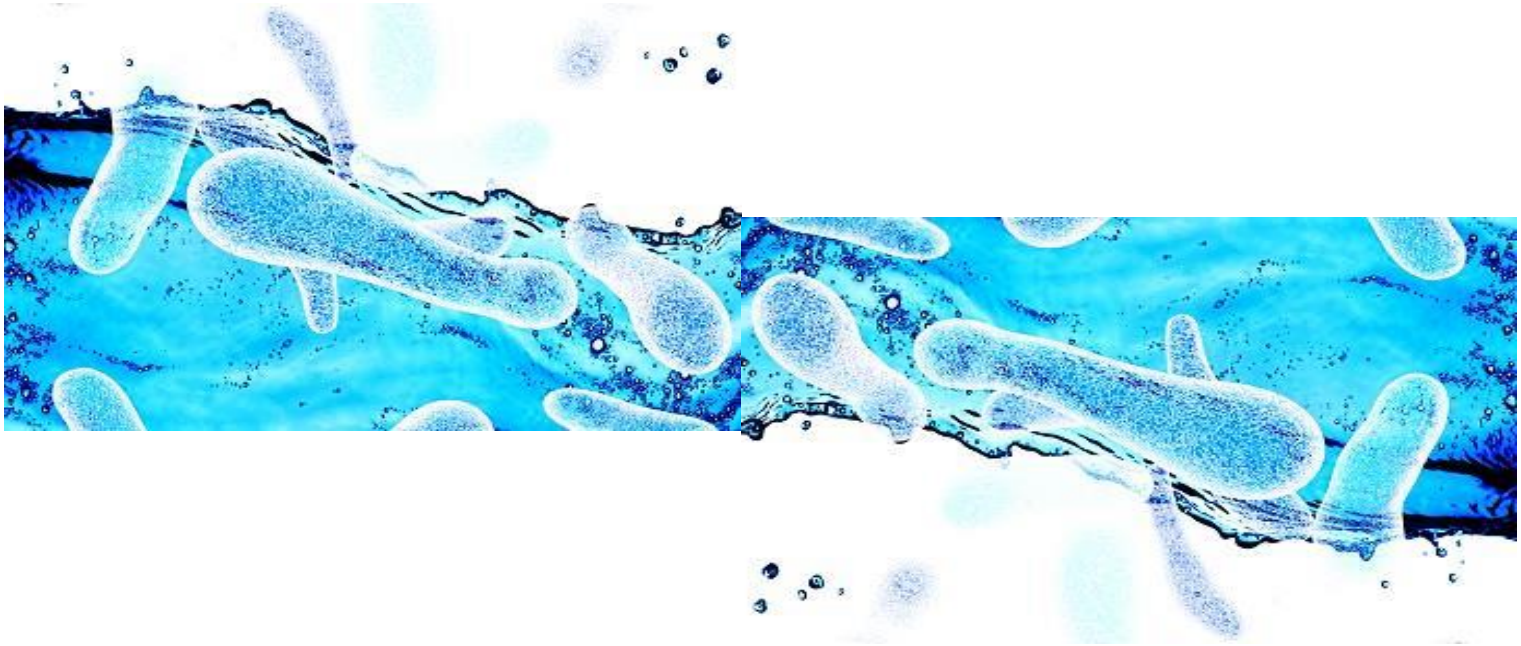
ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

ICFH Lisbon 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE

Potentially pathogenic microorganism's sampling and detection in water thermal SPAs

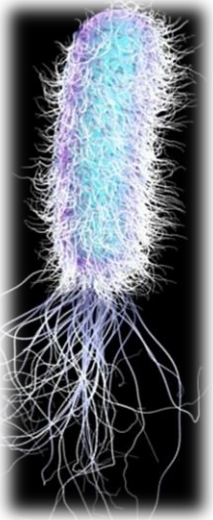
A. Monteiro, J. Santos, **E. Ribeiro**, S. Cabo Verde



ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

ICFH Lisbon 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE



Thermal bathing pools in spa centers

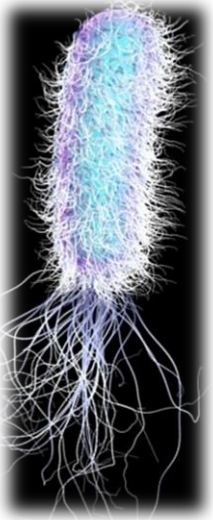
Microorganisms can spread through water vapor

Thermal water is not disinfected or treated, microorganisms such as *Staphylococcus*, *Pseudomonas* and *Legionella* sp. may grow in the indoor environment of these facilities and influence the health of users and staff.

