



Conferenza internazionale Exchange
“Piattaforma di scambio per il
Trasferimento di Metodologie e
Tecnologie nei Paesi in via di
sviluppo”.

Mercoledì 5 dicembre 2007, FAO, Roma

MBS-HACCP&ACQUE Easy test

A KIT FOR FAST, EASY AND LOW-COST
MICROBIOLOGICAL ANALYSIS OF WATER

*Presented by MBS srl, spin-off
of Roma Tre University*

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1. *The problem*

1.1 billion lack access to an “improved” drinking water supply and many more drink water that is grossly contaminated.

4 billion cases of diarrhoea occur annually and 1.8 million people die every year from diarrhoea diseases, the vast majority children under 5.

WHO estimates that **94% of diarrhoeal cases are preventable** through modification to the environment including interventions to increase the **availability of clean water**, and to improve sanitation and hygiene.

How can water safety be ensured?

Water chlorination alone is not the best solution since only a real-time monitoring of water contamination will avoid of using excess chlorine which may cause serious health problems.

Analytical monitoring has therefore increasingly become the focus of assuring water quality. However, by the time results are available the water has generally been supplied and many have been consumed.

For microbial hazards in particular, the **cost of analyses** and, in some circumstances, **lack of the laboratory facilities** may be additional constraints.



Comprehensive management of water quality, from catchment to consumer, is the most valuable preventive approach in the provision of safe drinking-water. This approach can be applied to any type of water supply – from a complex piped supply in a major city through to a village well (water safety plan)

A framework for safe drinking-water

The key activities required in actively controlling water safety:

- ❑ Health-based targets, set by national authorities.
- ❑ Checking whether systems are capable of delivering safe drinking-water through a 'system assessment' from catchment to consumer. This requires developing an understanding of occurrence, control and treatment of the different microbes (and other contaminants) in a particular water supply. To support these assessments, detailed characterizations of microbial hazards and critical reviews of control measures are prepared.
- ❑ Systematic monitoring for safe management achieved through monitoring of control measures by simple, frequently applied methods, building on 'sanitary inspection' and the multiple barrier principle in water supply practice.
- ❑ Ensuring water safety plans are in place documenting the assessment and monitoring plans, management and communication procedures for both 'normal' and 'incident' circumstances.
- ❑ Ensuring independent oversight 'surveillance', often through auditing-type approaches.

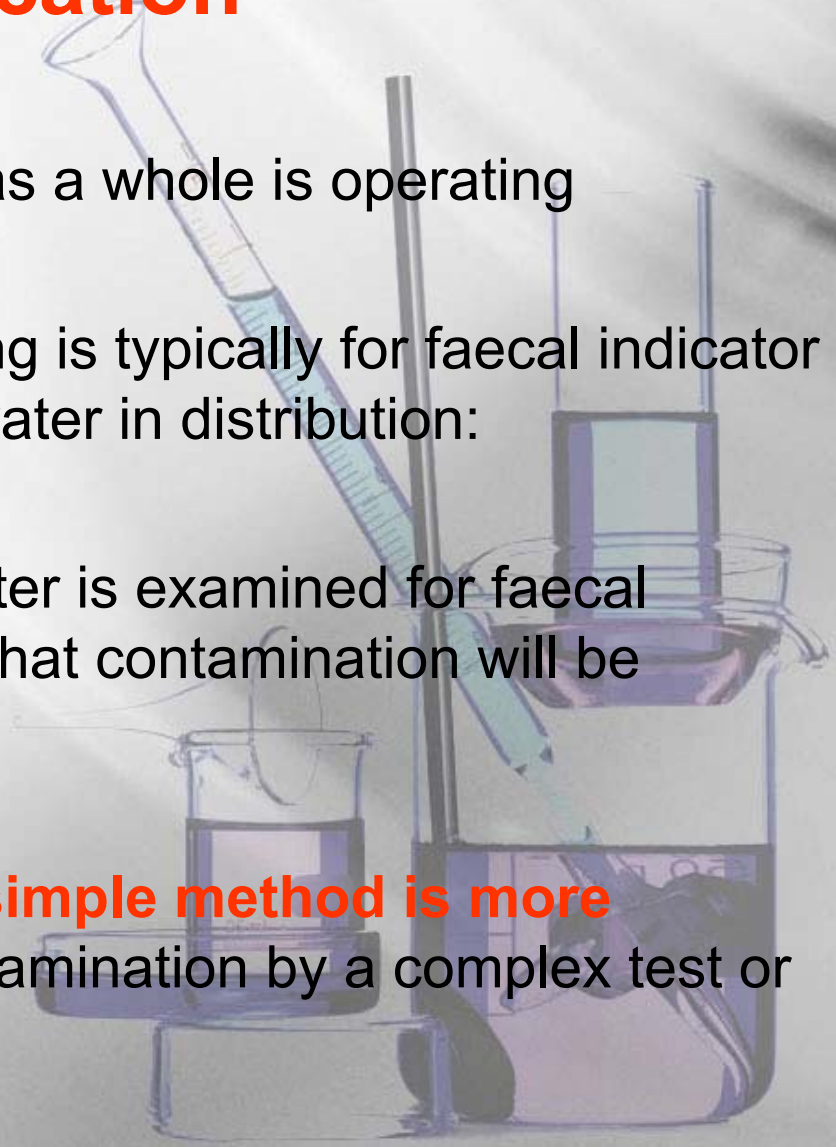
Source: WHO's guidelines for drinking water quality

