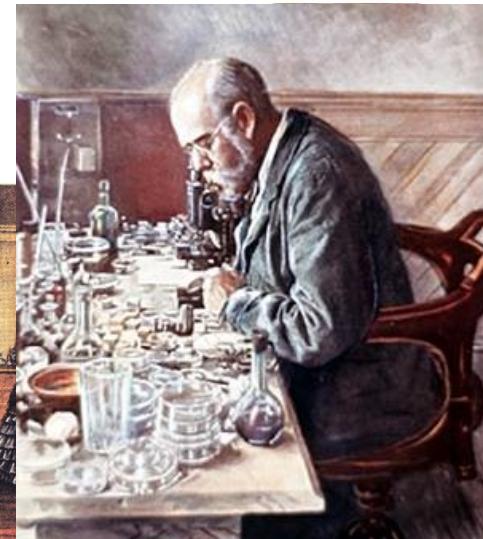
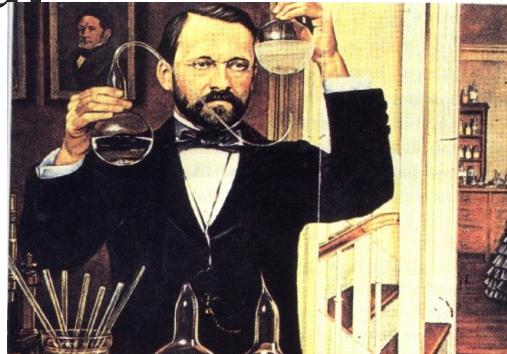




# MICROBIOLOGY 微生物

# Beginning of Microbiology

➤ **Anton van Leeuwenhoek**



➤ **Louis Pasteur**

➤ **Robert Koch**

- 第一，这种微生物必须能够在患病动物组织内找到，而未患病的动物体内则找不到；
- 第二，从患病动物体内分离的这种微生物能够在体外被纯化和培养；
- 第三，经培养的微生物被转移至健康动物后，动物将表现出感染的征象；
- 第四，受感染的健康动物体内又能分离出这种微生物。

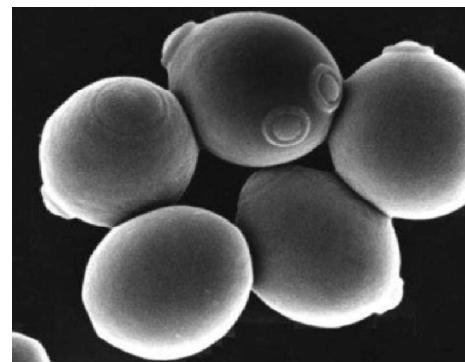
# Microbes in everyday life



Yogurt (*Lactobacillus*)



Wine and Beer  
(*Saccharomyces cerevisiae*)



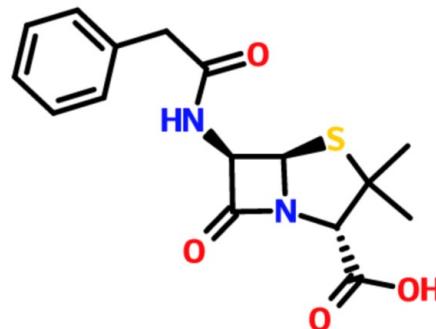
Vinegar  
(*Acetobacterium Balch*)



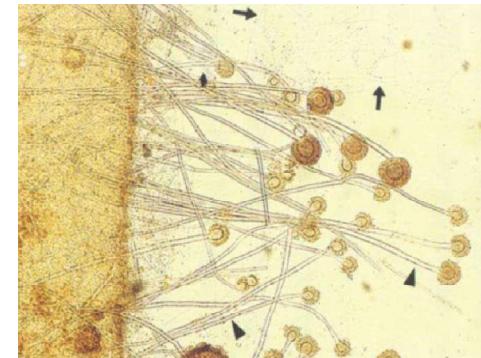
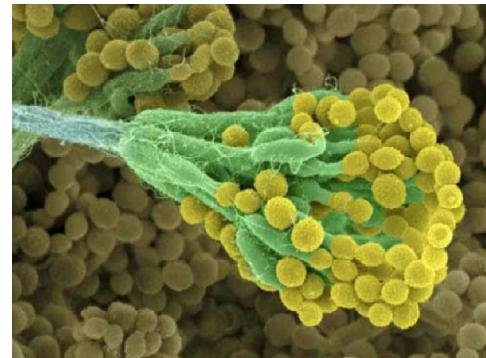
# Microbes in everyday life



