

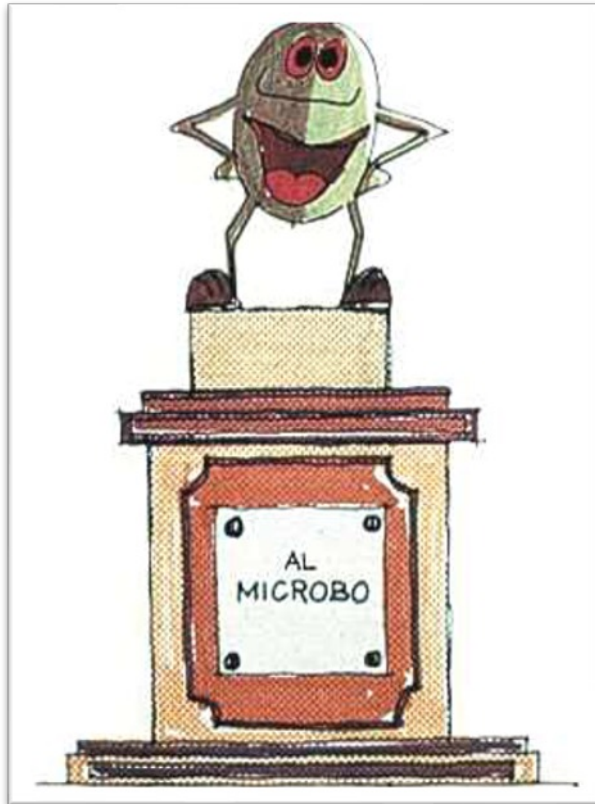
Microbiology per non microbiologists

Brief microbiological training for production and Public Health people

(Pharma, Agro-Food, Dairy, Beverage, Catering, Cosmetic, Public Health, Biotechnology, HVAC, Laboratory, Pharmacy, Hospital)

Roberto Ligugnana

LIGU *Bacteria* ***Family Monument***



Why a monument for the
microorganisms?

You will know the reason at the
end of slides presentation

Terminology

- Bio-aerosol
- Controlled environment contamination
- Bacteria
- Calibration
- Colony (CFU)
- Cross Contamination
- Disinfection
- Germ
- Laminar flow
- Microorganism
- Mold & Yeast
- Sterile
- Sterilization
- Streptococci
- Unidirectional flow

The big “handicap”

You do not see the microorganisms in «real time» with your eyes and therefore the humans are not easily involved.

The Staff

The personell should be therefore trained to understand the presence of germs around us.

It is not easy to convince the staff to follow the correct hygiene procedures.

The microorganisms

The germs are not visible with niked eyes and the results of their negative activity are visible only after several hours or days.

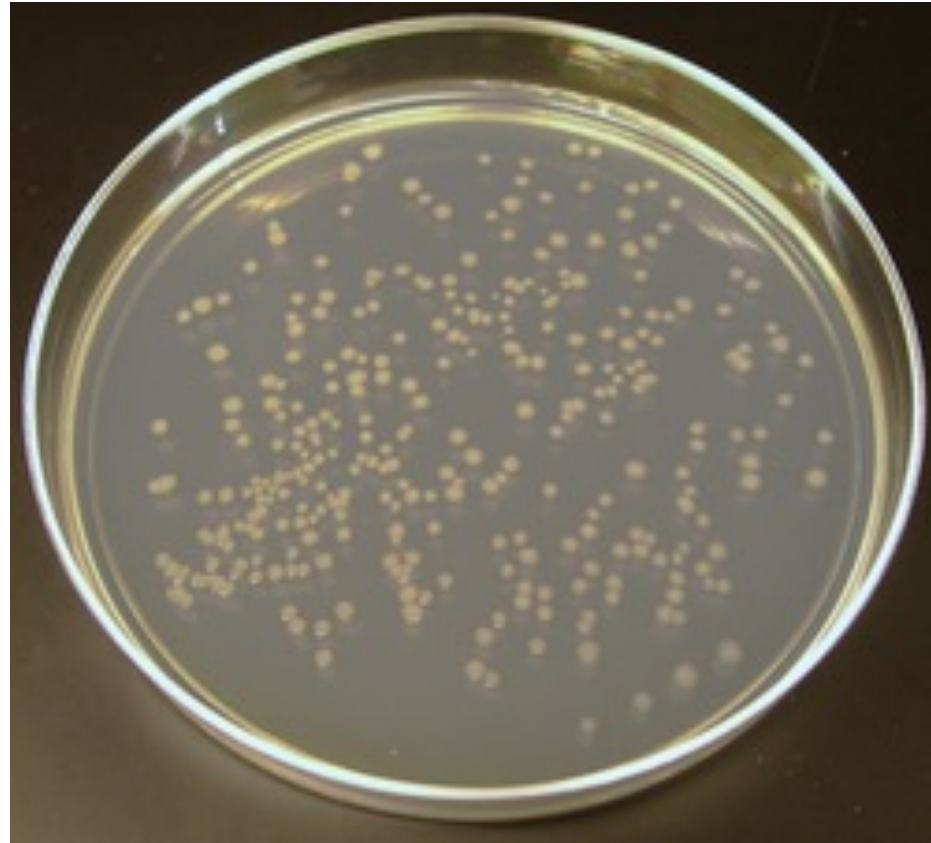
It is therefore difficult to connect a «disaster» (contamintion) with a specific wrong activity.

Germs visible to naked eye

To be sure the staff understand the reasons of a correct hygiene, we should demonstrate that the microorganisms are present.

A practical example is more effective than 1000 words!

Germs visible to naked eye



Practical suggestions to know the basis of microbiology

Few simple activities:

- A. Basic simple microbiology with the help of “comics”
- B. Basic simple Microscopy
- C. Growth of micro-organisms on agar (Demo, A, B, C, D, E, F)
- D. Grafic to evidentiate the results

Basic Microbiology by «comics»

The basic microbiology should be presented in simple way to be sure that it is very well understood.

The slides should be presented by the Production Manager with the adaptation to the local production conditions.

LIGU *Bacteria Family*

LIGU Bacteria family consists of:

- *Bacterium robyophylum*
- *Bacterium liguophylum*
- *Bacterium triobasophylum*
- *Bacterium Christmasophylum*

1. **LIGU *Bacteria Family*** ***day by day life***



The life of LIGU Bacteria family
will help us to discover the world of
micro-organisms

2. **LIGU *Bacteria Family*** ***day by day life***



My name is
Bacterium robyophylum

3. LIGU *Bacteria Family* *day by day life*



My identification card

- DOMAIN: Bacteria
- KINGDOM: Eubacteria
- PHYLUM: Proteobacteria
- CLASS: Hygienebacteria
- ORDER: Ligubacteriales
- FAMILY: Ligubacteriaceae
- GENUS: Ligu
- NAME: *Bacterium robyophylum*

4. **LIGU *Bacteria Family*** ***day by day life***



My name is
Bacterium liguophylum

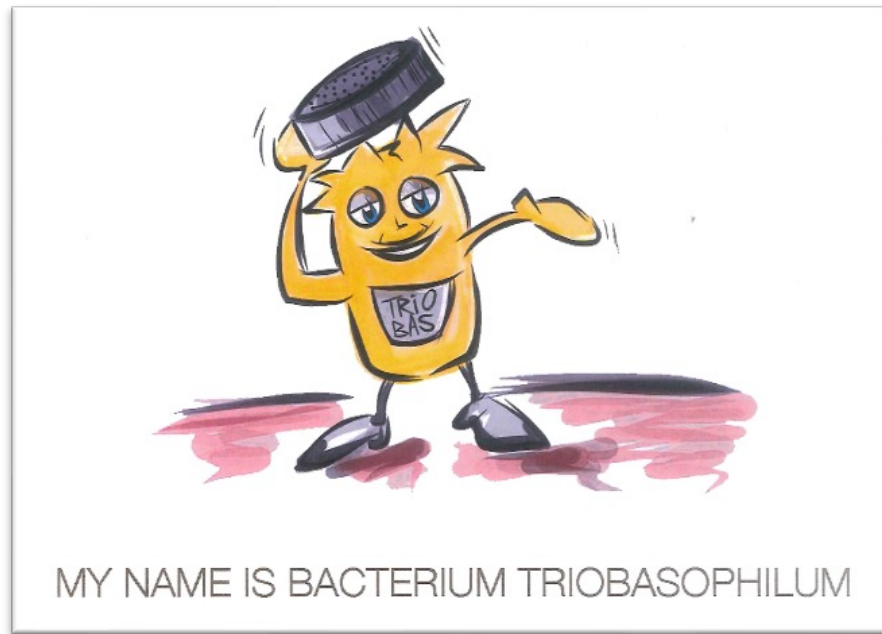
5. LIGU *Bacteria Family* *day by day life*



My identification card

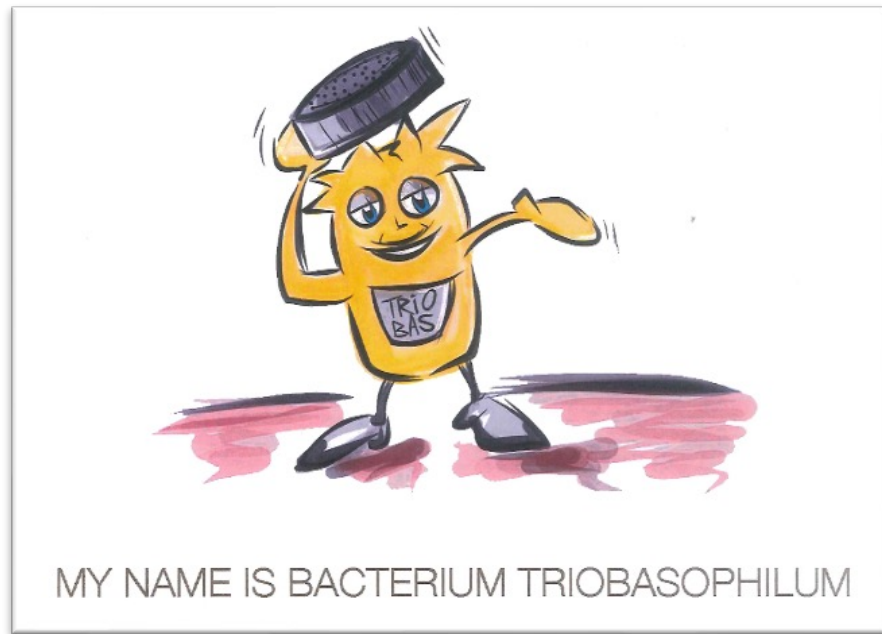
- DOMAIN: Bacteria
- KINGDOM: Eubacteria
- PHYLUM: Proteobacteria
- CLASS: Hygienebacteria
- ORDER: Ligubacteriales
- FAMILY: Ligubacteriaceae
- GENUS: Ligu
- NAME: *Bacterium liguophylum*

6. **LIGU *Bacteria Family*** ***day by day life***



My name is
Bacterium triobasophilum

7. LIGU *Bacteria Family* *day by day life*



My identification card

- DOMAIN: Bacteria
- KINGDOM: Eubacteria
- PHYLUM: Proteobacteria
- CLASS: Hygienebacteria
- ORDER: Ligubacteriales
- FAMILY: Ligubacteriaceae
- GENUS: Ligu
- NAME: *Bacterium triobasophilum*

8. *LIGU Bacteria Family* *day by day life*



My name is
Bacterium christmasophylum

9. *LIGU Bacteria Family* *day by day life*



My identification card

- *DOMAIN: Bacteria*
- *KINGDOM: Eubacteria*
- *PHYLUM: Proteobacteria*
- *CLASS: Hygienbacteria*
- *ORDER: Ligubacteriales*
- *FAMILY: Ligubacteriaceae*
- *GENUS: Ligu*
- *NAME: Bacterium christmasophylum*

10. *LIGU Bacteria Family*

Sexual life



They are very
sensible to the
“sex appeal”