Verification

Reassurance that the system as a whole is operating

For microbial verification, testing is typically for faecal indicator bacteria in treated water and water in distribution:

1. the more frequently the water is examined for faecal indicators, the more likely it is that contamination will be detected.
2. frequent examination by **a simple method is more valuable** than less frequent examination by a complex test or series of tests.



2. the MBS solution:

MBS-HACCP&ACQUE Easy test is an analytical kit utilizing **disposable, ready-to-use reaction vials for fast microbiological analysis of water** samples.

MBS, set-up and patented by Roma Tre University, **measures, through the color change of the medium, the catalytic activity of redox enzymes** of the main metabolic pathways of specific bacteria.

The analyses can be carried out by untrained personnel and everywhere they are necessary, without the need of any other instrumentation but a thermostat provided on request

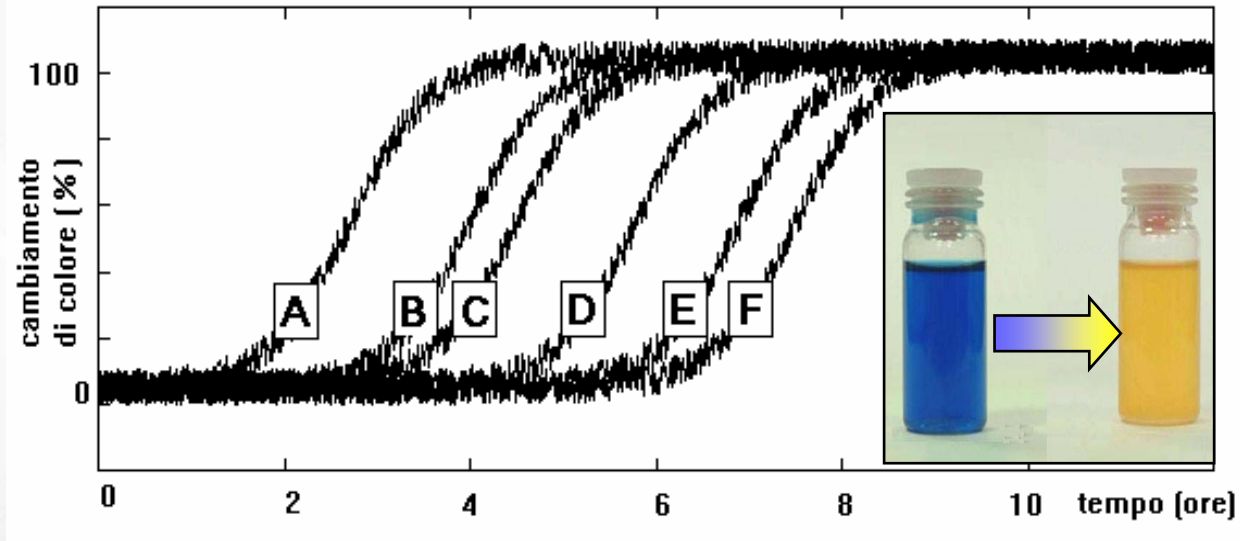
MBS-HACCP&ACQUE Easy test features:

- **Fast**
- Easy
- Sensitive
- Selective
- Low-cost
- Validated

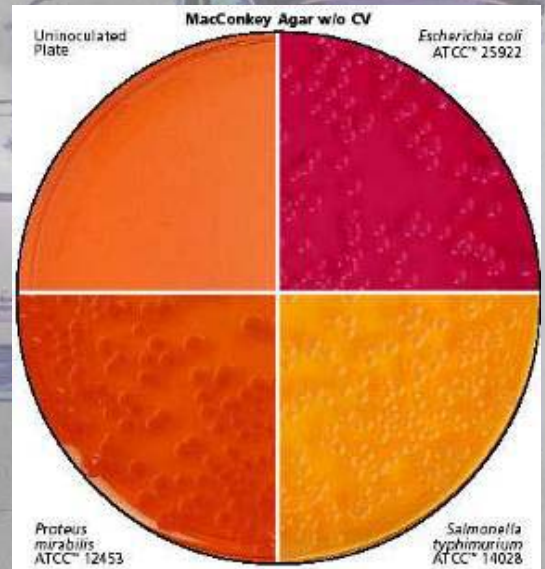


Fast: 3 to 10 fold faster than traditional analyses

MBS analysis in 3-12 hours, depending on microbial content of the sample



Traditional analyses (Plate count) are based on microbial replication and they need 24-48 hours for allowing the growth of colonies (the red dots on the Petri plate, deriving each one from a single cell).



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Easy: The analyses can be carried out
anywhere **(1/5)**

The vial is
disposable and
ready-to-use,
already containing
the analytical
reagents



Easy: The analyses can be carried out
anywhere **(2/5)**

No sample
homogenization is
required before
analysis.



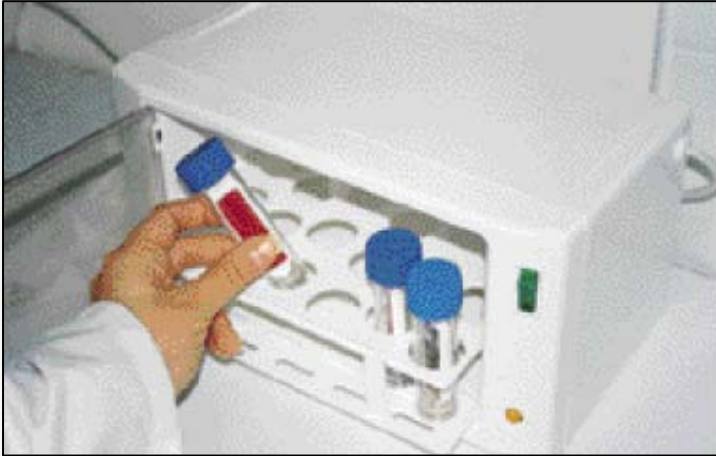
2: sample addition

Easy: The analyses can be carried out
anywhere **(3/5)**

The vial is closed
and the reaction
starts

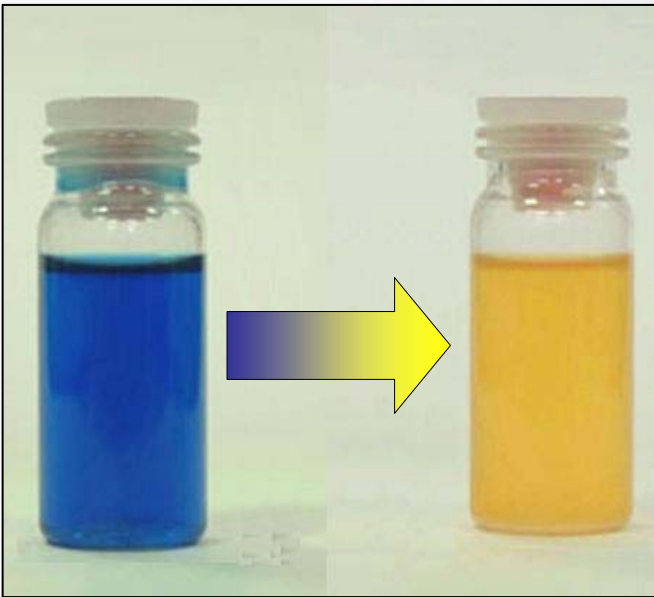


Easy: The analyses can be carried out
anywhere **(4/5)**



4: incubation and visual control of color change

Color change (blue to yellow) is controlled by visual inspections and the time required for color changes is correlated with the number of viable bacteria in the analyzed samples by means of specific correlation tables.



