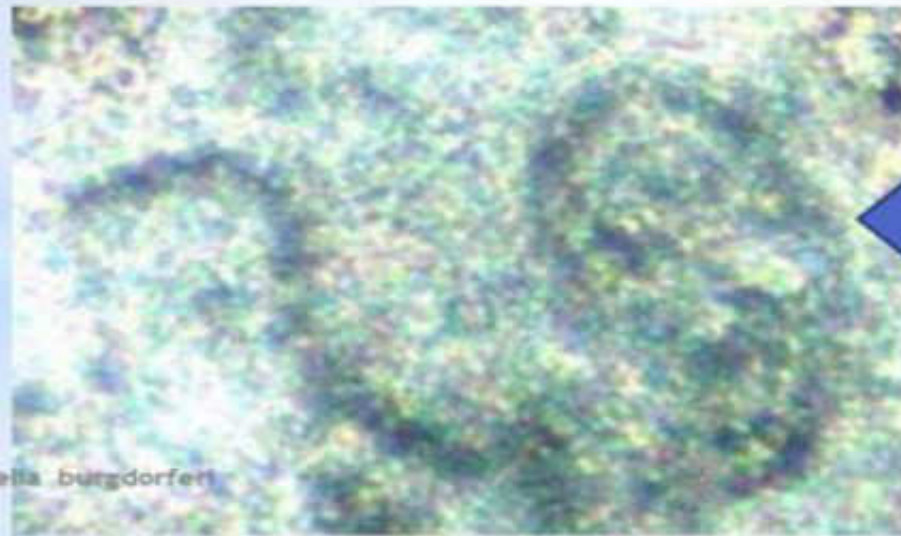


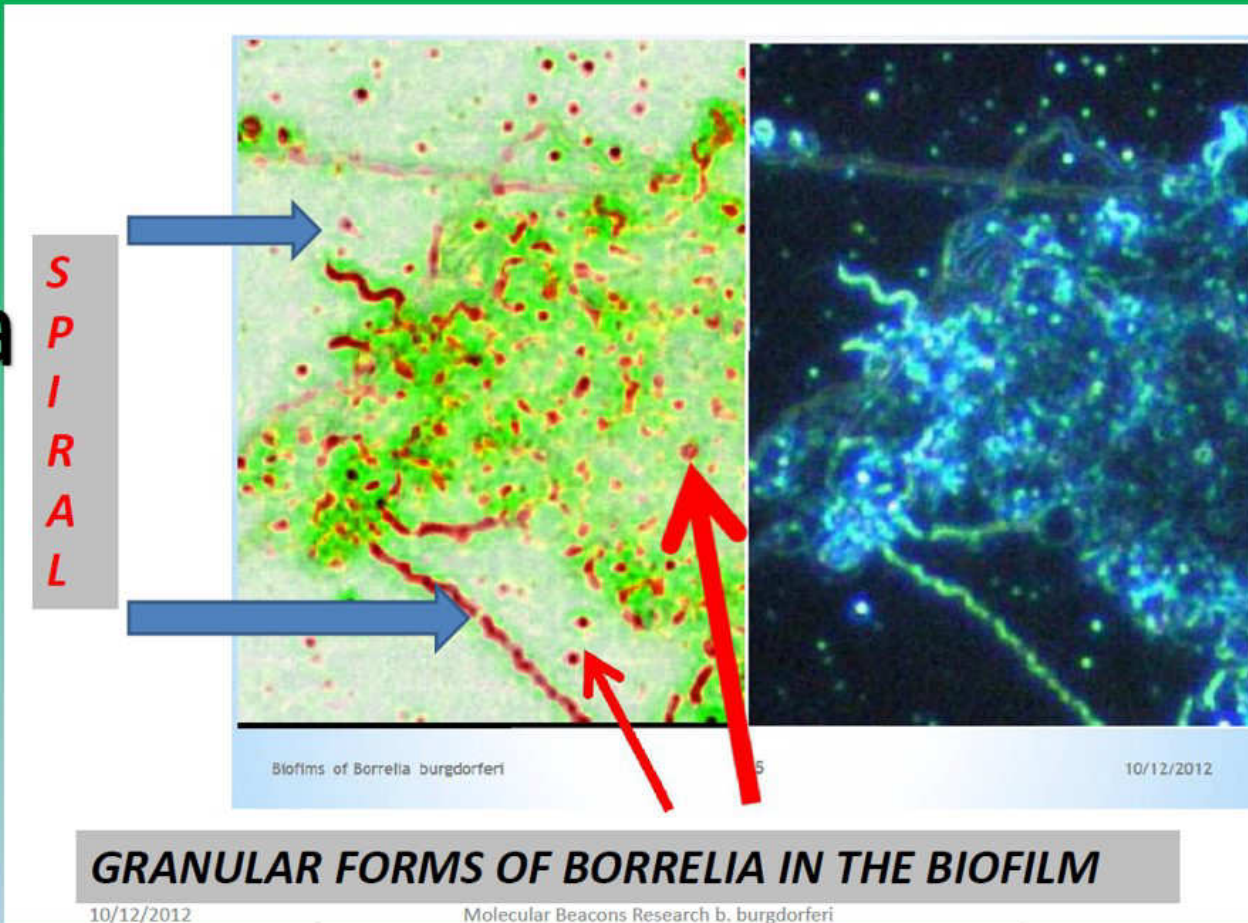
## Water channel formation in a biofilm



Biofilms of *Borrelia burgdorferi*

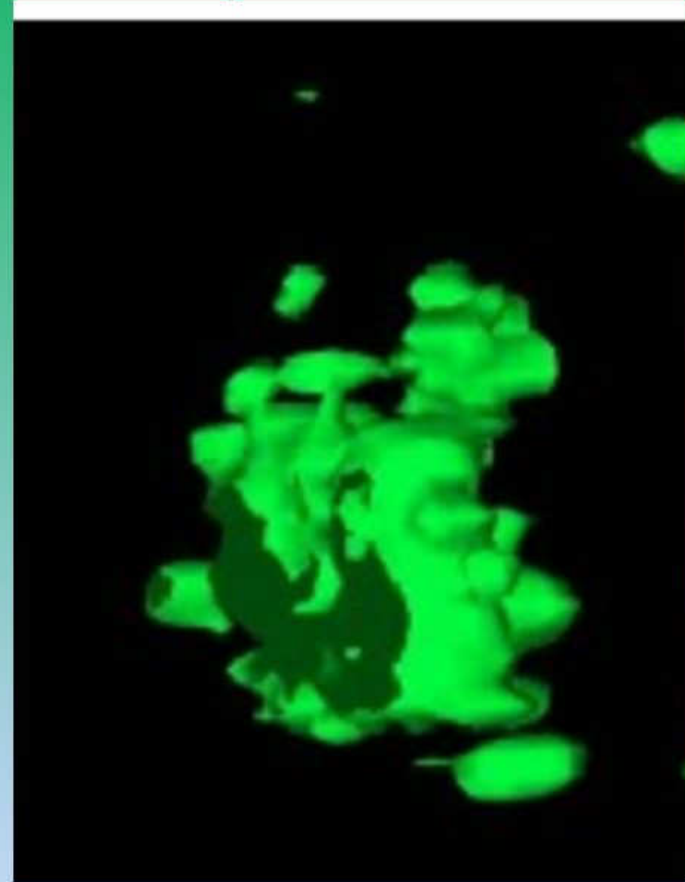
10/14/2012

# Biofilm Borrelia Grown In a Test Tube



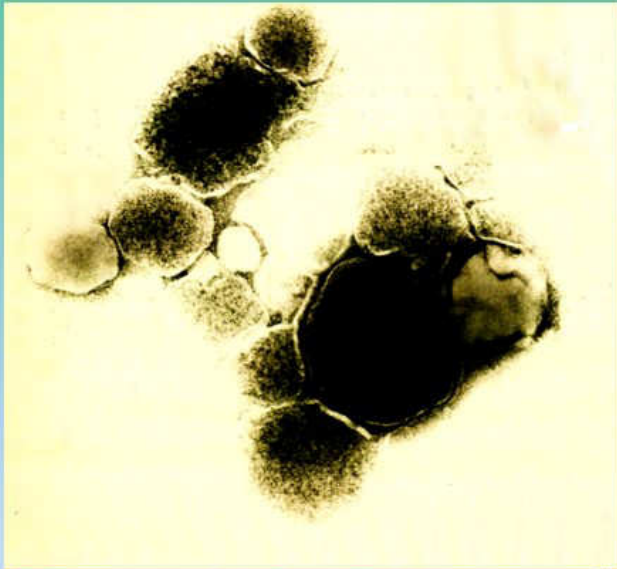
## 3 Dimension Reconstruction of Plaque

**Plaque of Alzheimer's  
Disease:  
A Mix of  
Solid and Empty spaces**



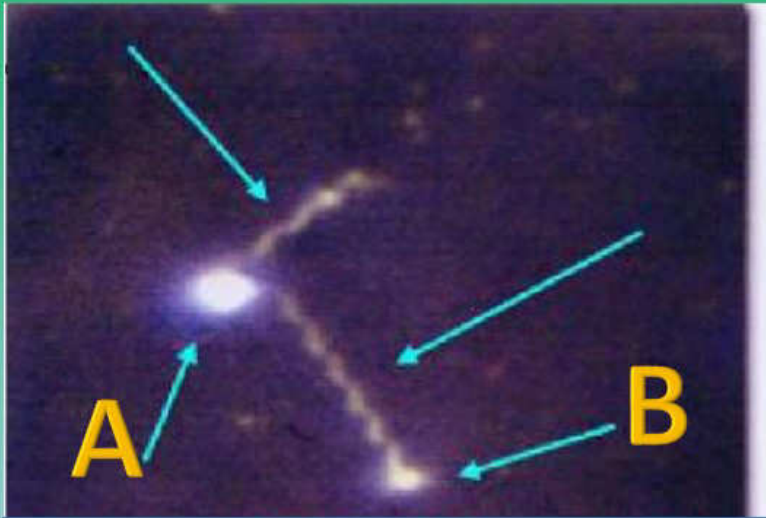