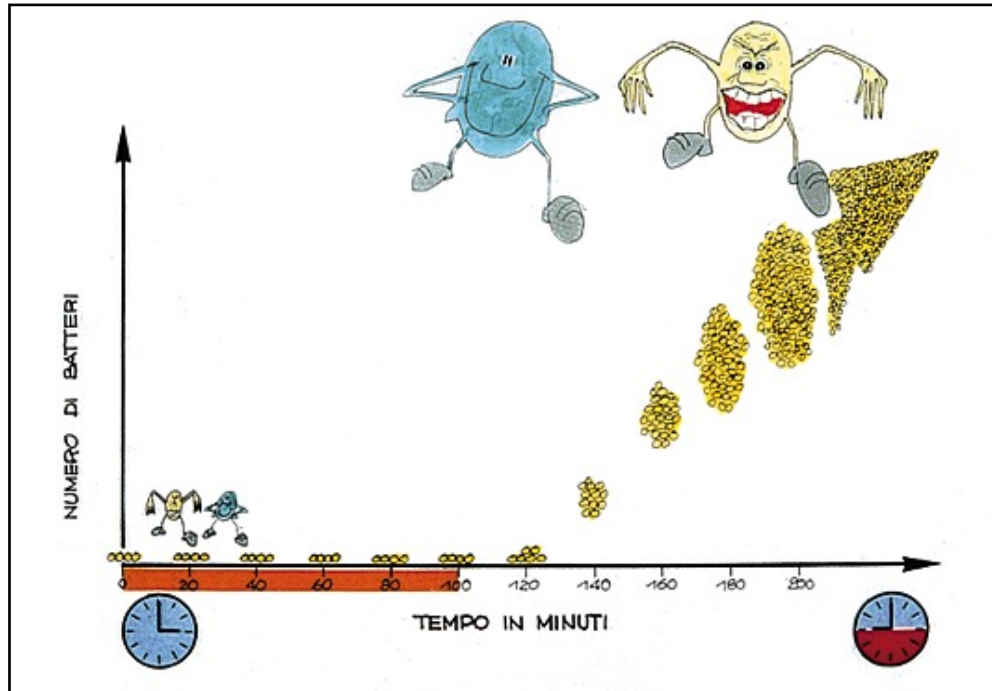
11. *LIGU Bacteria family*

Reproduction



They are very
prolific

12. *LIGU Bacteria Family*



Their names are in the Guinness book: a new generation in about 20 minutes!

13. *LIGU Bacteria Family*

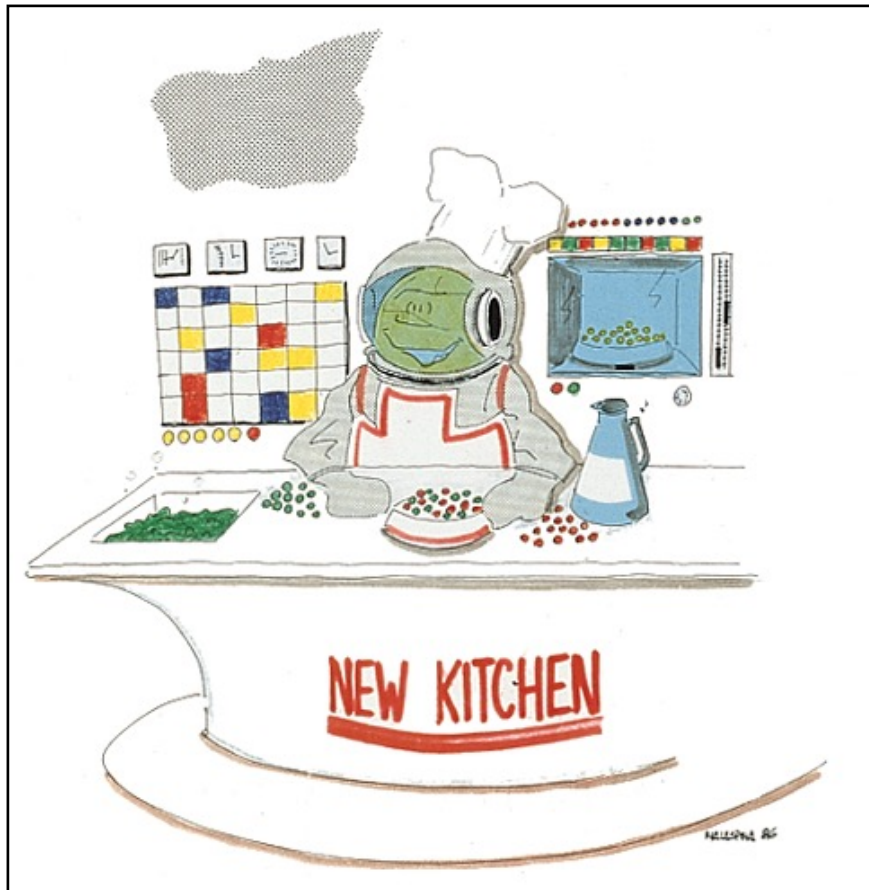
Social life



The family is very important

14. *LIGU Bacteria Family*

Food and drinks



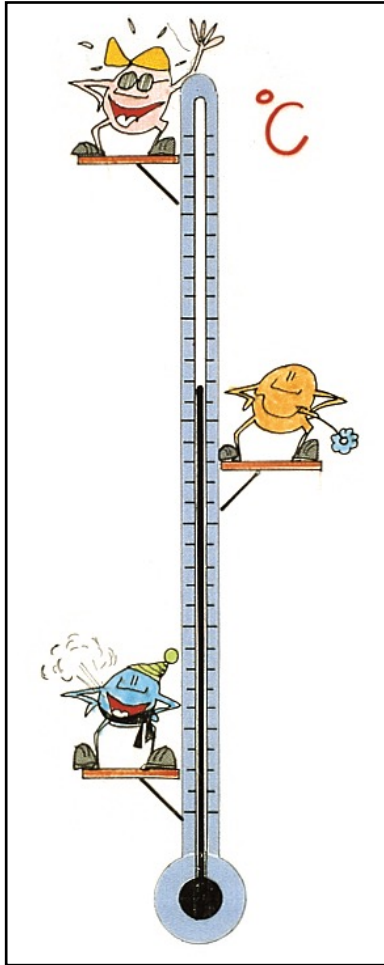
The food quality is very important
for his health.
He prefers the international kitchen.

15. *LIGU Bacteria Family Drinks*



He prefers fresh blood

16. *LIGU Bacteria Family* Temperature



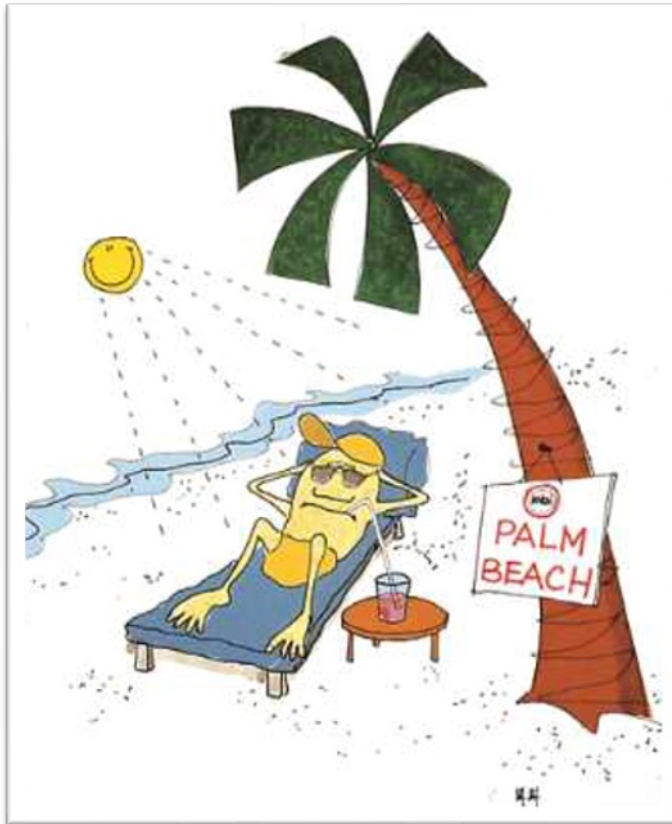
He is able to survive at
different environmental
temperatures
(from -0°C + 70°C)

17. LIGU *Bacteria Family* Habitat



He sometimes
prefers cold, dry
environments

18. *LIGU Bacteria Family* Habitat



He sometimes
prefers warm, wet
environments

19. LIGU *Bacteria Family* Habitat



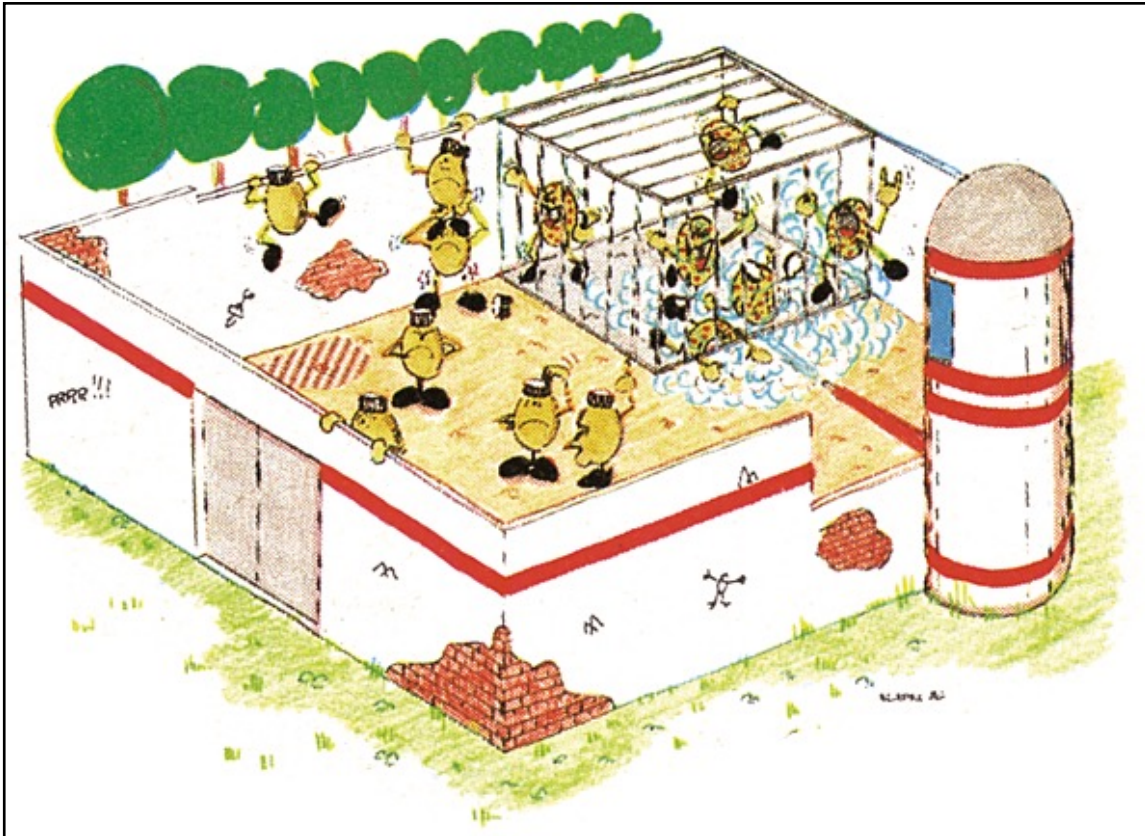
He sometimes
prefers environments
with river water

