ESCOLA SUPERIOR DE BIOTECNOLOGIA
UNIVERSIDADE CATÓLICA PORTUGUESA

Influence of disinfectant technologies on red bell peppers safety

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Fruits and Vegetables Safety

Contaminated fresh fruits and vegetables

Food-borne illness outbreaks

Serious public health problems !

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Conventional disinfectant treatments

Fruits and Vegetables Safety

citric acid

chlorine solutions

Chemical Treatments

hydrogen peroxide

acetic acid

Chlorine

Main application

water disinfection

surfaces disinfection

Characteristics

oxidant agent

lethal or inhibitory effect on microorganisms

broad bactericide spectrum

!

very reactive and corrosive

chlorine + organic substances → chlorination byproducts (carcinogenic)

irritant action in human body (respiratory system, eyes and skin)

Chlorine solutions

sodium hypoclorite

Main application

fruits and vegetables disinfection

Characteristics

lethal or inhibitory effect on microorganisms

E. coli

Salmonella

! **residuals**

Hydrogen peroxide

H_2O_2

Main application

prevention of post-harvest decay of fruits and vegetables

fruits and vegetables disinfection

Characteristics

oxidant agent

lethal or inhibitory effect on microorganisms

Bacteria

Fungi

low toxicity rating

little potential for environmental damage

! **products discoloration**

Acids

citric acid

Main application

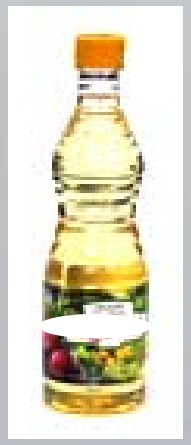
home-disinfection of fruits and vegetables

