# 27febbraio 2019 Incontro del Gruppo di lavoro sui BIOFILM

Società dei Naturalisti in Napoli, via Mezzocannone 8

Ore 9.30

**UNIVERSITA' degli STUDI di Napoli «Federico II»**
Dipartimento di Biologia
Laboratorio di Igiene e Microbiologia Industriale

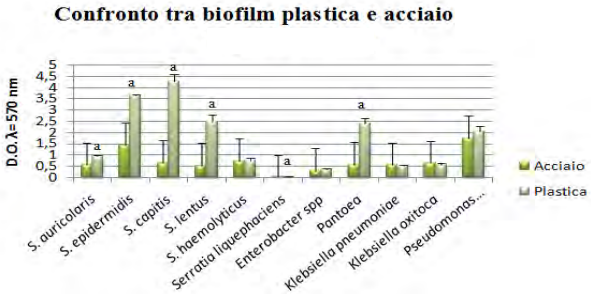
- Francesco Aliberti
- Elisabetta de Alteriis
- Emilia Galdiero
- Renato Gesuele
- Marco Guida
- Giovanni Libralato
- Antonia Siciliano

# Tematiche di interesse

- qualità delle acque superficiali e profonde
- igiene degli alimenti
- ecotossicologia: effetto di contaminanti su bioindicatori per la determinazione del rischio ambientale ed umano
- microbiologia industriale: lieviti per la produzione di metaboliti di interesse
- biofilm microbici: - nell'industria alimentare
  - di interesse clinico

## Biofilm microbici nell'industria alimentare

I materiali utilizzati nell'impiantistica alimentare (acciaio inox, vetro, polipropilene, alluminio, nailon) permettono lo sviluppo di biofilm



Sistemi di pulizia e disinfezione convenzionali insufficienti

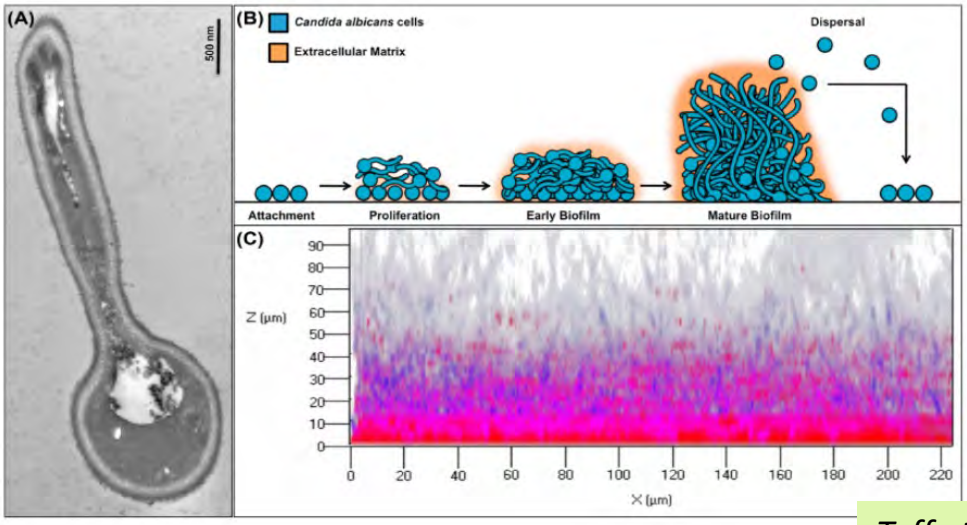
gravi conseguenze sulla qualità e sicurezza del prodotto finito → strategie alternative biocompatibili AMPs ?