# Granular Borrelia: Membrane Bound– What?

- Electron Micrograph: Granular Borrelia – Magnification 126,000x
  - *Borrelia* culture –pure *B. burgdorferi*- Erythema Migrans Skin biopsy
  - Dr. Willy Burgdorfer's EM Lab, Rocky Mtn. Lab ,NIH,NIAID



Specimen provided  
By  
Alan B. MacDonald , MD

# Granular *borrelia* – ALIVE? – What??



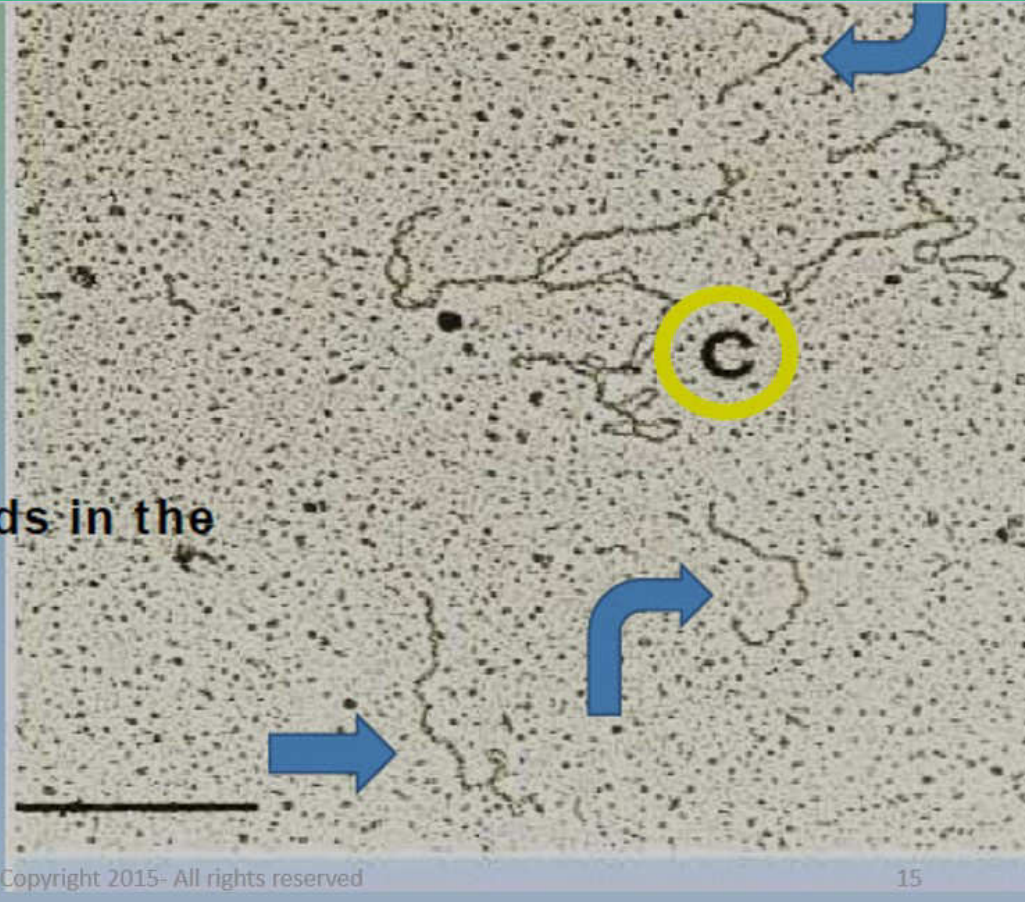
**Granules {A} [B] with emerging spiral borrelia in BSK –  
Pure Culture – *Borrelia burgdorferi***

