Le 10 cose che bisogna sapere sui probiotici

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I "10 comandamenti" dei probiotici

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1. Usare la corretta definizione di “probiotico”
2. Identificare correttamente il ceppo probiotico
3. Evitare la presenza di geni di antibiotico-resistenza nei ceppi probiotici
4. Evitare prodotti probiotici contenenti microorganismi portatori di geni conferenti antibiotico-resistenza
5. Prodotti monoceppo o multiceppo: come effettuare la scelta corretta
6. Scegliere ceppi probiotici resistenti all’ambiente gastrointestinale
7. I ceppi probiotici devono essere in grado di colonizzare l’ambiente gastrointestinale
8. Scegliere probiotici in grado di interagire positivamente con il microbiota intestinale
9. Valutare la sicurezza dei ceppi probiotici e lo stato di salute soggetto prima della somministrazione di probiotici
10. Utilizzare ceppi probiotici con una dimostrata efficacia clinica

1° COMANDAMENTO:
Usare la corretta definizione di "probiotico"

" Microorganismi vivi che se amministrati in adeguate quantità possono portare effetti benefici all'ospite "

By FAO/WHO (2002) Expert Consultation
http://www.fao.org/es/ESN/Probio/probio.htm

1° COMANDAMENTO:
Usare la corretta definizione di “probiotico”

- **Essere utilizzati per implementare il microbiota intestinale dell’ospite;**
- **Essere sicuri per l’utilizzo umano, rispettare i parametri introdotti dall’Autorità Europea per la Sicurezza Alimentare (EFSA) sullo status di “QPS” (Presunzione Qualificata di Sicurezza) e non essere portatori di antibiotico-resistenza acquisita e/o trasmissibile;**
- **Essere attivi a livello intestinale.**

Ministero della Salute, 2013

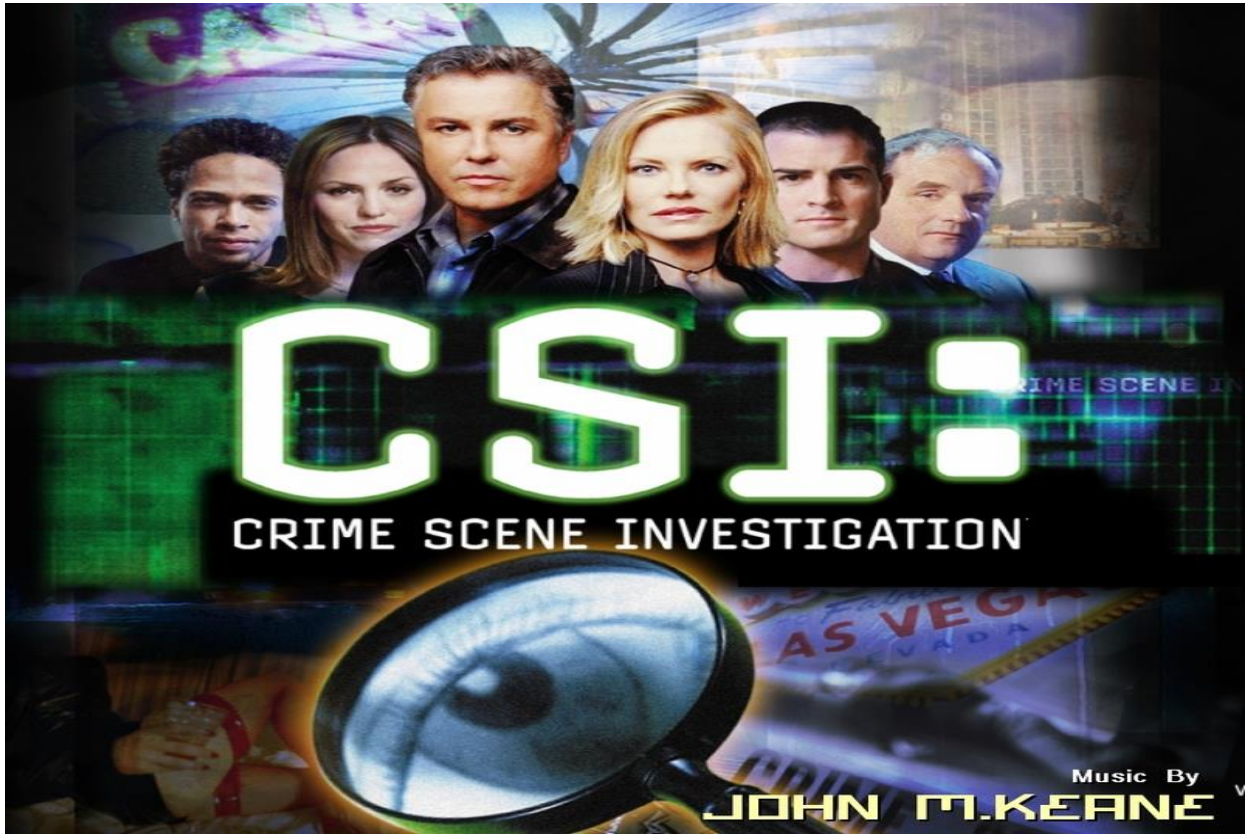
2° COMANDAMENTO:
Identificare correttamente il ceppo probiotico

Caratterizzazione del ceppo?