Int J Microbiol. 2019, 15: 4012394.
**Melittin Inhibition and Eradication Activity for Resistant Polymicrobial Biofilm Isolated from a Dairy Industry after Disinfection.**
Galdiero E, Siciliano A, Gesuele R, Di Onofrio V, Falanga A, Maione A, Liguori R, Libralato G, Guida M

## Biofilm di interesse clinico

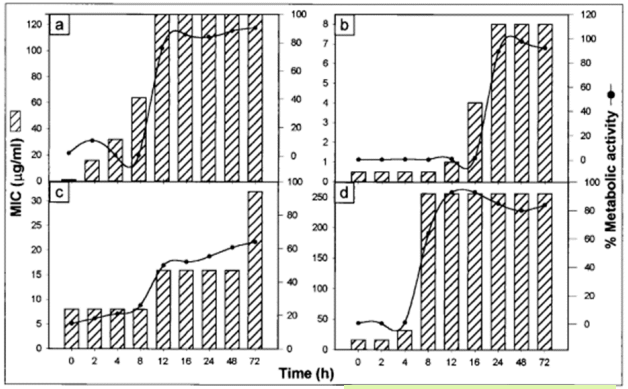
# Biofilm monospecie e multispecie di *Candida*: eradicazione con peptidi membranotropici

*C. albicans* produce biofilm altamente strutturati su superfici biotiche (mucose) e abiotiche (dispositivi medici)

