnification: 1000x.

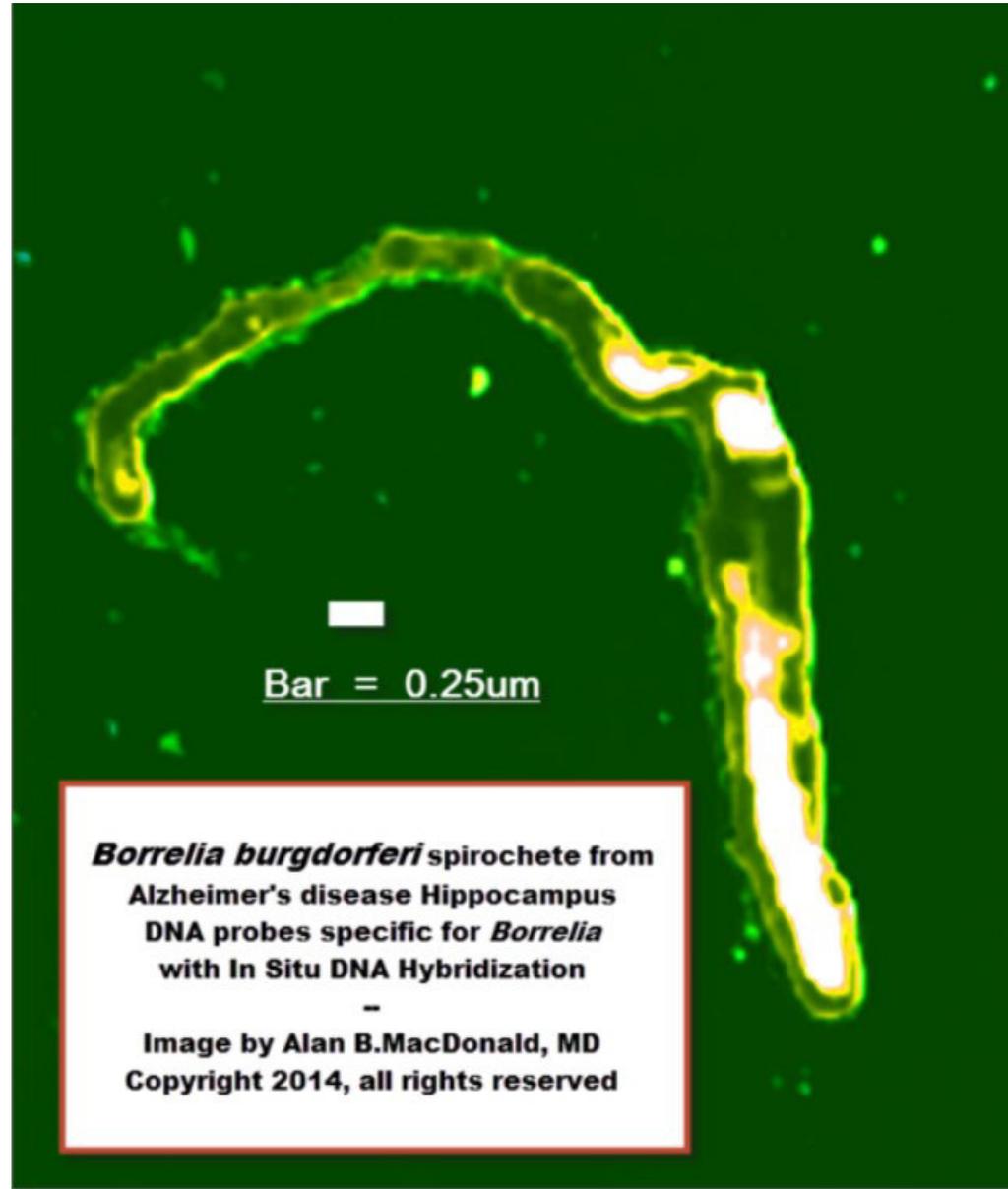
**Borrelia  
Spirochete  
[ magnified in box ]  
proof of Borrelia  
is  
POSITIVE  
H5332  
Monoclonal  
Antibody  
Reaction**

