

**Institute for Microbiology, Medical Faculty of Masaryk University  
and St. Anna Faculty Hospital in Brno**

# **Agents of digestive system infections – I**

# Digestive system

- „a fruitful microbial garden“
- Its both ends are the „buggiest“ parts of the body
- in the colon: approx.  $10^{12}$  bacteria/g
- **Normal colonic flora: 99 % anaerobes**  
(*Bacteroides*, *Fusobacterium*,  
*Clostridium*, *Peptostreptococcus*),  
**only 1 % enteric bacteria (mostly *E. coli*)**  
& *enterococci*

# Mouth cavity – I

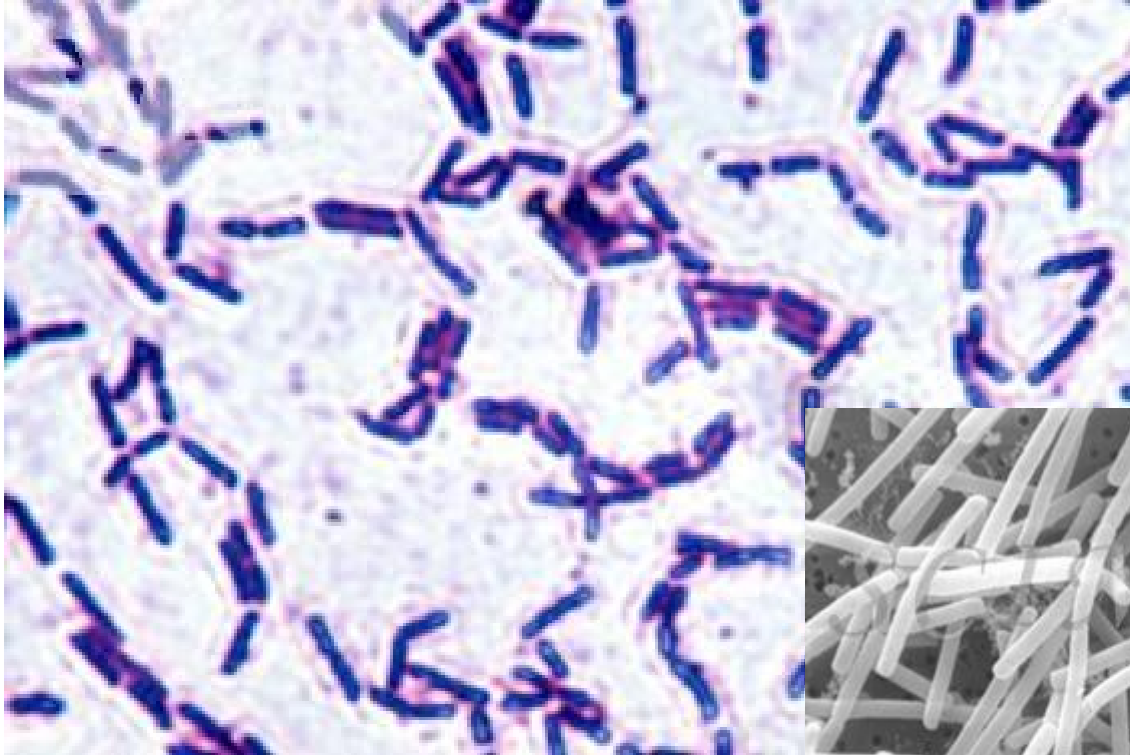
## Normal flora:

- viridans (=  $\alpha$ -haemolytic) streptococci (e.g. *Streptococcus salivarius*)
- oral neisseriae (e.g. *Neisseria subflava*)
- haemophili of very low pathogenity (e.g. *Haemophilus parainfluenzae*)