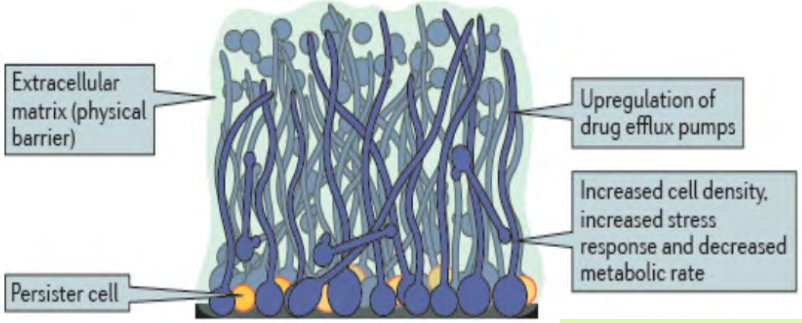



*Taff et al, 2016*

# I biofilm sono resistenti alle terapie tradizionali

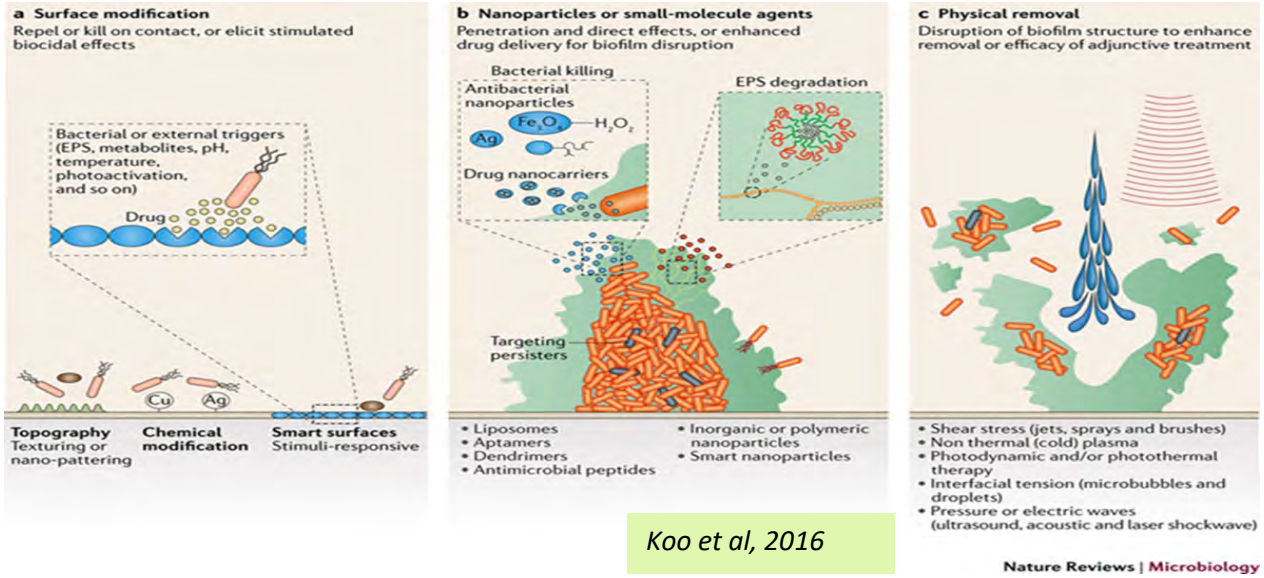



*Chandra et al, 2001*




*Lohse et al, 2017*

# Strategie innovative per il trattamento di biofilm microbici



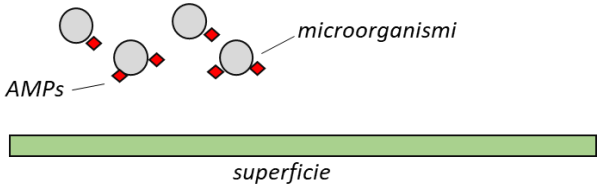

*Koo et al, 2016*

# AMPs per il controllo dei biofilm microbici

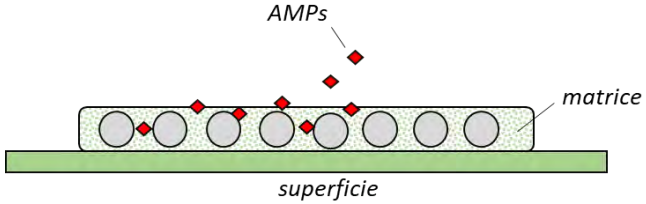
**BaAMPs**
Biofilm-active AMPs database

http://www.baamps.it.

## Prevenzione: inibizione dell'adesione

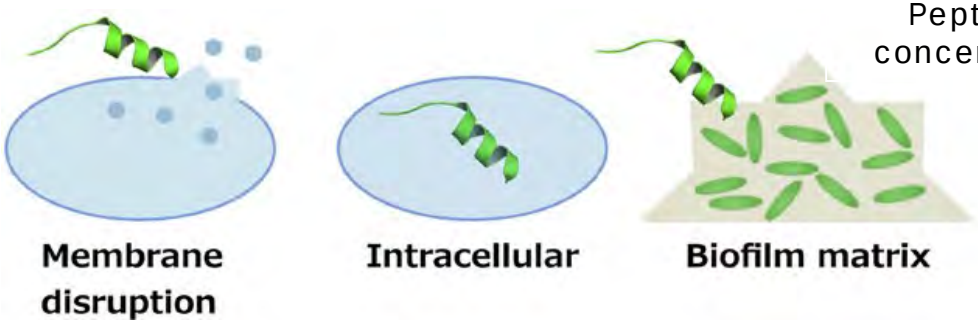



## Terapia: eradicazione




## Meccanismo d'azione

Peptide attivo a concentrazioni< MIC



Infect Drug Resist. 2018, 11: 915-925.

**Efficiency of gold nanoparticles coated with the antimicrobial peptide indolicidin against biofilm formation and development of *Candida* spp. clinical isolates.**

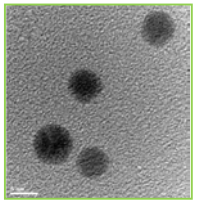
de Alteriis E, Maselli V, Falanga A, Galdiero S, Di Lella FM, Gesuele R, Guida M, Galdiero E.

Biofilm *IN VITRO* piastre di polistirene multi-well
dischetti di silicone (*medical grade*)