Characteristics

antimicrobial effect → related with pH

anti-browning agent

lethal or inhibitory effect on microorganisms



acetic acid

low toxicity rating

little potential for environmental damage

Fruits and Vegetables Safety

Innovative disinfectant technologies

Fruits and Vegetables Safety

Ultraviolet-C radiation

Ozone

Innovative disinfectant technologies

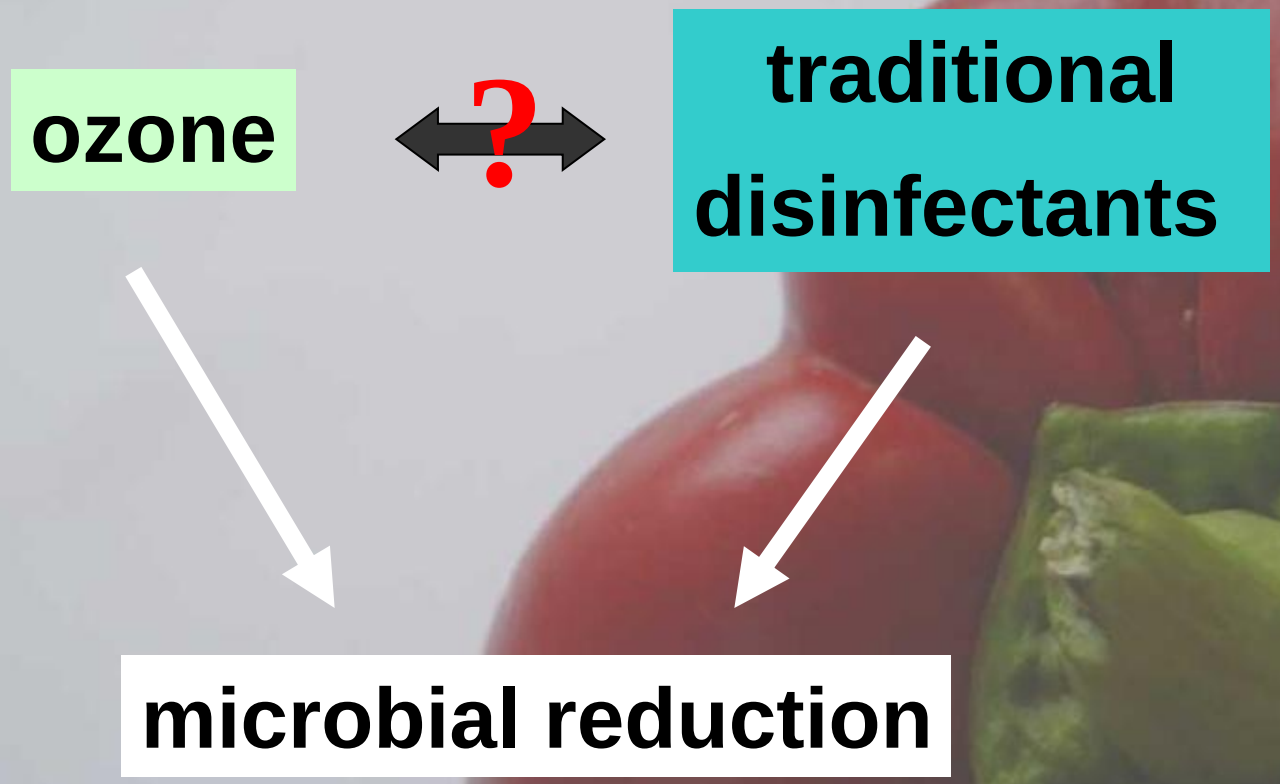
Ultrasonication

EMERCON

New Processing Technologies for Frozen Fruits and Vegetables
(Projecto AGRO, 2º concurso de 2003, código nº 822)
AGRO - Projecto do Programa Operacional Agricultura e Desenvolvimento
Instituto Nacional de Investigação Agrária