20. *LIGU Bacteria Family* Habitat



He doesn't like
confined spaces

21. *LIGU* *Bacteria Family* Habitat



If he is confined,
he tries to escape

22. *LIGU Bacteria Family* Dry Environment



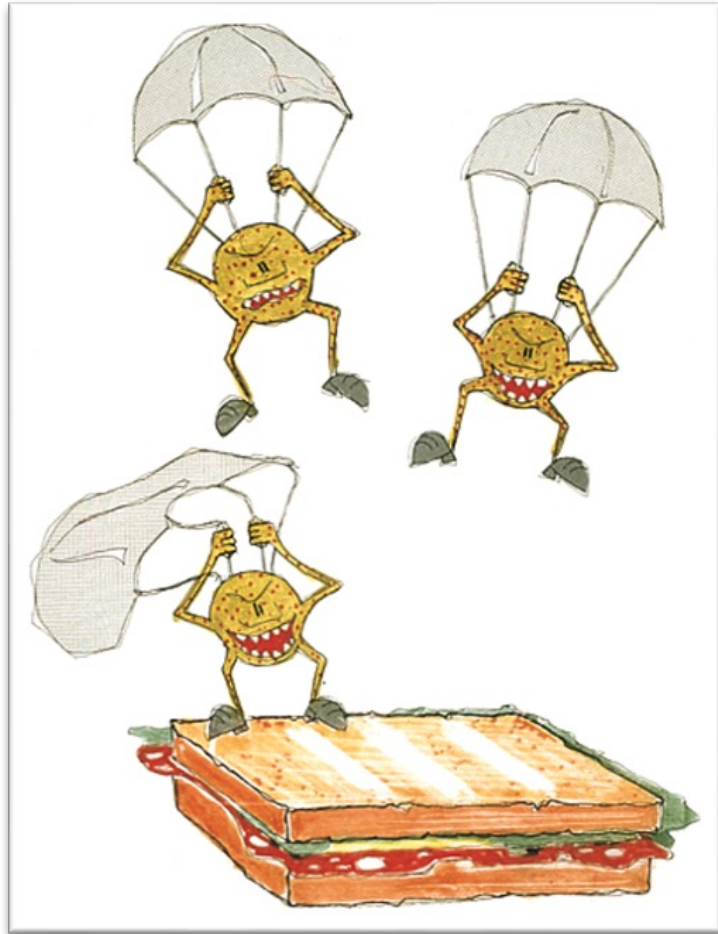
He is looking for water molecules in dry environments
(A_w = Water Activity)

23. LIGU *Bacteria Family* Spreading



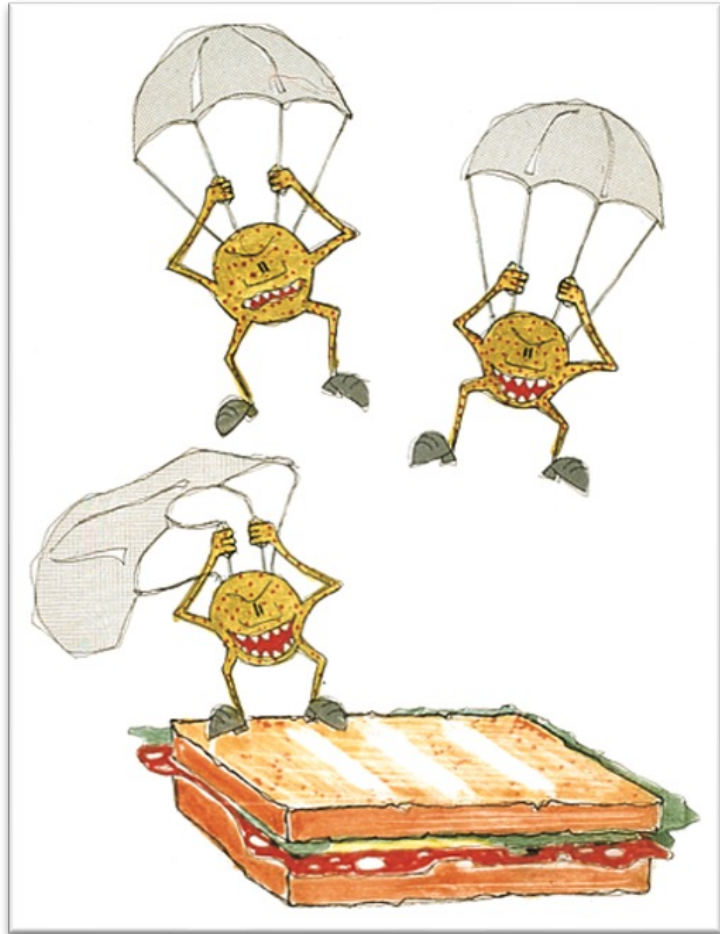
He is always ready to spread
everywhere

24. *LIGU Bacteria Family* Diffusion



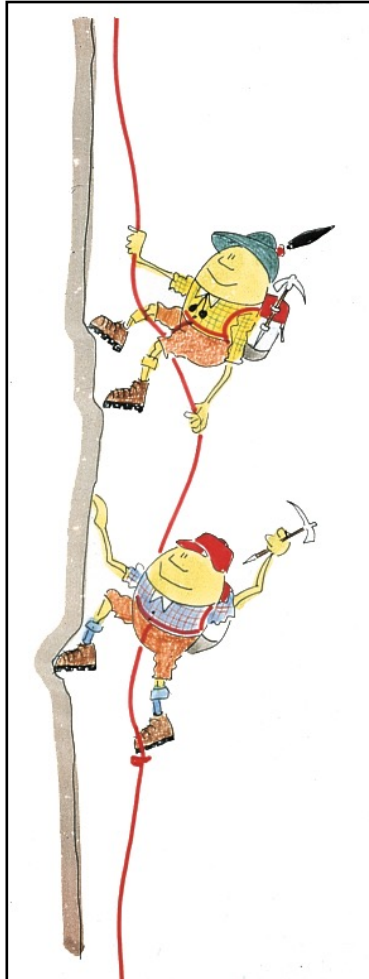
He uses water, air, humans, animals, food, for his spreading in the world around him

25. *LIGU Bacteria Family* Diffusion



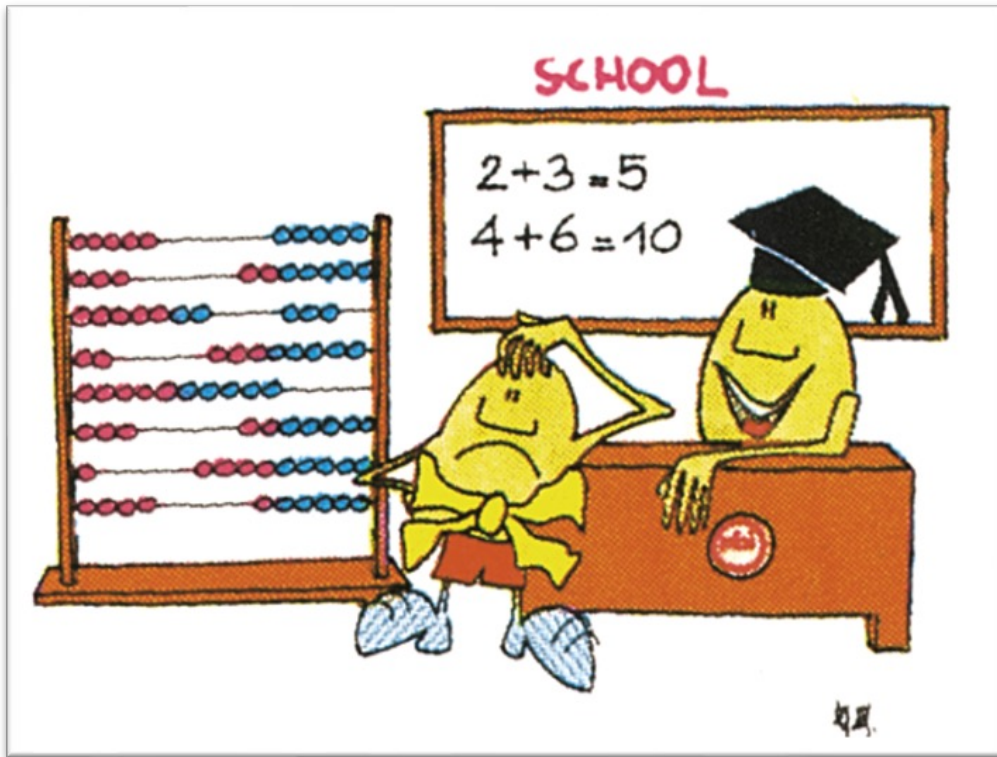
Several germs are connected
together to form a colony
(Colony Forming Unit)

26. LIGU *Bacteria Family* Diffusion



He is able to survive in difficult situations on any type of surfaces

27. *LIGU Bacteria Family* Education



He is an ideal student: he quickly and easily learns any type of activity

28. *LIGU Bacteria Family* *Arbiter elegantiarum*



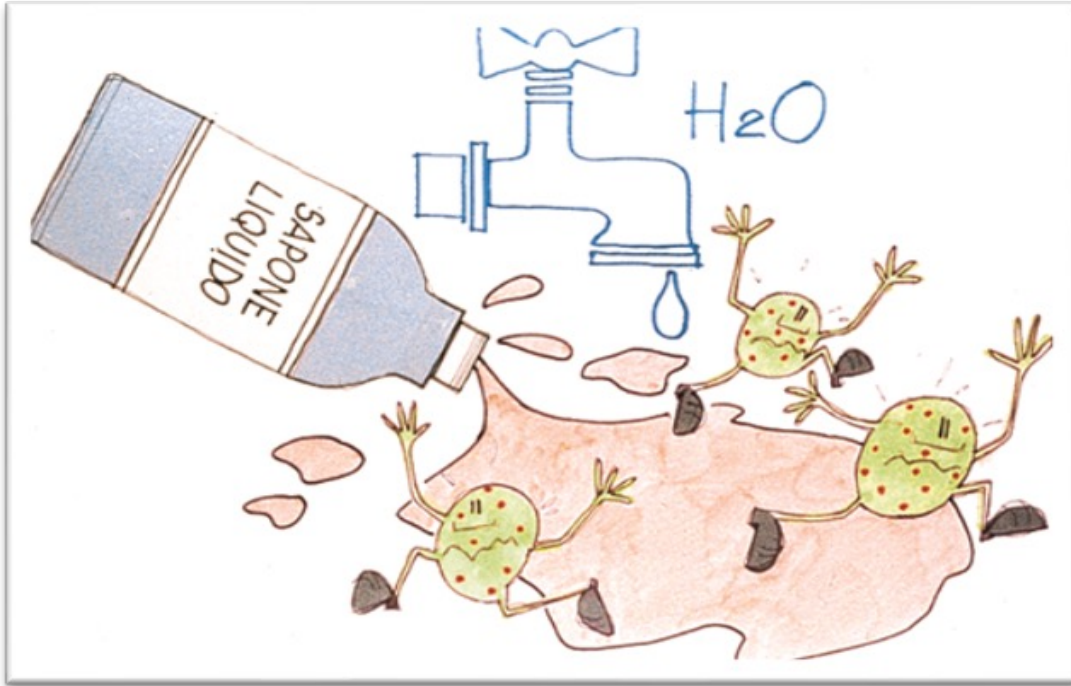
He can dress different colours and
parfums

29. *LIGU Bacteria Family* Policeman



The humans uses him as «hygiene indicator» to control the Public Health in food, drink, water, etc.