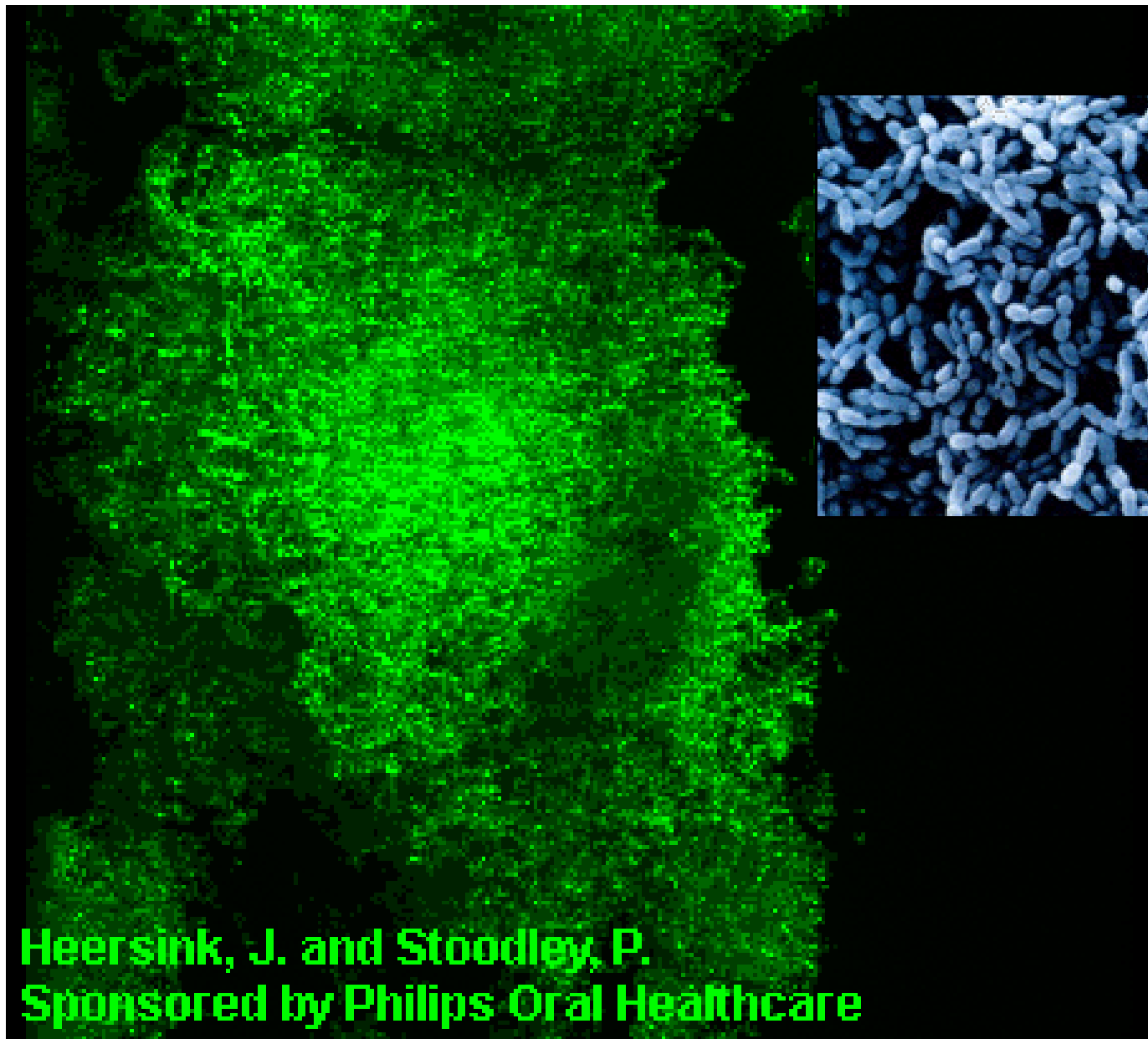
**Dental plaque:** adherent microbial layer at the tooth surface made up from living and dead bacteria and their products together with components from the saliva