Tuberculosis  
(*Mycobacterium tuberculosis*)



*Aspergillus flavus*



# The range ? Life or not ?

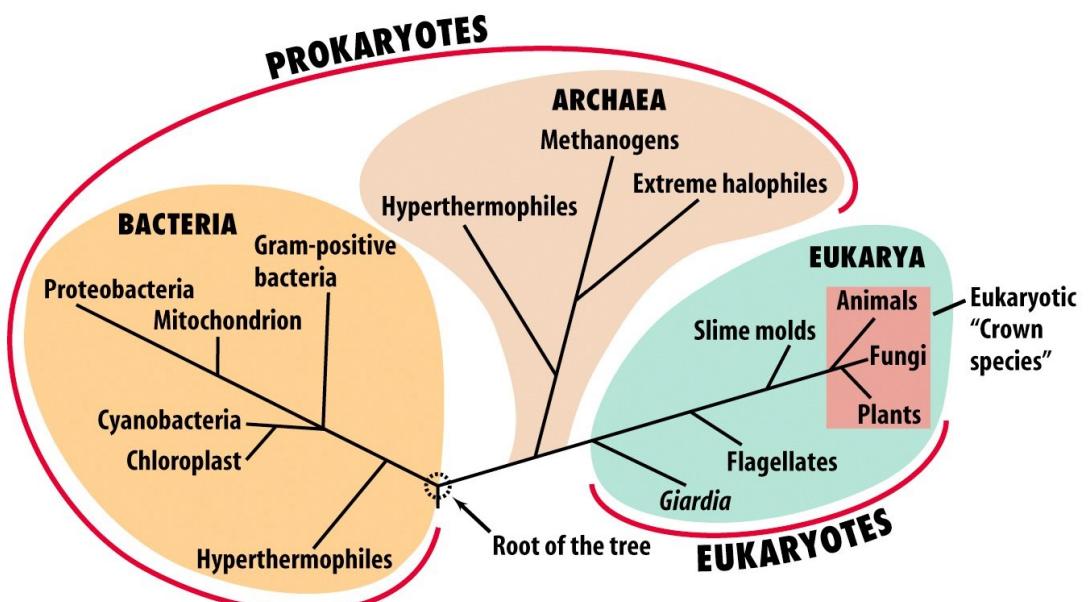
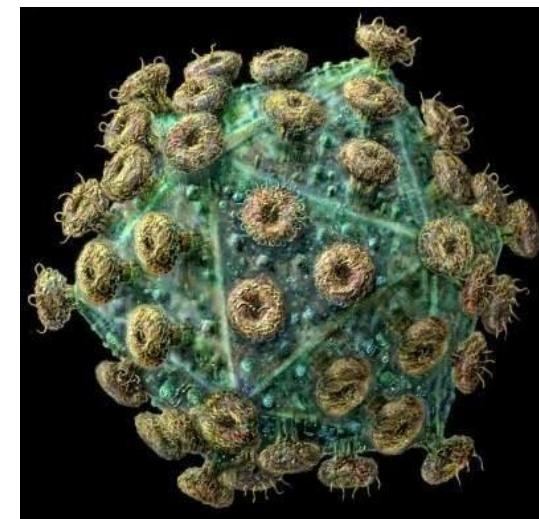
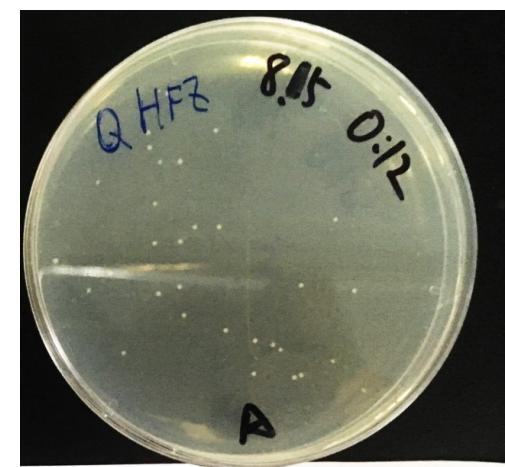
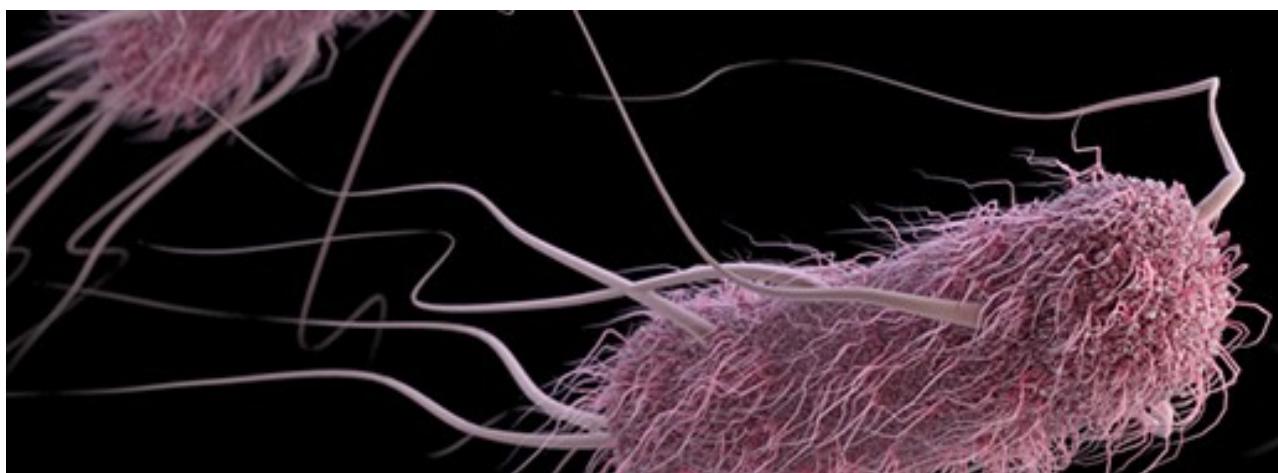
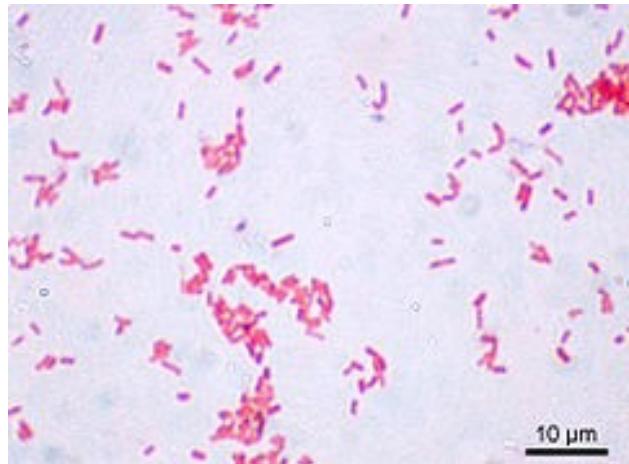