Fruits and Vegetables Safety

objective of the work developed …



Ozone

Main application

water disinfection

air purification

food decontamination

Pilot plant at
Escola Superior de Biotecnologia

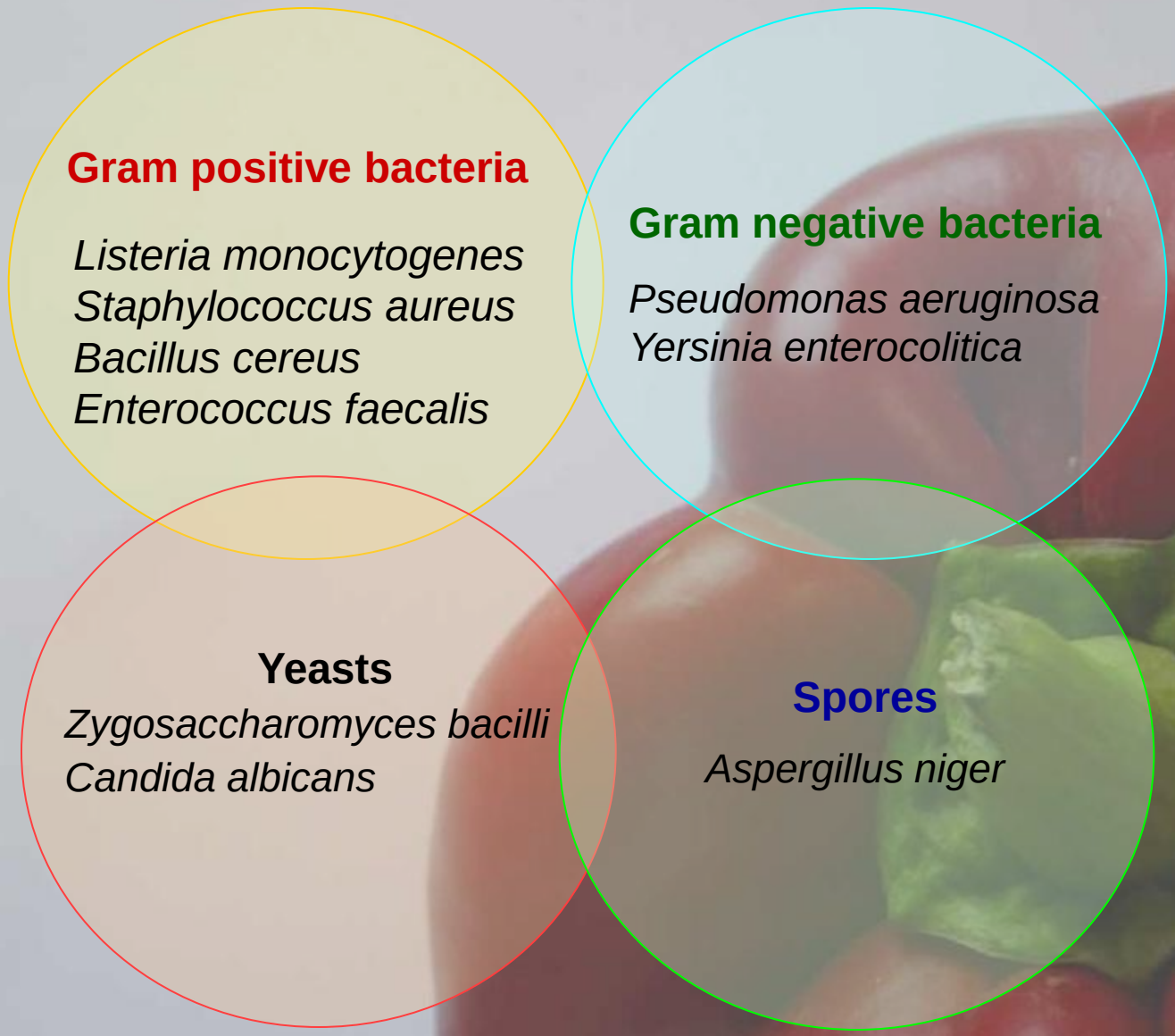
Characteristics

strong oxidant

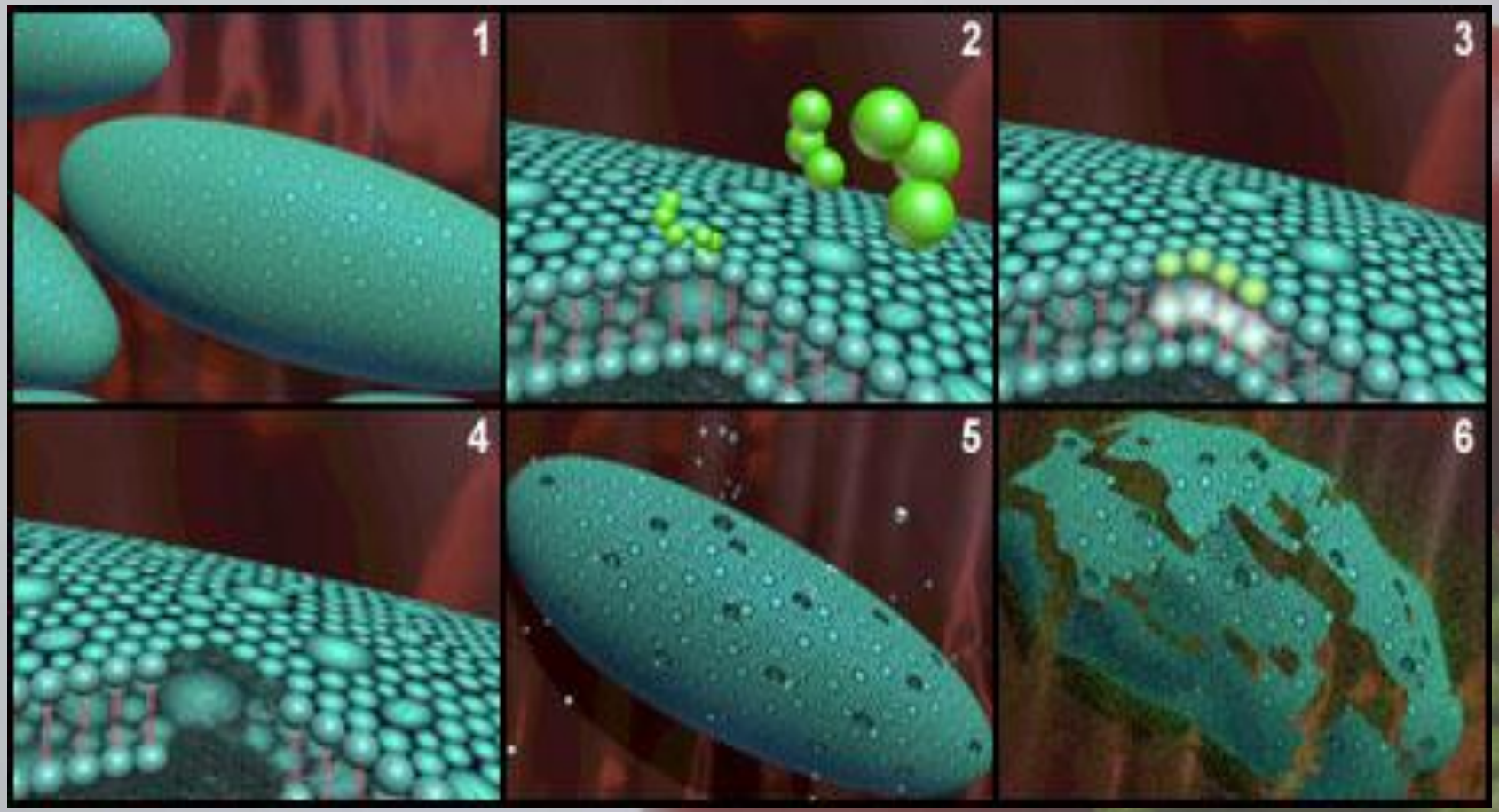
lethal or inhibitory effect on microorganisms

! **non-toxic products decomposition**

Ozone antimicrobial action



Ozone effect on bacteria



www.ozoneapplications.com

Work developed

- Sodium hypochlorite (Amukina)
- H_2O_2 (1 and 5% w/w)
- Ozone (aqueous solution)

→ reduction of *Listeria innocua* →

artificial contamination

Capsicum annuum L.