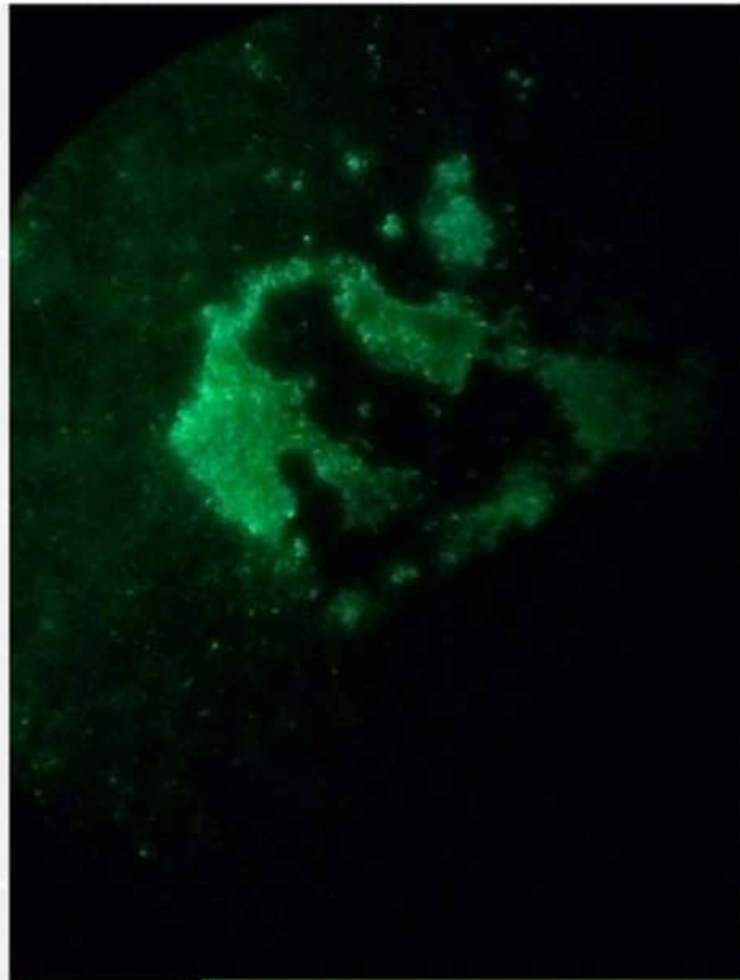
# Granular *Borrelia* – Containing *Borrelia* DNA – WHAT?

INDIVIDUAL MOLECULES  
OF DNA  
INSIDE OF  
GRANULES  
FROM  
***BORRELIA***  
***BURGDORFERI***

--  
IMAGE  
Dr. Claude Garon  
Rocky Mtn. Lab.  
NIH, NIAID

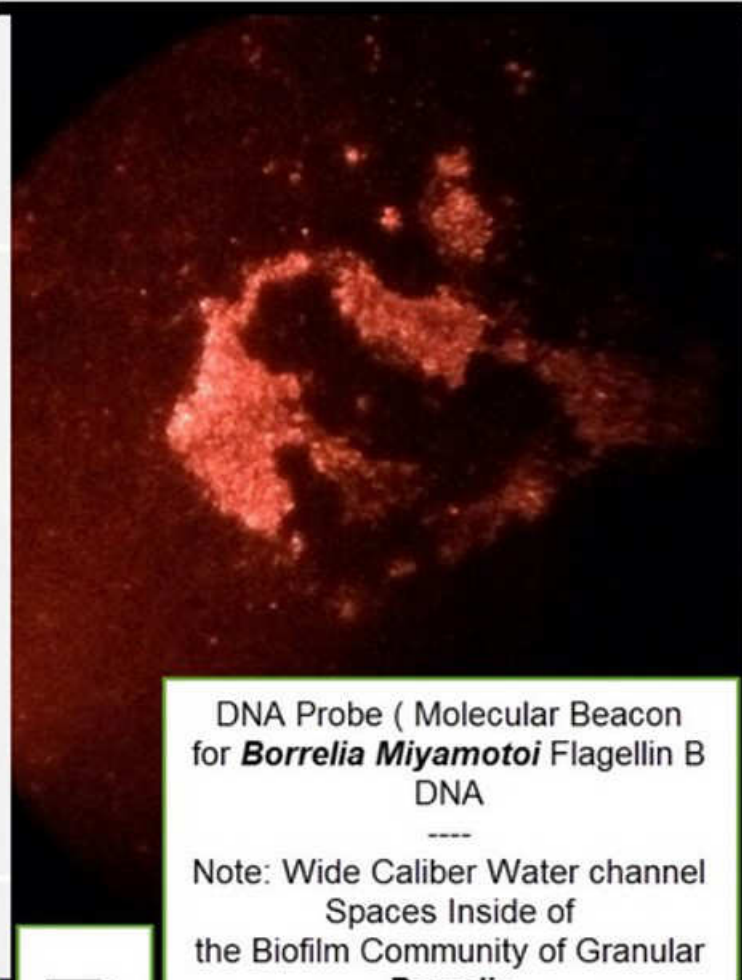
Other Strands in the  
Photo  
Are:  
Linear DNA  
[[ →