In essence, **dental plaque is a biofilm**

It cannot be washed off, only mechanically removed



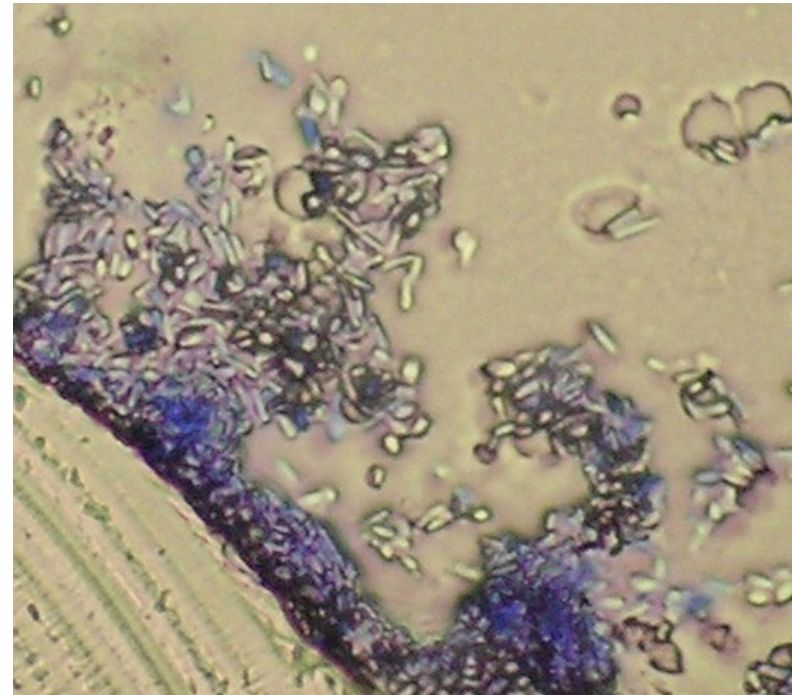
**Lactobacillus**



**Heersink, J. and Stoodley, P.  
Sponsored by Philips Oral Healthcare**

# Biofilm

- **Bacteria can regulate the quantity of their population by regulative compounds**
- **Process – quorum sensing**
- **More resistant to**
  - **desinfectants**
  - **antibiotics**
  - **immune reaction**
- **A product of normal flora (which is positive) and pathogens as well**





# Mouth cavity – II

**Dental caries:** chronic infections caused by normal oral flora → localized destruction of tooth tissue

**Etiology:** mouth microbes (mostly *Strept. mutans*) making acids from sucrose in food

**Thrush** (in Latin soor): *Candida albicans*  
It occurs mostly in newborns

**Herpetic stomatitis:** primary infection with **HSV 1**

**Ludwig s angina:** polymicrobial **anaerobic** infection of sublingual and submandibular spaces (*Porphyromonas, Prevotella* etc.)



# Herpetic stomatitis



# Thrush



[http://www.mydochub.com/images/oral\\_thrush.jpg](http://www.mydochub.com/images/oral_thrush.jpg)