**Magnified  
view of Spirochete  
[ yellow arrows ]**



**FIGURE 1.** Borrelia spirochetes. **Left,** Subculture of frontal lobe of brain in Barbour-Stanley-Kelly medium. (Darkfield microscope image  $\times 500$ ) **Right,** Cytologic preparations from fresh frontal lobe cortex (touch preparations) stained with mouse monoclonal antibody H5.3.12. IgG [outer envelope epitope]. (Indirect immunofluorescence microscope image.  $\times 1000$ )

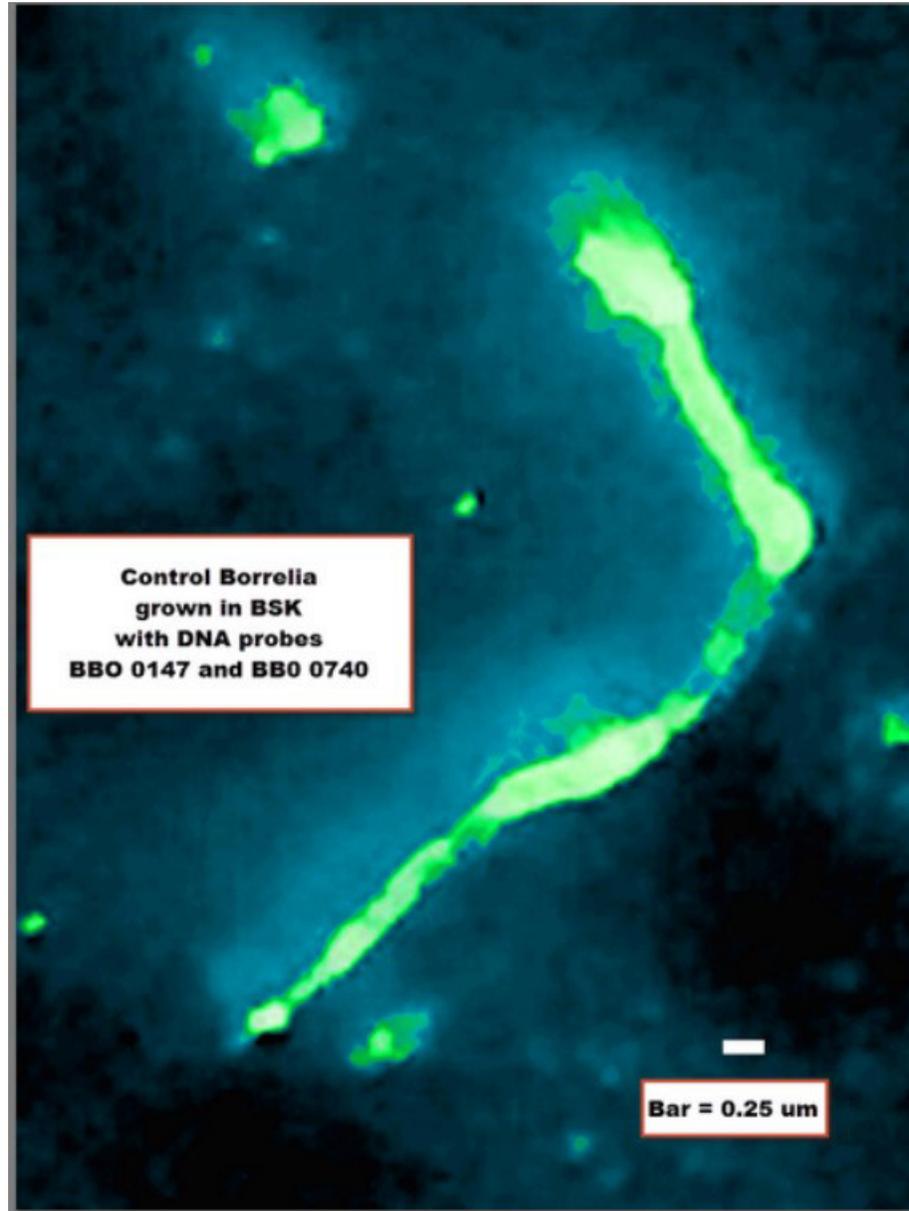




Bar = 0.25um

***Borrelia burgdorferi*** spirochete from  
Alzheimer's disease Hippocampus  
DNA probes specific for *Borrelia*  
with In Situ DNA Hybridization