**A**

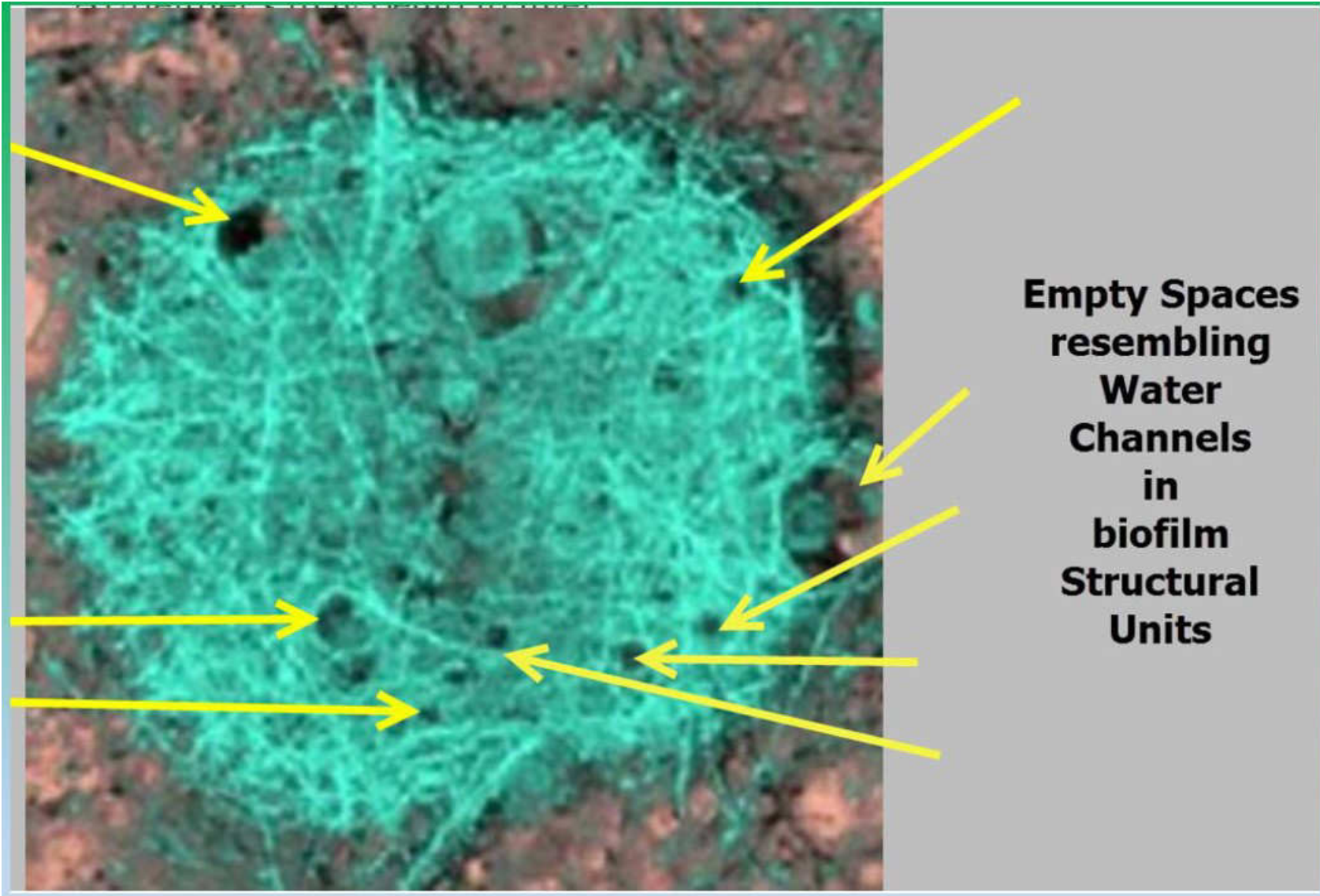
**Thioflavin T stain for  
Amyloid**



**B**

DNA Probe ( Molecular Beacon  
for *Borrelia Miyamotoi* Flagellin B  
DNA

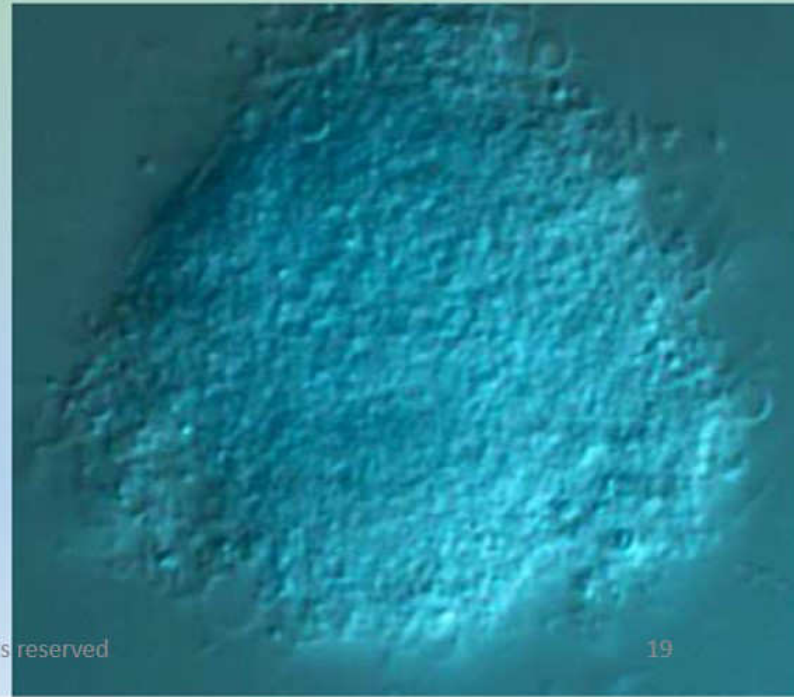
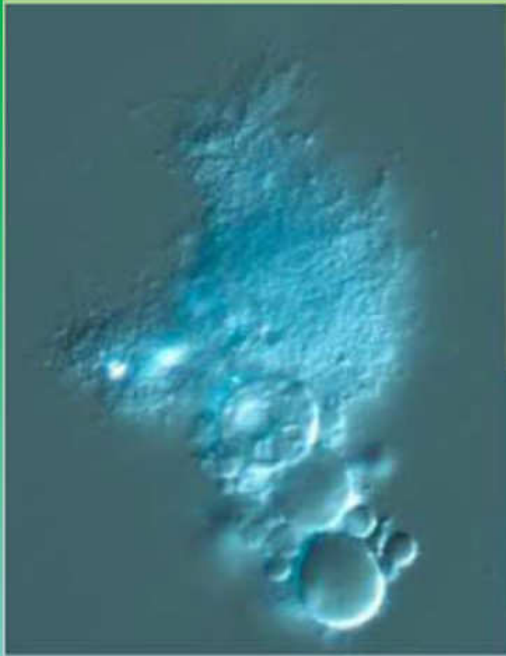
----  
Note: Wide Caliber Water channel  
Spaces Inside of  
the Biofilm Community of Granular  
*Borrelia*  
--All dwelling INSIDE of the Amyloid  
Plaque





