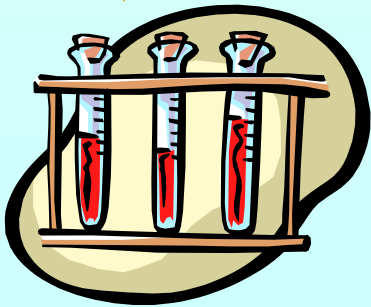
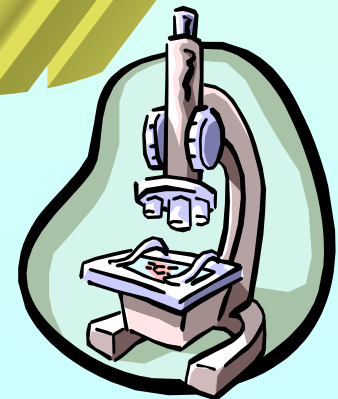


**Dr. habil. Anna Salek**

# **BIOTECHNOLOGY**



**Food Science**



**Dr. habil. Anna Salek**

**Mikrobiologist  
Biotechnologist  
Research Associate**



# Yeast Antimicrobial Proteins



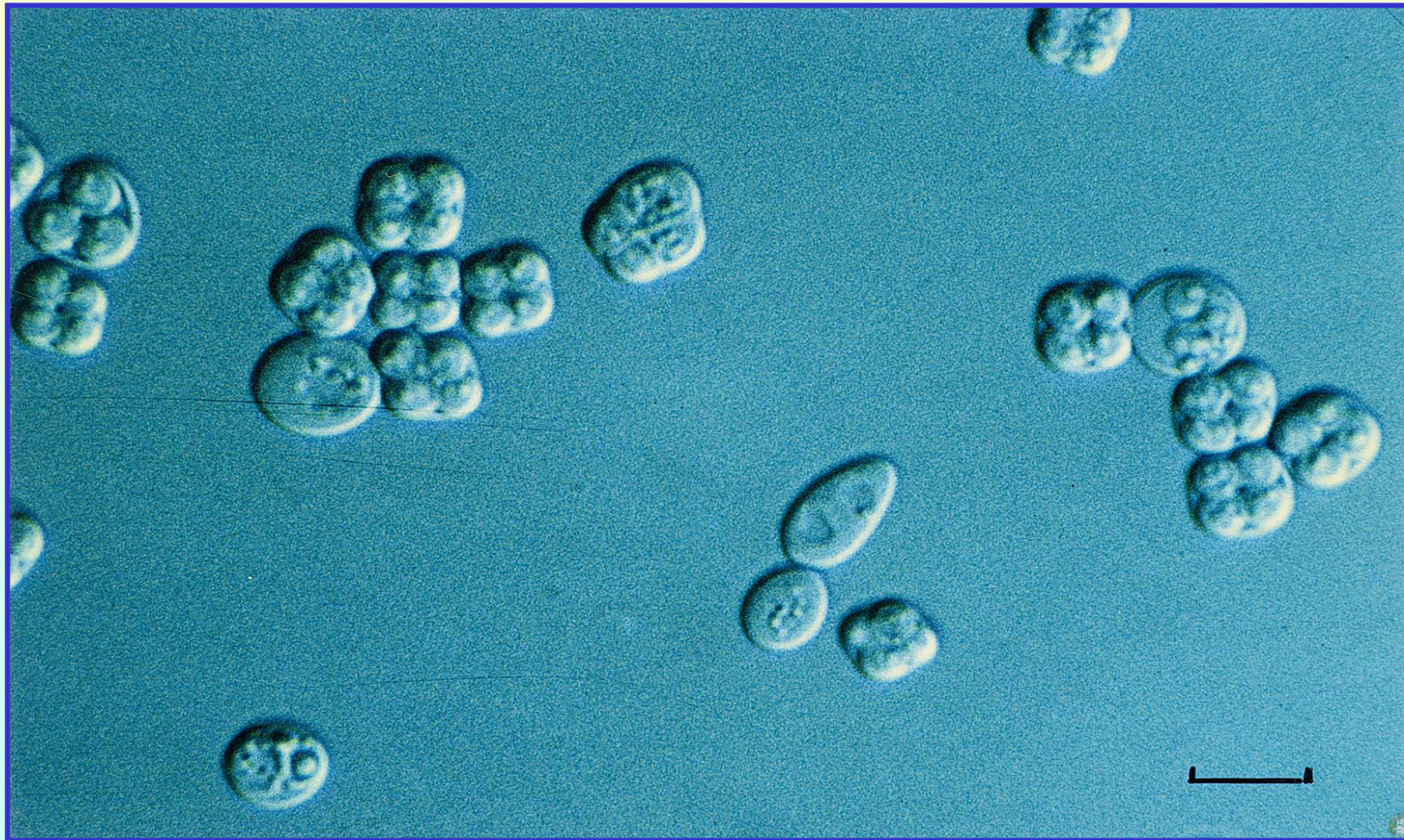
*Bacteria EHEC  
(sensitive)*



**Dr. habil. Anna Salek**

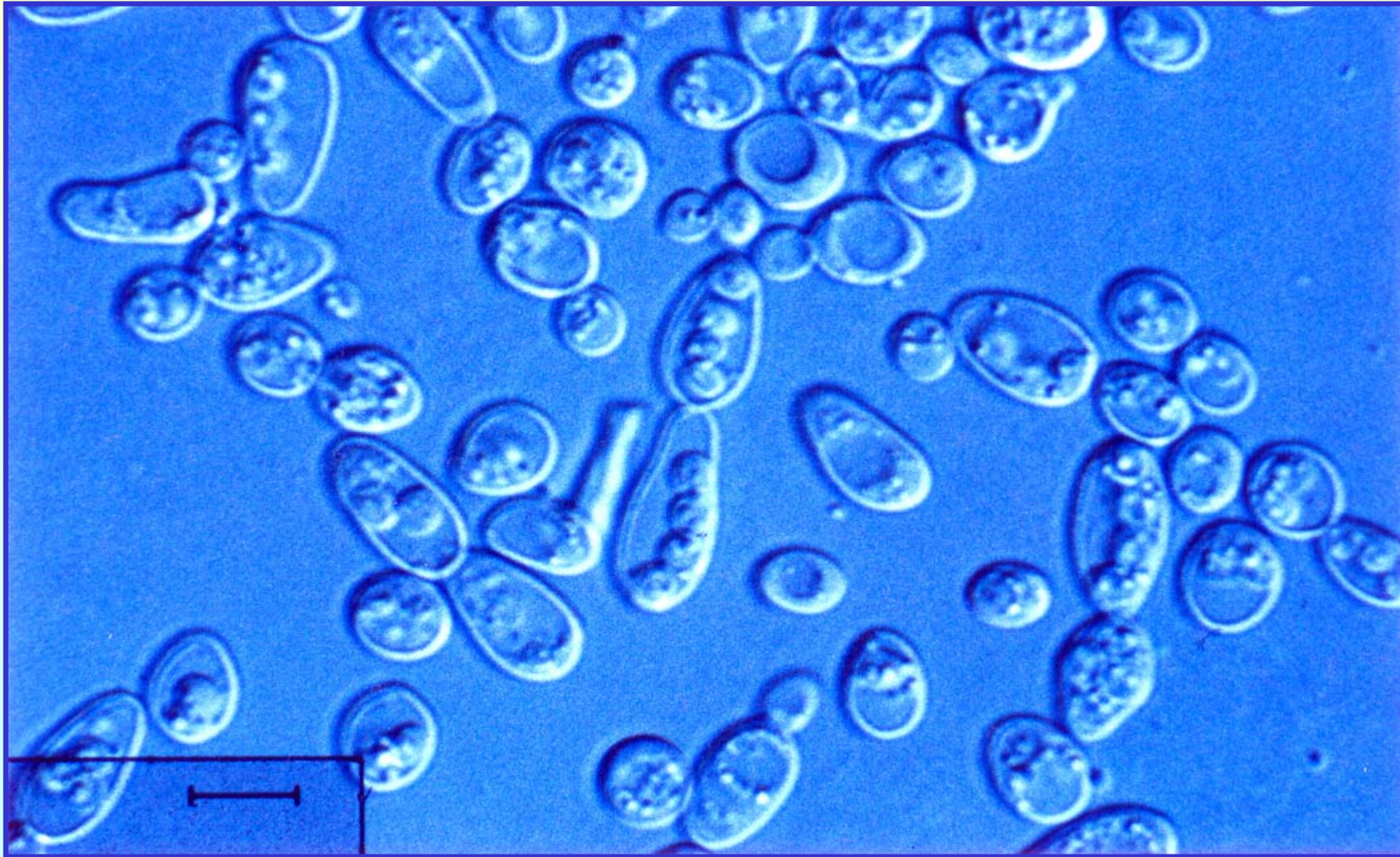


*Yeast Saccharomyces cerevisiae and  
Hanseniaspora valbyensis cells*