Easy: The analyses can be carried out
anywhere **(5/5)**

Final sterilization
allows to dispose
safely the used
vials after
analysis.

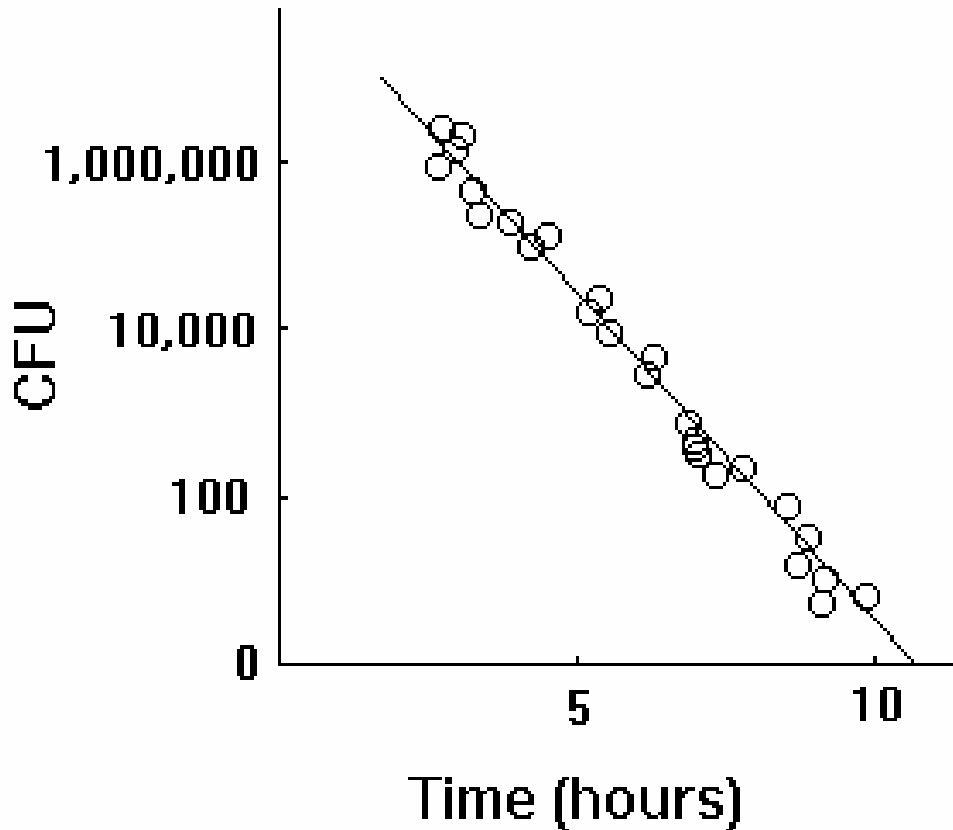


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- **Fast**
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- **Sensitive**
- **Selective**
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- **Sensitive:** Down to the theoretical limit of just 1 viable microbial cell present in the sample
- **Selective:** Up to the experimental limit of 99.9% with respect to other bacterial species



Correlation between
time for colour change
and bacterial
contamination of the
sample

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- 
- A collection of laboratory glassware including a graduated cylinder, a beaker, and a flask with a stirrer, all containing a blue liquid. The glassware is arranged in a cluster, with the graduated cylinder tilted and the beaker and flask upright. The background is a light, textured surface.

Low-cost: The overall cost of a single analysis is much lower than that of a traditional analysis.