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

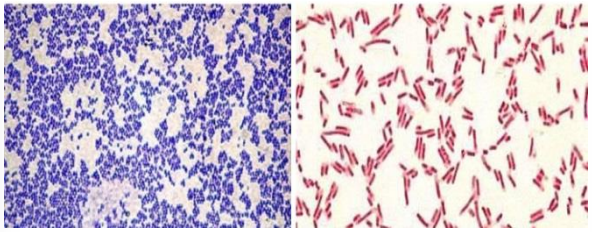
ICFH Lisbon, 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE

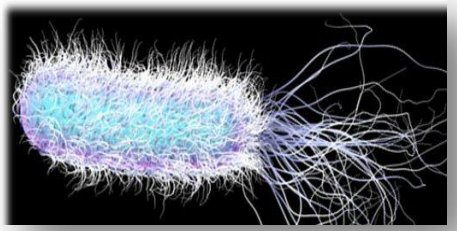


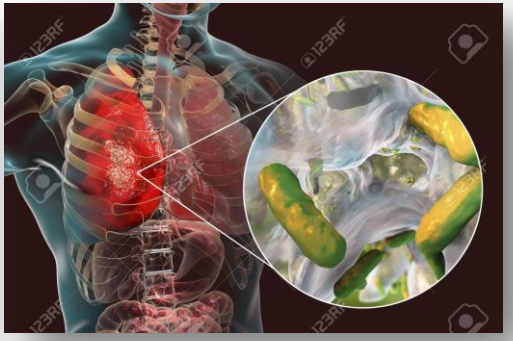
Staphylococcus aureus and Pseudomonas aeruginosa

S. aureus **and** ***P. aeruginosa*** **are well-known worldwide as a cause of numerous hospitalizations and deaths associated with extremely high mortality rates for invasive infections.**

Gm+ve cocci & Gm-ve bacilli



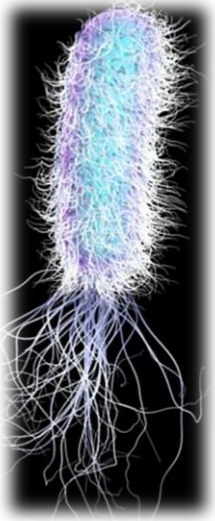




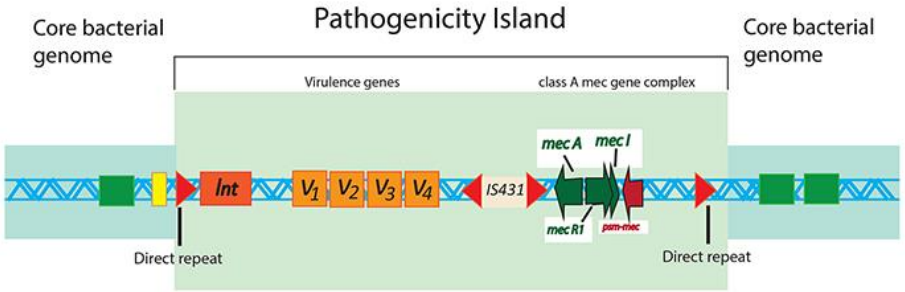
ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

ICFH Lisbon, 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE



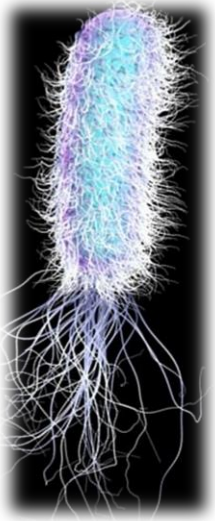
Methicillin Resistant *Staphylococcus aureus* (MRSA)