Figure 2-7 Brock Biology of Microorganisms 11/e  
© 2006 Pearson Prentice Hall, Inc.

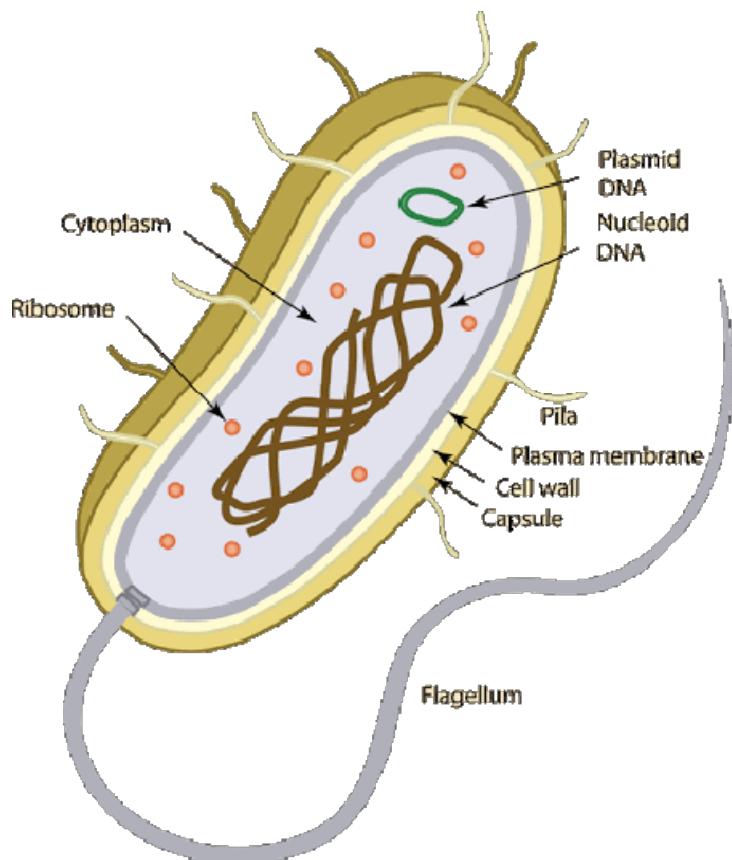


要求：小 (0.5~5 μm)

# 大肠杆菌 (*Escherichia coli*, *E. coli*)



# 大肠杆菌 (*Escherichia coli*, *E. coli*)



Why a widely used basis organism ?

1. 人（及动物）肠道菌群 ( gut flora or gut microbiome) 的组分。
2. 条件性致病菌。
3. 兼性厌氧，无氧呼吸产物：酸和气。异养。
4. 平均长度：2 μm, 平均宽度：0.5 μm. 每毫克含菌10~100亿。
5. 原核生物：细胞器只有核糖体。
6. 生长速度快：20~30 min/代（适宜条件下）。
7. 基因序列等信息相对清晰。
8. 易保存：4°C, -80°C。

# Cultivation of E. coli



需氧

摇床  
空气

异养

LB培养基  
1% 蛋白胨  
0.5% 酵母提取物  
1% 氯化钠  
(琼脂粉)  
灭菌

肠道  
菌群

37°C

生长  
迅速

过夜培养

# Modification of E.coli

基因编辑 + 突变-筛选

**Trans1-T1 Phage Resistant Chemically Competent Cell**

使用前请仔细阅读说明书

目录号：CD501

保存：-70°C保存六个月。不适合在液氮中保存。

**产品说明**

Trans1-T1 Phage Resistant化学感受态细胞经特殊工艺制作，可用于DNA的化学转化。使用pUC19质粒DNA检测，转化效率高达 $10^9$ cfu/ $\mu$ g DNA以上。

**基因型**

F<sup>-</sup> φ80(lacZ)ΔM15ΔlacX74hsdR(r<sub>k</sub>, m<sub>k</sub><sup>r</sup>)ΔrecA1398endA1tonA