Selective count of *E.coli* in a surface water

PLATE COUNT METHOD

TOTAL ANALYTICAL TIME: 50
hours

WORKING TIME: 2.5 hours

REAGENTS COST: 10 €

MBS METHOD

TOTAL ANALYTICAL TIME:
13.5 hours

WORKING TIME: 0.5 hours

REAGENTS COST: 5 €

MBS

MICRO
BIOLOGICAL
SURVEY

MBS-HACCP&ACQUE Easy test features:

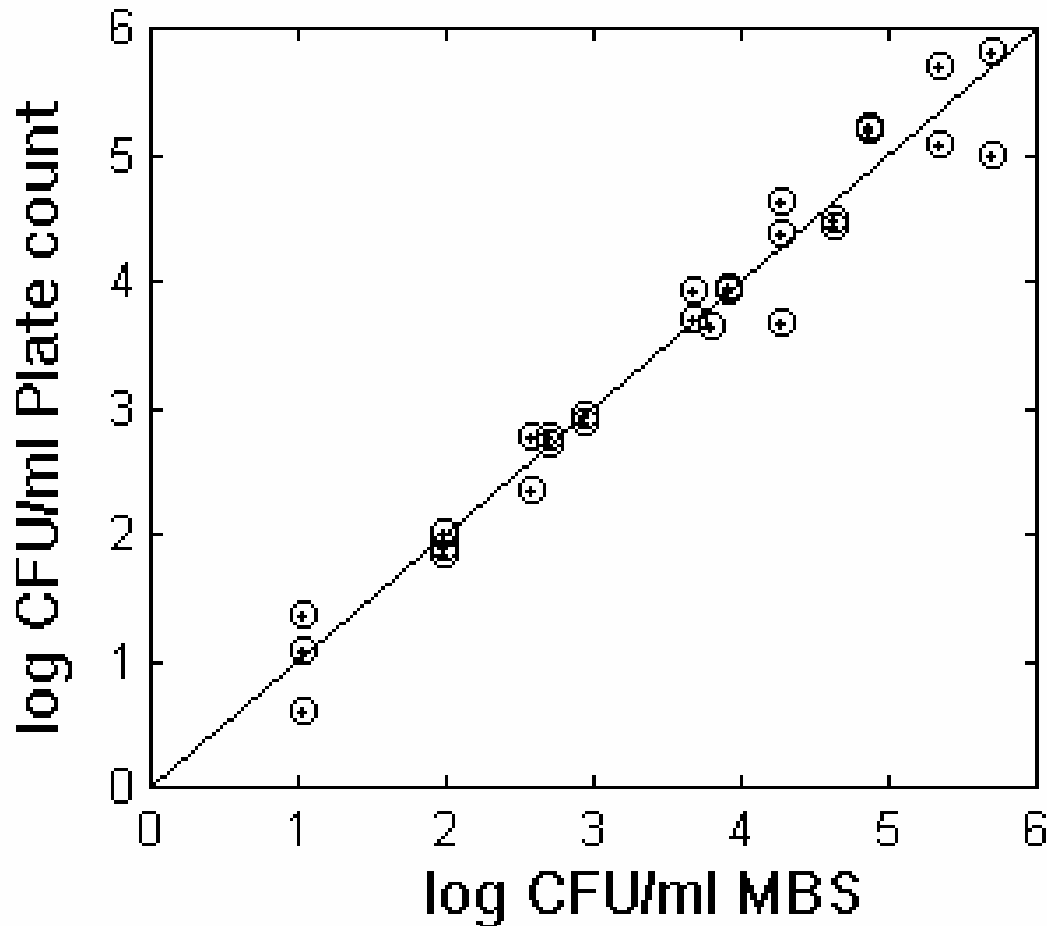
- Fast
- Easy
- Sensitive
- Selective
- Low-cost
- Validated



MBS

MICRO
BIOLOGICAL
SURVEY

Validated: in Italy according to the International Rules ISO 9998 (1991), ISO/TR 13843 (2000) and tested in a small pilot study in Ethiopia



Interlaboratory validation on river water.