***Yeast Williopsis mrakii cells***

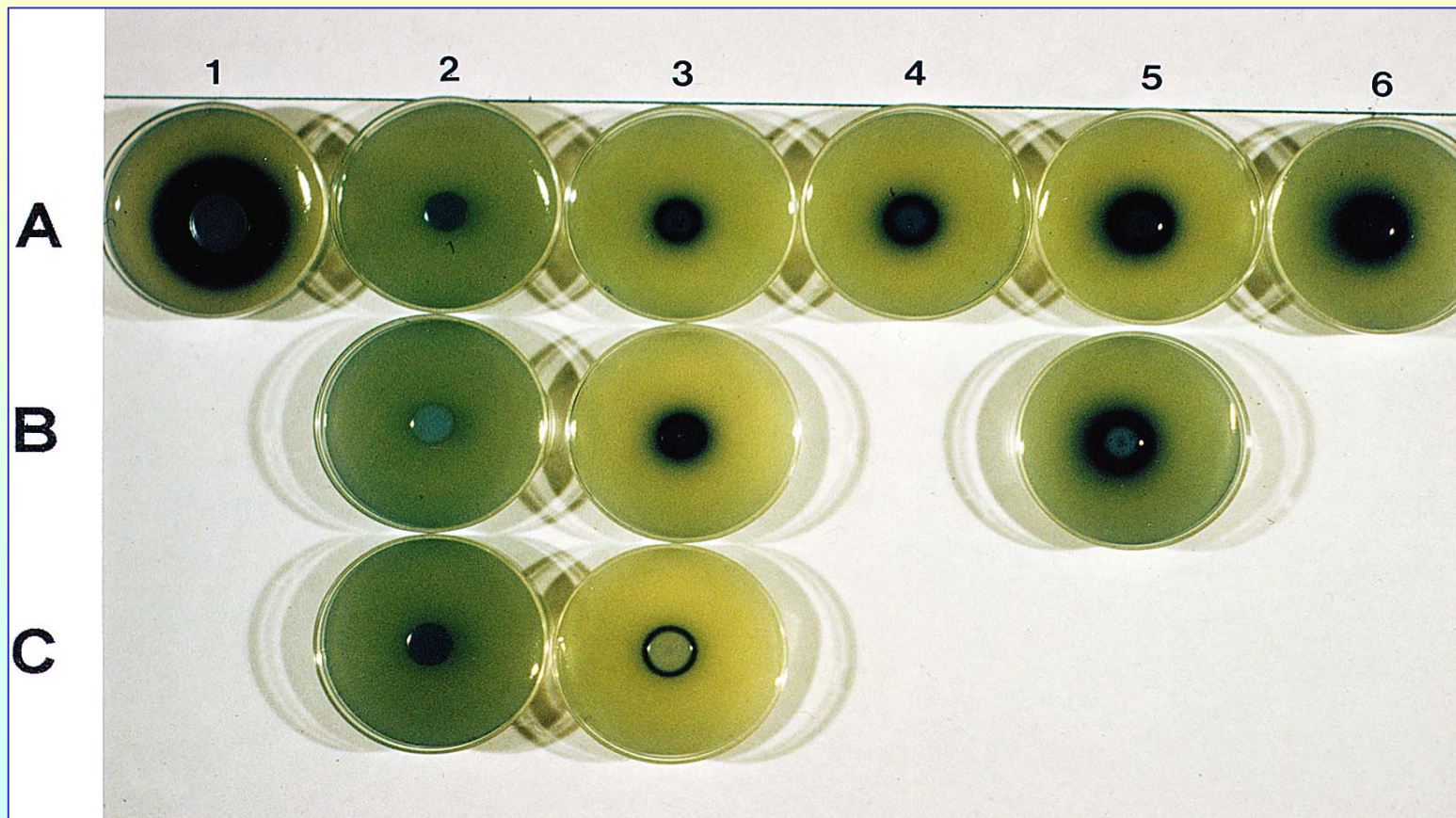


## **KILLER PHENOMENON – SPECIFIC SECRETORY SYSTEM**

**The killer phenomenon has been reported for strains of the genera *Saccharomyces*, *Kluyveromyces*, *Hansenula* (or *Pichia*), *Hanseniaspora*, *Williopsis*, *Candida*, *Torulopsis*, *Debaromyces*, *Cryptococcus* and *Ustilago*. The above-mentioned yeasts produce toxins which act against sensitive strains of the same or closely related species as well as against unrelated microorganisms, including pathogenic yeasts.**