—  
Image by Alan B. MacDonald, MD  
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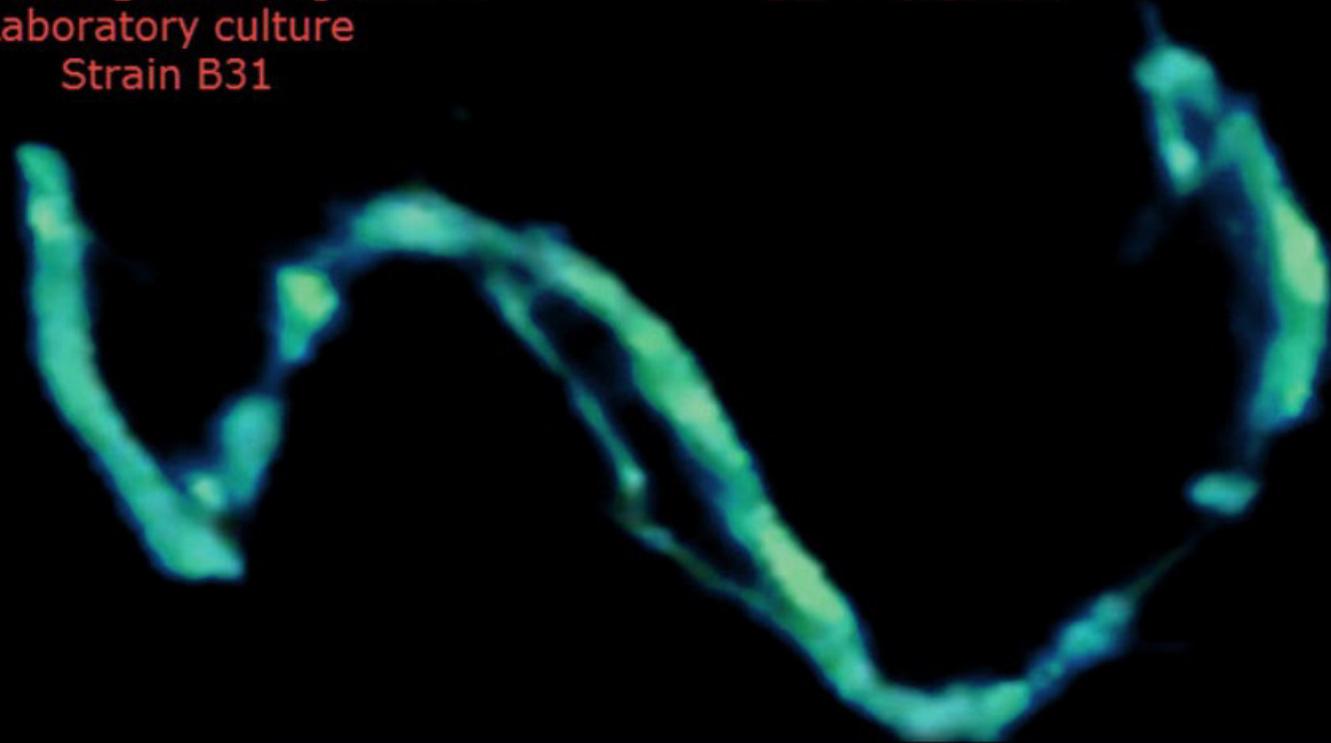
**Control Borrelia  
grown in BSK  
with DNA probes  
BBO 0147 and BB0 0740**