**特点**

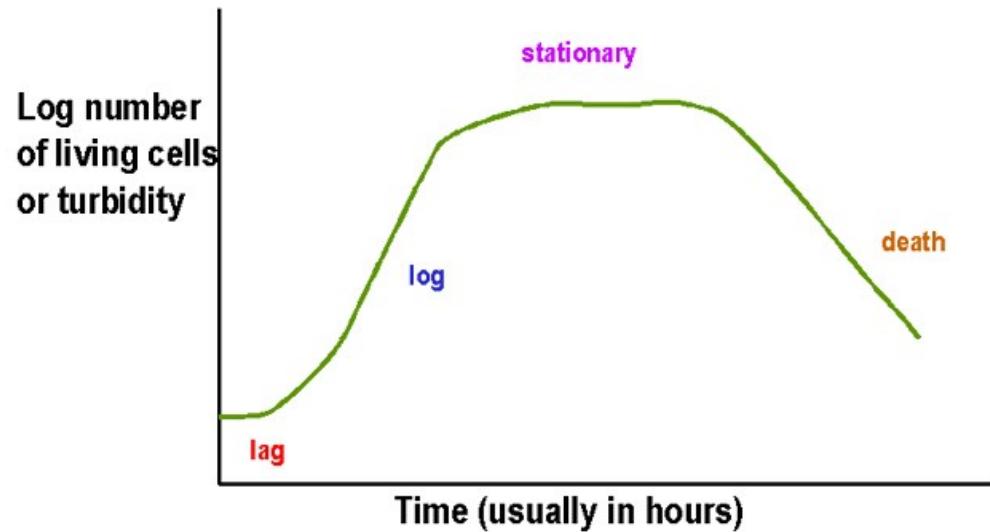
- Trans1-T1 Phage Resistant感受态细胞是目前生长速度最快的感受态细胞，在氯苄青霉素平板上，8-9小时可见克隆；
- 用于蓝、白斑筛选，12小时可见蓝斑；
- 将过夜培养的单克隆在2 ml的LB培养基中培养4-5小时即可进行小量质粒提取；
- 适用于高效的DNA克隆和质粒扩增，减少克隆DNA同源重组的发生，提高质粒DNA的产量和质量；
- 具有T1, T5噬菌体抗性。