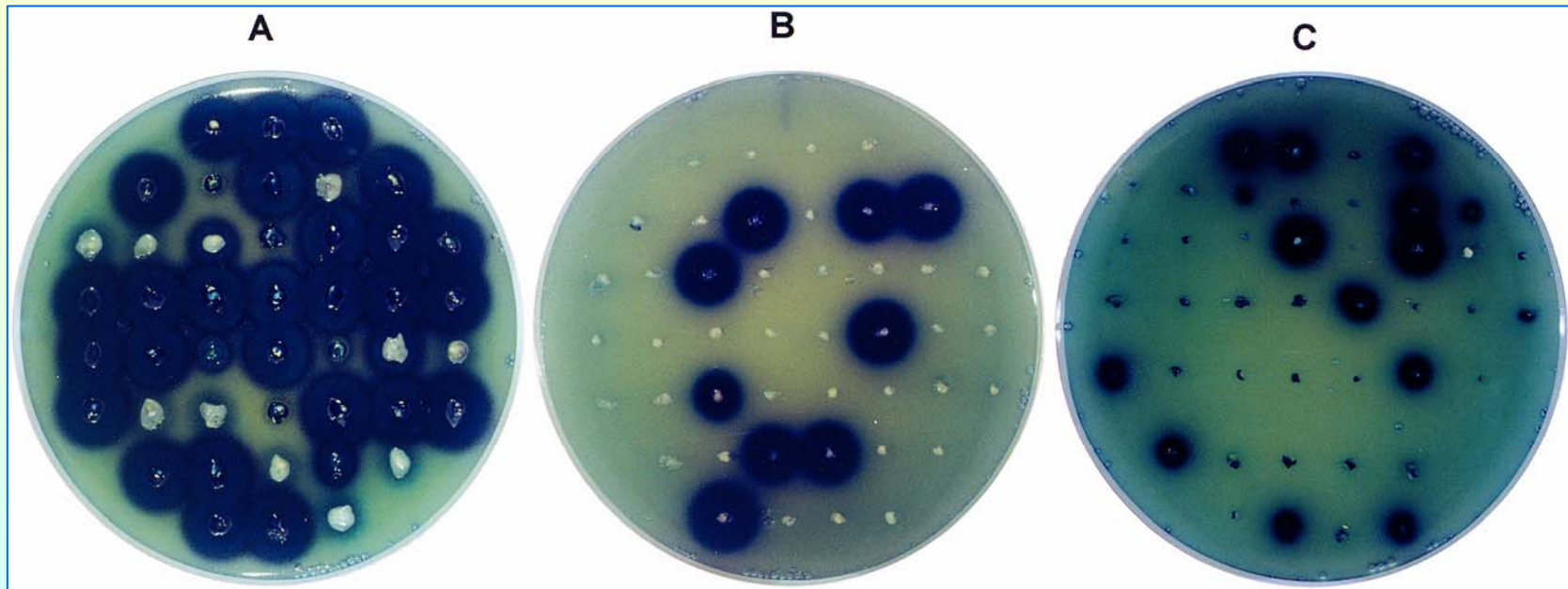


## Killer activity assay



Petri dishes carrying assays for killer activity of single colonies  
of different yeast strains