Characterised fully (complete genome)

Safe (no toxins, virulence factors, antibiotic production or mobile ATBR)

Identifiable (International Code of Nomenclature & strain deposit)



Antimicrobial Original Research Paper

Microbiological and genetic identification of some probiotics proposed for medical use in 2011

Marco Toscano[1], Elena de Vecchi[2], Valentina Rodighiero[1], Lorenzo Drago[1,2]

Journal of Chemotherapy 2013

In conclusion, both this study and earlier works have shown that some products on the Italian and European market do not comply with the specific guidelines. There is a need of a clear legislation providing for the accurate testing of all products, as the effectiveness of a probiotic cannot be guaranteed if quality standards are not complied.

I probiotici Italiani

Product name (type)	Declared total count (CFU/dose)	Species claimed on the label	Organism detected count (CFU/dose)				Unreported organism detected count (CFU/dose)	Molecular identification
			TO	3 Months	6 Months	1 Year		
†A(spore suspension)	$2*10^9$	*Bacillus clausii*	$1.7*10^9$	$1.4*10^9$	$7.4*10^8$	$5.1*10^8$	-	*B. clausii*
†B1 (sachet)	$8*10^9$	*Lactobacillus casei* DG	$1.2*10^{10}$	$7.7*10^9$	$2.5*10^8$	$5.3*10^7$	-	*L. casei*
B2 (vials)	$8*10^9$	*Lactobacillus casei* DG	$6.0*10^{10}$	$5.5*10^{10}$	$1.8*10^{10}$	$8.2*10^9$	-	*L. casei*
B3 (capsule)	$8*10^9$	*Lactobacillus casei* DG	$1.6*10^{10}$	$1.1*10^{10}$	$7.8*10^9$	$3.7*10^9$	-	*L. casei*
†B4 (powder)	$2.4*10^{10}$	*Lactobacillus casei* DG	$4.0*10^9$	$1.9*10^9$	$7.0*10^8$	$9.9*10^7$	-	*L. casei*
B5 (capsule)	$2.4*10^{10}$	*Lactobacillus casei* DG	$2.5*10^{10}$	$2.4*10^{10}$	$2.3*10^{10}$	$9.5*10^9$	-	*L. casei*
C1 (capsule)	$6*10^9$	*Lactobacillus rhamnosus* GG	$7.6*10^9$	$6.8*10^9$	$6.6*10^9$	$4.1*10^9$	-	*L. rhamnosus*
C2 (sachet)	$3*10^9$	*Lactobacillus rhamnosus* GG	$1.3*10^{10}$	$1.1*10^{10}$	$7.2*10^9$	$3.1*10^9$	-	*L. rhamnosus*

I probiotici Italiani

C3 (drops)	$5*10^9$	*Lactobacillus rhamnosus* GG	$2.9*10^9$	$2.5*10^9$	$2.2*10^9$	$1.7*10^9$	-	*L. rhamnosus*
D1 (sachet)	10^9	*Lactobacillus reuteri*	$3.7*10^{10}$	$2.4*10^{10}$	$2.1*10^{10}$	$6.4*10^9$	-	*L. reuteri*
D2 (tablet)	10^8	*Lactobacillus reuteri*	$5.3*10^8$	$2.9*10^8$	$2.9*10^8$	$1.0*10^8$	-	*L. reuteri*
D3 (drops)	10^8	*Lactobacillus reuteri*	$2.4*10^9$	$5*10^8$	$3.8*10^8$	$1.7*10^8$	-	*L. reuteri*
E (capsule)	$7.5*10^7$	*Enterococcus faecium* SF68	$1.4*10^9$	$1.2*10^9$	$1.2*10^9$	$9.8*10^8$	-	*E. faecium*
F1 (capsule)	$5*10^9$	*Saccharomyces boulardii*	$3.6*10^9$	$3.5*10^9$	$2.6*10^9$	$1.6*10^9$	-	*S. boulardii*
F2 (powder)	$5*10^9$	*Saccharomyces boulardii*	$3.8*10^9$	$2.5*10^9$	$2.4*10^9$	$2.0*10^9$	-	*S. boulardii*
G (sachet)	$5*10^9$	*Lactobacillus paracasei*	$8.5*10^9$	$6.4*10^9$	$6.1*10^9$	$4.3*10^9$	-	*L. paracasei*
†H (sachet)	$3.5*10^9$	*Lactobacillus acidophilus*	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$		-
		Lactobacillus delbrueckii	$2.1*10^8$	$1.9*10^8$	$5.1*10^6$	$3.3*10^4$	-	*L. delbrueckii*
		Streptococcus thermophilus	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$		-
		Bifidobacterium bifidum	$3.9*10^5$	$5.4*10^4$	$5.0*10^3$	$1.2*10^2$		*B. bifidum*
†I (sachet)	$6*10^9$	*Lactobacillus paracasei* F19	$1.2*10^4$	$8*10^2$	$< 10^2$	$< 10^2$	-	*L. paracasei*