Ozone (aqueous solution) → reduction of *Listeria innocua* →

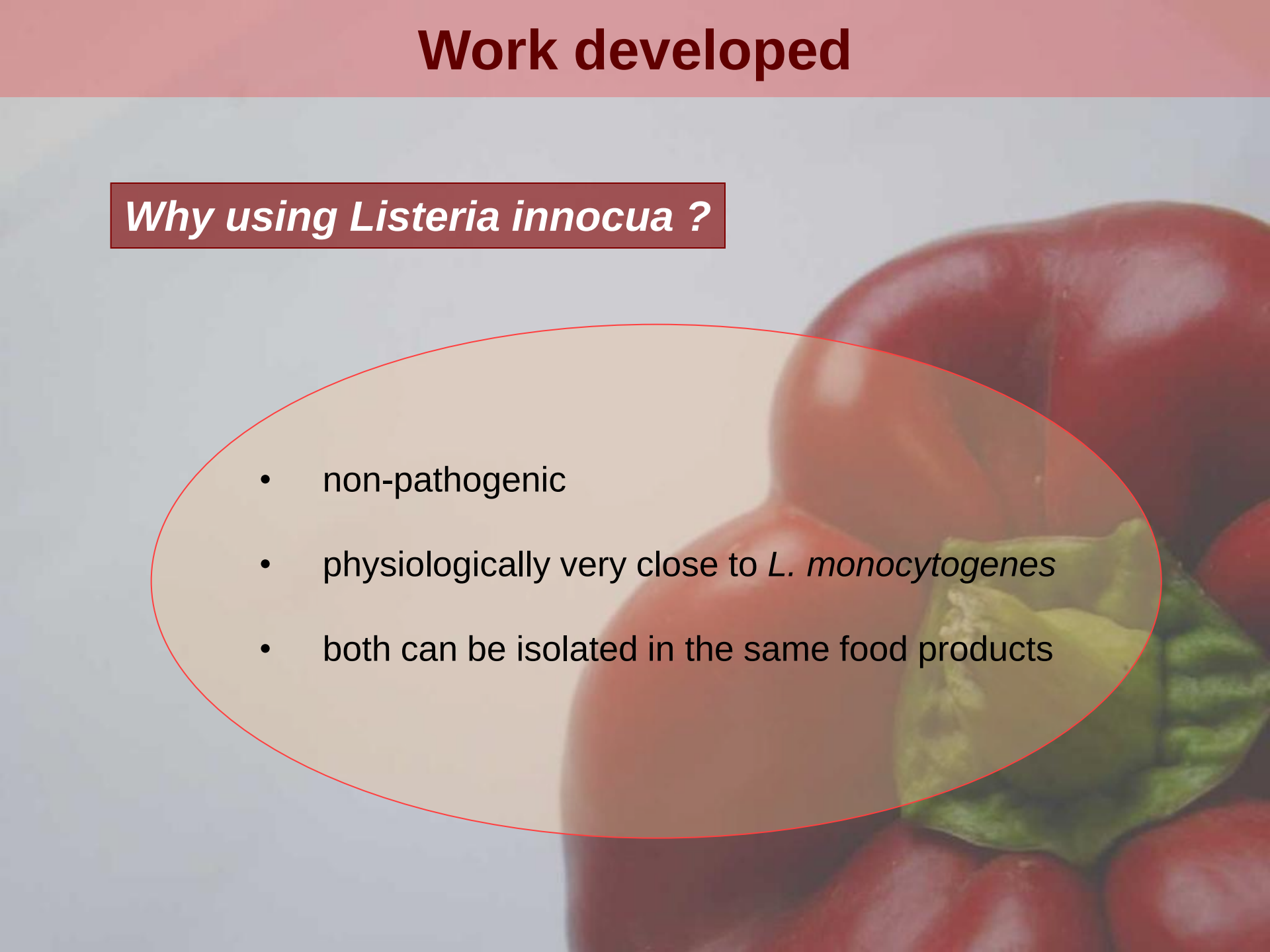
water

artificial contamination

Work developed

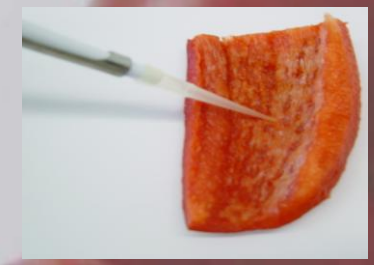
Why using Listeria innocua ?