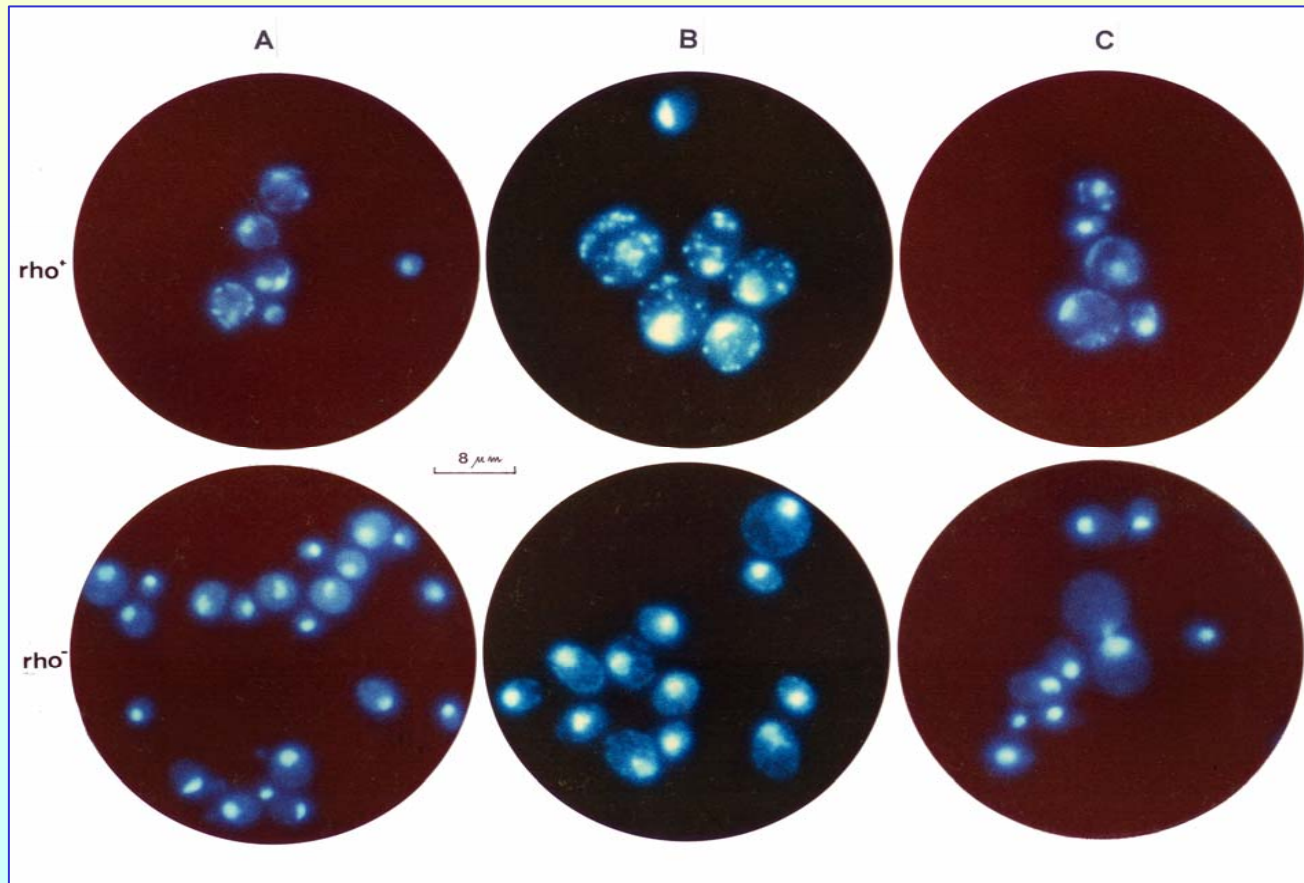
## Results of killer activity assay

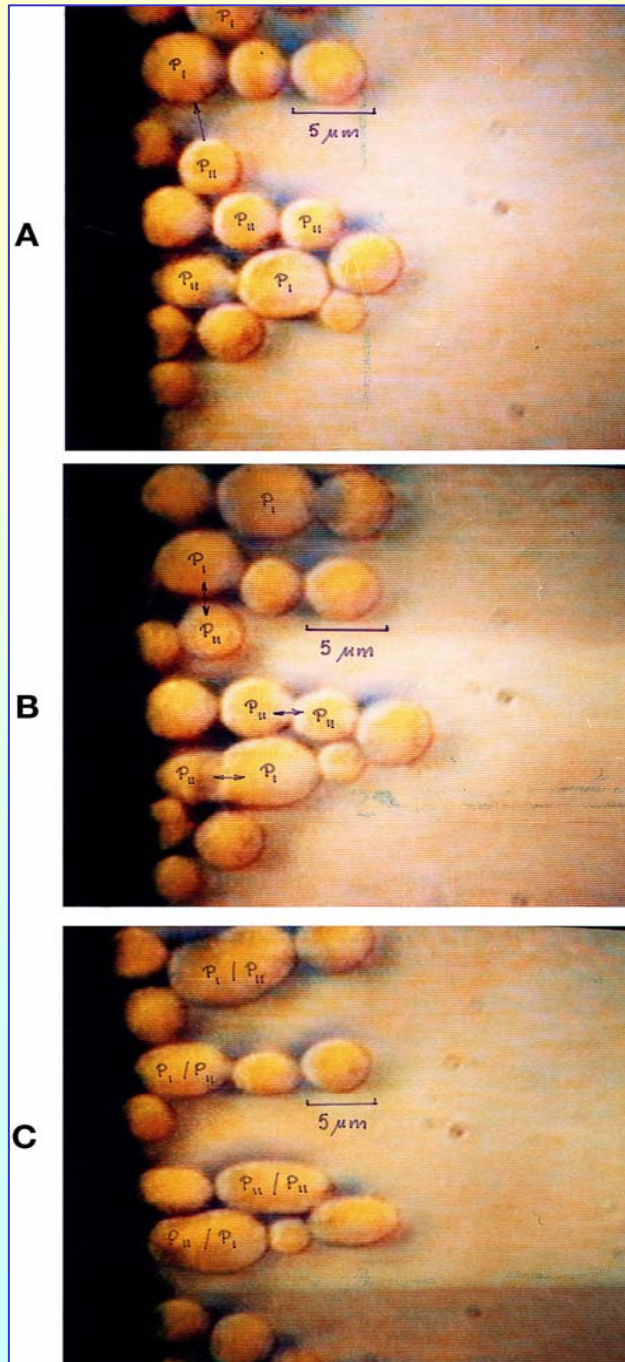


A - in transformed killer-negative strain,  
B - in the laboratory killer-sensitive strain,  
C - in the industrial killer-sensitive strain



Fluorescence micrographs of DAPI - stained  
yeast cells of *rho*<sup>+</sup> and *rho*<sup>-</sup>