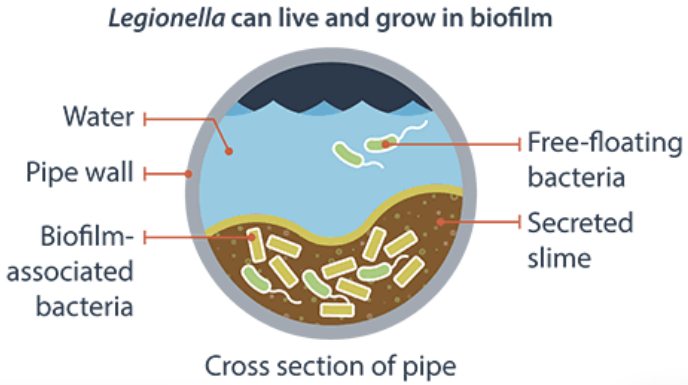
Health Care Associated HA-MRSA

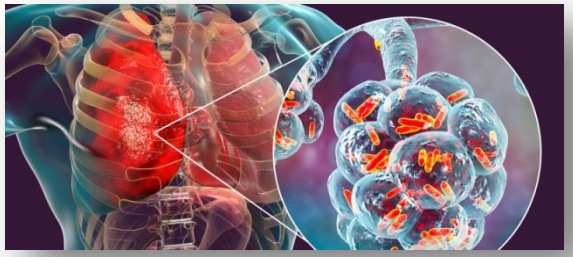
Community Associated CA-MRSA

Livestock Associated LA-MRSA



L. pneumophila



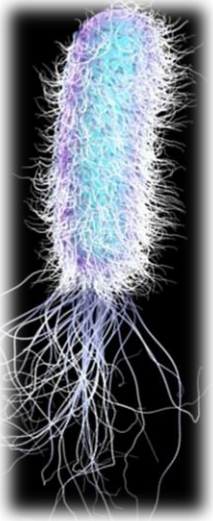


***L. pneumophila* outbreaks have been recorded potentially associated with severe pneumonia and Pontiac fever which is a severe public health issue**

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

ICFH Lisbon 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE



Objective

Assess the presence of potentially pathogenic microorganism's in two thermal SPAs in Portugal and propose recommendations.

- ***S. aureus*** **methicillin sensible (MSSA) and resistant (MRSA)**
- ***P. aeruginosa***
- ***Legionella sp.***

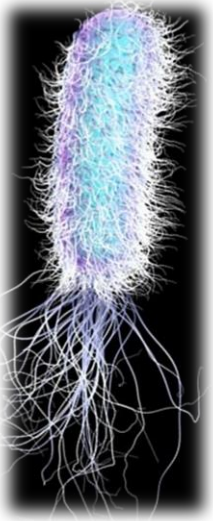
BRISAir

Bioburden and Radon in Indoor SPAs Air

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

ICFH Lisbon 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE



Material and methods

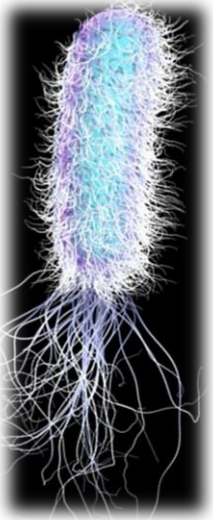
Surface samples – SPA A
Thermal Pool
Bertholet treatment
Vichy Shower
Double Cab Treatment
Spa pool
Otolaryngologist treatment
Reception
Workers locker room

Surface samples – SPA B
Vichy Shower B1
Otolaryngologist treatment B1
Thermal pool B1
Reception B1
Reception B2
Thermal pool B2
Vichy Shower B2
Workers locker room B2
Otolaryngologist treatment B2

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

ICFH Lisbon 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE



Material and methods

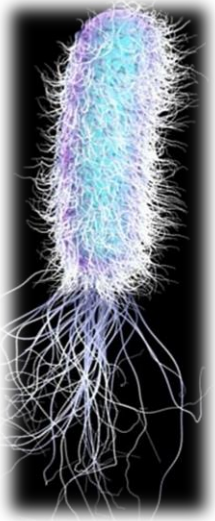
Samples were collected according to the orientations from Health General Direction

The culture method described in ISO 11731:2017 was applied for the isolation of *Legionella* and estimation of their quantity in water samples.

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

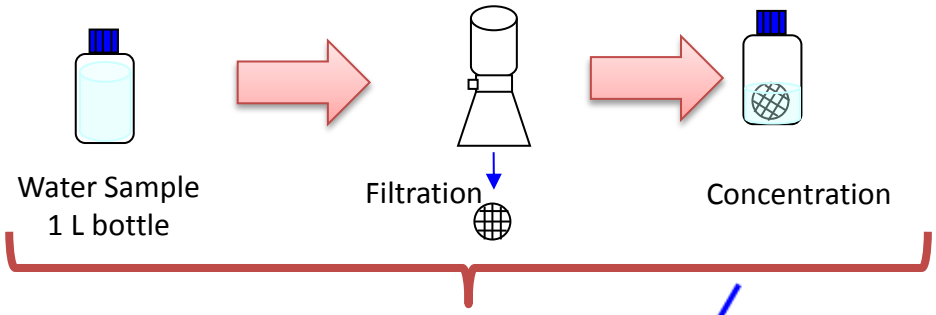
HTRC Health and Technology Research Center