- non-pathogenic
- physiologically very close to *L. monocytogenes*
- both can be isolated in the same food products



Experimental procedure

wash and clean



Artificial inoculation

250 µl

Listeria innocua

15 min.

~10^7 CFU/g

disinfectant agents

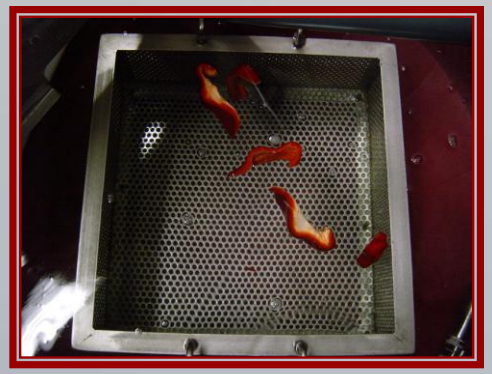
2 min.

Experimental procedure

disinfectant agents

- sodium hypochlorite (11.5 g/L)
- H_2O_2 (1% and 5% w/w)

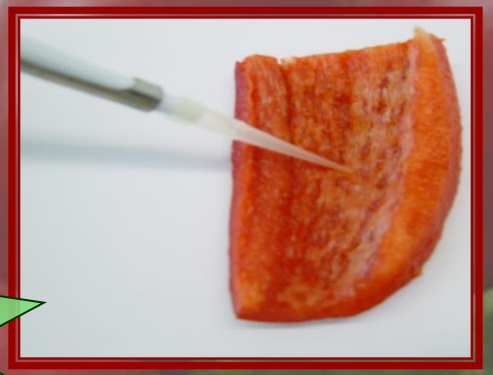
- ozone (~2 p.p.m.)