**Bar = 0.25 um**

Control  
*Borrelia burgdorferi* grown in  
Laboratory culture  
Strain B31

—  
Bar = 0.25  $\mu\text{m}$

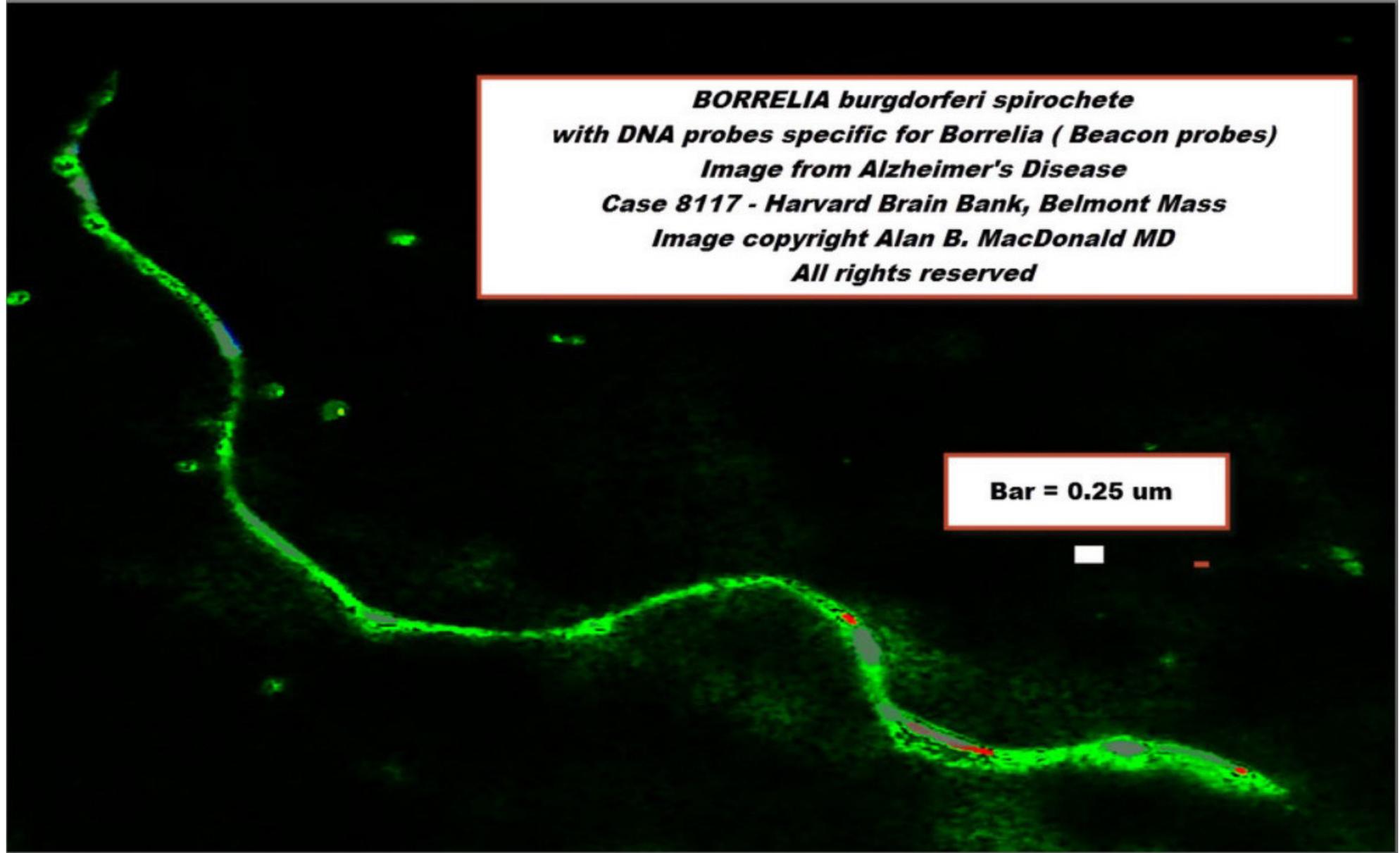