I probiotici Italiani

†J (vials)	$1.5*10^{10}$	*Lactobacillus acidophilus*	$4.6*10^9$	$3.1*10^9$	$1.3*10^9$	$6.7*10^8$	-	*L. acidophilus*
		Lactobacillus rhamnosus	$9.8*10^7$	$5.9*10^7$	$4.9*10^7$	$4.1*10^6$		*L. rhamnosus*
†K (sachet)	$> 5*10^{10}$	*Streptococcus thermophilus*	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$	*E. faecium* $1.1*10^8$	-
	10^9	*Lactobacillus acidophilus*	$4.1*10^8$	$1.7*10^8$	$1.6*10^8$	$7.6*10^7$		*L. acidophilus*
	$2*10^9$	*Lactobacillus rhamnosus*	$2.1*10^9$	$4.4*10^8$	$4.3*10^8$	$5.8*10^7$		*L. rhamnosus*
	$5*10^9$	*Lactobacillus plantarum*	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$		*L. plantarum* *
	10^9	*Lactobacillus salivarius*	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$		*L. salivarius* *
	$2*10^9$	*Lactobacillus gasseri*	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$		-
	10^9	*Bifidobacterium infantis*	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$		-
	10^9	*Bifidobacterium longum*	$< 10^2$	$< 10^2$	$< 10^2$	$< 10^2$		*B. longum* *
	-	-	$8.7*10^7$	$2.3*10^7$	$2.1*10^7$	$7.4*10^6$		*Bifidobact.* spp
	10^9	*Lactobacillus sporogenes*	$2.7*10^8$	$7.5*10^7$	$7.4*10^7$	$1.0*10^7$		*B. coagulans*
L1 (capsule)	10^9	*Lactobacillus acidophilus*	$5.8*10^8$	$3.3*10^8$	$2.1*10^8$	$3.3*10^7$	-	*L. acidophilus*
		Lactobacillus paracasei	$1.0*10^7$	$7.0*10^6$	$4.0*10^6$	$7.2*10^5$		*L. paracasei*
		Bifidobacterium BB12	$8.5*10^7$	$5.2*10^7$	$3.3*10^7$	$5.0*10^6$		*B. lactis*
		Bacillus coagulans	$5.1*10^8$	$3.7*10^8$	$3.0*10^8$	$6.6*10^7$		*B. coagulans*

I probiotici Italiani

In conclusion, both this study and earlier works have shown that some products on the Italian and European market do not comply with the specific guidelines. There is a need of a clear legislation providing for the accurate testing of all products, as the effectiveness of a probiotic cannot be guaranteed if quality standards are not complied.

3° COMANDAMENTO:
Evitare la presenza di geni di antibiotico-resistenza nei ceppi probiotici

".....bacteria (probiotics) carrying an acquired resistance to antimicrobial(s) should not be used as feed additives....."
(i.e.: *tet*, *erm*, *aac*, *aad*, *aph* genes)

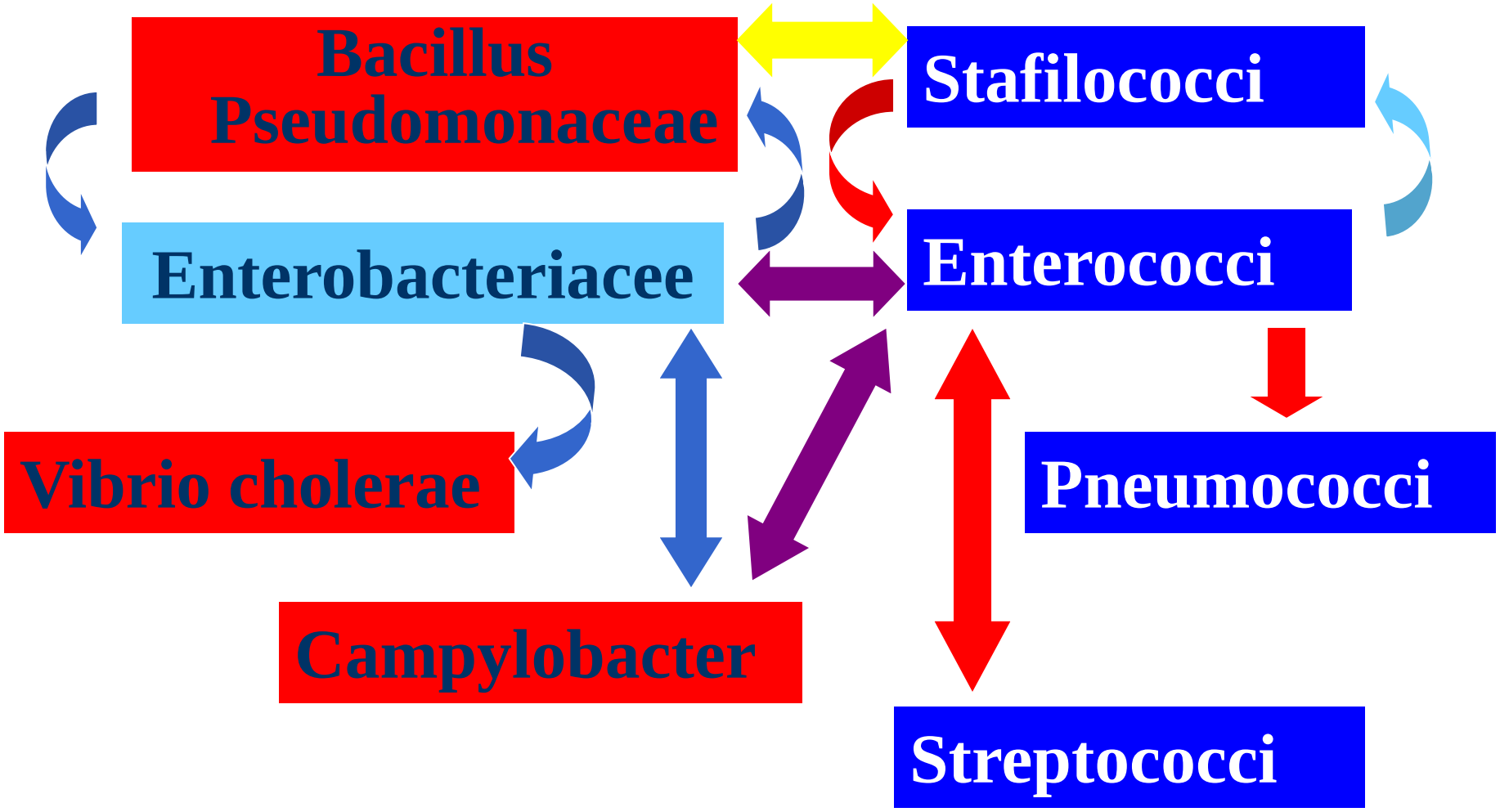
I probiotici non dovrebbero acquisire o trasferire determinanti di ANTIBIOTICO-RESISTENZA