ICFH Lisbon, 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE

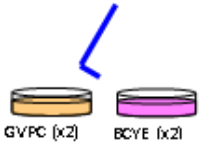


Sample (Legionella)

Norma ISO 11731



sample seeding



Without Treatment | Hot treatment | Acid treatment

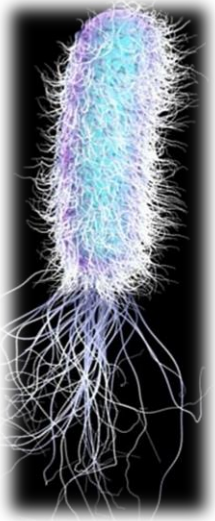
Incubate the dishes at 37 ±1ºC for 7 to 10 days.

Reading and confirming suspicious colonies

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

ICFH Lisbon 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE



Material and methods

For *S. aureus* and *P. aeruginosa* detection, surface samples were inoculated in Tryptic Soy Broth for 24h at 37ºC and inoculated in non-selective Columbia blood agar and selective culture media plates Chromogen MRSA and Cetrimide Selective Agar, respectively. MRSA isolates were confirmed by immunologic assays.

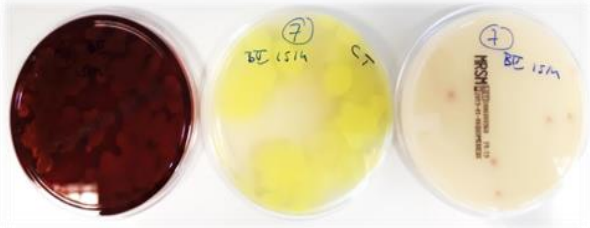
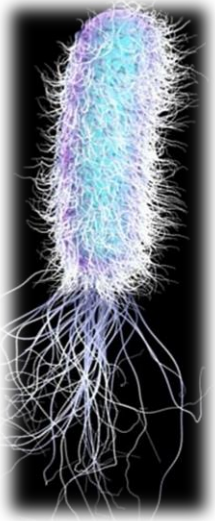


Fig. 1 – Surface swabs

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

ICFH Lisbon 2019



Results

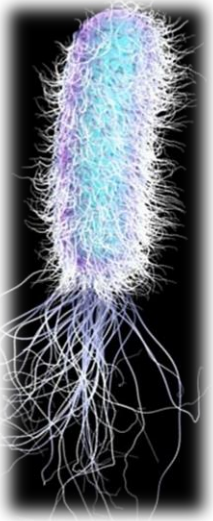
No detected culturable *Legionella* species

Molecular methods must be utilized in order to confirm these results

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

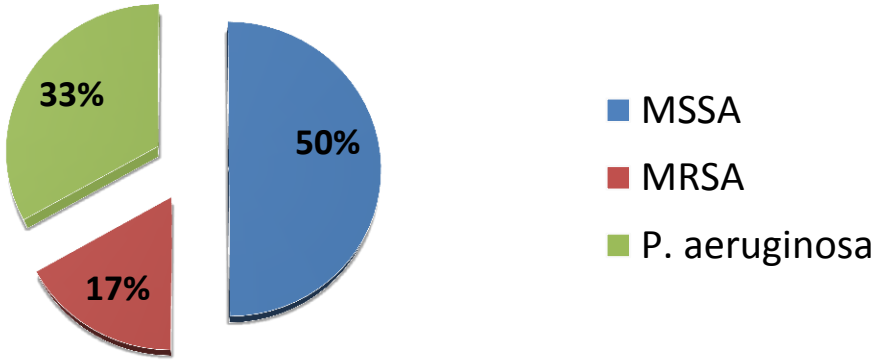
HTRC Health and Technology Research Center

ICFH Lisbon 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE

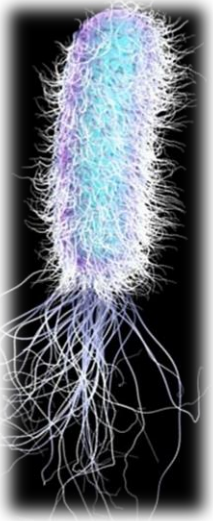


Results

S. aureus and *P. aeruginosa* prevalence



2 Staphylococcus aureus (MSSA) Vichy shower **SPA B** and workers locker room **SPA B**
1 Staphylococcus aureus (MSSA) e Pseudomonas aeruginosa **(**Vichy shower **SPA A)**
1 Staphylococcus aureus (MRSA) e Pseudomonas aeruginosa (Vichy shower **SPA B**)
13- Negative samples