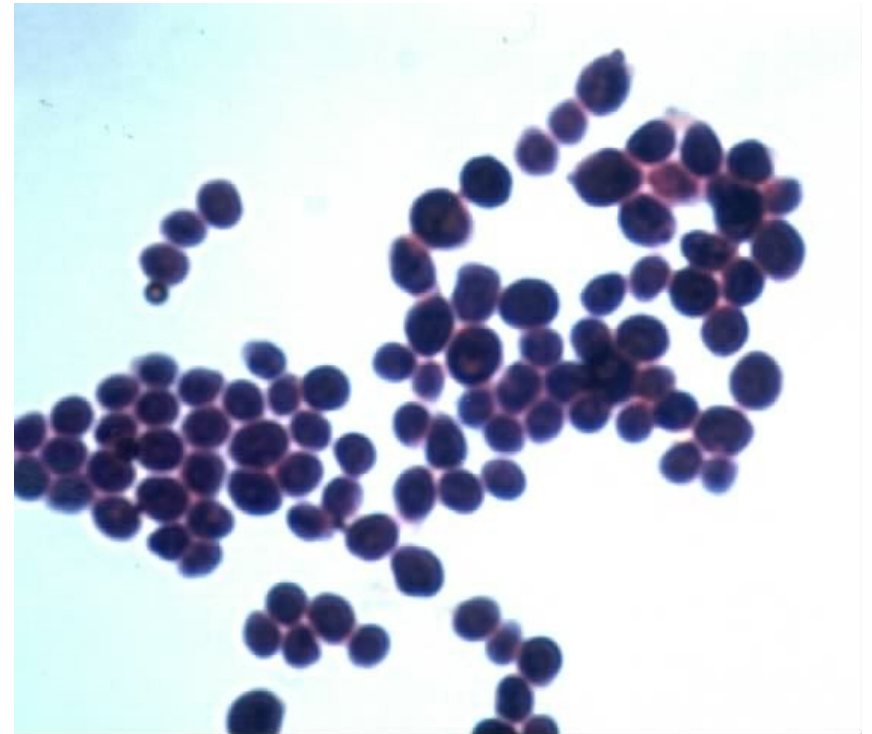
Oral thrush



 ADAM.

<http://www.clarian.org/ADAM/doc/graphics/images/en/17284.jpg>

# *C.albicans*



# Oesophagus

Infections **never** in previously healthy individuals

**Only** in severely immunocompromised persons (AIDS):

- *Candida albicans*
- Cytomegalovirus (CMV)