EFSA 2008

3° COMANDAMENTO:
Evitare la presenza di geni di antibiotico-resistenza nei ceppi probiotici

- **È corretto somministrare i PROBIOTICI e gli ANTIBIOTICI insieme?**
- **I probiotici possono sviluppare resistenza?**
- **Può tale resistenza essere trasferita ad altri microorganismi?**

ANTIBIOTICO-RESISTENZA



4° COMANDAMENTO:
Evitare prodotti probiotici contenenti microorganismi portatori di geni conferenti antibiotico-resistenza

Product name	Species	Erythromycin	Tetracycline	Gentamicin	Penicillin
A	*B. clausii*	R (unknown)	S	S	S
B	*L. casei* DG	S	S	R (aph3-III)	S
C	*L. rhamnosus* GG	S	S	R (aadA)	S
D	*L. reuteri*	S	S	R (aac6-aph2)	S
E	*E. faecium*	R (ermB)	S	S	S
G	*L. paracasei*	S	S	R (unknown)	S
H	*L. delbrueckii*	S	S	S	S
	B. bifidum	S	S	S	S
I	*L. paracasei*	S	S	R (unknown)	S
J	*L. rhamnosus*	S	S	R (aac6-aph2) (ant6-I)	S
	L. acidophilus	R (ermB)	S	R (aadA)	S

4° COMANDAMENTO:
Evitare prodotti probiotici contenenti microorganismi portatori di geni conferenti antibiotico-resistenza

Product name	Species	Erythromycin	Tetracycline	Gentamicin	Penicillin
K	*E. faecium*	S	S	S	S
	L. rhamnosus	R (unknown)	R (tetS) (tetW)	R (aadA)	S
	L. acidophilus	S	S	R (unknown)	S
	Bifidobacerium spp	S	S	R (aph3-III)	S
L	*L. paracasei*	S	S	R (aadA)	S
	L. acidophilus	S	S	R (ant6-I)	S
	B. lactis BB12	S	S	R (aph3-III)	S
	E. faecium	R (ermB)	S	S	S
	B. coagulans	S	S	S	S
M	*L. paracasei*	S	S	R (aadA)	S
	L. acidophilus	S	S	R (ant6-I)	S
	B. lactis BB12	S	R (tetW)	R (aph3-III)	S
	B. coagulans	S	S	S	S
N	*L. paracasei*	R (unknown)	S	S	S
	L. plantarum	R (unknown)	S	R (aph3-III) (aadA)	S

5° COMANDAMENTO: Prodotti monoceppo o multiceppo: come effettuare la scelta corretta

Contents lists available at SciVerse ScienceDirect

Anaerobe

journal homepage: www.elsevier.com/locate/anaerobe

Clinical microbiology

In vitro evaluation of single- and multi-strain probiotics: Inter-species inhibition between probiotic strains, and inhibition of pathogens

C.M.C. Chapman*, G.R. Gibson, I. Rowland

Department of Food and Nutritional Sciences, University of Reading, P.O. Box 226, Whiteknights, Reading RG6 6AP, United Kingdom

Available online at www.sciencedirect.com

ScienceDirect

Food Research International 40 (2007) 629–636

FOOD RESEARCH INTERNATIONAL

www.elsevier.com/locate/foodres

In vitro analysis of probiotic strain combinations to inhibit pathogen adhesion to human intestinal mucus

M. Carmen Collado [a,*], Jussi Meriluoto [b], Seppo Salminen [a]

Eur J Nutr

DOI 10.1007/s00394-013-0501-2

ORIGINAL CONTRIBUTION

Comparative in vitro inhibition of urinary tract pathogens by single- and multi-strain probiotics

C. M. C. Chapman · G. R. Gibson · S. Todd · I. Rowland

Health benefits of probiotics: are mixtures more effective than single strains?

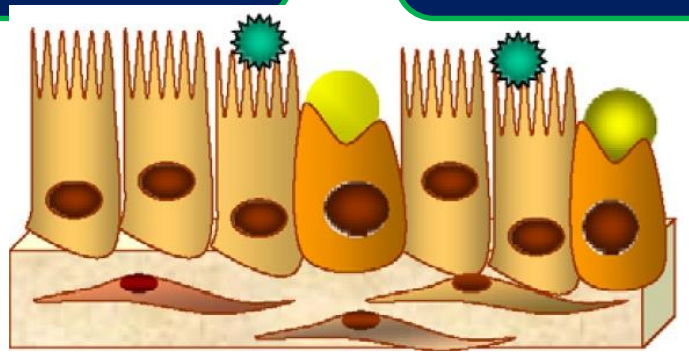
C. M. C. Chapman · G. R. Gibson · I. Rowland

Eur J Nutr (2011) 50:1–17
DOI 10.1007/s00394-010-0166-z

A further potential advantage of multi-strain probiotics in addition to exerting additive or synergistic effects on a single health end point is that strain-specific effects of individual probiotic components could together influence a wider range of end points. Currently, the evidence for this is lacking. More research is needed with a variety of multi-strain preparations, to clarify which species within a mixture have a synergistic relationship that might enhance the preparation's effectiveness and allow the development of probiotic products with broader spectrum of activity.