符合科研需要（图片来自全式金公司）

生物  
安 全

# How E. coli grow: fission

Fission



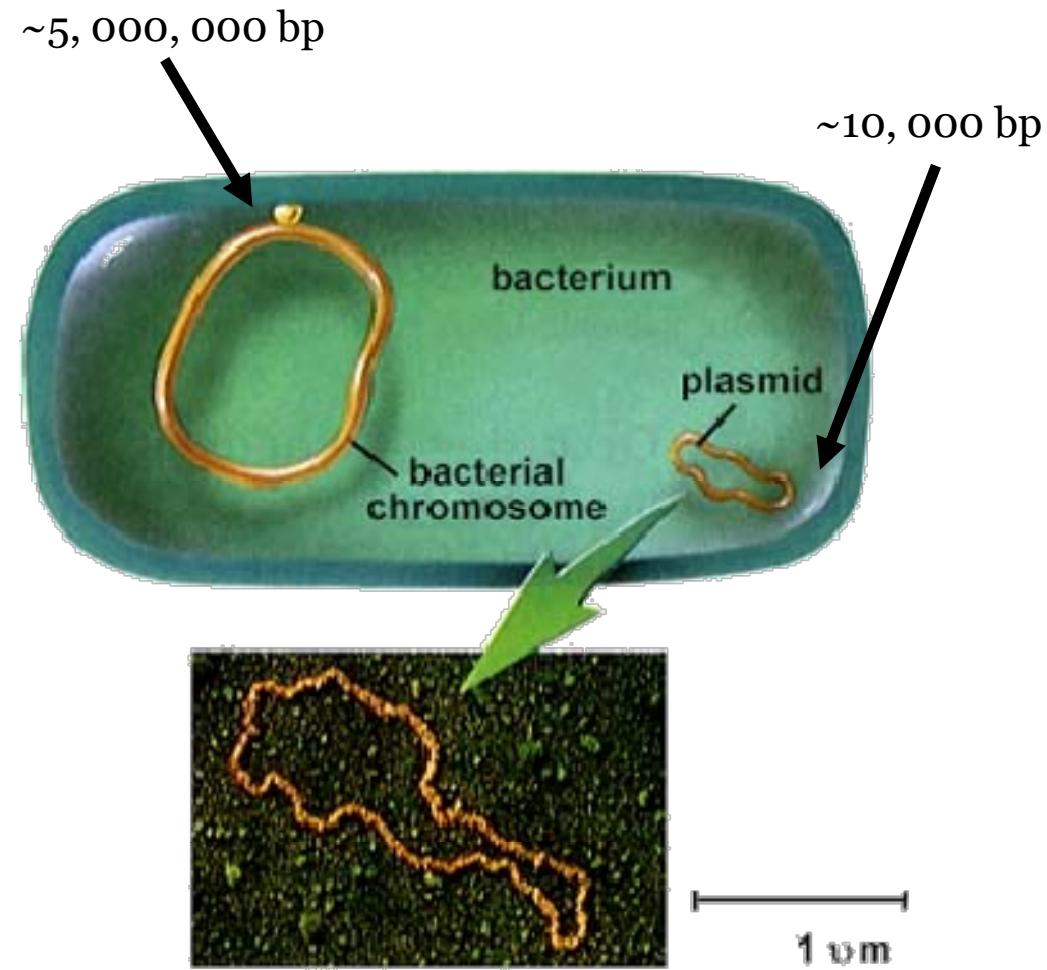
The Growth Curve

- ↗ Growth in liquid medium
  - 1. Lag Phase
  - 2. Log Phase
  - 3. Stationary Phase
  - 4. Death (decline) Phase

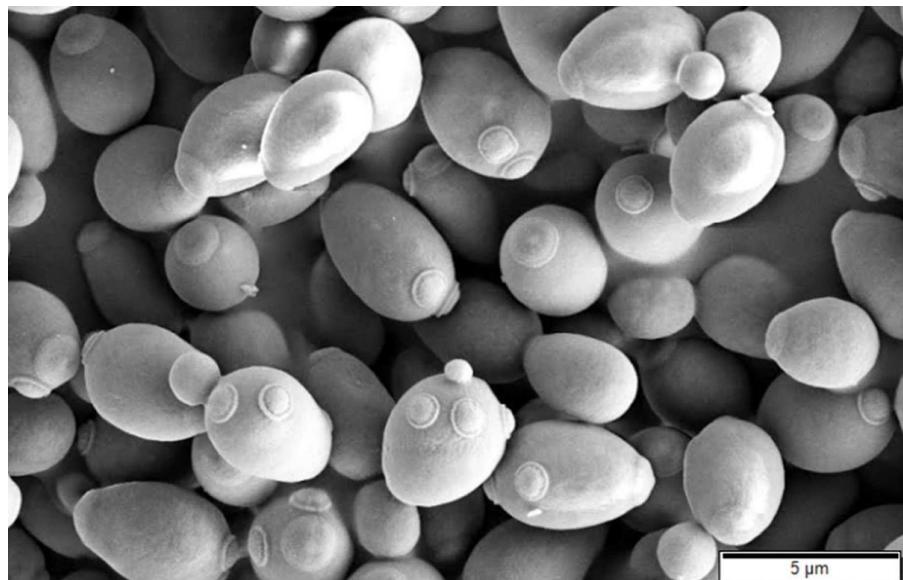
- 1. 每个时期适合做什么实验?
- 2. 细菌密度怎样测定?
- 3. 细菌状态调整与种子菌液制备。

# Plasmid

Many prokaryotic cells contain other genetic elements, in particular, plasmids, in addition to the chromosome. Plasmids are genetic elements that replicate independently of the host chromosome, in the sense of