# Stomach

**Stomach = a sterilization chamber killing by means of HCl most of swallowed microbes**

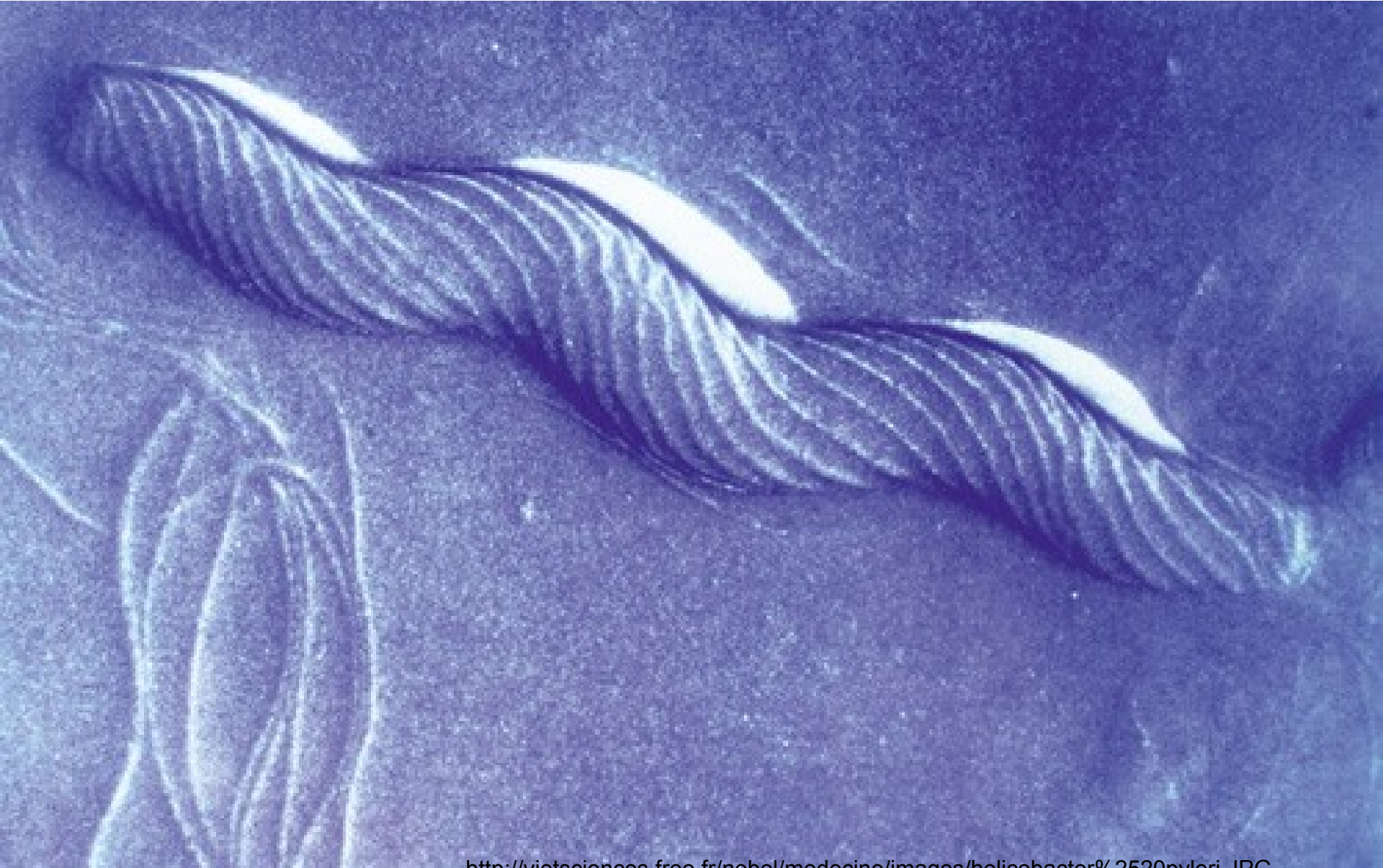
**Exception: *Helicobacter pylori***

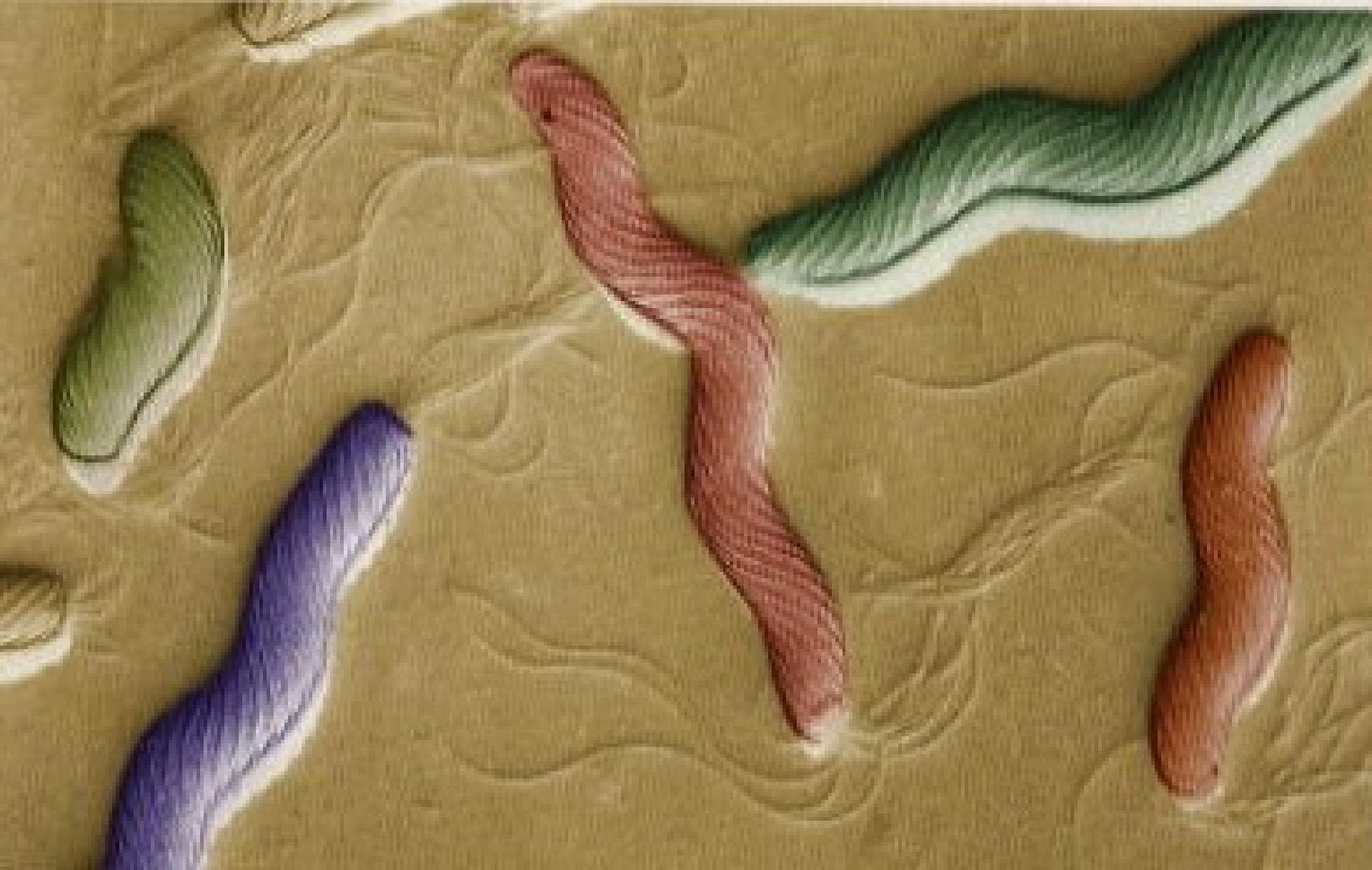
**It produces a potent **urease** and by splitting tissue urea it increases pH around itself (1 molecule of urea  $\rightarrow$  1  $\text{CO}_2$  + 2  $\text{NH}_3$ )**