- Dipartimento di Biologia, University Roma Tre
- Dipartimento di Igiene e Sanità Pubblica, Rome University "La Sapienza"

MBS

MICRO
BIOLOGICAL
SURVEY

MBS-HACCP&ACQUE Easy test features:

- **Fast**
- **Easy**
- **Sensitive**
- **Selective**
- **Low-cost**
- **Validated**

**No other competitor provides
altogether these features**

3. *The work plan:*

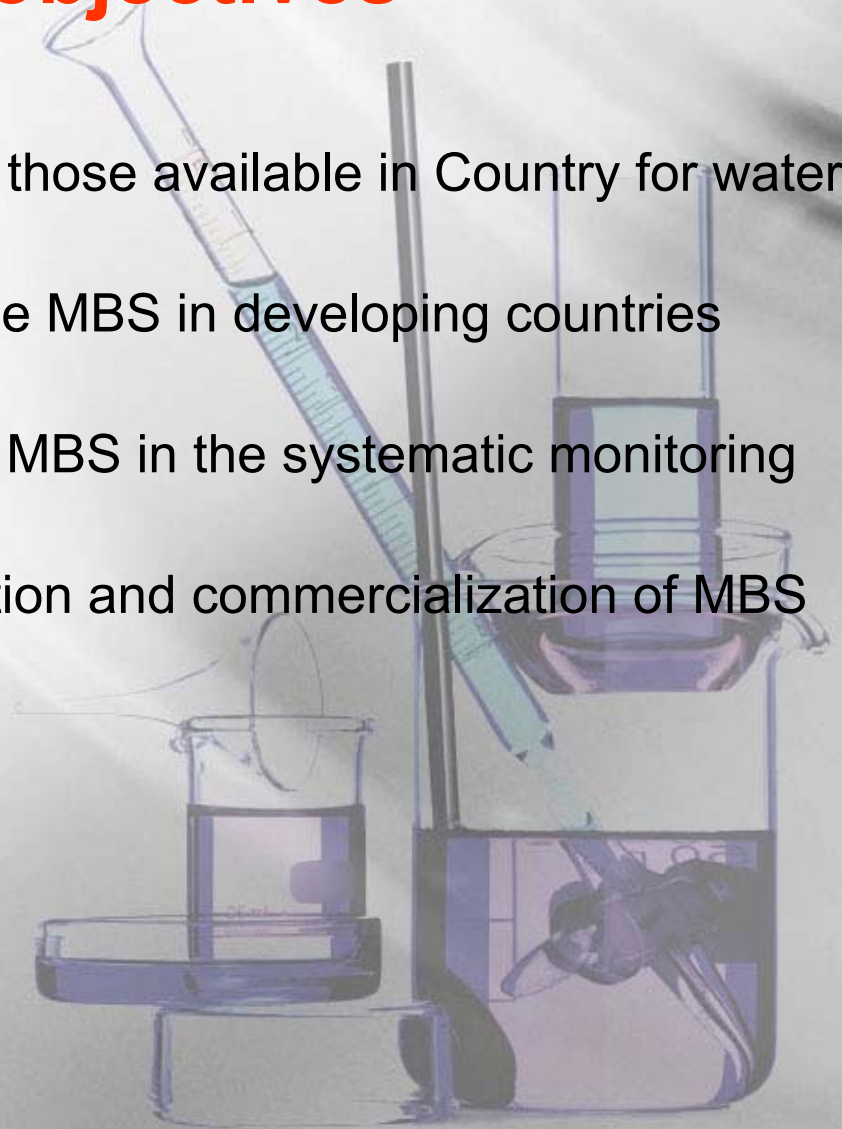
Experiences on the use of the MBS in developing Countries is missing, thus MBS srl is looking for **international partners and for trans-national co-operation** for carrying out, in the developing Countries:

- a field study,
- a market analysis
- an investigation for the local production and commercialization of MBS



Working objectives

- Compare the MBS method with those available in Country for water microbial analysis
- assess the feasibility of using the MBS in developing countries (including pros and cons)
- Identify the potential use of the MBS in the systematic monitoring of water
- Recognize the potential production and commercialization of MBS in Country



Working activities

- analysis of water supply system (piped system in major cities or village well). The exercise will be performed either cooperating during the local sanitary inspections or as an independent oversight analysis. The results will be compared to those obtained with the traditional methods for microbial water analysis available in Country.
- stakeholder work-shop including national authorities, university, NGOs, water supply system administration to present the results of the MBS analysis and discuss challenges for MBS promotion and use in Country
- interview with key informants (water supply management and national authorities) on systematic monitoring for safe management; water safety control/plans to discuss potential application of the MBS within the local system of water safety management
- Production and commercialization agreements with local firms

