

# MICROBIAL ASPECTS OF CORAL HEALTH AND DISEASE

(ISEEQS: 2005)

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**Health:** Large and diverse microbial population

Microbes are coral specific

G. Smith – culturables

F. Rohwer – unculturables

Co-evolution evidence

Role? N- Fixation, catabolism, disease resistance

**Disease:** Global problem (~ 30% damaged)

Global warming

Pollution

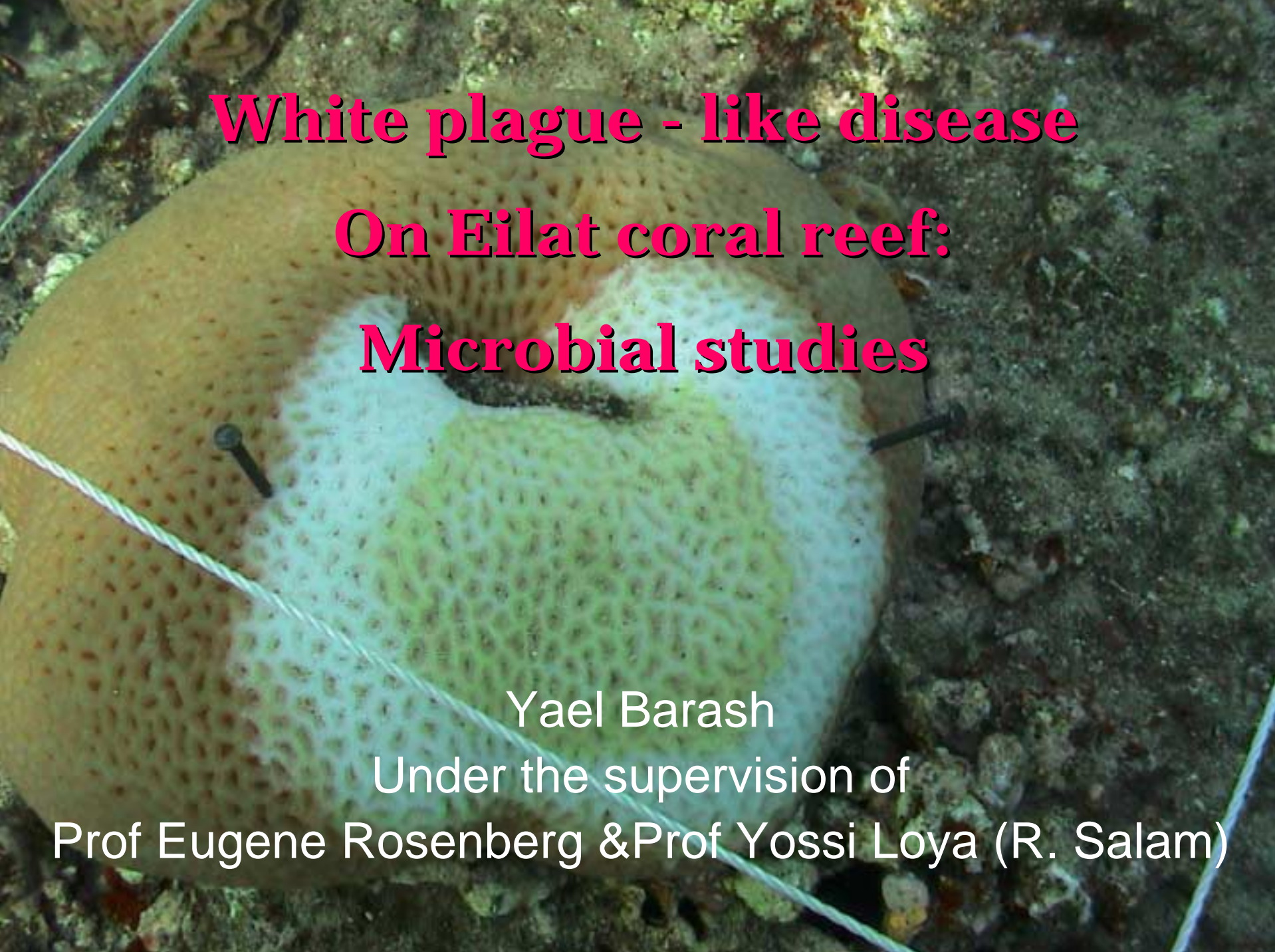
General Problem of mass mortalities (sea grasses, fish, sponges, etc.)