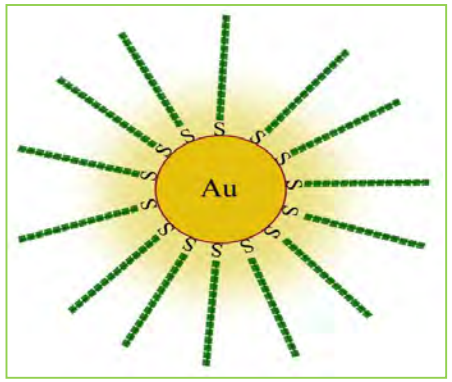
Ac-CILPWKWPWWPWRR-$CONH_2$

indolicidin

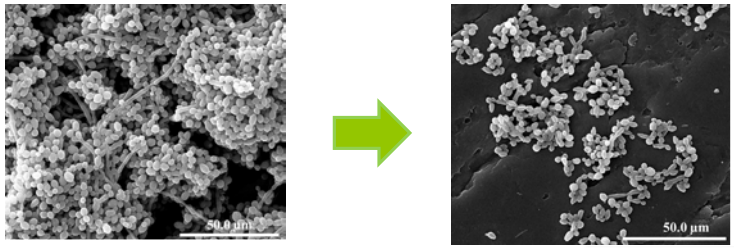
+

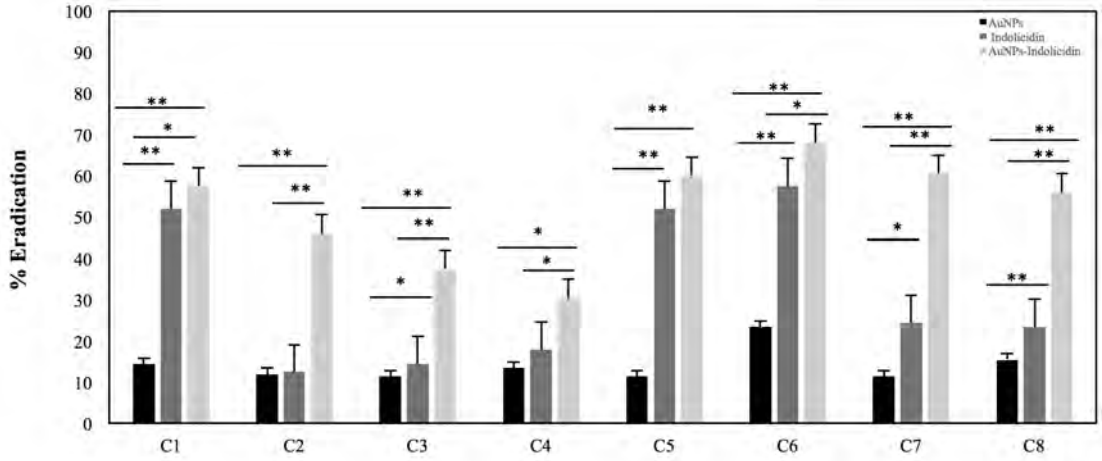


AuNp

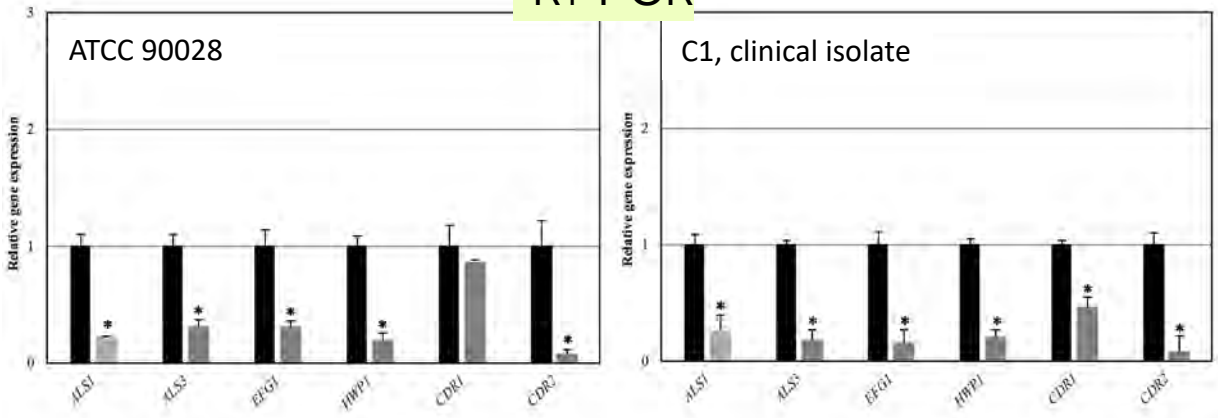



AuNP-indolicidin


50.0 µm
50.0 µm


% Eradication
AuNPs
Indolicidin
AuNPs-Indolicidin
C1
C2
C3
C4
C5
C6
C7
C8

RT-PCR

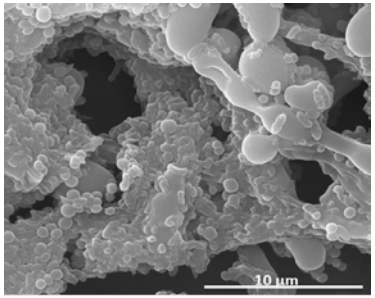

ATCC 90028
C1, clinical isolate
Relative gene expression
ALS1
ALS3
EFG1
HWP1
CDR1
CDR2

Microb Pathog. 2018, 125:189-195

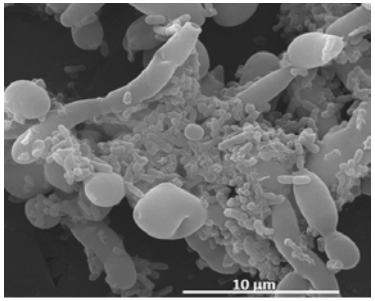
**Polymicrobial antibiofilm activity of the membranotropic peptide gH625 and its analogue**

de Alteriis E, Lombardi L, Falanga A, Napolano M, Galdiero S, Siciliano A, Carotenuto R, Guida M, Galdiero E