possessing their own origin of replication. However, they do rely on chromosomally encoded enzymes for their replication. Unlike viruses, plasmids do not have an extracellular form and exist inside cells as free, typically circular, DNA. Plasmids differ from chromosomes in carrying only nonessential (but often very helpful) genes. Essential genes reside on chromosomes. Thousands of different plasmids are known.



# 酵母菌 (Yeast, *Saccharomyces*)



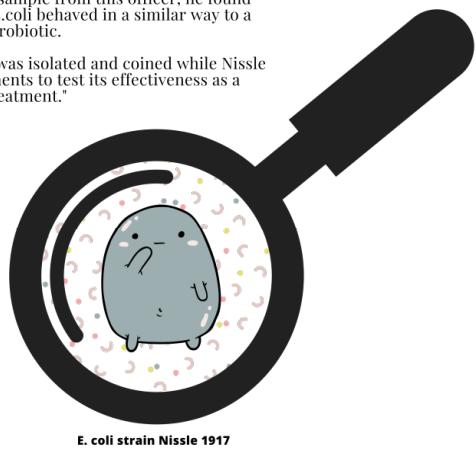
1. 产酒精；
2. 真核生物（某些蛋白或酶的生产）；
3. 一些实验（酵母双杂交实验）。

其他真核微生物：青霉、毛霉、黄曲霉.....