## Electrofusion

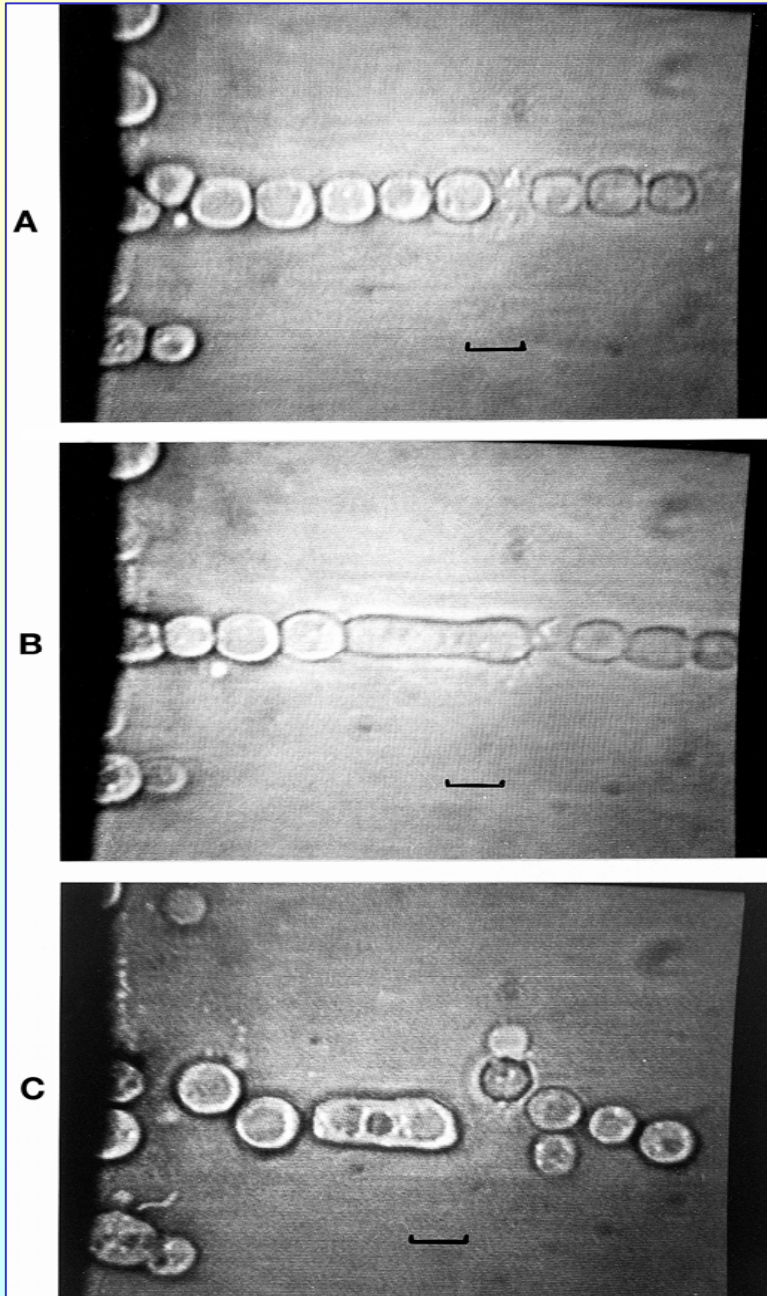
### A. Dielectrophoresis

## Electrofusion

### B. Disturbance of phospholipids

## Electrofusion

### C. Fusion of cytoplasms



## **Electrofusion**

### **A. Dielectrophoresis**

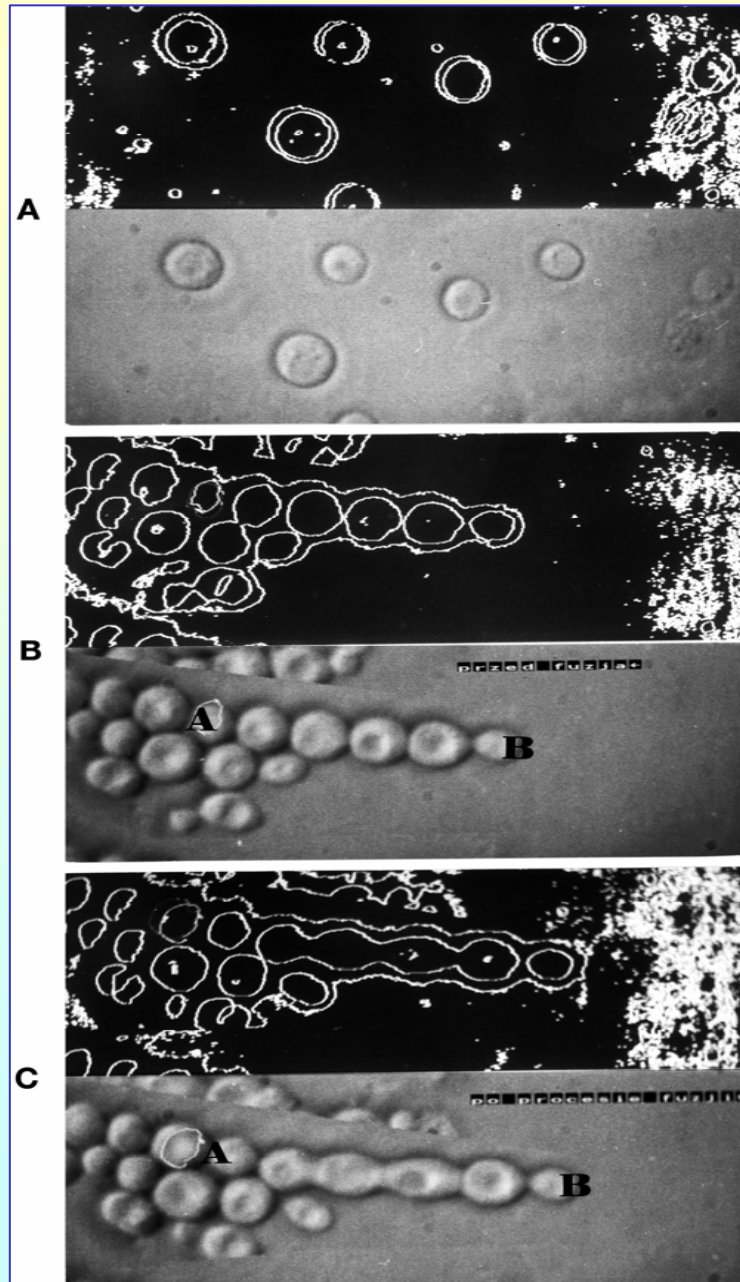
## **Electrofusion**

### **B. Disturbance of phospholipids**

## **Electrofusion**

### **C. Fusion of cytoplasms**