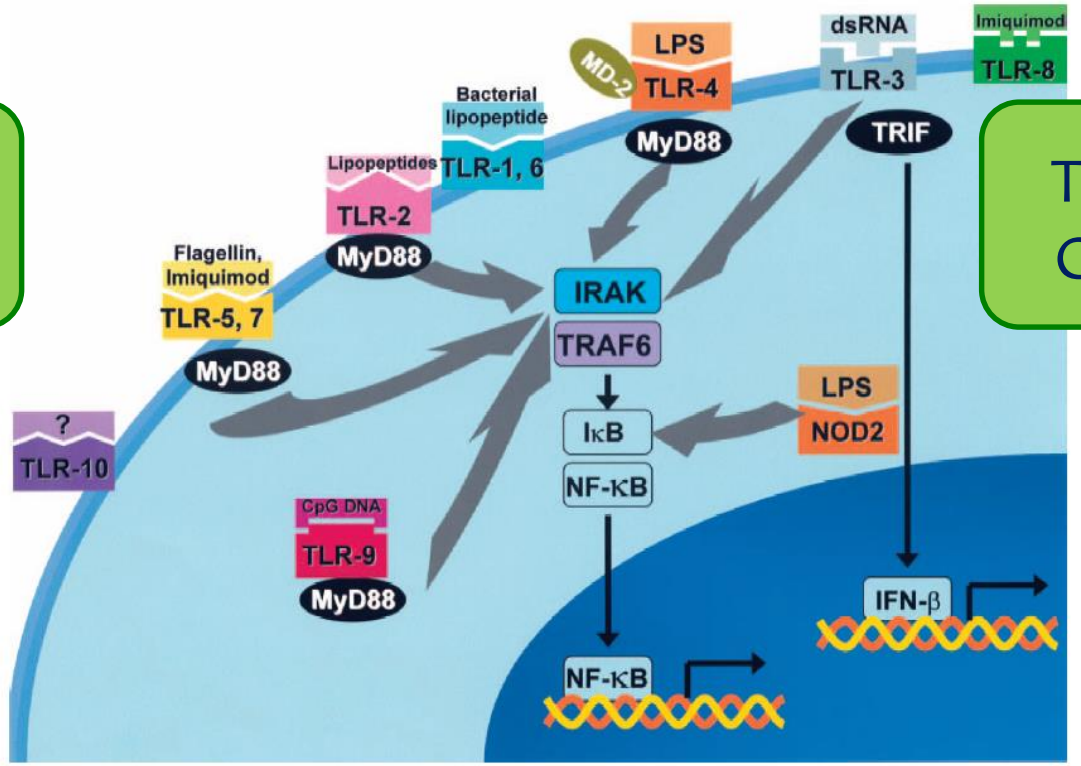
Monoceppo

Multiceppo

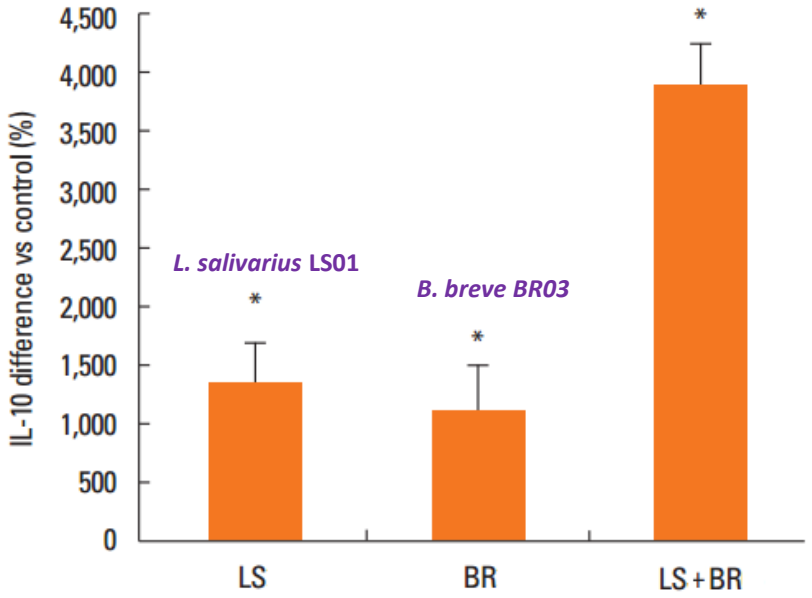


Attivazione TLR

TLR Sinergia o Competizione



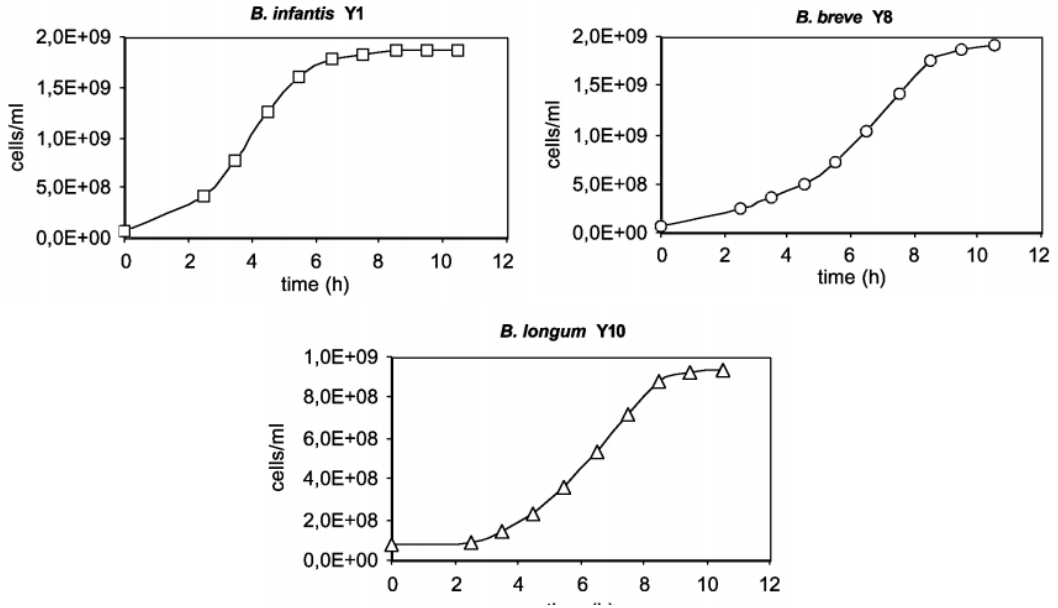
SINERGIA

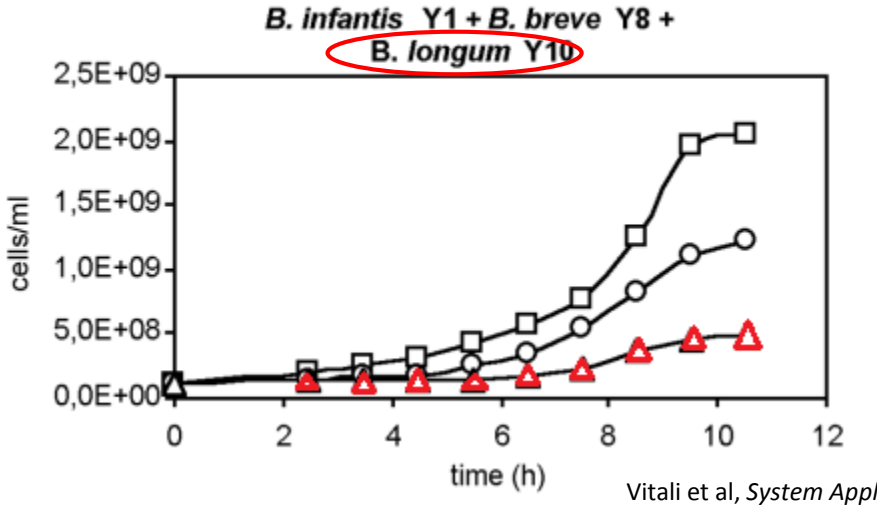


Release of IL-10 by PBMCs. *$P<0.05$ vs control (non-stimulated cells). Data are means ± SD of the 3 experiments.