MBS

MICRO
BIOLOGICAL
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For more information:

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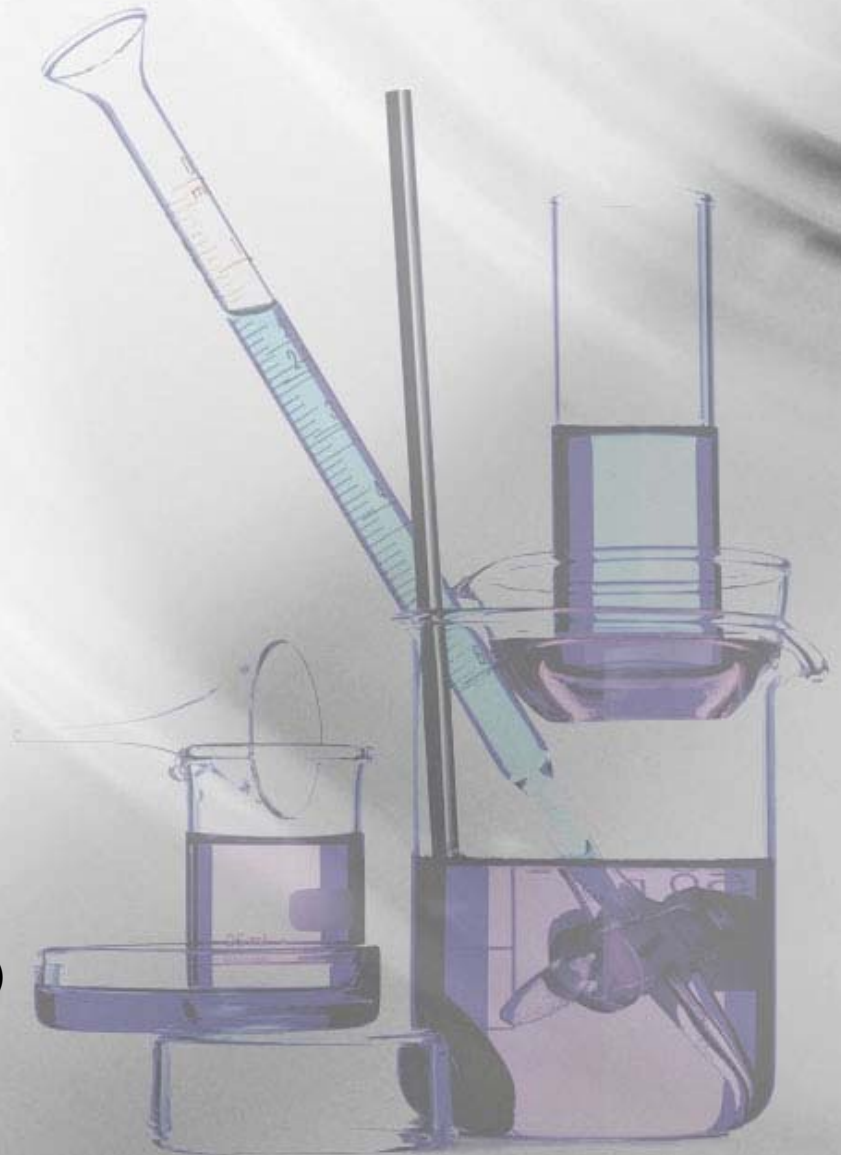
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DALLA RICERCA LA VITA

La MBS srl nasce dalle ricerche originali sviluppate in collaborazione con l'Università "Roma Tre" e rappresenta la migliore dimostrazione delle potenzialità di trasferimento tecnologico di ricerche universitarie che hanno importanti ricadute anche nel campo economico e sociale.



L'ing. Alberto Mari è l'amministratore delegato.

Il prof. Giovanni Antonini (Ordinario di Biologia Molecolare dell'Università Roma Tre) è il direttore scientifico

Fanno parte del team di ricerca e sviluppo le dr.sse Serena Salvucci, Alessandra Capodaglio, Alessandra Antonini, Eleonora Lo Cicero, Francesca Romana Priolisi.

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IN UNA PROVETTA**



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