30. *LIGU Bacteria Family* *Homo sapiens*



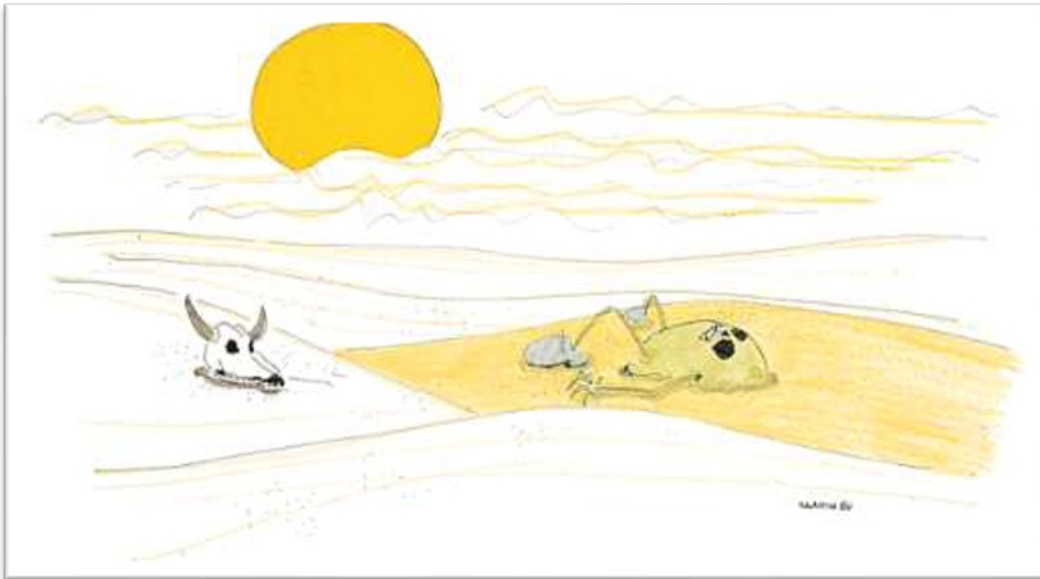
The humans use water and soap to neutralize the bad bacteria

31. *LIGU Bacteria Family* Steam



The humans fight bad bacteria with
different methods
(e.g. steam sterilization)

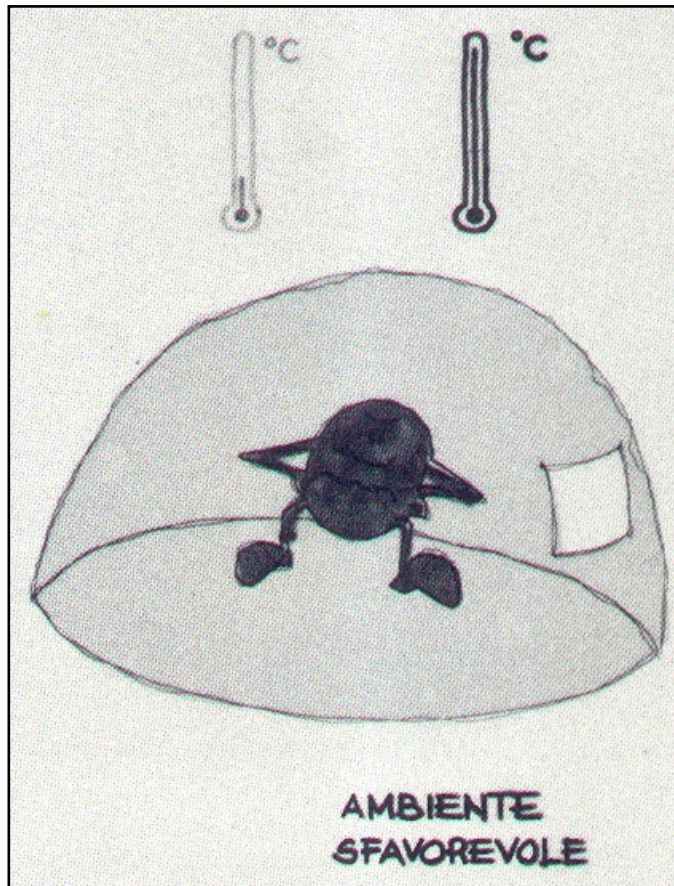
32. LIGU *Bacteria Family* dry



The humans fight bad bacteria
with different methods
(e.g. dry sterilization)

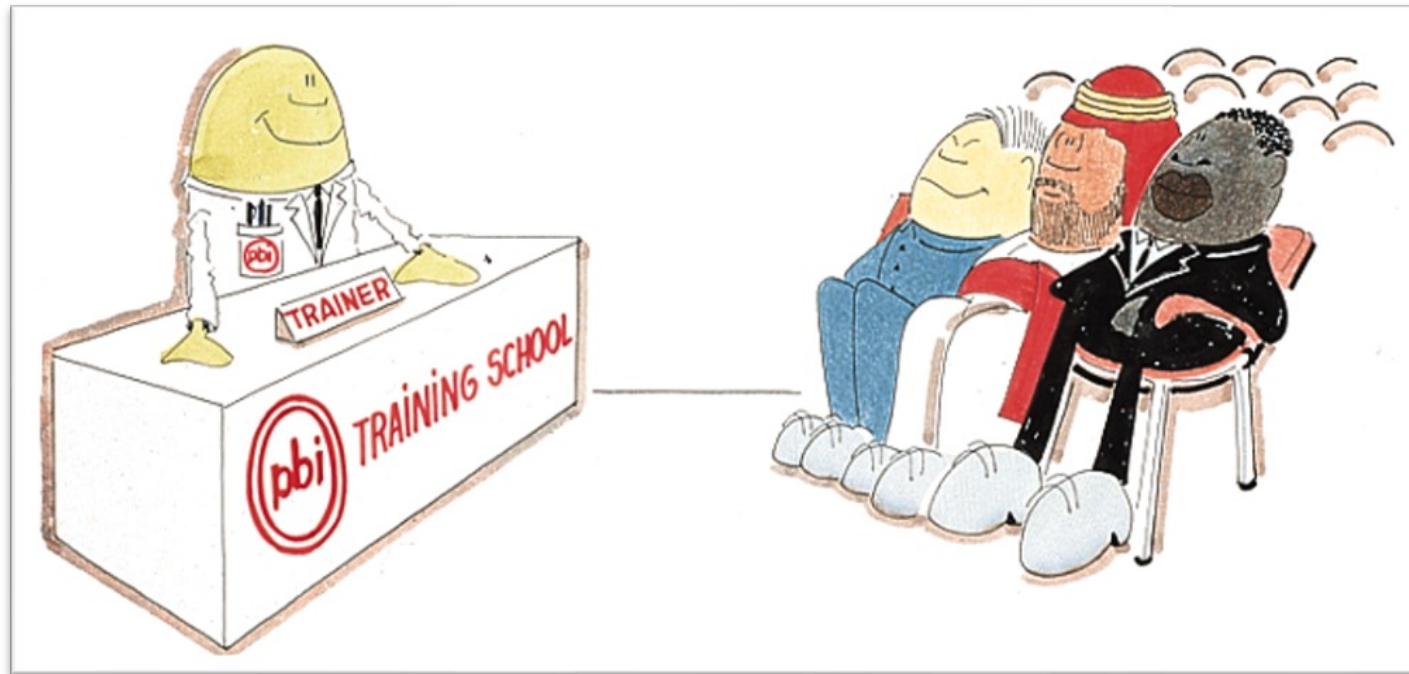
33. *LIGU Bacteria Family*

Surviving in adverse condition



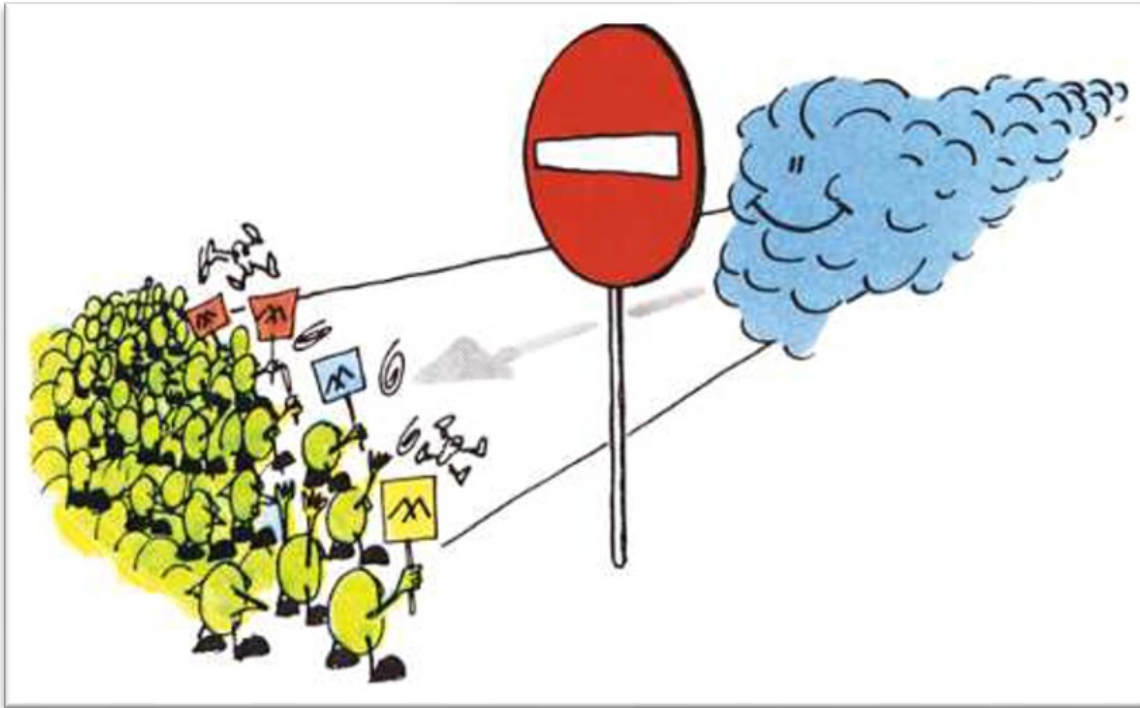
In adverse environmental conditions
he protects himself by an envelope
(spore) for several years

34. *LIGU Bacteria Family* Race



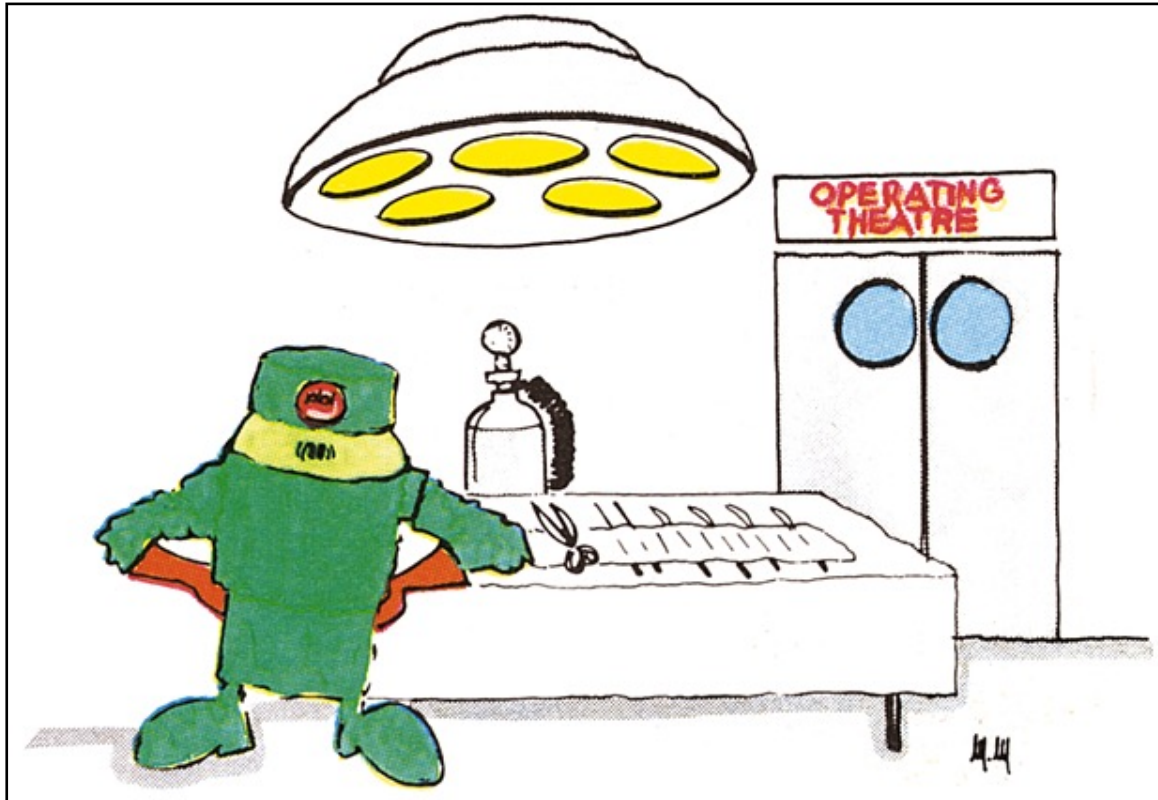
The microorganisms have differen origins