Image by : Alan B.  
MacDonald MD  
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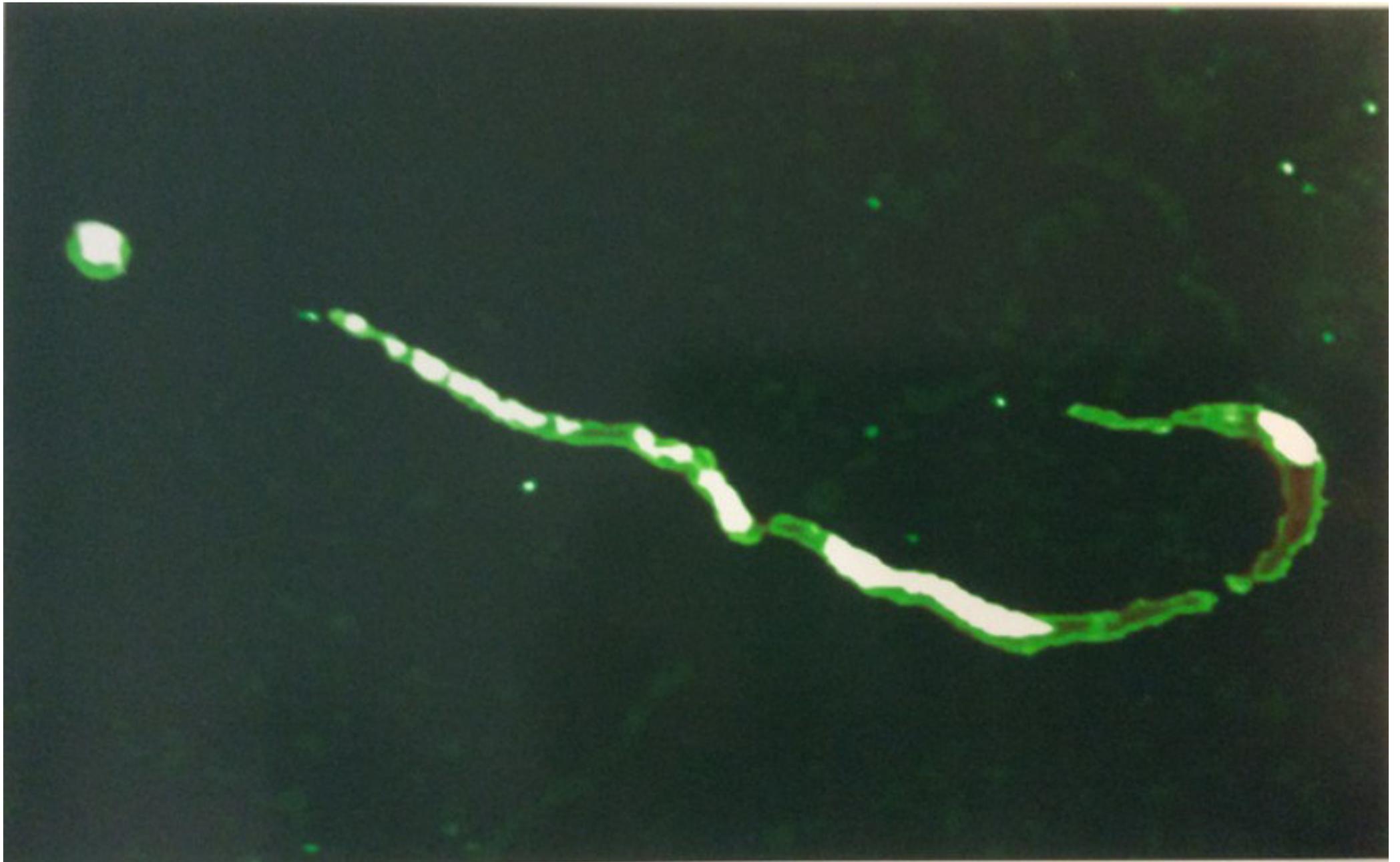