5 replicates

control

untreated sample



water-washing

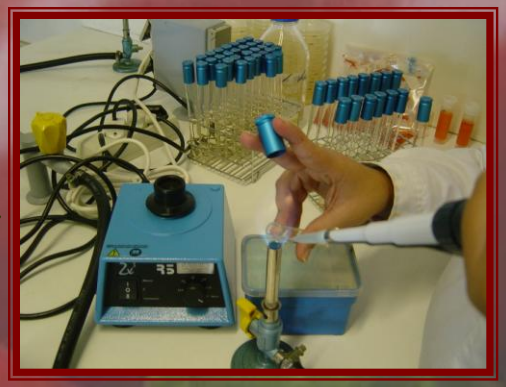
Experimental procedure

Listeria innocua enumeration …

cut in small pieces

Stomacher homogenization

decimal dilutions



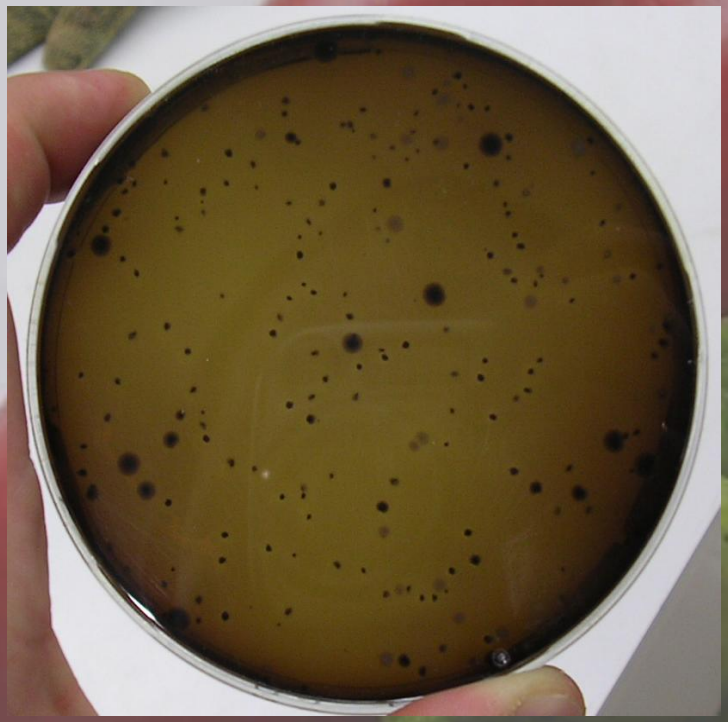
buffered peptone water

Palcam agar
+ selective supplement

3 days at 30 ºC

Experimental procedure

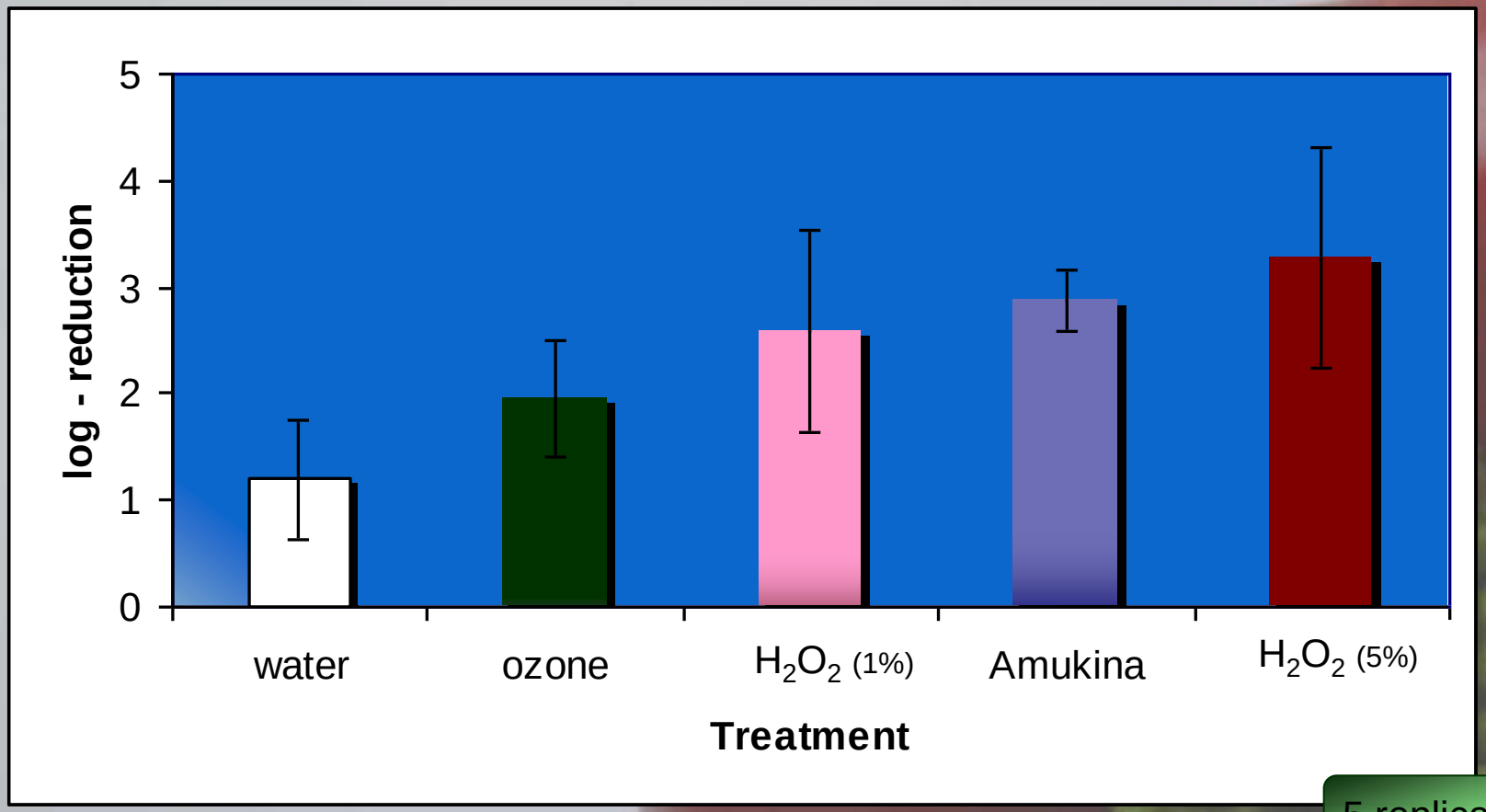
Listeria innocua enumeration …



in duplicate

Results

Treatment effect on *Listeria innocua* reduction



5 replicates

initial contamination

~10^7 CFU/g

Results

disinfectant agents

- sodium hypochlorite (11.5 g/L)
- H_2O_2 (1% and 5% w/w)
- Ozone (~2 p.p.pm)

no significant effects observed
(ANOVA; significance level of 5%)

2 - 3 log-reductions
of *Listeria innocua*

control

- water-washings reduced 1.2 ± 0.6 log cycles

Some interesting results !