**Biofilm Communities of *Borrelia burgdorferi* – grown in vitro  
from pure cultures of *Borrelia burgdorferi* ATCC 35210  
American Type Culture Collection**

Image credit: Alan B. MacDonald, MD  
Copyright 2006  
All rights reserved

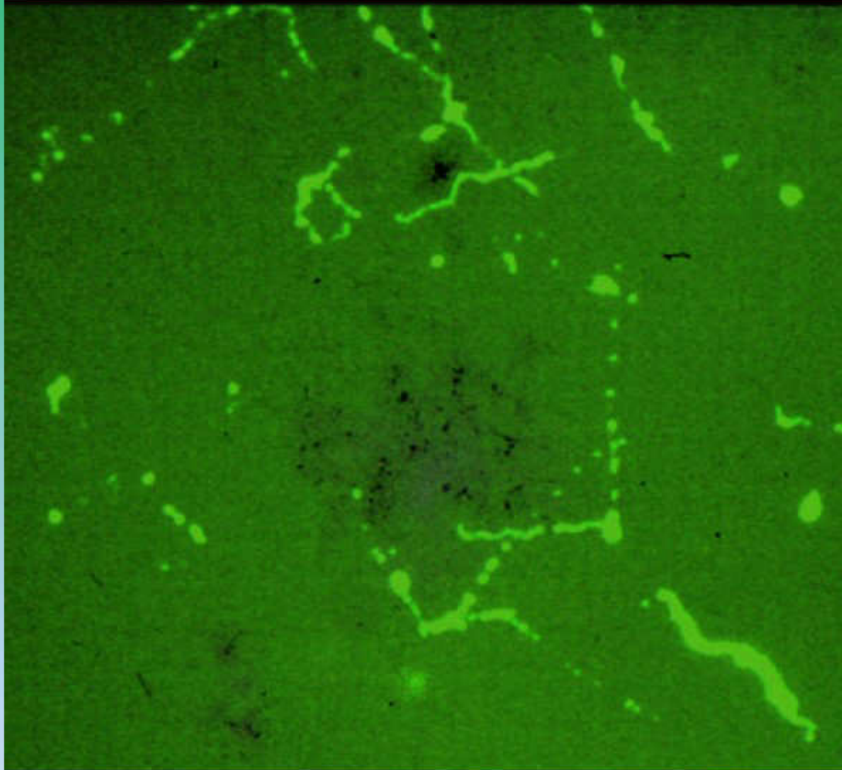


Phase Contrast Microscopy  
1000x original magnification

Note: Granular *borrelia* and Cystic *borrelia* are demonstrated in abundance indicating SPECIALIZATION by microbes from the Motile Spiral form of *Borrelia*

Alan B. MacDonald, M.D. Copyright 2015- All rights reserved

Granular *Borrelia* – Alive??- WHAT???

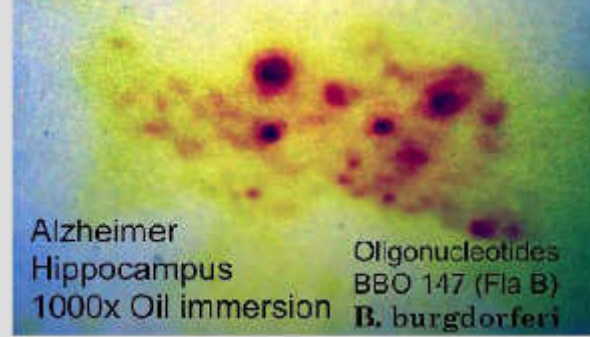


Pure Culture  
*Borrelia burgdorferi*  
Erythema Migrans  
Skin biopsy  
Drs. B. Berger, &  
A. MacDonald