35. *LIGU Bacteria Family* in the traffic



He doesn't like to be
neutralized by HEPA filters

36. *LIGU Bacteria Family* CleanRoom



He is considered an enemy in
Clean Room and operating
theatres in hospitals

37. *LIGU Bacteria Family*

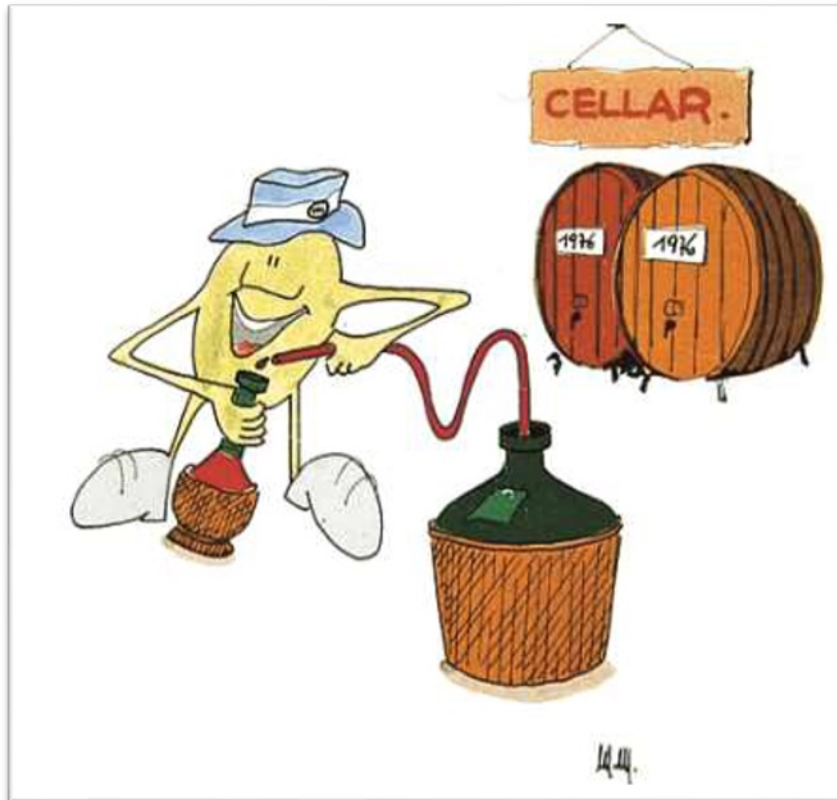
The capture from the air



The microorganisms can be captured from the air by impact on agar culture using an aspiration

38. *LIGU Bacteria Family*

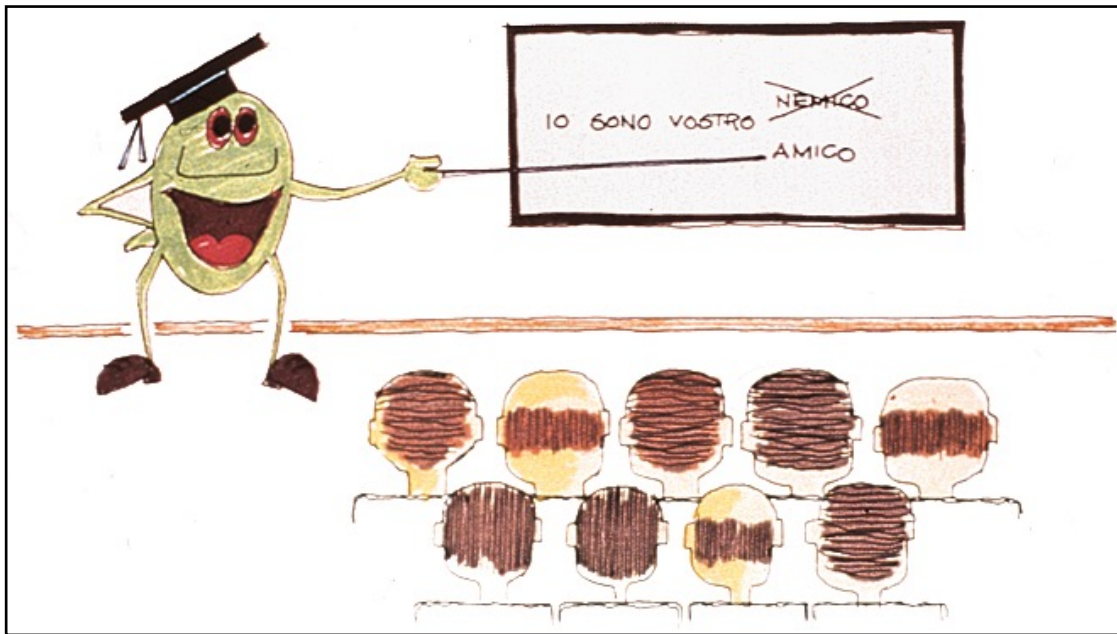
The *homo sapiens* best friend



Food, dairy, wine, medicines are produced with his help. Thanks to his activity, several human lives are saved and fantastic lunches and dinners are served.

39. LIGU *Bacteria Family*

The *Homo sapiens* best friends



He is our friend!
If *homo sapiens* is on our planet, it is also his merit

40. *LIGU Bacteria Family* Bad Boy



THE BACTERIUM *TRIOBASOPHILUM* DURING HIS
TRAINING TO REACH THE TARGET

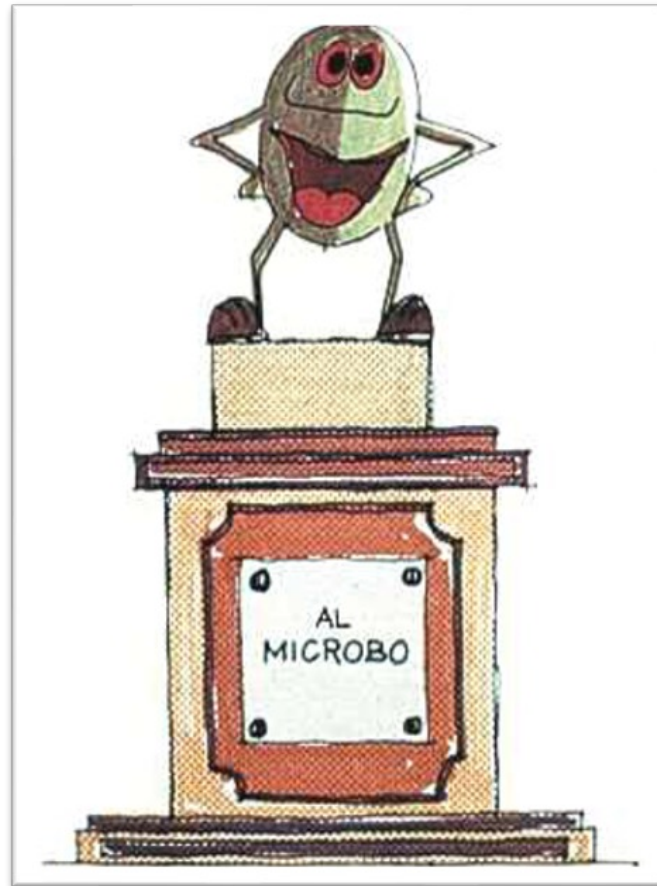
Over 95% of bacteria are
«good boy» but a minority are
«bad boy».

41. *LIGU Bacteria Family* Guilty



Some microorganisms are «bad boy» and when they produce disasters are death sentenced

42. *LIGU Bacteria Family* monument



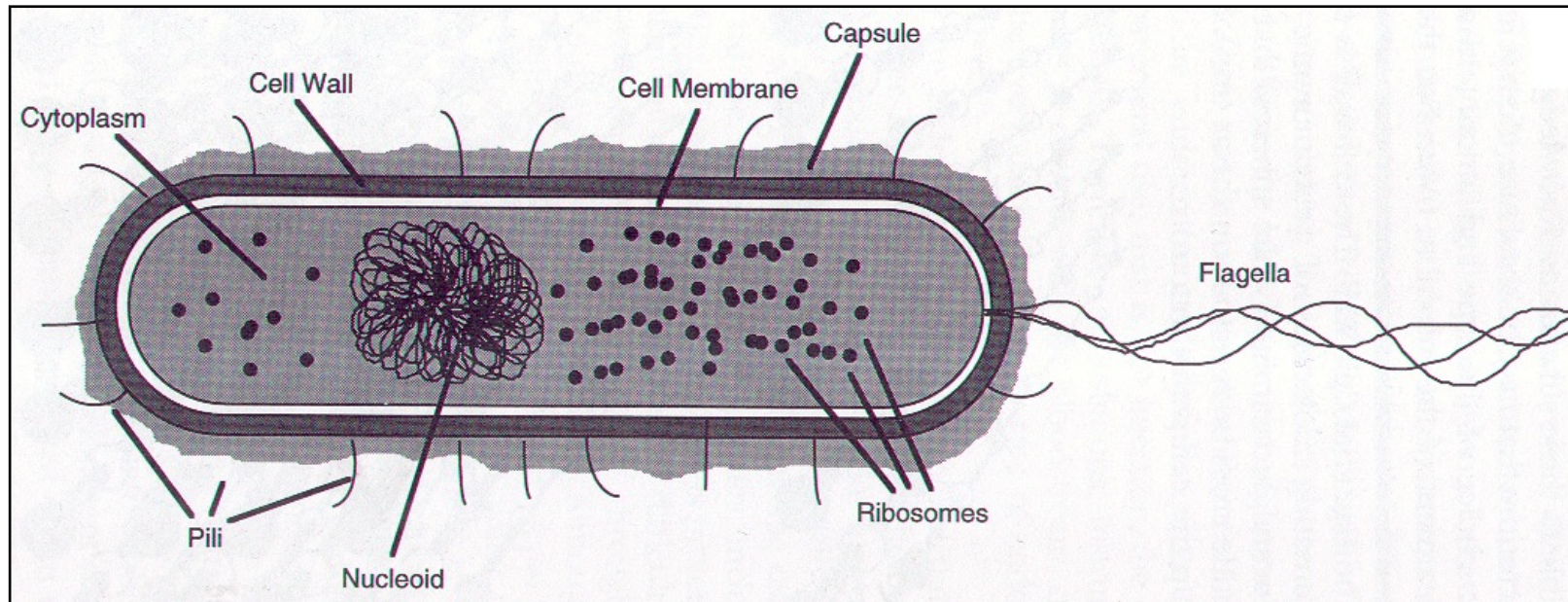
Man can live on earth thanks to the intense activity of microbes and it is therefore properly to raise a monument in their honor

43. *LIGU Bacteria Family* monument



Man can live on earth thanks to the intense activity of microbes and it is therefore properly to raise a monument in their honor