## Best studied microbial diseases of corals

Disease	Host	Pathogen	Reference
Bleaching	<i>Oculina patagonica</i>	<i>Vibrio shiloi</i>	Kushmaro, Loya and Rosenberg, 1996; Rosenberg, 2004
Bleaching	<i>Pocillopora damicornis</i>	<i>Vibrio coralliilyticus</i>	Ben-Haim and Rosenberg, 2002; Ben-Haim, and Rosenberg, 2003
Black band	Many species	Consortium <sup>a</sup>	Antonius, 1973; Richardson, 2004
Aspergilosis	Many species of <i>Gorgonacea</i> (sea fan)	<i>Aspergillus sydowii</i>	Smith, 2005
White plague I	<i>Copophyllia</i> , <i>Mycetophyllia</i>	Unknown	Dustan, 1977
White plague II	<i>Monastrea</i> and others	<i>Aurantimonas coralicida</i>	Denner and Richardson, 2003
White band I	<i>Acroporids</i>	Unknown	Bythell and Sheppard, 1993
White band II	Many species	<i>Vibrio charcharvina</i>	Ritchie & Smith, 1998
White pox	<i>Acropora palmate</i> (elkhorn coral)	<i>Serratia marscens</i>	Patterson et al., 2002; Sutherland & Ritchie, 2004
Yellow band	<i>Monastrea</i> and others	3 <i>Vibrio</i> species	Smith et al., 2005



The coral *Favia veroni* showing black band disease.  
Photograph taken by O. Pollak.



**White plague - like disease**

**On Eilat coral reef:**

**Microbial studies**

Yael Barash

Under the supervision of

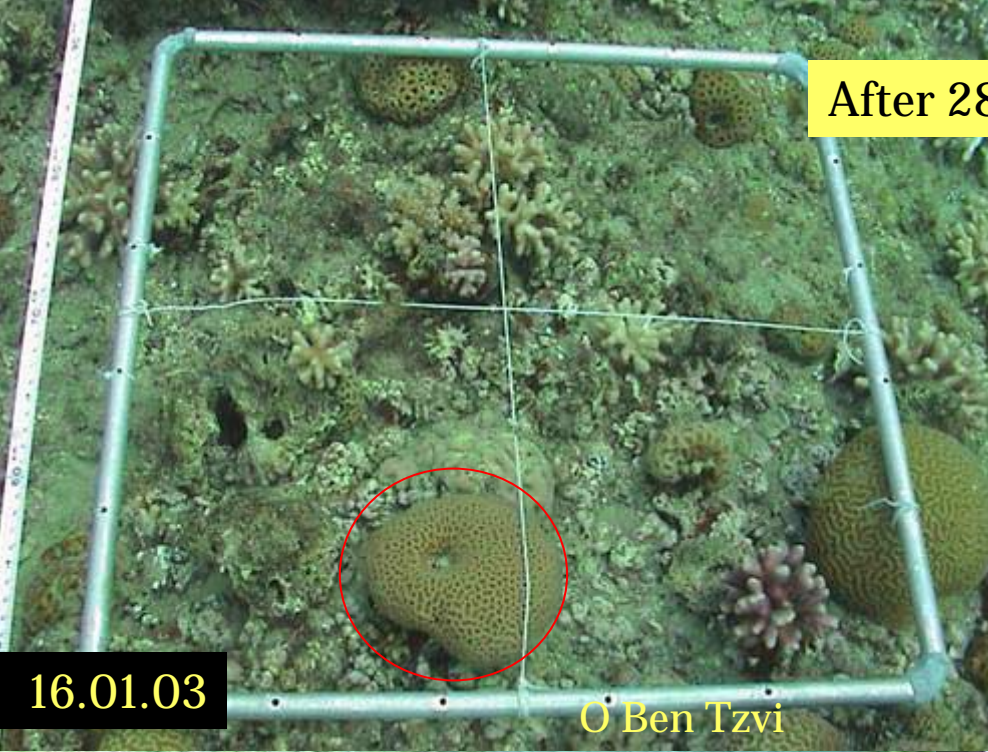
Prof Eugene Rosenberg & Prof Yossi Loya (R. Salam)