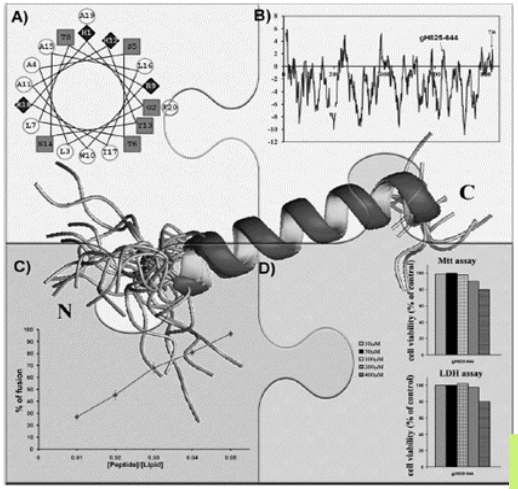
*C. tropicalis + S. aureus*




*C. tropicalis + S. marcescens*




Sinergia, maggiore capacità di adesione



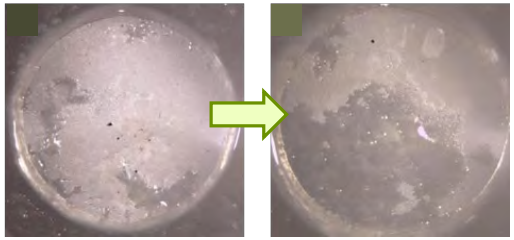

*Galdiero et al, 2015*

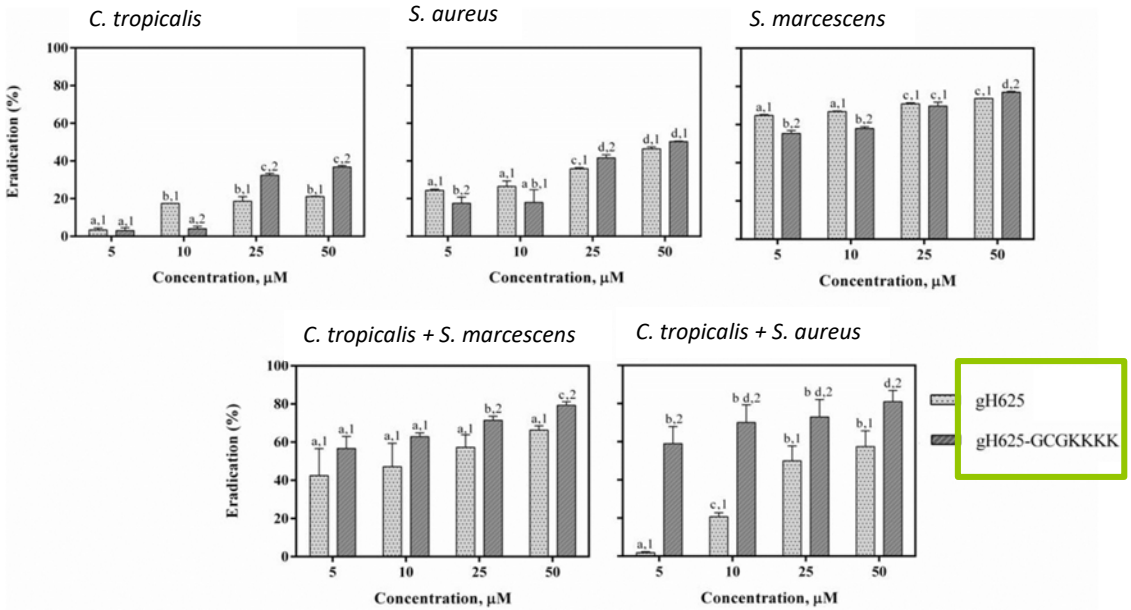
gH625

$NH_2$-HGLASTLTRWAHYNALIRAF-$CONH_2$

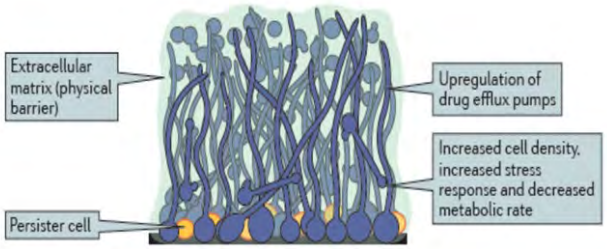
attività antimicrobica?
attività anti-biofilm?

| | |
|---|---|
| gH625 (*guest sequence*) | $NH_2$-HGLASTLTRWAHYNALIRAF-$CONH_2$ |
| (*host sequence*) | $NH_2$-GGGKKKK-$CONH_2$ |
| gH625-M (*host-guest monomeric system*) | $NH_2$-HGLASTLTRWAHYNALIRAFGGGKKKK-$CONH_2$ |
| gH625-D (*host-guest dimeric system*) | $NH_2$-HGLASTLTRWAHYNALIRAFGCGKKKK-$CONH_2$<br>\|<br>$NH_2$-HGLASTLTRWAHYNALIRAFGCGKKKK-$CONH_2$ |