Drago et al, *Allergy Asthma Immunol Res* (2015)

COMPETIZIONE



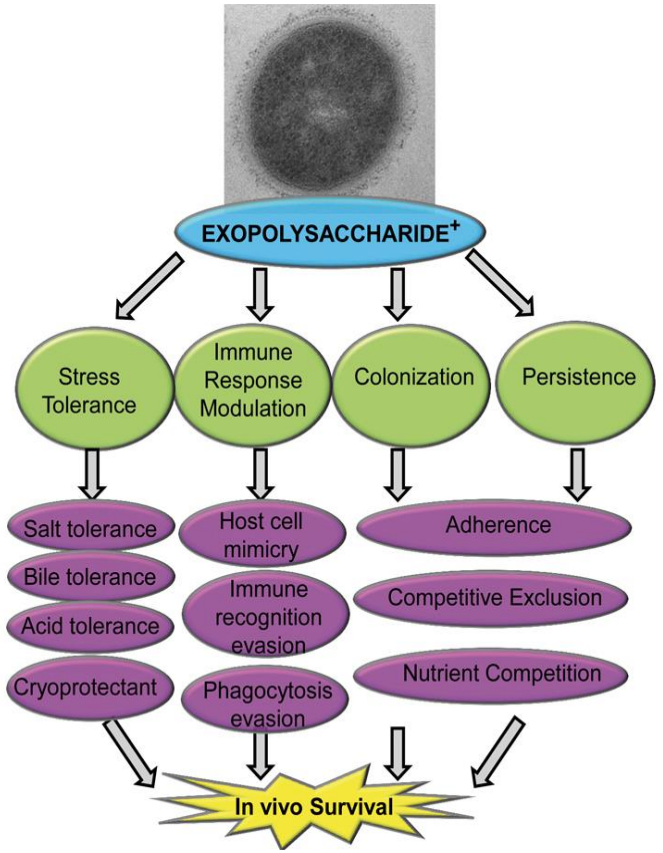


Vitali et al, *System Appl Microbiol* (2003)

6° e 7° COMANDAMENTO:
Scegliere ceppi probiotici resistenti all'ambiente gastrointestinale e in grado di colonizzarlo