Discussion

Surface samples – SPA A		
sample	Total bacteria UFC/m2	Gram-negative bacteria UFC/m2
Thermal Pool	8 000	0
Bertholet treatment	6 000	0
Vichy Shower	**1 000 000**	**35 000**
Double Cab Treatment	1 000	0
Spa pool	33 000	0
Otolaryngologist treatment	9 000	0
Reception	0	0
Workers locker room	312 000	0

Staphylococcus aureus (MSSA) e Pseudomonas aeruginosa **(**Vichy shower**)**

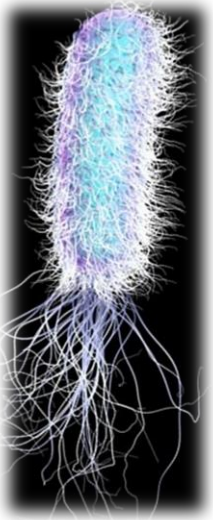
Bioburden in Indoor SPAs Air

A. Monteiro[1*], J. Cardoso[1], A. Mergulhão[1], J. Moreira[1], B. Almeida[1], C. Viegas[1,2], S. Cabo-Verde[3]

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

ICFH Lisbon 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE



Discussion

Surface samples – SPA B		
Sample	Total bacteria CFU.m-2	Gram-negative bacteria CFU.m-2
Vichy Shower B1	**476 000**	**95 000**
Otolaryngologist treatment B1	10 000	0
Thermal pool B1	0	0
Reception B1	1 000	0
Reception B2	11 000	0
Thermal pool B2	2 000	0
Vichy Shower B2	61 000	0
Workers locker room B2	6 000	0
Otolaryngologist treatment B2	1 000	0

Staphylococcus aureus (MSSA) Vichy shower **B1 SPA B** and workers locker room **B2 SPA B**

Staphylococcus aureus (MRSA) e Pseudomonas aeruginosa (Vichy shower **B2 SPA B**)

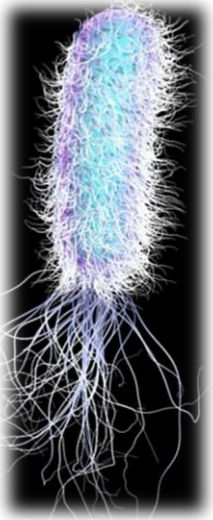
Bioburden in Indoor SPAs Air

A. Monteiro[1*], J. Cardoso[1], A. Mergulhão[1], J. Moreira[1], B. Almeida[1], C. Viegas[1,2], S. Cabo-Verde[3]

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

ICFH Lisbon 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE



Conclusions

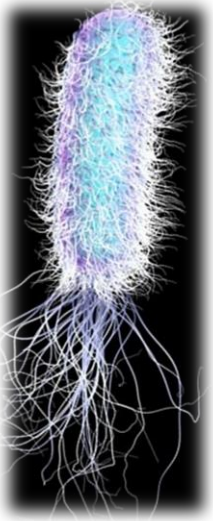
Thermal spa environments can create extremely good conditions for the development of potentially pathogenic microorganisms, with associated antibiotic resistance, which may represent a health hazard for workers and users and became a public health concern.

The presence of MRSA, even in low prevalence levels is of significant concern considering the immunocompromised state of patients that may be exposed.

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

H&TRC Health and Technology Research Center

ICFH Lisboa 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE



Acknowledgments

Instituto Politécnico de Lisboa, Lisbon, Portugal for funding the Project " Bioburden and Radon in Indoor SPAs Air" (IPL/2018/BRISAir_ESTeSL).

ESTeSL, Centro de Investigação em Saúde e Tecnologia (H&TRC)

ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
INSTITUTO POLITÉCNICO DE LISBOA

HTRC Health and Technology Research Center

ICFH Lisbon 25-27 September 2019 "NEW" CHALLENGES FOR THE FUTURE

Potentially pathogenic microorganism's sampling and detection in water thermal SPAs

A. Monteiro, J. Santos, E. Ribeiro, S. Cabo Verde

Edna Ribeiro PhD