## **Electrofusion**

### **A. Dielectrophoresis**

## **Electrofusion**

### **B. Disturbance of phospholipids**

## **Electrofusion**

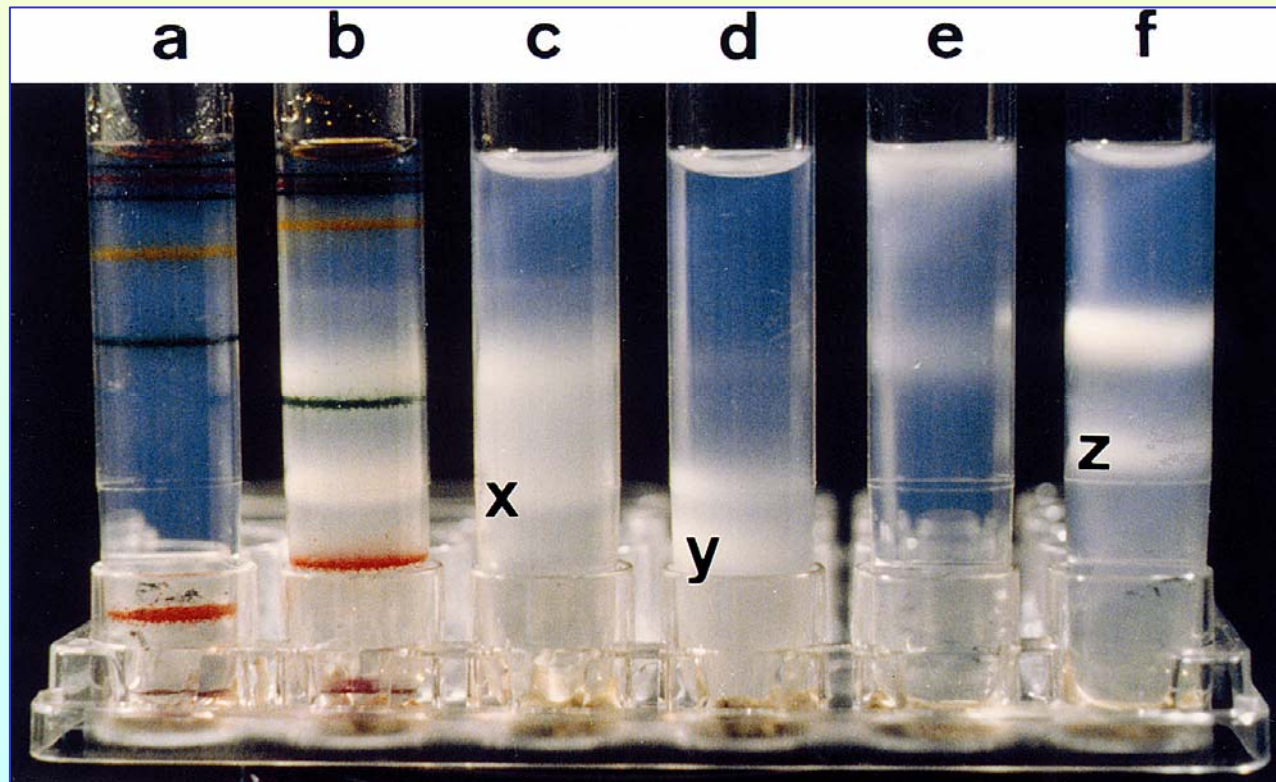
### **C. Fusion of cytoplasms**

## Colonies of amylolytic hybrids formed by electrofusion



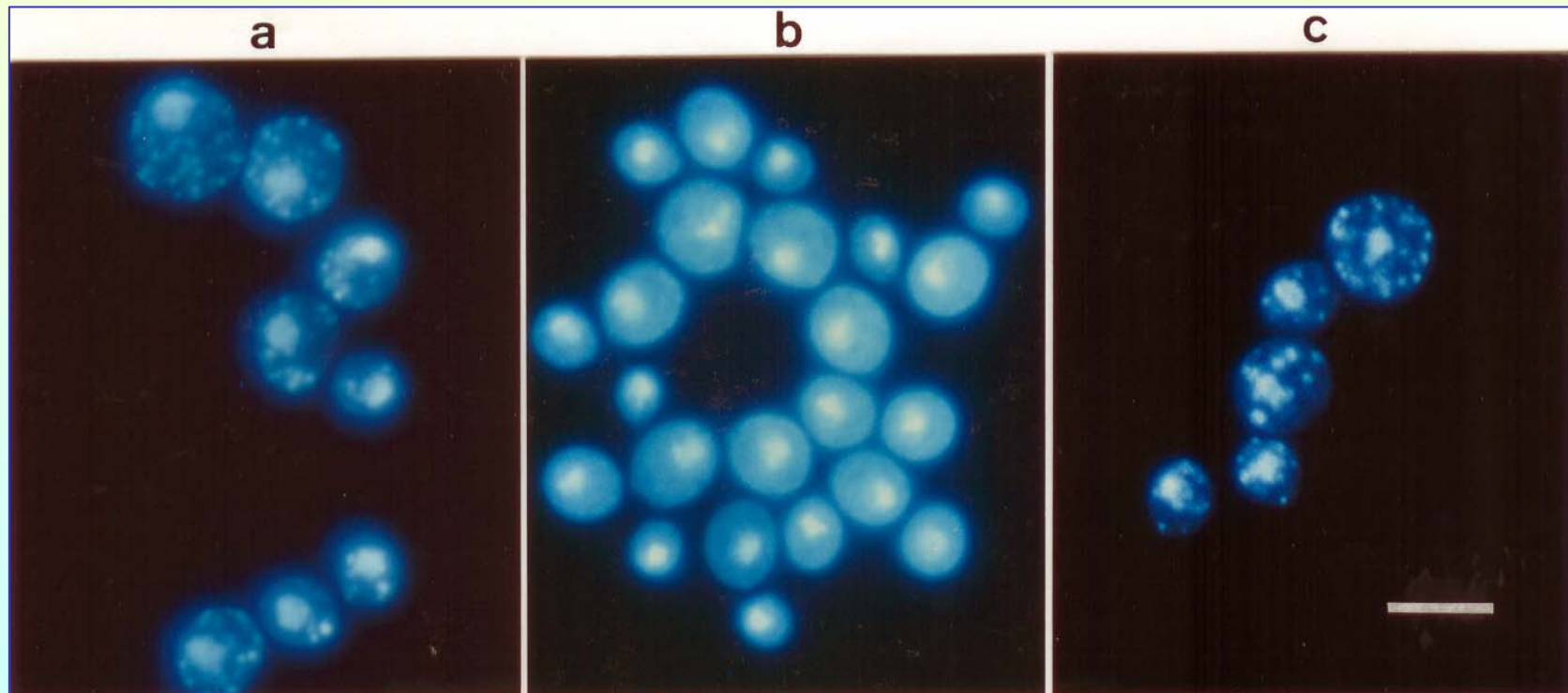


## Separation of enucleated protoplasts from discontinuous density gradient of Percoll



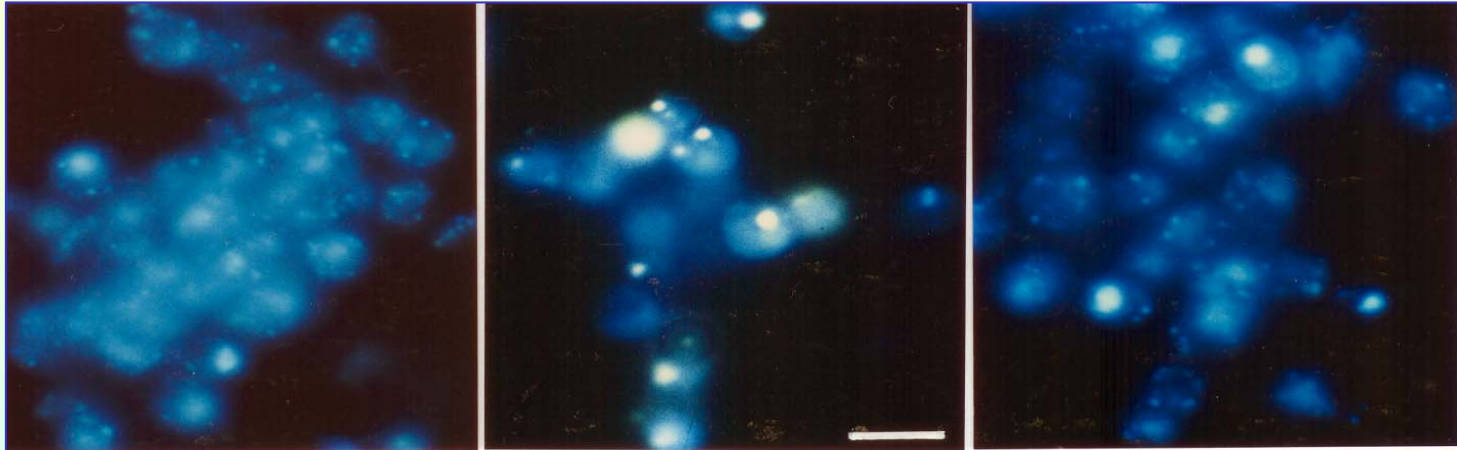