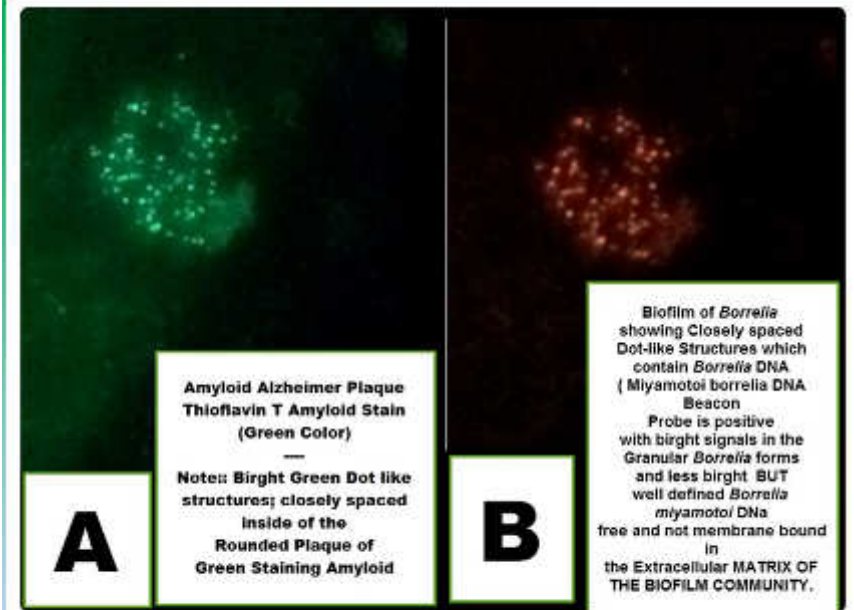
# DNA<sub>in</sub> GVB

In Situ DNA hybridization  
Alexa Fluor (red) Fluorochrome



Alzheimer  
Hippocampus  
1000x Oil immersion

Oligonucleotides  
BBO 147 (Fla B)  
*B. burgdorferi*



**A**

**Amyloid Alzheimer Plaque**  
Thioflavin T Amyloid Stain  
(Green Color)

—

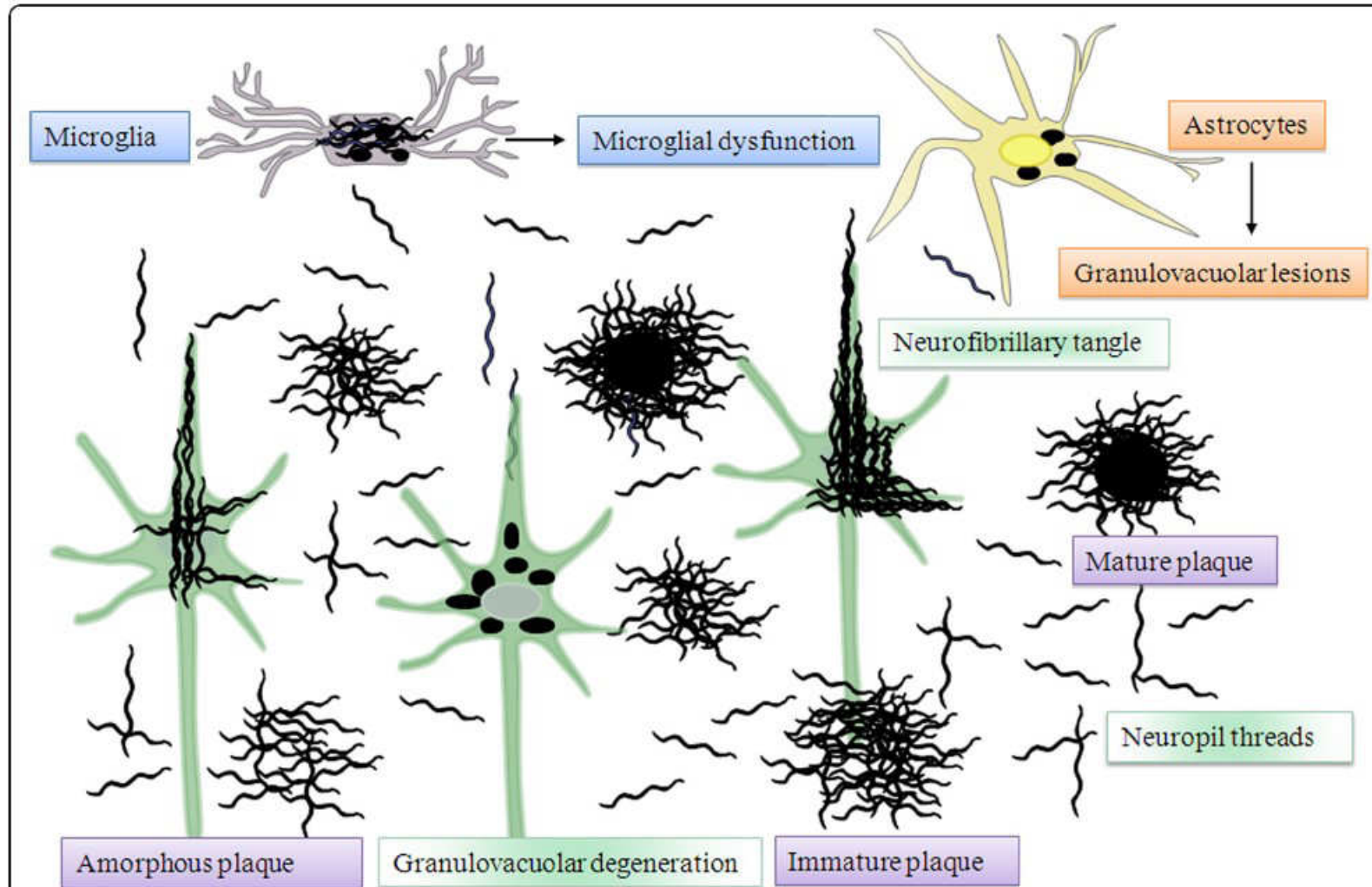
**Note:** Bright Green Dot like  
structures; closely spaced  
inside of the  
Rounded Plaque of  
Green Staining Amyloid

**B**

Biofilm of *Borrelia*  
showing Closely spaced  
Dot-like Structures which  
contain *Borrelia* DNA  
(Miyamotoi borrelia DNA  
Beacon)

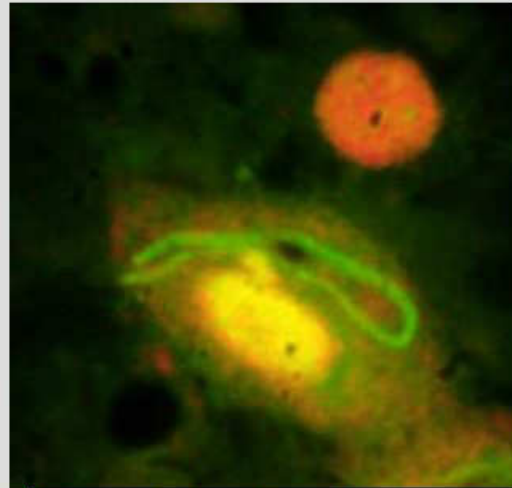
Probe is positive  
with bright signals in the  
Granular *Borrelia* forms  
and less bright BUT  
well defined *Borrelia*  
*miyamotoi* DNA  
free and not membrane bound  
in  
the Extracellular MATRIX OF  
THE BIOFILM COMMUNITY.