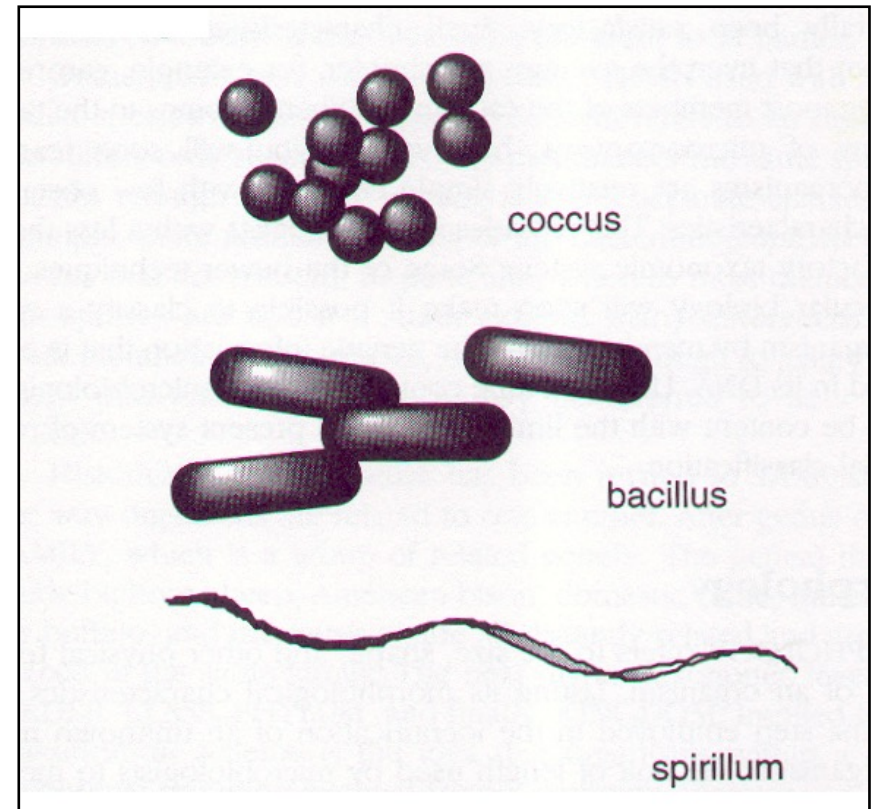
Basic Microbiology microscopy



The microbial cell

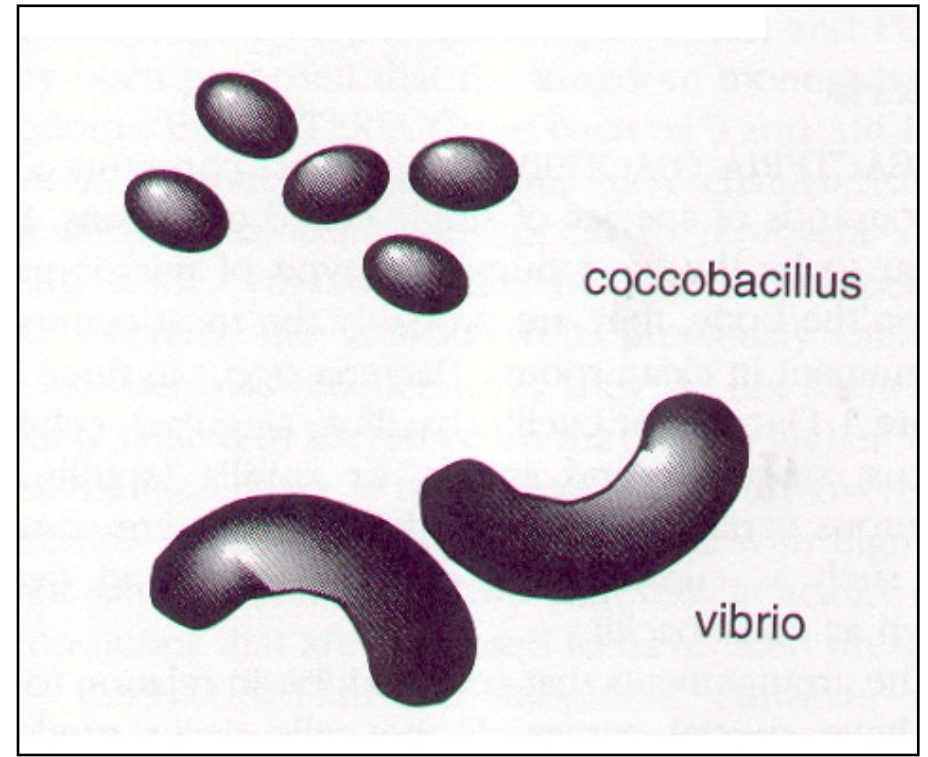
Basic Microbiology microscopy

The bacteria are classified in 3 groups depending from their looking: coccus, bacillus, spirillum



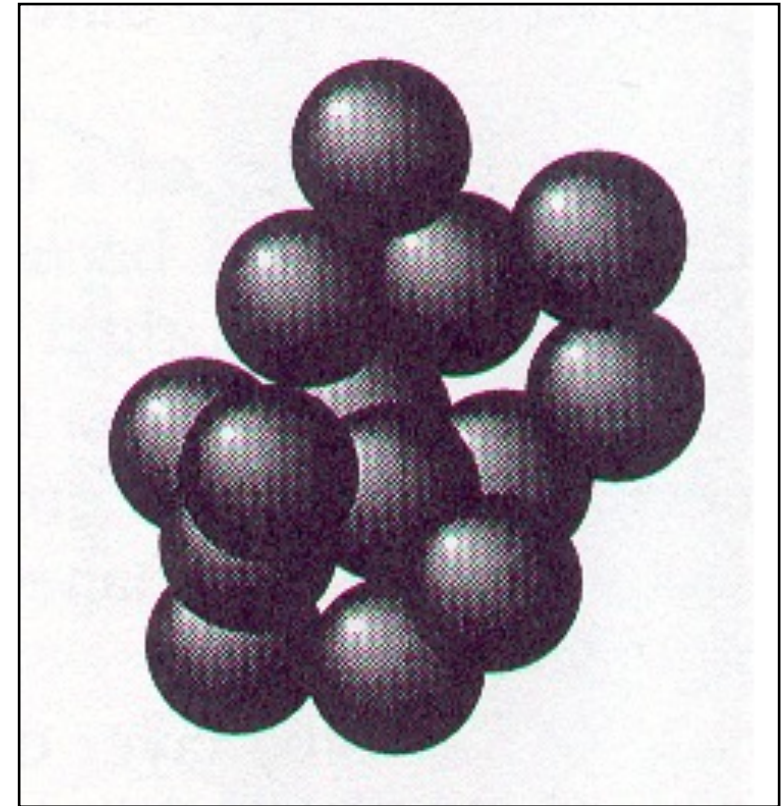
Basic Microbiology microscopy

Some bacteria have different
looking: coccobacillus, vibrio

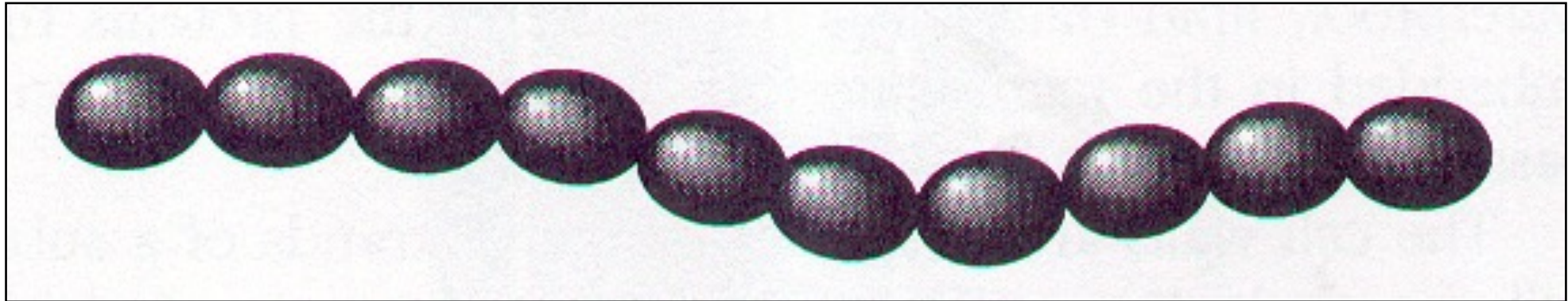


Basic Microbiology microscopy

For the spherical shape and union
these bacteria are called
staphylococcus



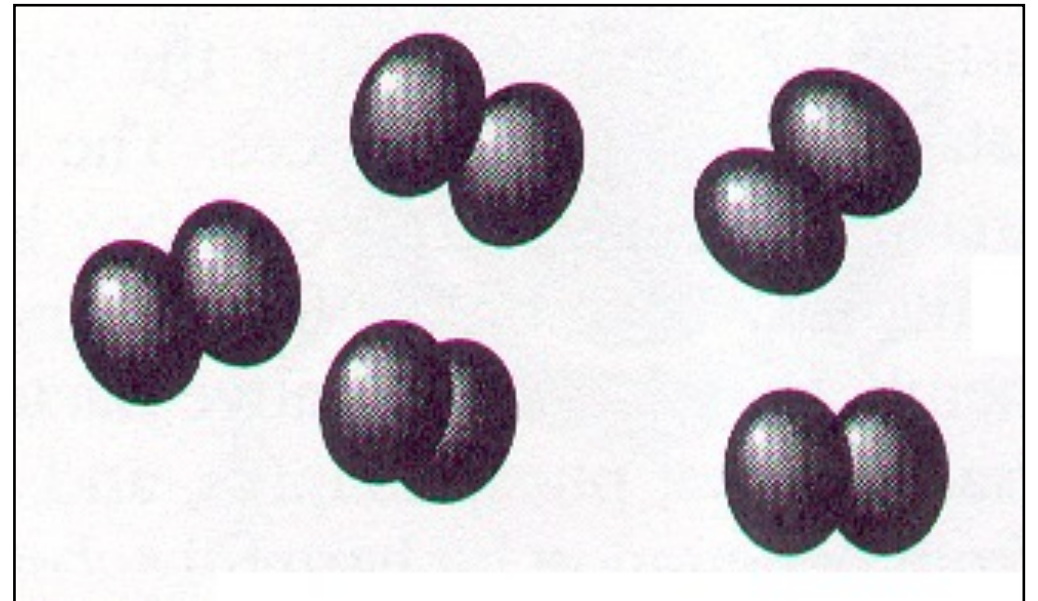
Basic Microbiology microscopy



The name Streptococcus is used for the description of coccus that quite often are found in chains

Basic Microbiology microscopy

Two united coccus are called
diplococcus



Microorganism growth on Agar

Demo A

Purpose. To show why the surface should be cleaned and washed before disinfection.

Action.

1. The operator press a Contact Plate on the cleaned and disinfected surface.
2. The operator repeats the same action on a dirty surface.

Microorganism growth on Agar

The colonies (CFU) will appear on agar surface after 24-48 hours of incubation at 32-37°C.



Microorganism growth on Agar

Demo A

Comment.

At the end of incubation time, the not cleaned dirty surface will show a higher number of colonies.

This will be the demonstration how the correct sanification is important.

Microorganism growth on Agar

Demo B

Purpose. To show why utensils and surfaces in contact with food must be cleaned

Action. The operator press the Contact plates on the surface of blames, mixers, working table before and after the cleaning procedures

Microorganism growth on Agar

Demo B

Comment.

At the end of incubation time, the higher number of colonies on the Contact plate used before cleaning protocol will show the importance of a correct procedure.

Microorganism growth on Agar

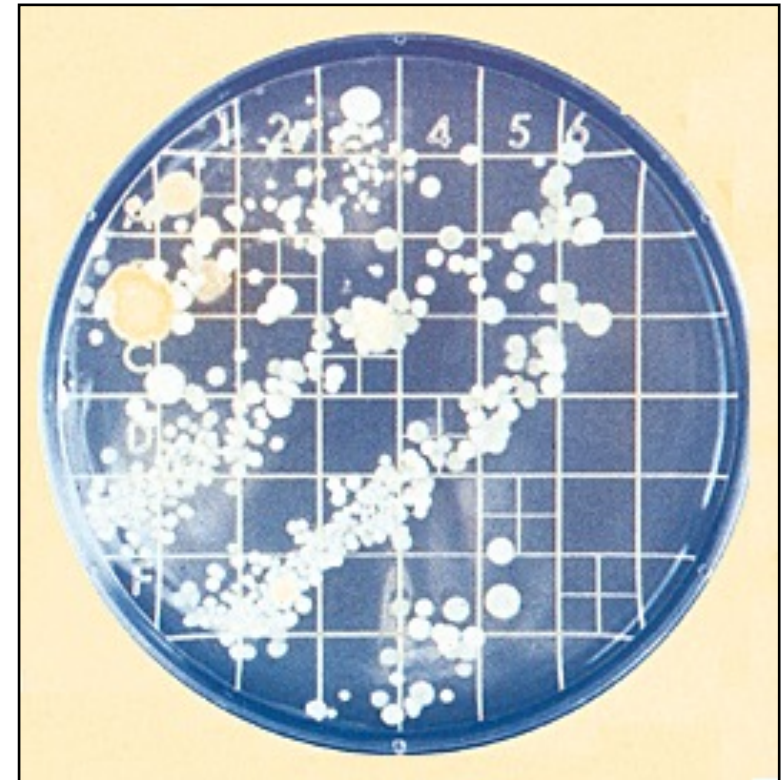
Demo C

Purpose. To show the importance of hands washing after the use of toilet.

Action. The operator press a Contact plate on the finger before and after the use of toilet (with and without hands washing).