# The Caribbean White plague

- Was first reported in 1975
- re-emerged in the Caribbean in 1995
- Denner et al, 2003.  
Identified *Aurantimonas coralicidia* as the causative agent of the Caribbean white plague



A.W. Bruckner, 2001  
*Stokessi dichocoenia* colony with white plague type II



After 28 days

16.01.03

O Ben Tzvi



13.02.03

R Sulam



After 54 days

11.03.03

R Sulam

**White plague like disease in Eilat coral reef**

# Infection studies

Infection by putting sick coral with a healthy one in the same aquarium



Infection of healthy *Favia* (smaller colony) with a diseased coral (A). After 3 days, the healthy colony became diseased (B)

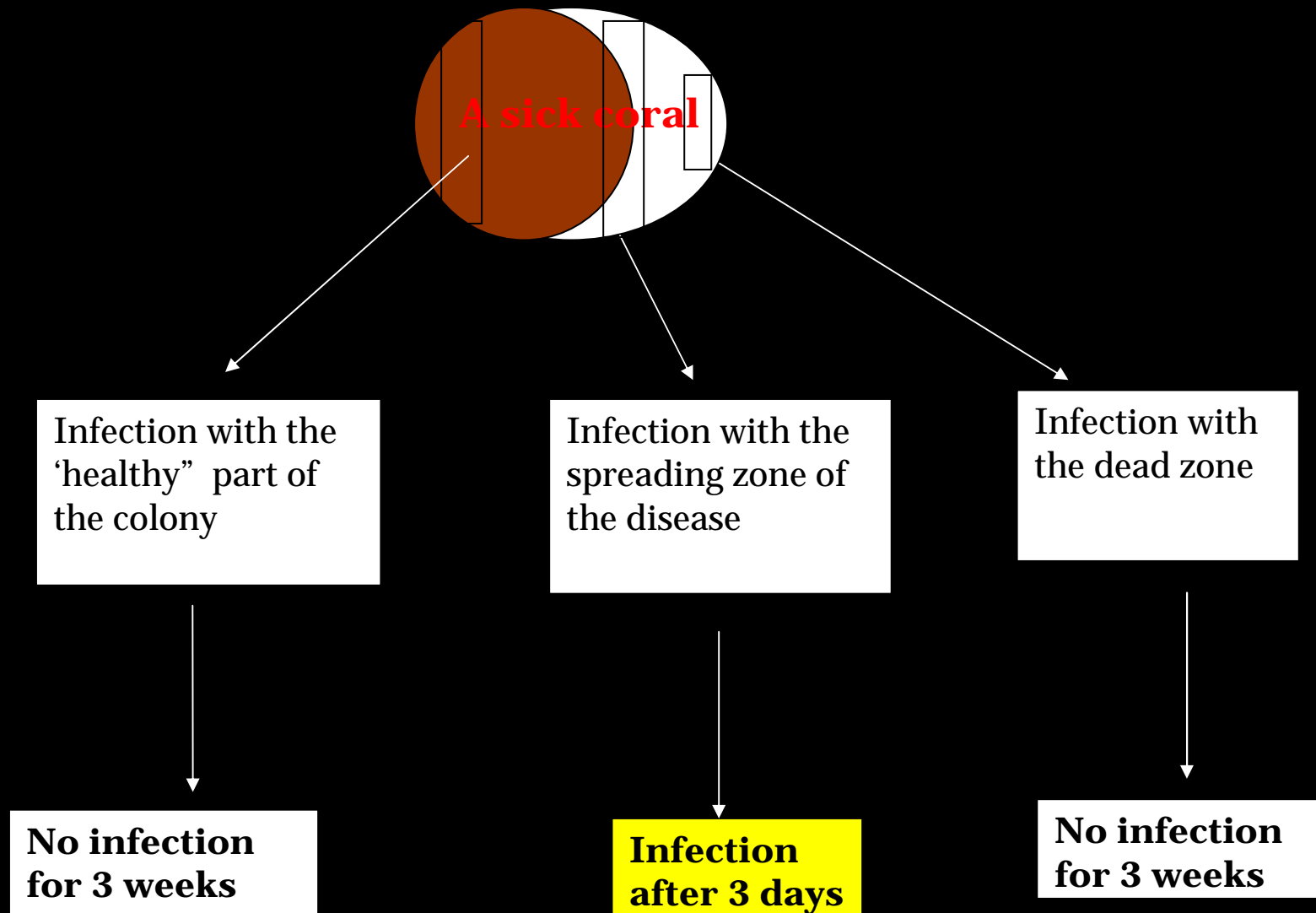
# Infection between different genera

Sick *Favia* infected:

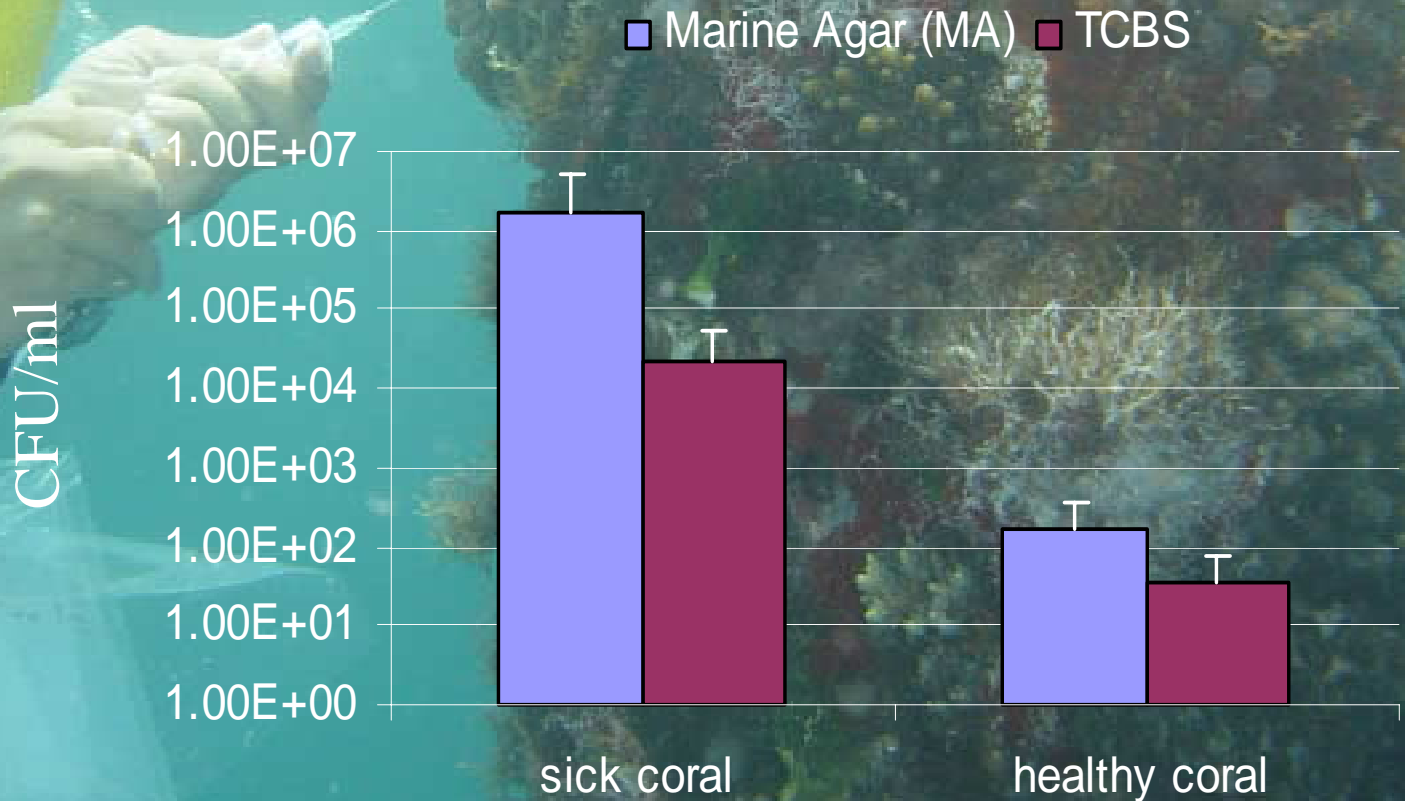
- *Platygyra* sp.
- *Coscinaraea* sp.
- *Goniastrea* sp.