Amyloid Stain (A) DNA Probe (B)



**Figure 3** Schematic representation of spirochetal invasion of the cerebral cortex reproducing the pathological hallmarks of Alzheimer's disease. Spirochetes, in an analogous way to *Treponema pallidum*, form argyrophilic "plaques", colonies or masses along the

# Borrelia to Tangles



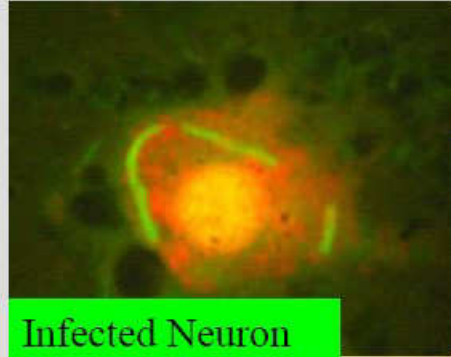
**Borrelia spirochetes inside  
Hippocampal neurons in  
Alzheimer's disease**

**Infectious Agent Inside of the  
Nerve cell**

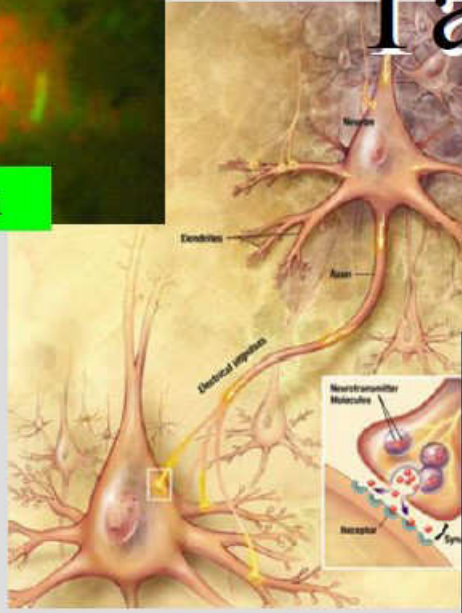


**Inside of the cell Infection**

# Borrelia to Tangles



Infected Neuron



Infection  
Crosses  
The  
Synapse




# Trans-Synaptic Neuroborreliosis

YMEHY 3712  
4 October 2006; Date Used  
Medical Hypotheses (2006) x, xxx–xxx

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No. of Pages 4

1  ELSEVIER

medical  
hypotheses

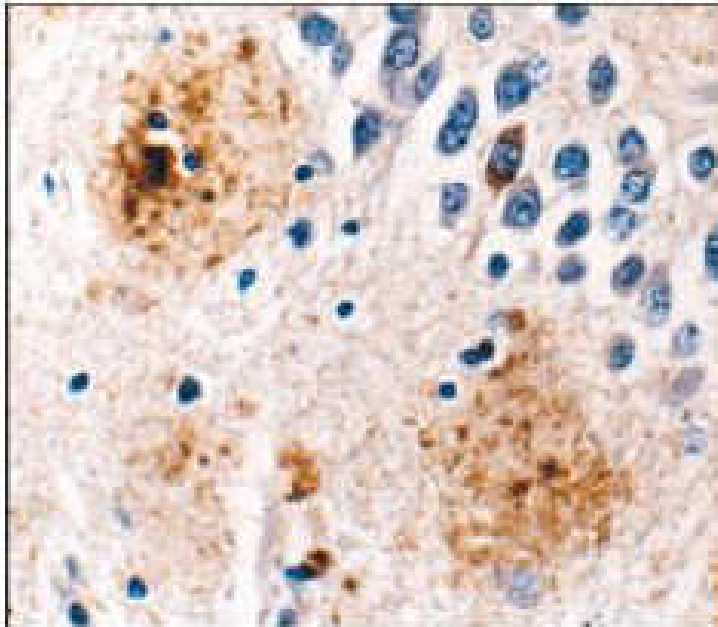
<http://intl.elsevierhealth.com/journals/mehy>

2 **Alzheimer's neuroborreliosis with *trans*-synaptic**  
3 **spread of infection and neurofibrillary tangles**  
4 **derived from intraneuronal spirochetes**

5 Alan B. MacDonald \*

6 *Department of Pathology, St Catherine of Siena Medical Center, 50 Rte 25 A, Smithtown, NY 11787,*  
7 *United States*

8 Received 22 August 2006; accepted 22 August 2006



Neurofibrillary tangle

Normal pyramidal neuron



Figure 1. Amyloid plaques and neurofibrillary tangles at specified densities in sectioned brain tissue constitute the neuropathologic criteria confirming Alzheimer's disease. Here both plaques and tangles appear