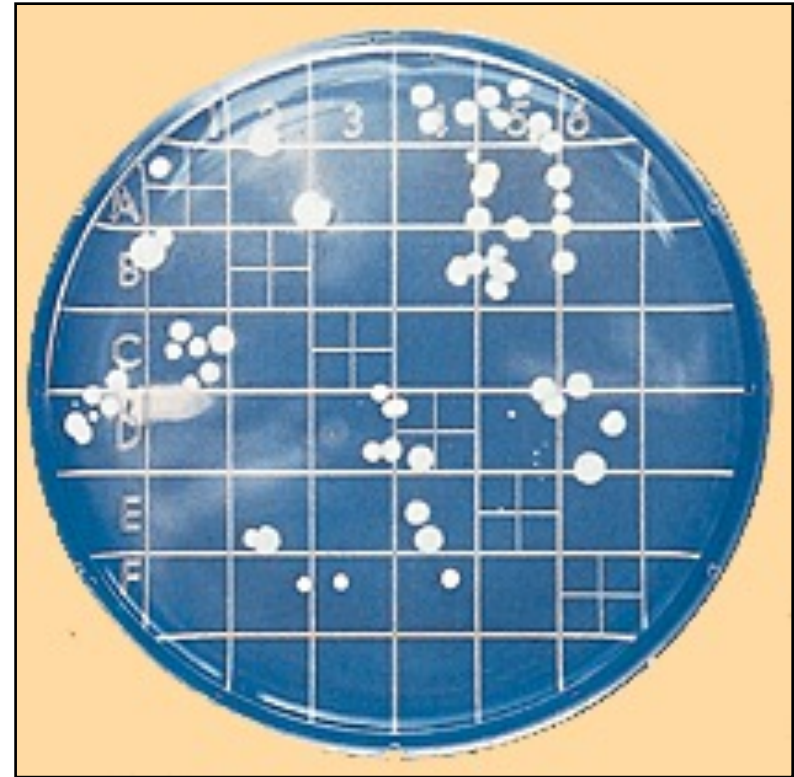
Microbiological fingers imprint

Fingers Imprint
before washing



Microbiological fingers imprint

Fingers Imprint after
cleaning and washing



Microorganism growth on Agar

Demo C

Comment.

At the end of incubation time, the higher number of colonies on the Contact plate used before cleaning will show the importance of a correct procedure at the end of use of toilet

Surface Example of Microorganisms growth

ufc/24 cm ² Surfair Plate	Punteggio	Classificaz.
0	+	No contaminazione
1-9	++	Bassa contaminazione
10-20	+++	Alta contaminazione
21-100	++++	Livello di Allerta
101- confluenti	+++++	Livello di Allarme

Microorganism growth on Agar

Demo D

Purpose. To show how the dry cleaning of the floor is a high source of contamination in comparison with wet cleaning

Action. Air sampling with an air sampler before and after dry and wet cleaning cycles

Microbial air sampling

Microbial air sampler
TRIO.BAS MONO



Microbial air sampling

Microbial air sampler
TRIO.BAS DUO



Microbial air sampling

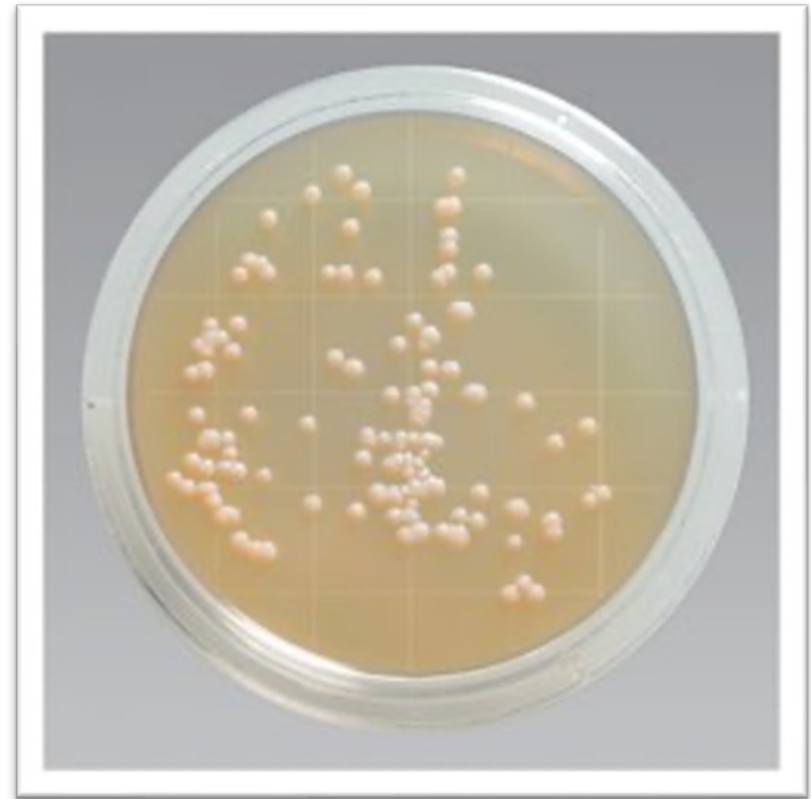
Microbial air sampler
TRIO.BAS TRIO



Microbial air sampling

Protocol

- A. Insert a Contact plate
- B. Aspirate 250 lts of air
- C. Transfer the plate to incubator
- D. Count the colonies



Microorganism growth on Agar

Demo D

Comment.

The difference in number of colonies on the Contact plates with dry and wet cleaning procedures will show the importance of a correct cleaning protocol

Microorganism growth on Agar

Demo E

Purpose. To show the efficacy of aerosol disinfectant in a closed environment (e.g. refrigerator, ripening room, etc.)

Action. Air sampling with microbial air sampler before and after disinfection treatment

Microorganism growth on Agar

Demo E

Comment.

The lowest number of colonies on the plate after incubation will show the efficacy of the disinfection treatment.

Microorganism growth on Agar

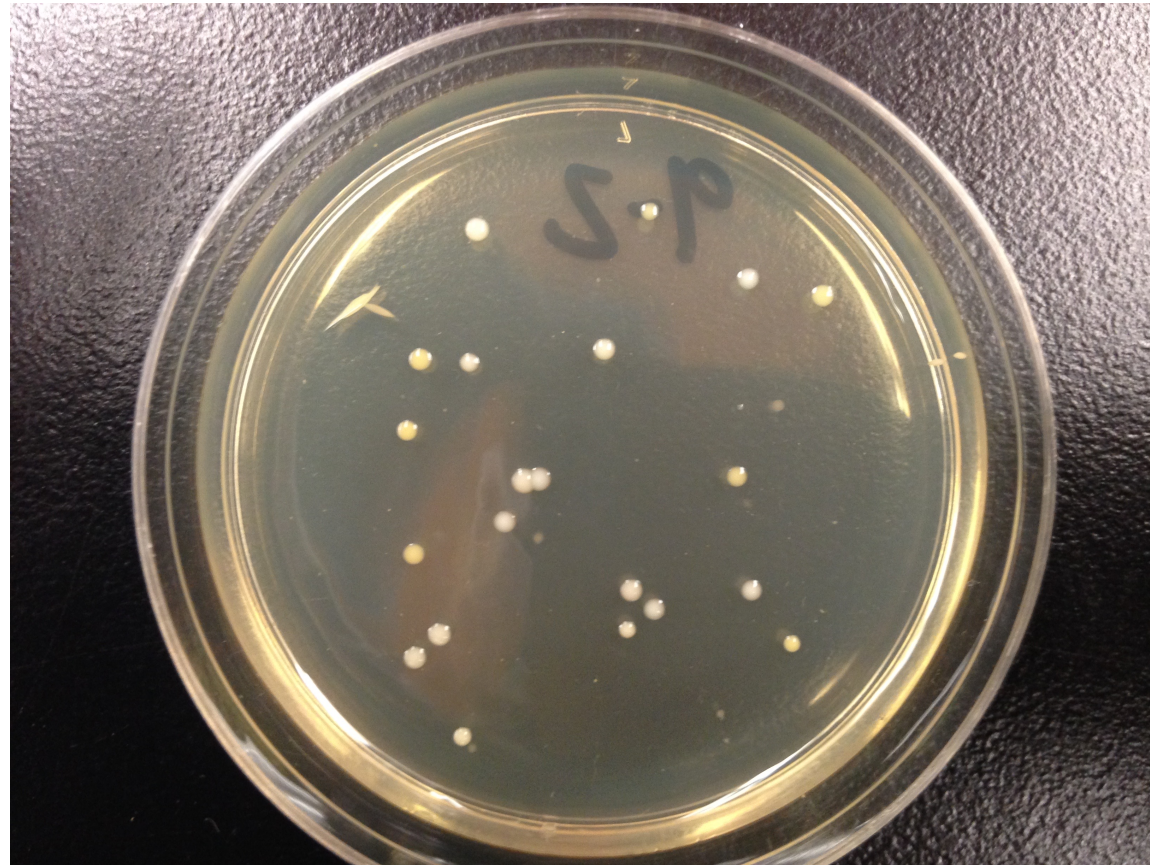
Demo F

Purpose. To show how a crowded room is more contaminated than an empty room

Action. Air sampling with microbial air sampler «At Rest» (before activity starting) and «In Operation»

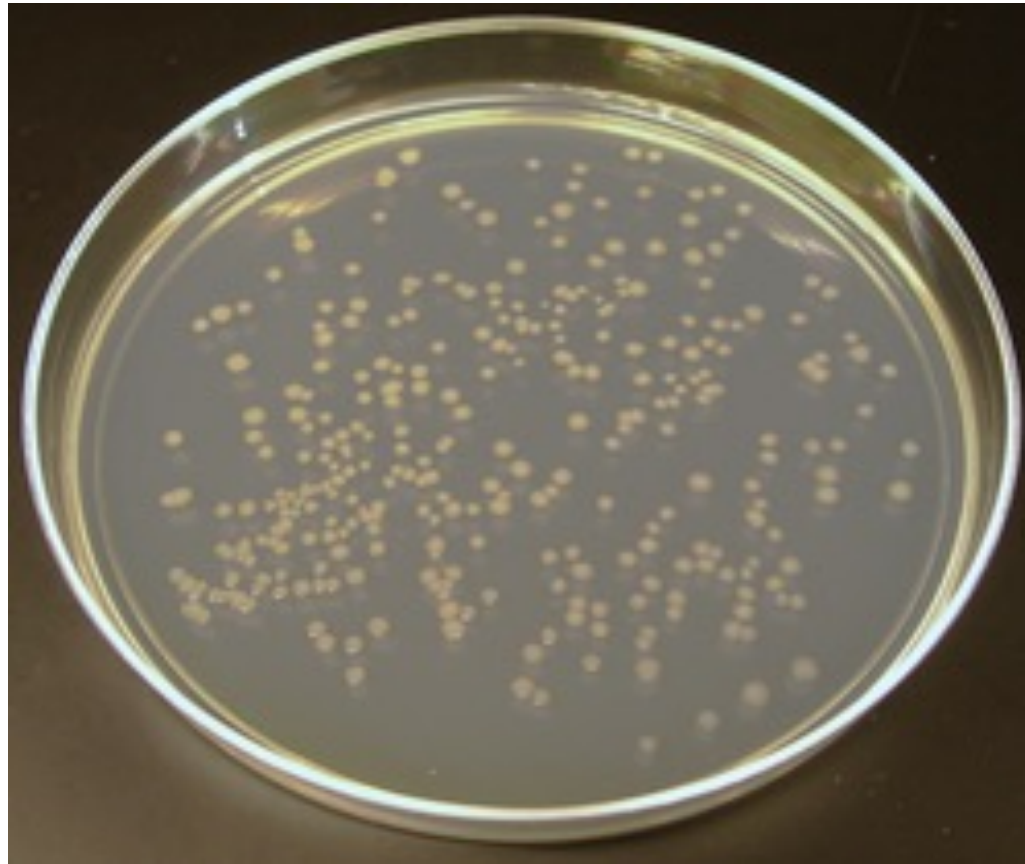
«At Rest»

(e.g.: Low contamination in food factory)



«In Operation»

(e.g.: High contamination in food factory)



Microorganism growth on Agar

Demo F

Comment.