***H. pylori* causes**

- **chronic gastritis**
- **peptic ulcers (Nobel price in 2005)**

# *Helicobacter pylori*





[www.univie.ac.at/hygiene-aktuell/helicobacter.jpg](http://www.univie.ac.at/hygiene-aktuell/helicobacter.jpg)

# Biliary tree & the liver – I

**Acute cholecystitis** (colic, jaundice, fever):  
obstruction due to gallstones

**Etiology:** intestinal bacteria (*E. coli* etc.)

**Complication:** ascending cholangitis

**Chronic cholecystitis:** the most important  
is *Salmonella Typhi* (carriers of typhoid  
fever)

**Granulomatous hepatitis:** Q fever, tbc,  
brucellosis



# Biliary tree & the liver – II

**Parasitic infections of the liver:**

**Amoebiasis** (*Entamoeba histolytica*: liver abscess)

**Malaria** (the very first, clinically silent part of the life cycle of malaric plasmodia)

**Leishmaniasis** (*Leishmania donovani*: kala-azar, *L. infantum*)

**Schistosomiasis** (eggs of *Schistosoma japonicum*, less often *S. mansoni*)

# Systemic infections which start in the digestive tract

**Enteric fever** (typhoid fever and paratyphoid fever): *Salmonella* Typhi, *Salmonella* Paratyphi A, B and C

**Listeriosis**: *Listeria monocytogenes*

**Peritonitis**: colonic flora (*Bacteroides fragilis* + other anaerobes + mixture of facultative anaerobes)

**Viral hepatitis**: HAV, HBV, HCV, HDV, HEV

# Small and large intestine

## **Bacterial overgrowth syndrome:**

**After surgery, depressed peristalsis, or gastric achlorhydria bacteria may overgrow in the small intestine → steatorrhea, deficiency of vitamin B<sub>12</sub>, diarrhea, malabsorption of vitamins A and D**

**Diarrhea:** increase in daily amount of stool water  
– common intestinal response to many agents

**Dysentery:** acute inflammation of the colon → abdominal pain & small-volume stools with blood, pus and mucus

# Diarrheal disease

## Infectious:

- **Bacterial (most frequent)**
- **Viral**
- **Parasitic**
- **Mycotic**

## Non-infectious:

- **Food poisoning**

# „Homework 1“

What is the name of the picture and of its author?