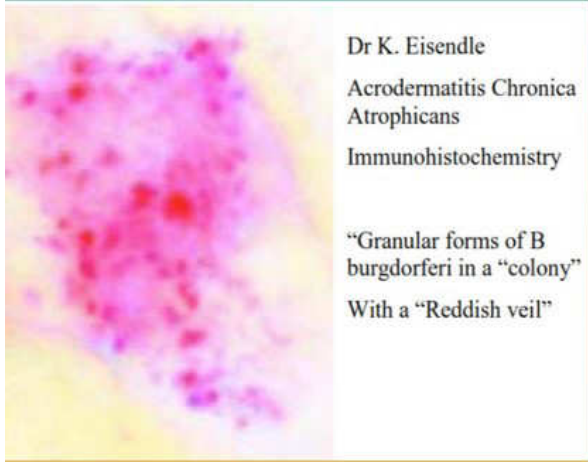
Granules vary in size ---little to big



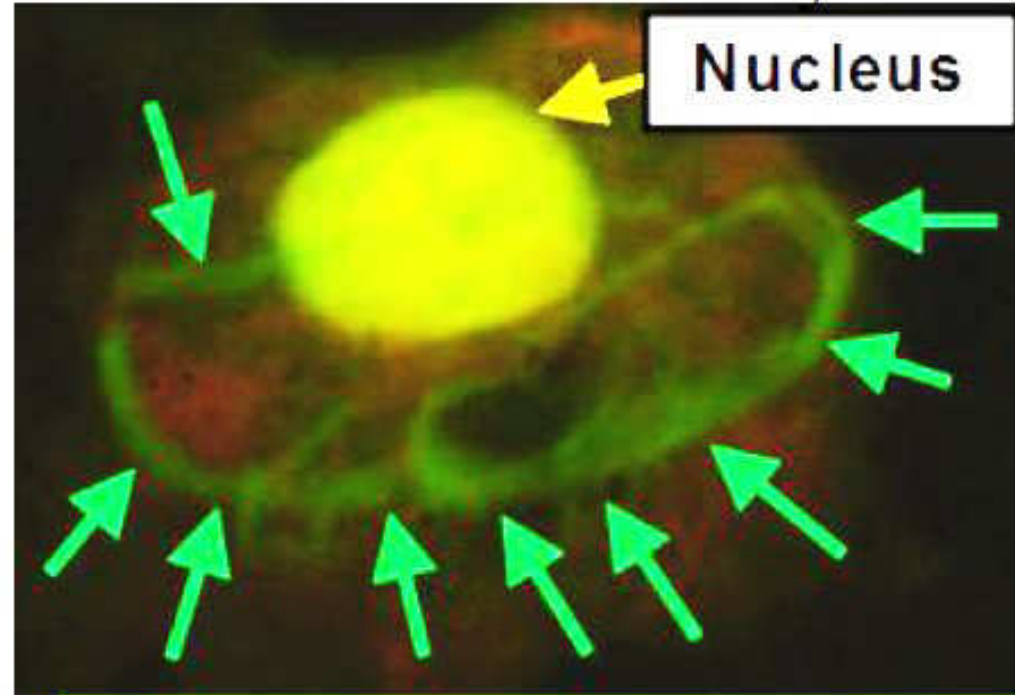
# Lecture Ends Here

## Now.. Connect the Dots...

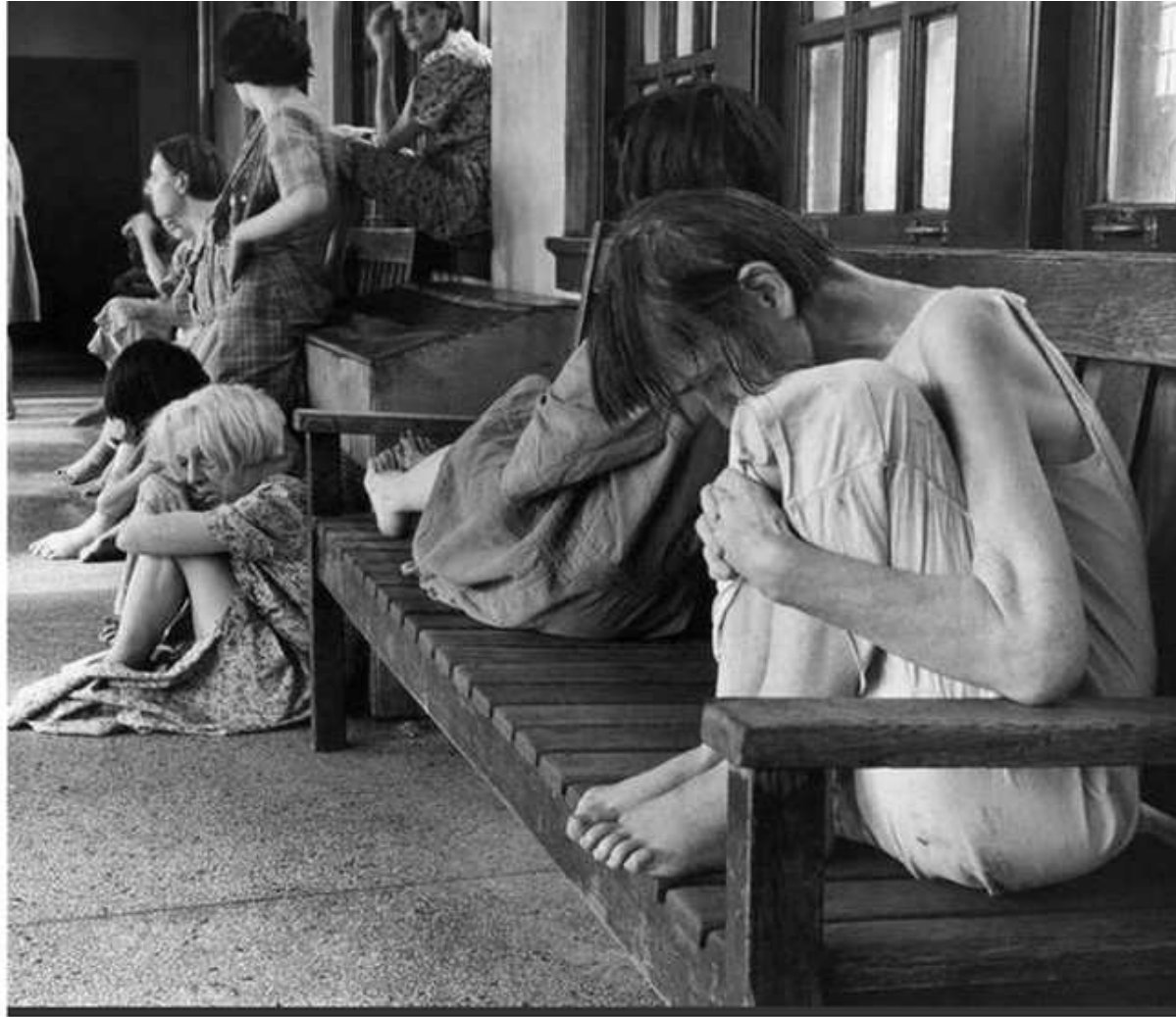
## Please..!



Single Strand DNA in Cytoplasm is  
Never seen in Healthy Neuron



**Spirochetal DNA**  
Green strands inside cell



Pinterest

Patients in various states of misery, at the Ohio Insane Asylum. The photo was taken in 1946. Psychiatric medicine improved in leaps and bounds during the intervening decades.

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