Study of ozone effect on *Listeria innocua* in water

water

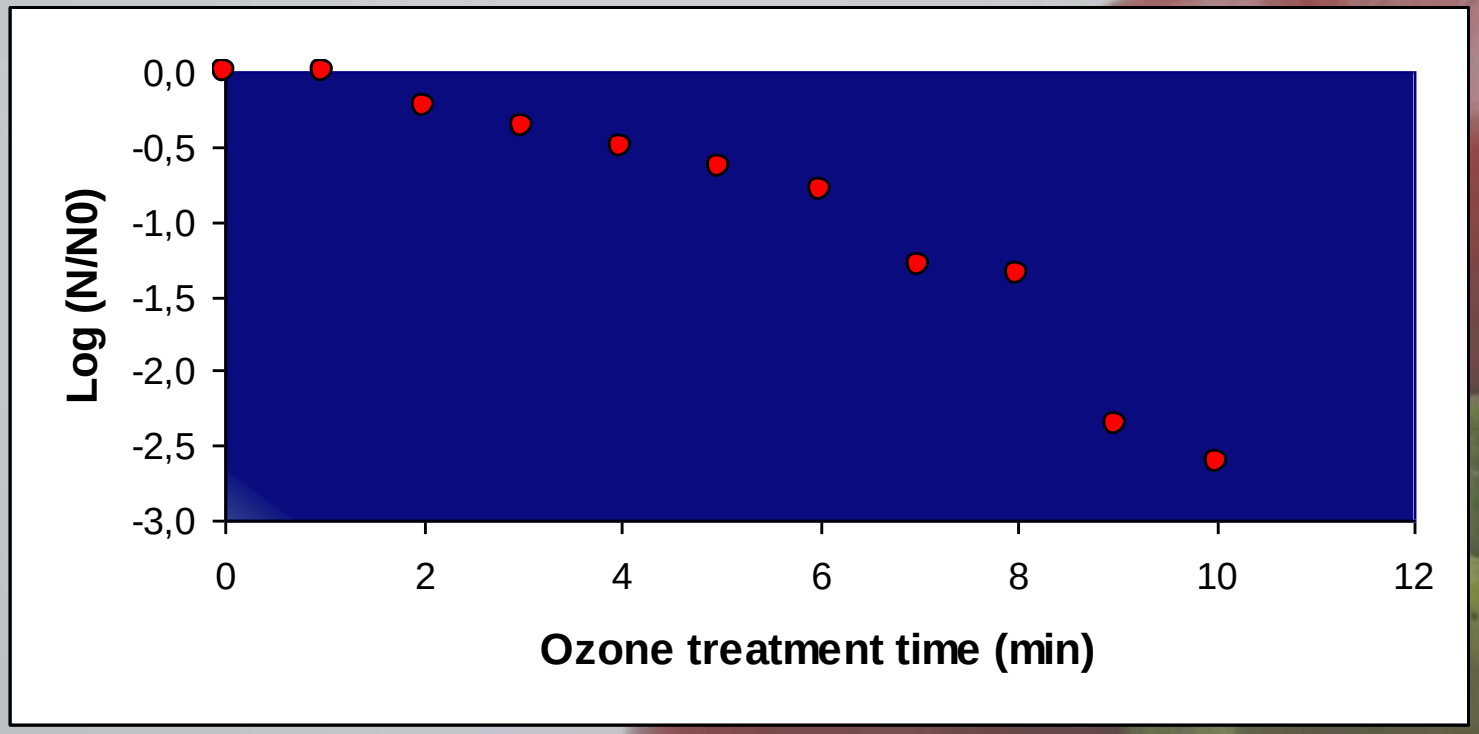
artificial contamination

heuristic sampling
every 1 minute → total 10 minutes

Listeria innocua inumeration

Some interesting results !