## Fluorescence micrographs of DAPI-stained yeast spheroplasts



**Fluorescence micrographs of DAPI-stained:**  
**A - yeast protoplasts,**  
**B - yeast spheroplasts**

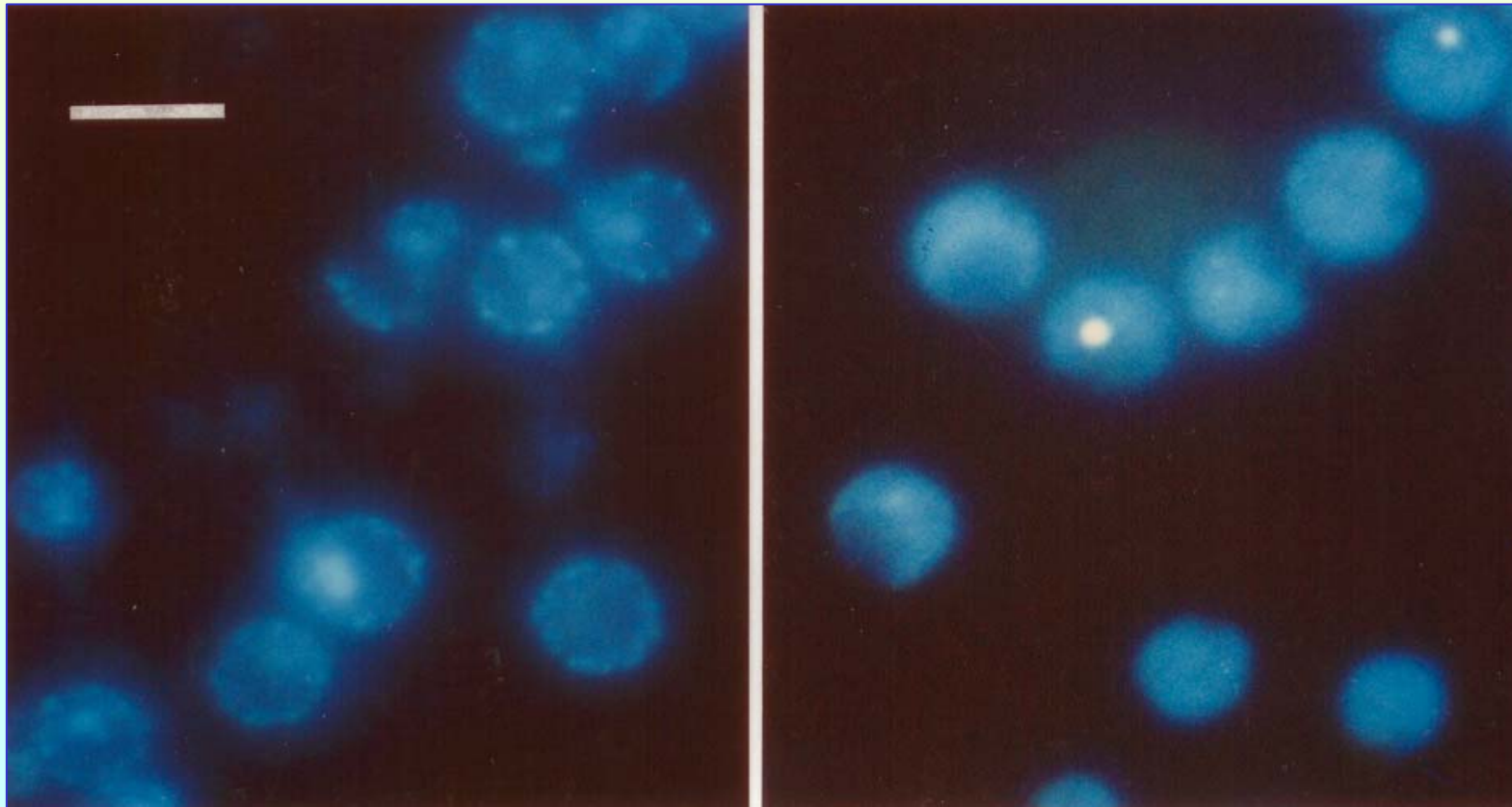
**A**



**B**

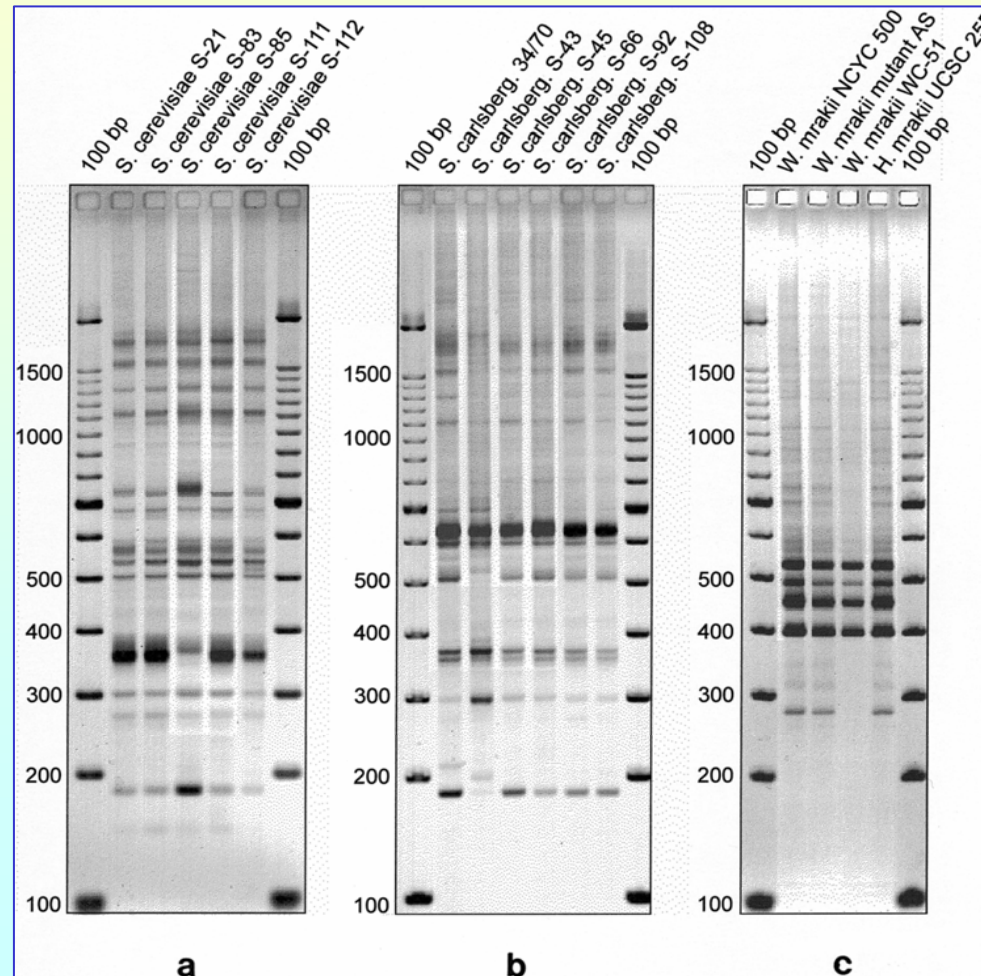


Fluorescence micrographs of DAPI-stained yeast spheroplasts of *rho*<sup>+</sup> and *rho*<sup>-</sup> of *S. carlsbergensis*, enucleated by nocodazole and optimal medium II

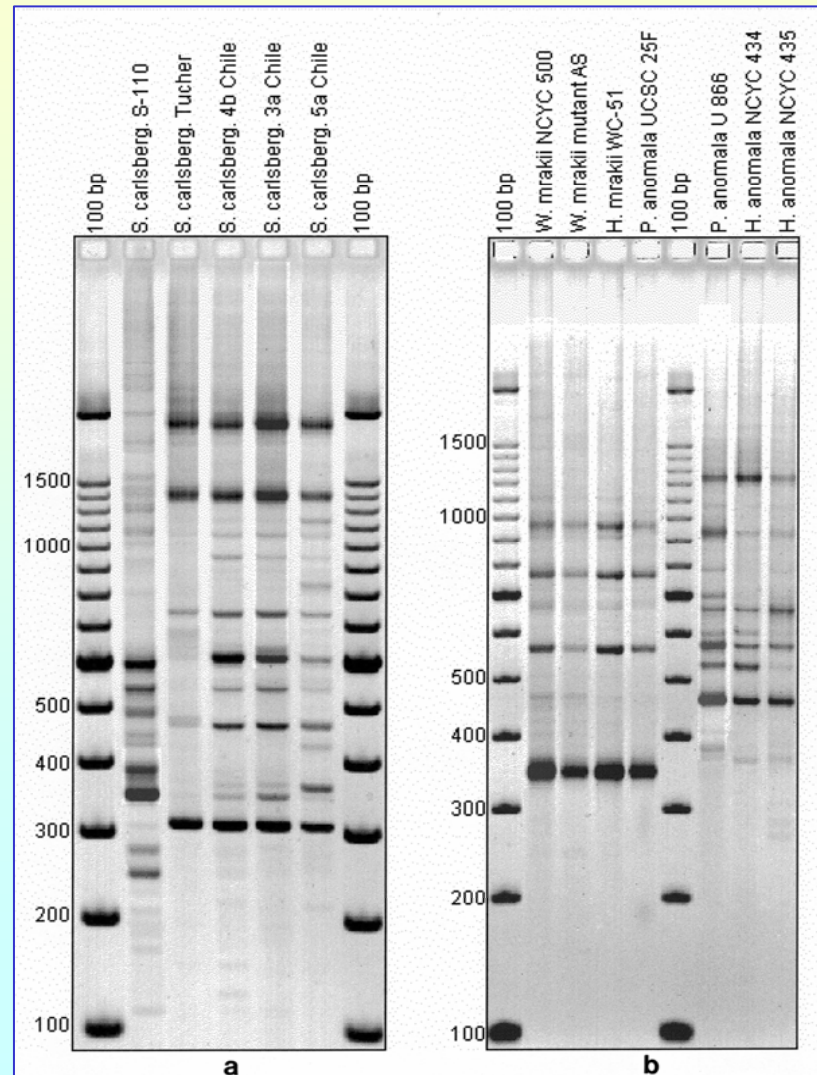




## IL-PCR-fingerprints of *S. cerevisiae* and *Williopsis mrakii* generated by IL-primer GR



## Detection by IL-PCR fingerprints (primer GF) of misclassification of yeast strains



## Databasing of DNA-fingerprints: Density profiles of *Saccharomyces cerevisiae*