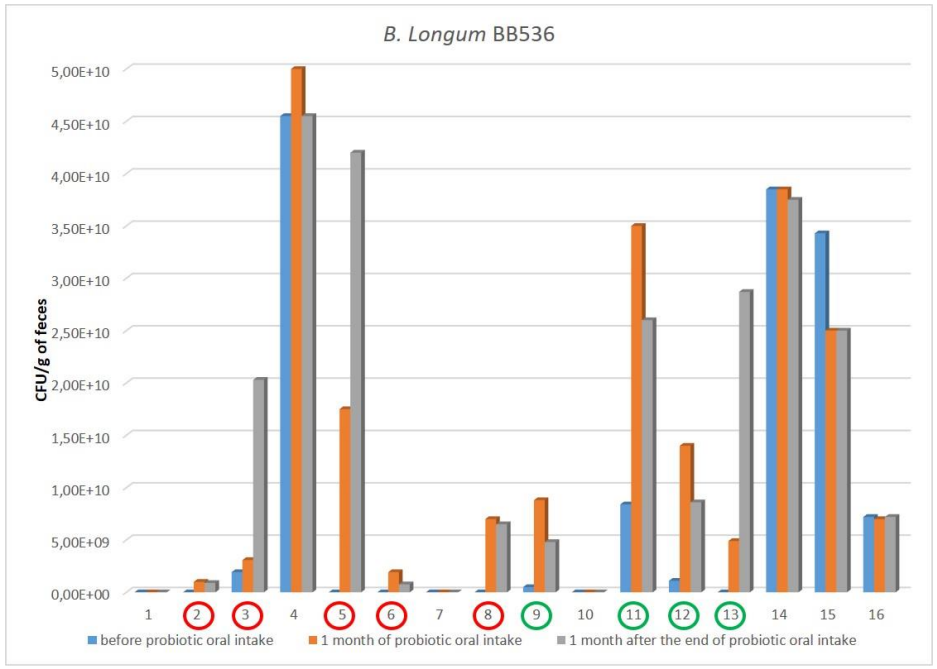
- **Resistenza al pH gastrico;**
- **Resistenza al pH intestinale;**
- **Resistenza ai sali biliari;**
- **Colonizzazione intestino**

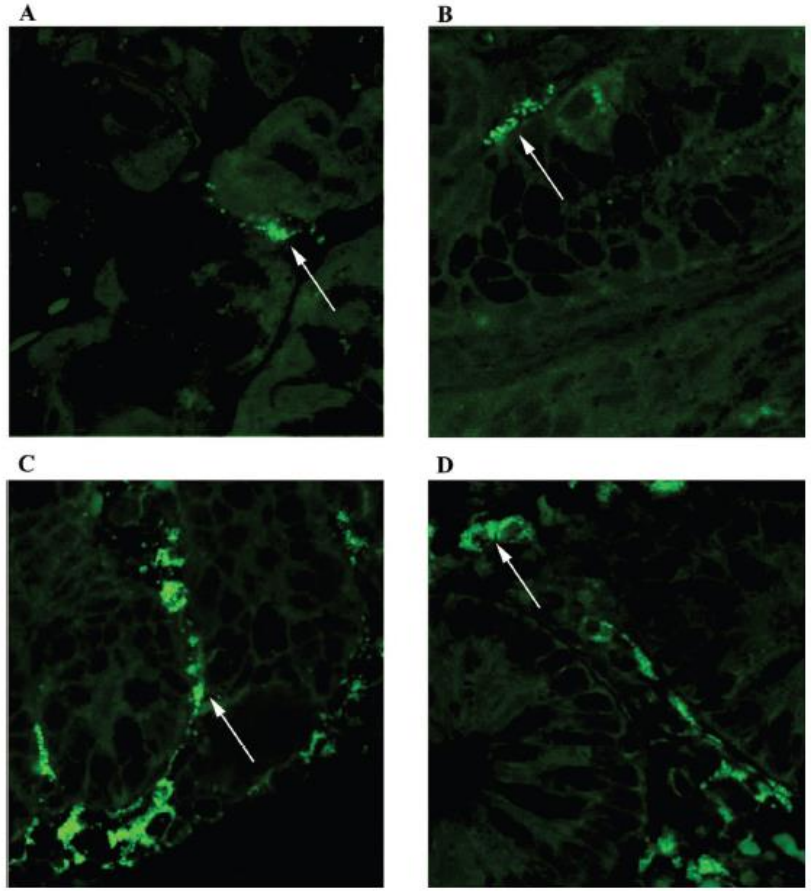
(adesione cellulare, produzione di biofilm, etc.)



6° e 7° COMANDAMENTO:

Scegliere ceppi probiotici resistenti all'ambiente gastrointestinale e in grado di colonizzarlo