Kinetics of *Listeria innocua* inactivation in aqueous ozone

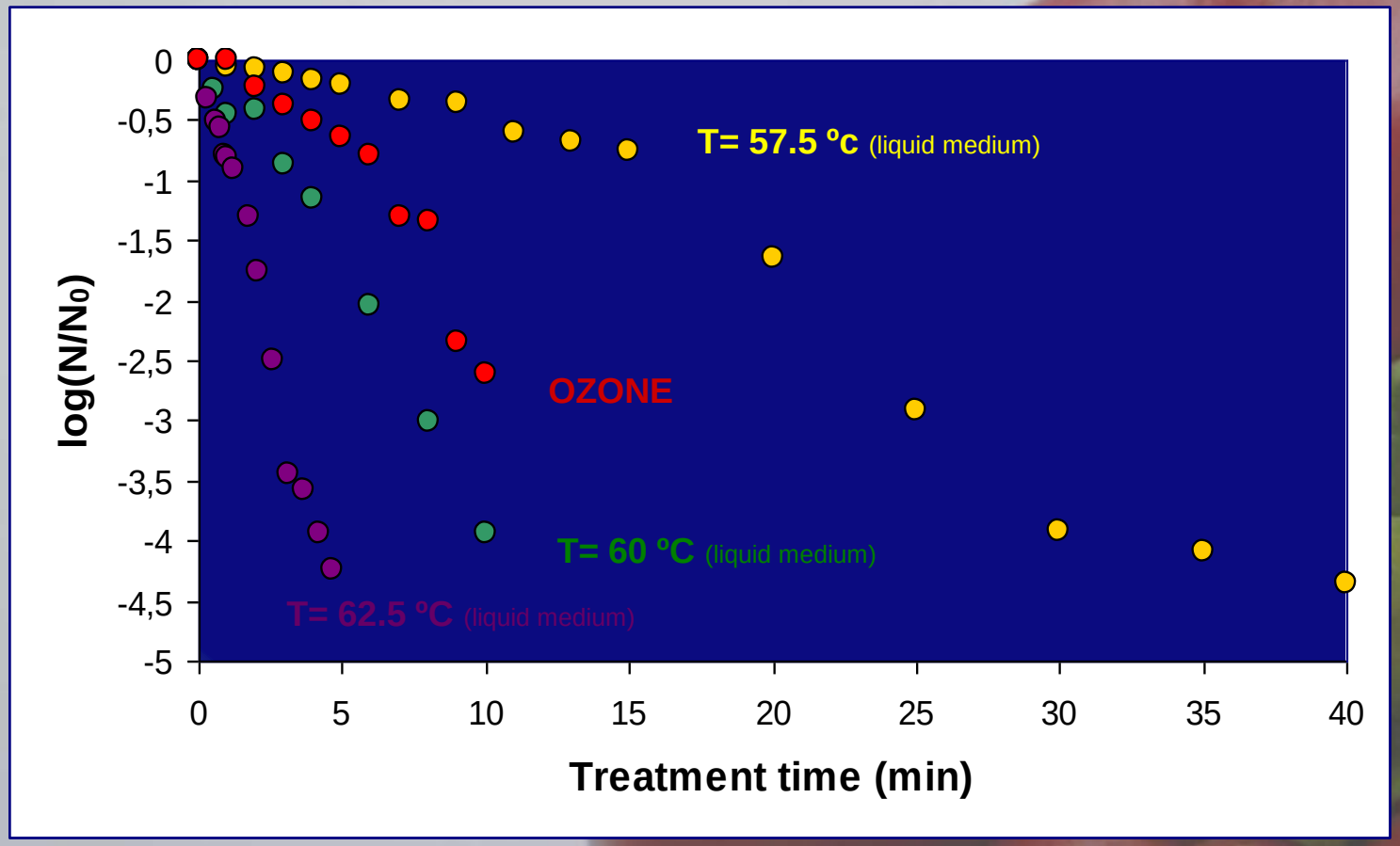


initial contamination

~10^5 CFU/g

Some interesting results !

Kinetics of *Listeria innocua* inactivation



Conclusions

The use of **ozone** in aqueous solutions allowed identical reductions in ***Listeria innocua*** of red bell peppers, when compared to solutions of **hydrogen peroxide** and **sodium hypochlorite**.

In average, all treatments allowed a reduction of 2 to 3 log-cyles, which was higher than the reduction observed with water-washings.

Kinetics of *Listeria innocua* inactivation in **ozonated** water was identical to **thermal** inactivation in liquid medium.

Conclusions

Acknowledgments

Thank you for your attention

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