# The *E-coli* strain Nissle 1917 (EcN)

"After examining the stool sample from this officer, he found that a particular strain of *E.coli* behaved in a similar way to a probiotic.

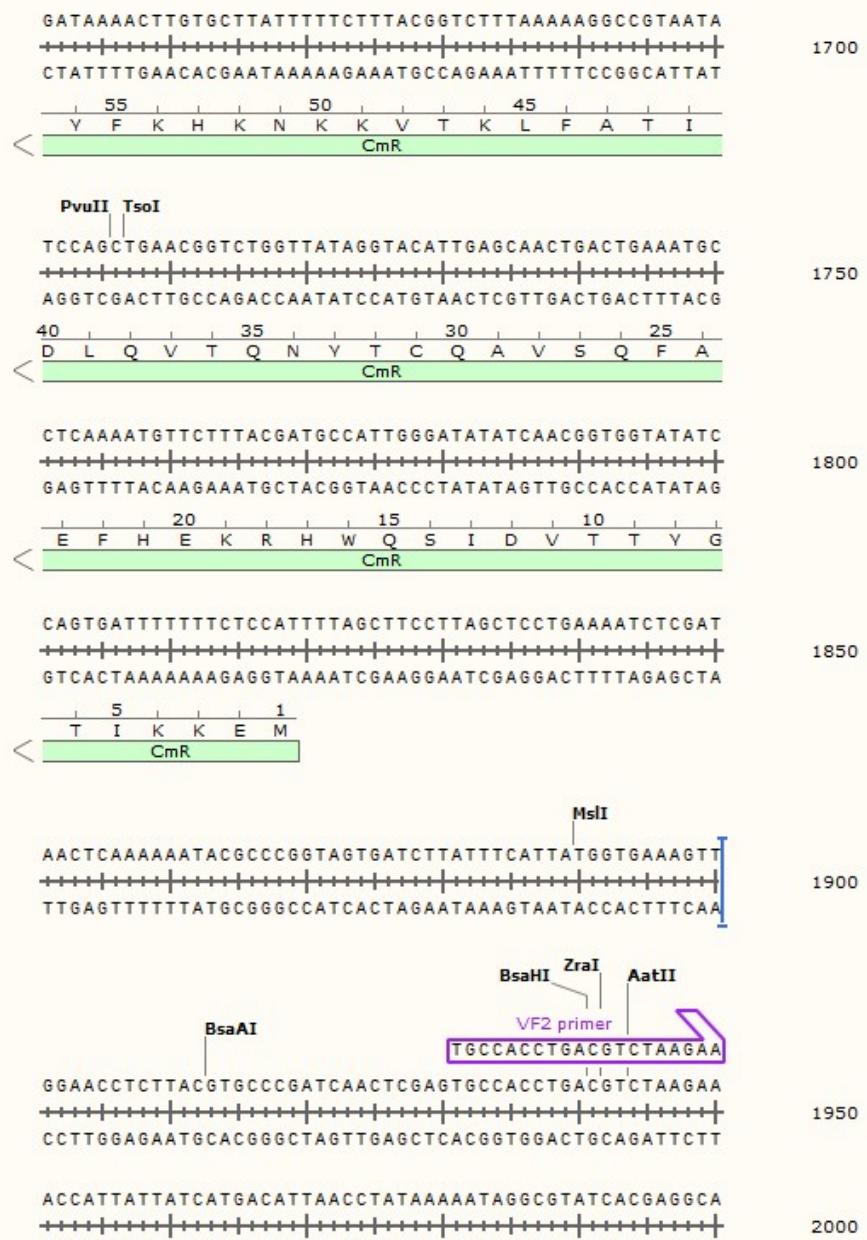
The *E. coli* strain Nissle 1917 was isolated and coined while Nissle continued to run experiments to test its effectiveness as a treatment."



## 1. 著名益生菌

## 2. Nissle发现于1917年;

As Nissle continued to collect stool samples from soldiers, one man caught his attention. He was a non-commissioned officer who despite others around him falling sick, remained healthy.



## 讨论：

1. 穿梭质粒需要具备什么特点？
  2. 灭菌方法有哪些，为何湿热灭菌最流行？
  3. 灭菌条件了解一下？
- 紫外、酒精、灼烧、干热、湿热.....