- Note:
1. the *Borrelia* spirochete is segmented
  - 2.. The *Borrelia* spirochete DNA is present within an outer compartment turquoise color and an Inner compartment in chunk-like green regions

***BORRELIA burgdorferi* spirochete**  
**with DNA probes specific for Borrelia ( Beacon probes)**  
**Image from Alzheimer's Disease**  
**Case 8117 - Harvard Brain Bank, Belmont Mass**  
**Image copyright Alan B. MacDonald MD**  
**All rights reserved**

**Bar = 0.25 um**





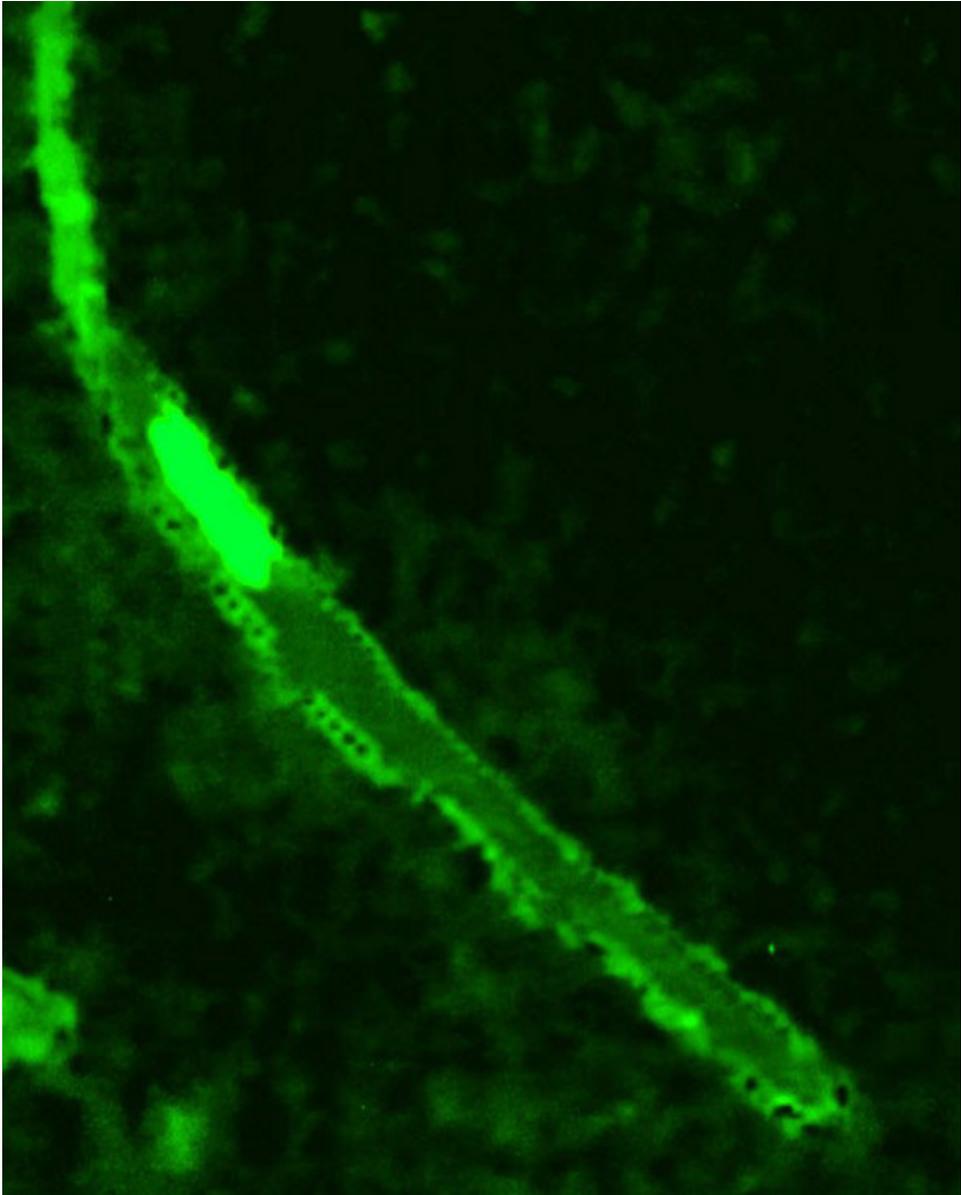
**Borrelia burgdorferi Spirochete  
from Alzheimer's brain hippocampus  
with Borrelia specific DNA Probes  
Imaged with FISH technique  
in Paraffin embedded formalin fixed  
tissues by  
Alan B. MacDonald, MD  
Copyright, 2014, All rights reserved**

Bar = 0.25  $\mu$ m

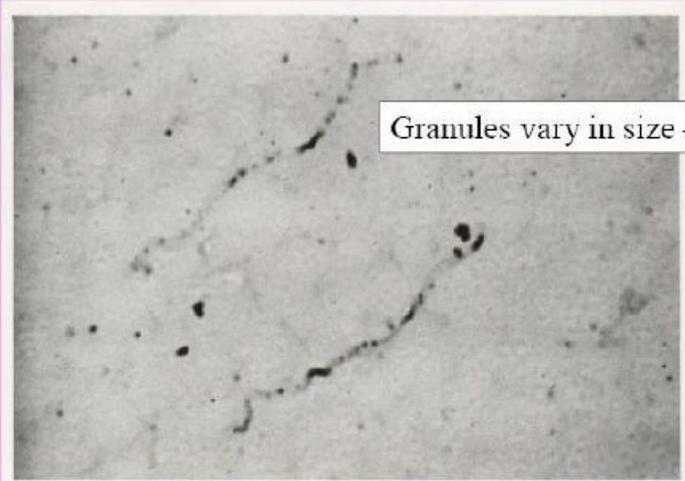
Note: Two DNA compartments are  
demonstrated in Borrelia spirochete:

First: the inner compartment deep to the Cell wall  
Staining turquoise and yellow green

Second: the outer DNA compartment exterior to the cell wall and  
beneath the Outer Surface Membrane (OSM)  
staining green with a line of dark dots

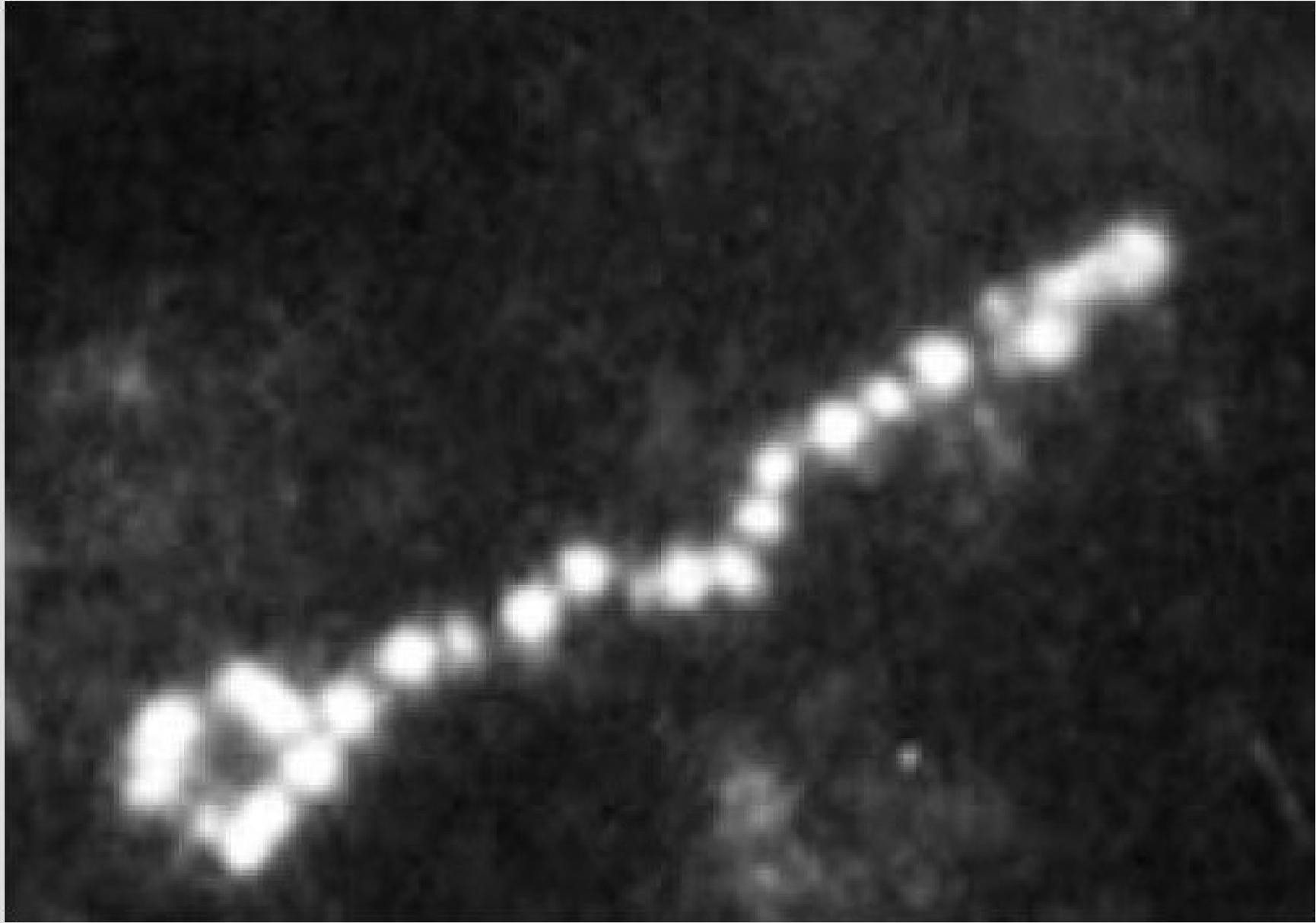


*Borrelia burgd.* In transformation  
to granular forms



Granules vary in size – from little to big





Alzheimer's with GVB  
and ? Spirochetal form at 9 oclock



Granules vary in size – from little to big