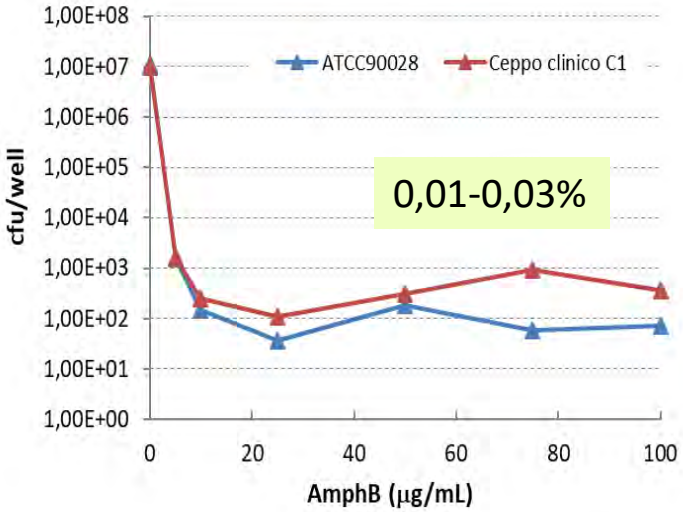


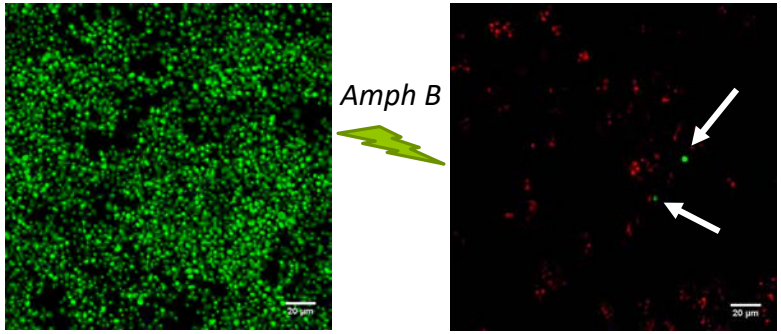
# Biofilm da cellule persistenti

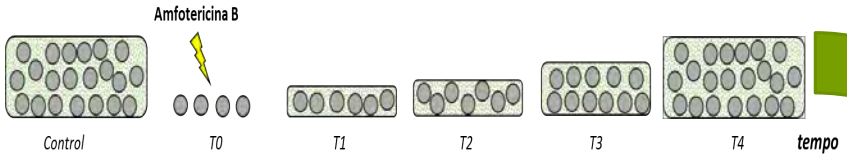


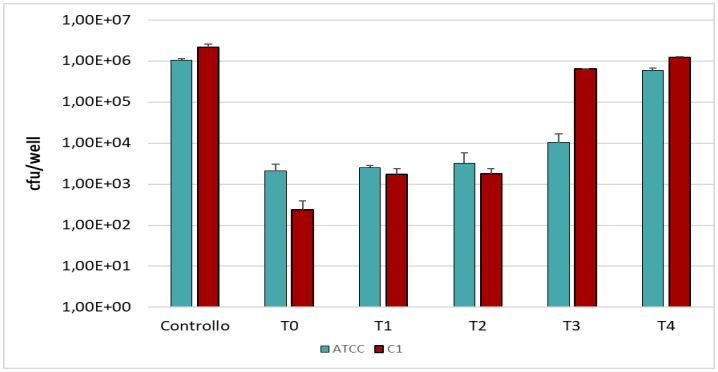

varianti fenotipiche non proliferanti, capaci di sopravvivere ad alte dosi di antifungini

persisters ⇨ infezioni recalcitranti

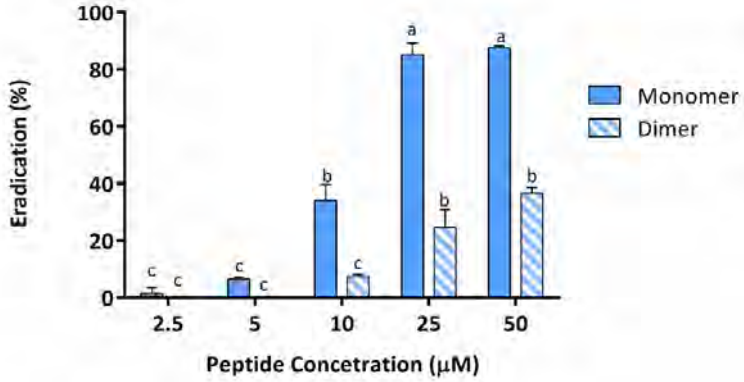


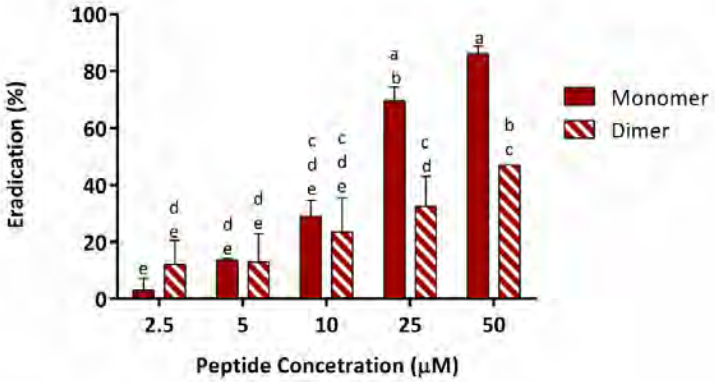






# Eradicazione con analoghi del gH625



# Prospettive future

- interazione peptide-biofilm
- sviluppo del biofilm al CSLM
- azione combinata peptide + antifungino tradizionale
- biofilm *in vivo*

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