# HSiTAIWAN 2016 iGEM (High School Grand Prize)



**Wolfberry chrysanthemum**  
*Brain function enhancement*



**Herb diet**  
*Immune system improvement Liver function improvement*



**Herb tea**  
*Liver function improvement*



**Licorice dates quail**  
*Menopausal symptoms*



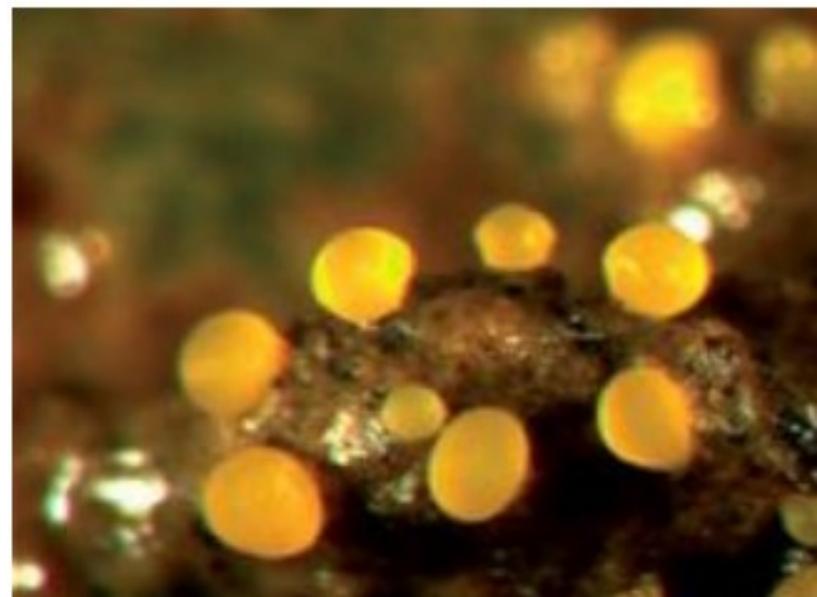
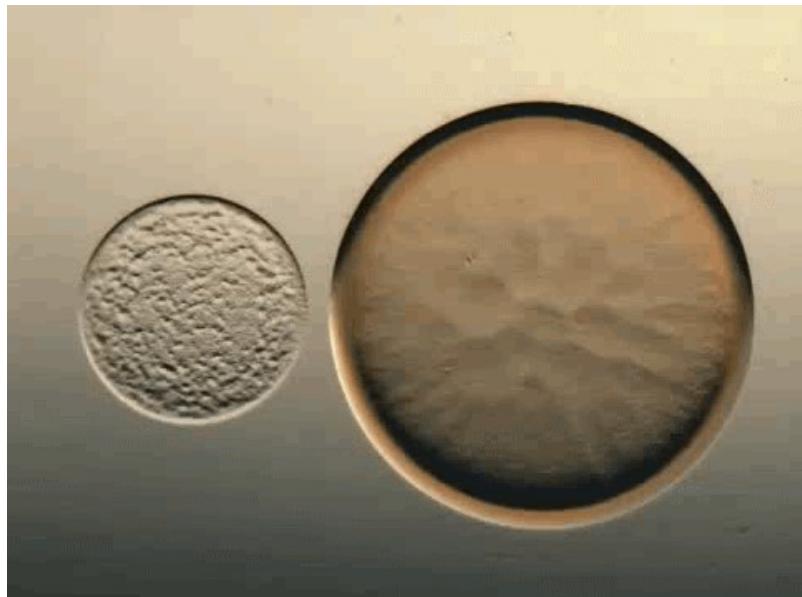
**Wolfberry egg soup**  
*Vision improvement*



**Angelica chicken**  
*Flavor and warm up body*

# 群体感应 ( Quorum sensing )

Quorum sensing describes the phenomenon that the accumulation of signaling molecules in the surrounding environment enables a single cell to assess cell density so that the population as a whole can make a coordinated response. (West *et al.*, 2007)



*Myxococcus xanthus* (黄色黏球菌)

是菌不是菌？