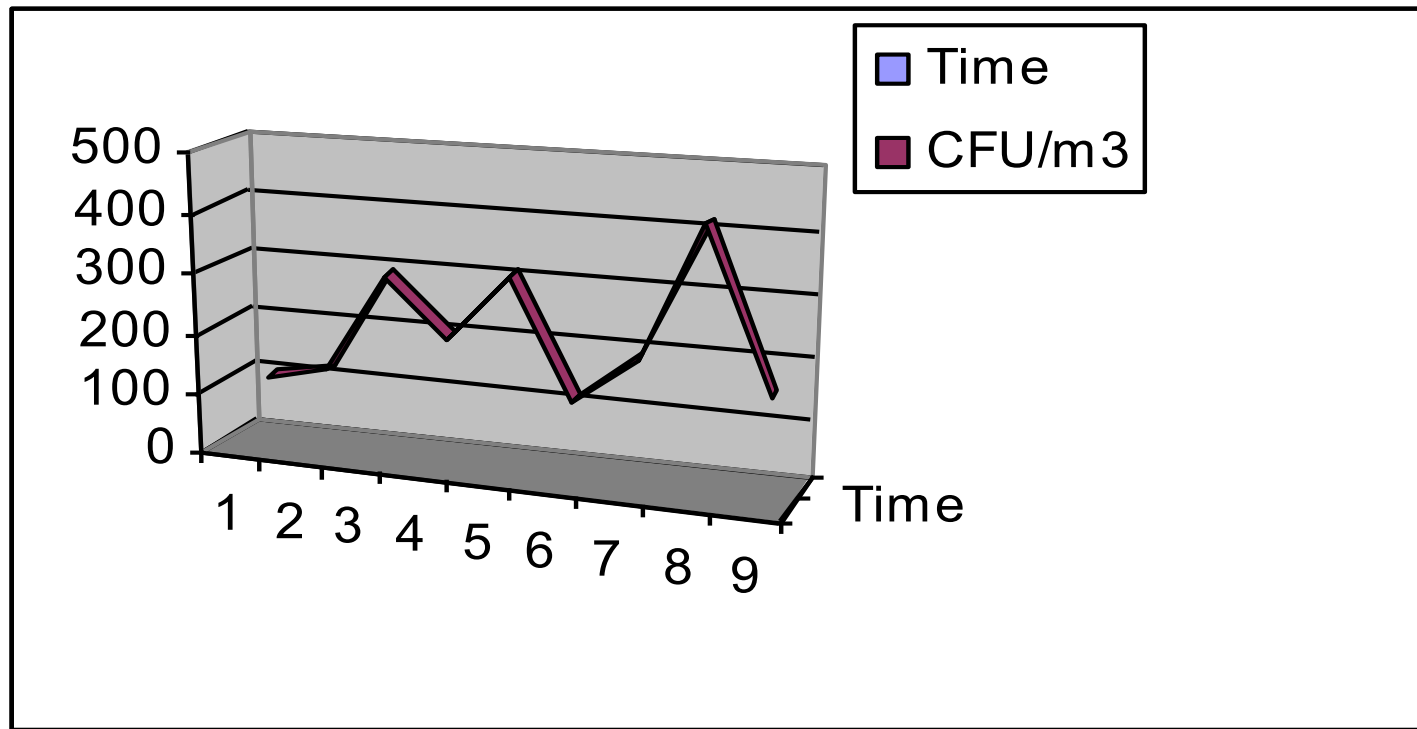
The lower number of colonies on the plate of «At Rest» after incubation will show how the presence of people brings contamination.

Result presentation on graphic

The reported graphic is an example of what it is possible to produce in Excel

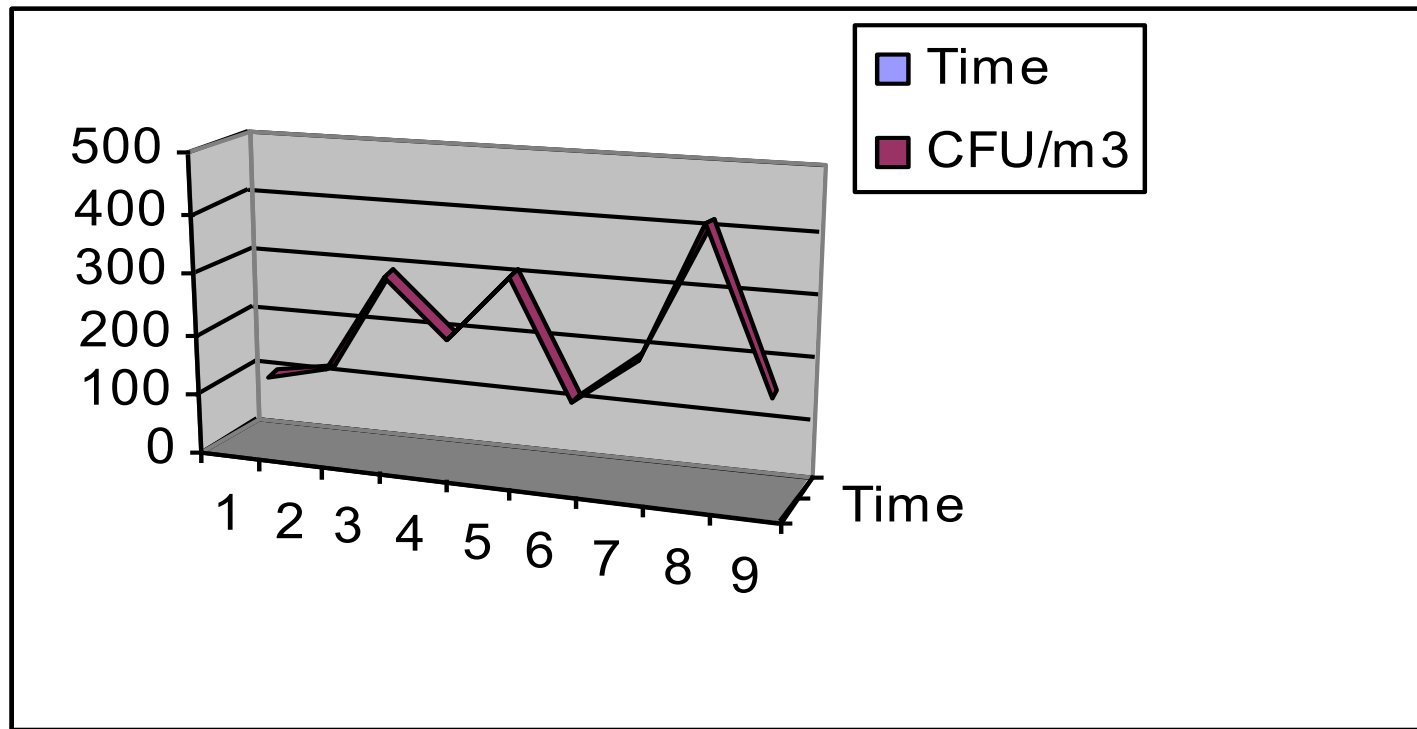
It is important that the graphic is updated and visible for all the personell to give the possibility to everyone to evaluate and comment the results.

Graphic example



Graphic example

The trend of the graphic (week by week) is the most effective method to involve the operator in the evaluation of operative hygienic conditions



Correct behaviour in Cleanroom



Correct behaviour in Cleanroom

1. Avoid nervous movements such as scratching your head or touching the chin or cheeks.

Such actions contaminate gloves and generate contamination.

Correct behaviour in Cleanroom

- 2. Never open the clothes and reach undergarments when operating.
- 3. The talk should be limited to essentials.

Correct behaviour in Cleanroom

4. Everything that falls on the floor should not be reused before being "refurbished". In gathering the fallen objects, protect the gloves or replace them.
5. Gloves should be replaced whenever it is believed they are contaminated and in case of damage or breakage.

Correct behaviour in Cleanroom

6. Do not put on the production line spilled products

Correct behaviour in Cleanroom

7. Eating, drinking, chewing are not allowed, not only because the foods and their packages are a source of contamination, but also because the movements of the mouth and face while chewing contribute to increase the particle contamination of the air.

Correct behaviour in Cleanroom

8. Wear clean clothes, light in color, maintaining a high degree of personal cleanliness

Correct behaviour in Cleanroom

- 9. Wash and disinfect the hands carefully with appropriate products, before starting work for any reason.
- 10. Use hand towels and other disposable cleaning cloths.

Correct behaviour in Cleanroom

11. Remove all jewelery and insecure, when you handle the product with your hands; take off your rings.

Correct behaviour in Cleanroom

- 12. If the gloves are used to handle the product, keep them intact, washed, disinfected, replace them frequently.
- 13. Wear hats or other effective means to retain the hair.

Correct behaviour in Cleanroom

14. Do not keep personal items or clothing, do not eat or drink, do not smoke in the working areas of the premises, in the areas destined to the cleaning of equipment and utensils.

15. Take any precaution to prevent the possible contamination of the product (protective masks, easily disinfected rubber shoes etc.).

Conclusions for the trainer

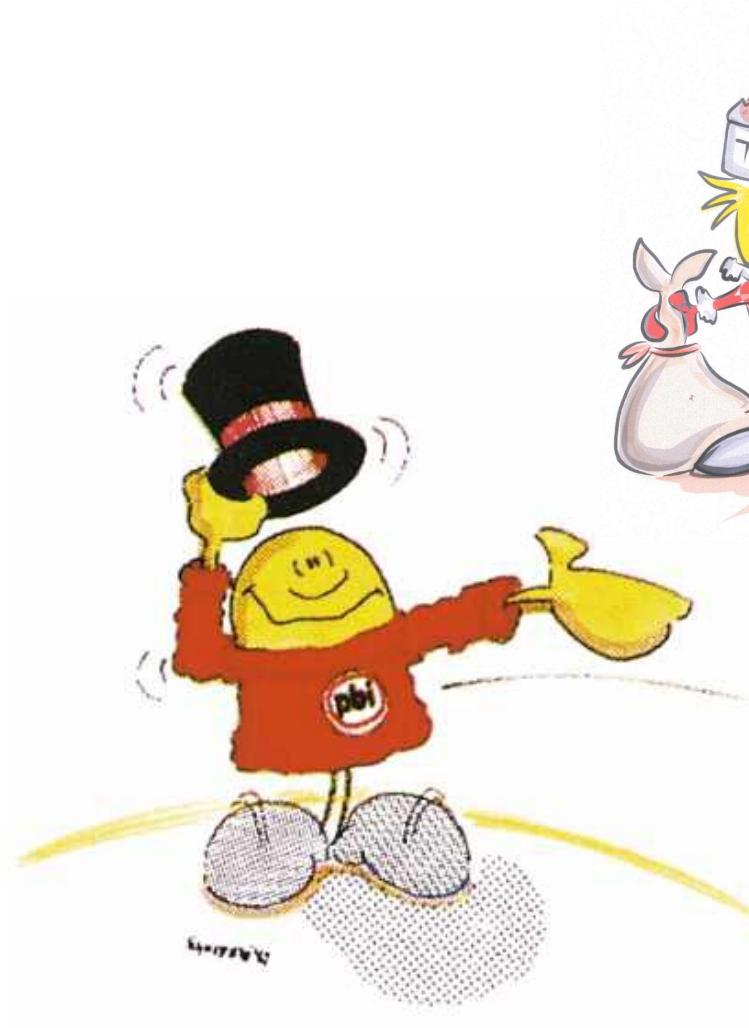
To implement an educational plan, you must follow some basic points:

1. Management Involvement
 2. Availability of material for demonstrations
 3. Training planned in subsequent sessions
- in order to enable participants to "absorb" and "digest" the basic knowledge of hygiene

Conclusions for the trainer

- 4. Persist even in case of initial difficulties and lack of cooperation on the part of some operators
- 5. The practical task must be completed with practical demonstrations largely centered on proper hand washing

Thanks to the LIGU Bacteria Family actors



MY NAME IS BACTERIUM TRIOBASOPHILUM

Usus magister est optimus (Latin)

(Cfr. Cicerone, Pro Rabirio Postumo, 4; and e De Orat., 1, 4)

***The exercise and the example
are the best teacher***