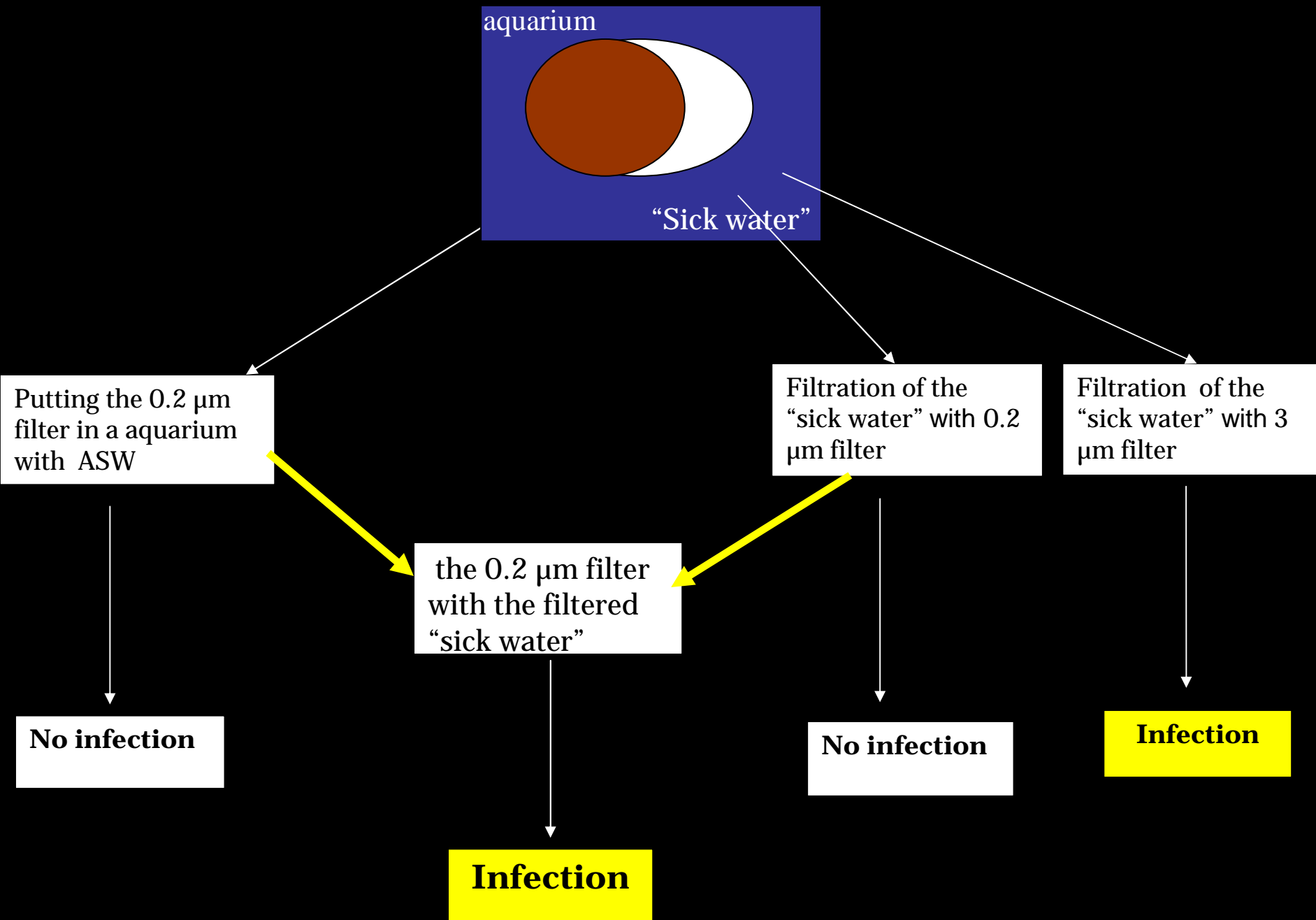


# Infection with different area of the sick coral

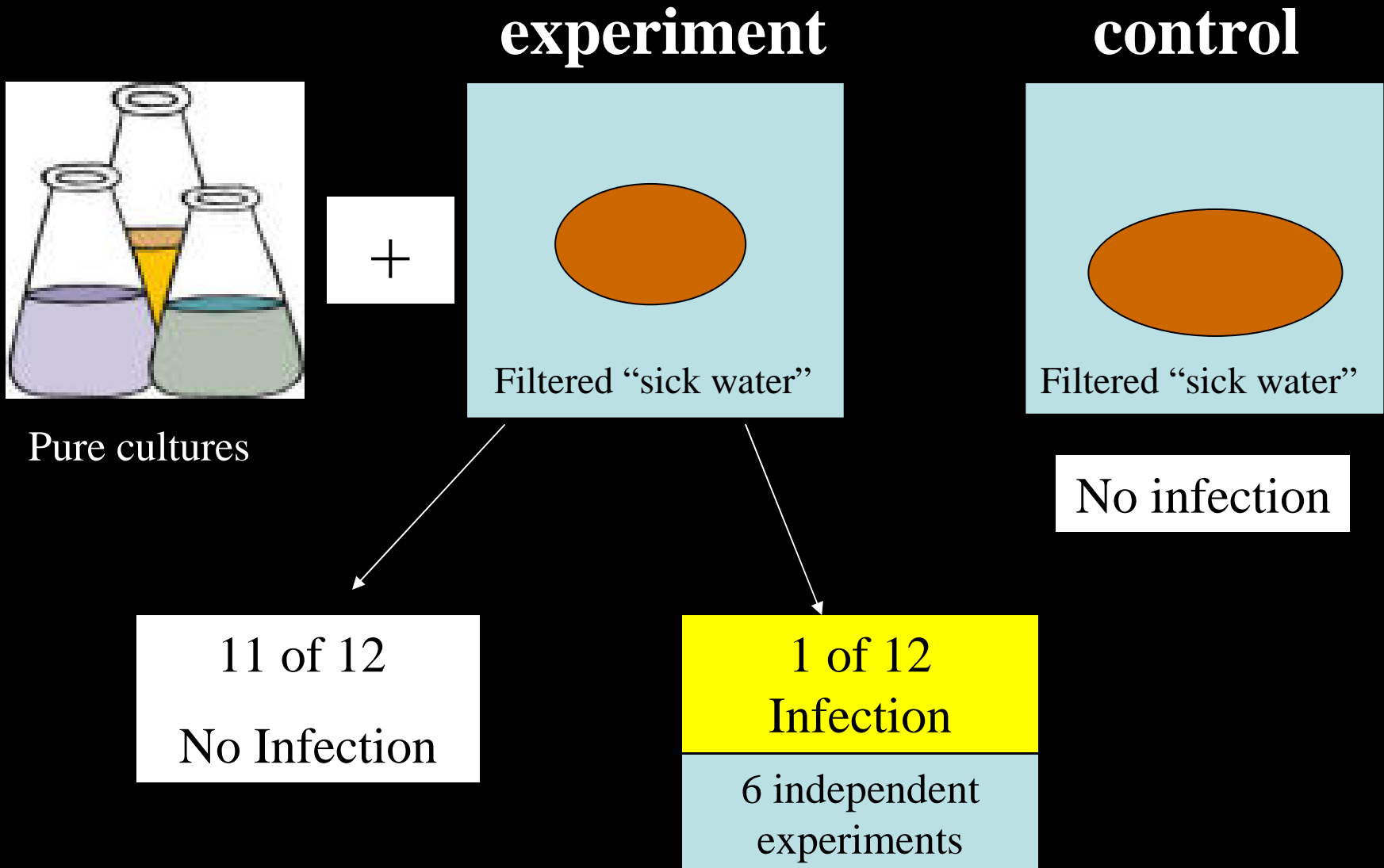


# No. of bacteria from spreading zone of sick corals compared to healthy corals “Syringe method”





# Testing 12 pure cultures of bacteria



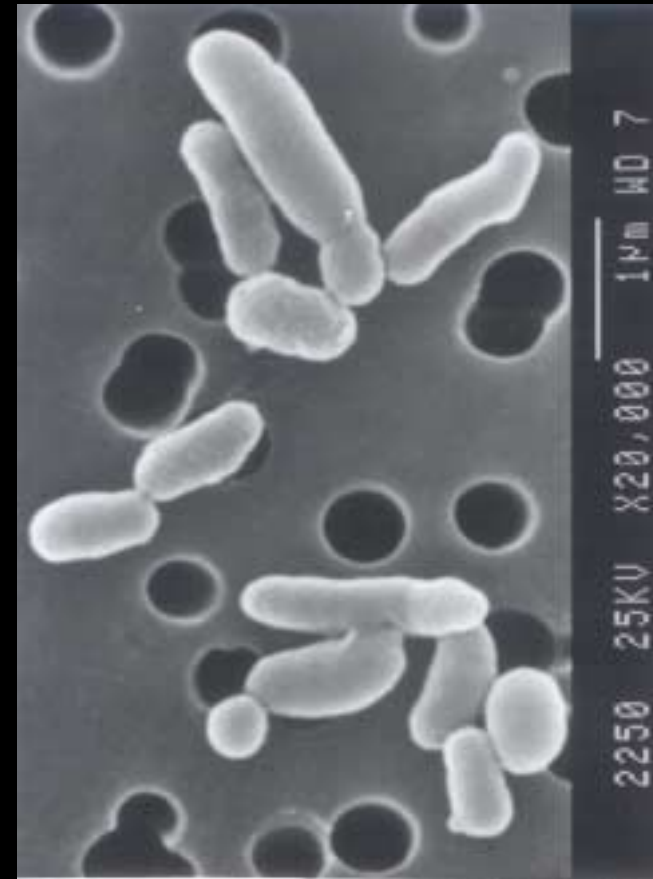
# The pathogen was...

- Isolated on Marine agar plate (MA).
- Does not grow on TCBS agar.
- Requires peptone for its growth.
- Sensitive to antibiotics: Tetracycline, Gentamicin, Kanamycin, Streptomycin, Ampicilin.



# Morphological characteristics

- Microscopic characteristic: 1.5 X 0.8  $\mu\text{m}$ , rod shape & motile.
- Gram negative.
- Asymmetric cell division.



# The pathogen is...

**16S rDNA showed closest similarity (94%)  
to:**



- the family *Alteromonadaceae*
- the closest species was *Thalassomonas ganghwensi*
- Therefore, it is a new species which we have designated *Thalassomonas loyaeana*

# The Water Factor?

**Nondialyzable: < 3 kDa**

**Heat-sensitive (60°C, 10 min):**

**Protein? Virus?**

**“As the area of light increases, so does the circumference of darkness” A. Einstein”**