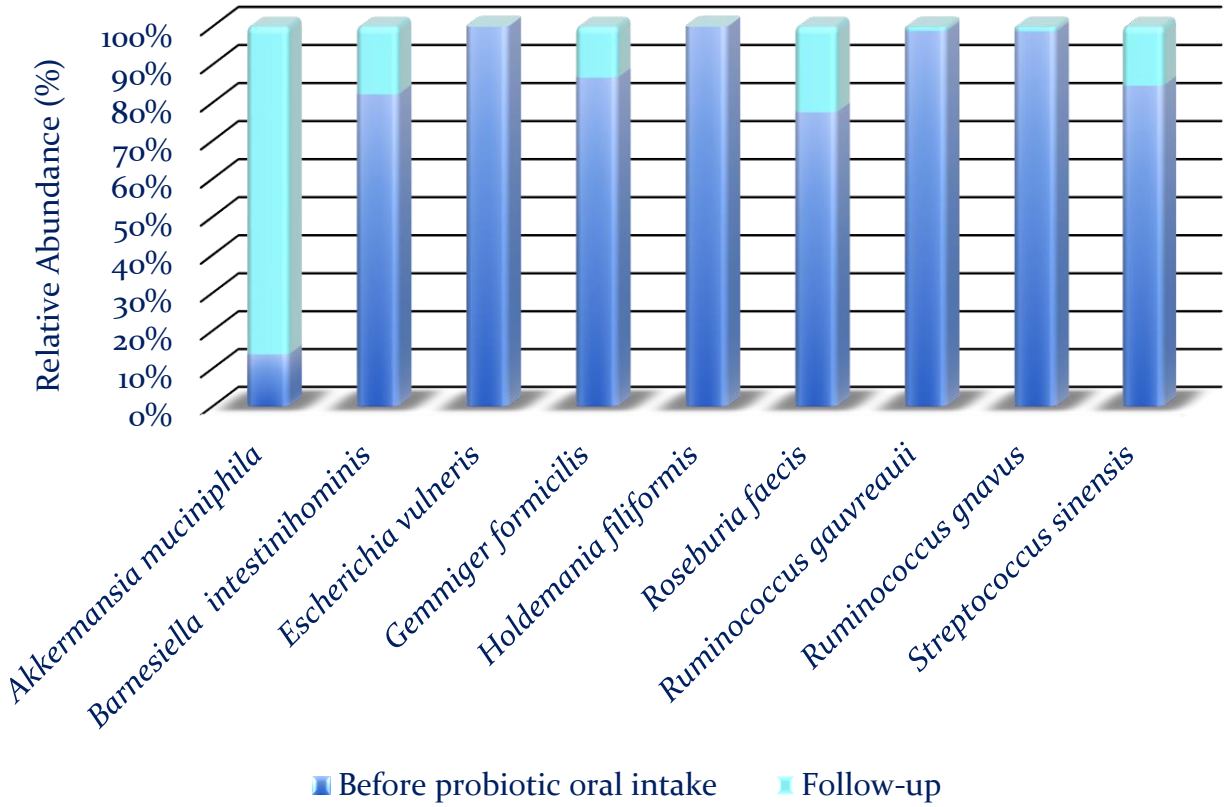
A: **gastric corpus**

B: **gastric antrum**

C: **duodenum**

D: **ileum**

8° COMANDAMENTO:
Scegliere probiotici in grado di interagire positivamente con il microbiota intestinale



Somministrazione di una miscela a base di bifidobatteri e lattobacilli:

Riduzione patogeni e incremento di microorganismi benefici (es. *Akkermansia municiphila*)

9° COMANDAMENTO:

Valutare la sicurezza dei ceppi probiotici e lo stato di salute soggetto prima della somministrazione di probiotici

Lactobacillus Bacteremia Associated With Probiotic Use in a Pediatric Patient With Ulcerative Colitis

Elaheh Vahabnezhad, MD, Albert Brian Mochon, PhD,† Laura Joyce Wozniak, MD,* and David Alexander Ziring, MD**

Abstract: Probiotic strains of *Lactobacillus* are currently used in a variety of clinical practices with limited evidence to support their use. *Lactobacillus* species are a normal part of gastrointestinal flora, and bacteremia with probiotic strains of *Lactobacillus* is very uncommon. We describe a case of *Lactobacillus* bacteremia in a 17-year-old boy with ulcerative colitis managed with systemic corticosteroids and infliximab, who presented with fever to 102°F, flushing, and chills 1 week after starting *Lactobacillus rhamnosus* GG probiotics. Initial blood culture on day 2 of his fever was positive for *Lactobacillus*, however, subsequent blood cultures on day 3 and 5 were negative. He was treated empirically with antibiotics for 5 days and defervesced by day 8 of his illness. 16 S rRNA sequence analysis identified the organism from the patient's blood culture and probiotic capsule as *L. rhamnosus* with a 99.78% match for both the strains. This case report highlights the potential risk of *Lactobacillus* bacteremia in immunosuppressed patients with severe active ulcerative colitis.

9° COMANDAMENTO:

Valutare la sicurezza dei ceppi probiotici e lo stato di salute soggetto prima della somministrazione di probiotici

Breakthrough *Lactobacillus rhamnosus* GG bacteremia associated with probiotic use in an adult patient with severe active ulcerative colitis: case report and review of the literature

Simone Meini[1] · Raffaele Laureano[1] · Lucia Fani[1] · Carlo Tascini[2] · Angelo Galano[3] · Alberto Antonelli[3] · Gian Maria Rossolini[3,4,5]

Abstract

Background Probiotics are widely investigated in the treatment of various bowel diseases. However, they may also have a pathogenic potential, and the role of *Lactobacillus* spp. as opportunistic pathogens, mostly following disruption of the intestinal mucosa, is emerging.

Case report We report on a case of bacteremia caused by *L. rhamnosus* GG in an adult patient affected by severe active ulcerative colitis under treatment with corticosteroids and mesalazine. *Lactobacillus* bacteremia was associated with candidemia and occurred while the patient was receiving a probiotic formulation containing the same strain (as determined by PFGE typing), and was being concomitantly treated with i.v. vancomycin, to which the *Lactobacillus* strain was resistant. *L. rhamnosus* GG bacteremia, therefore, was apparently related with translocation of bacteria from the intestinal lumen to the blood.

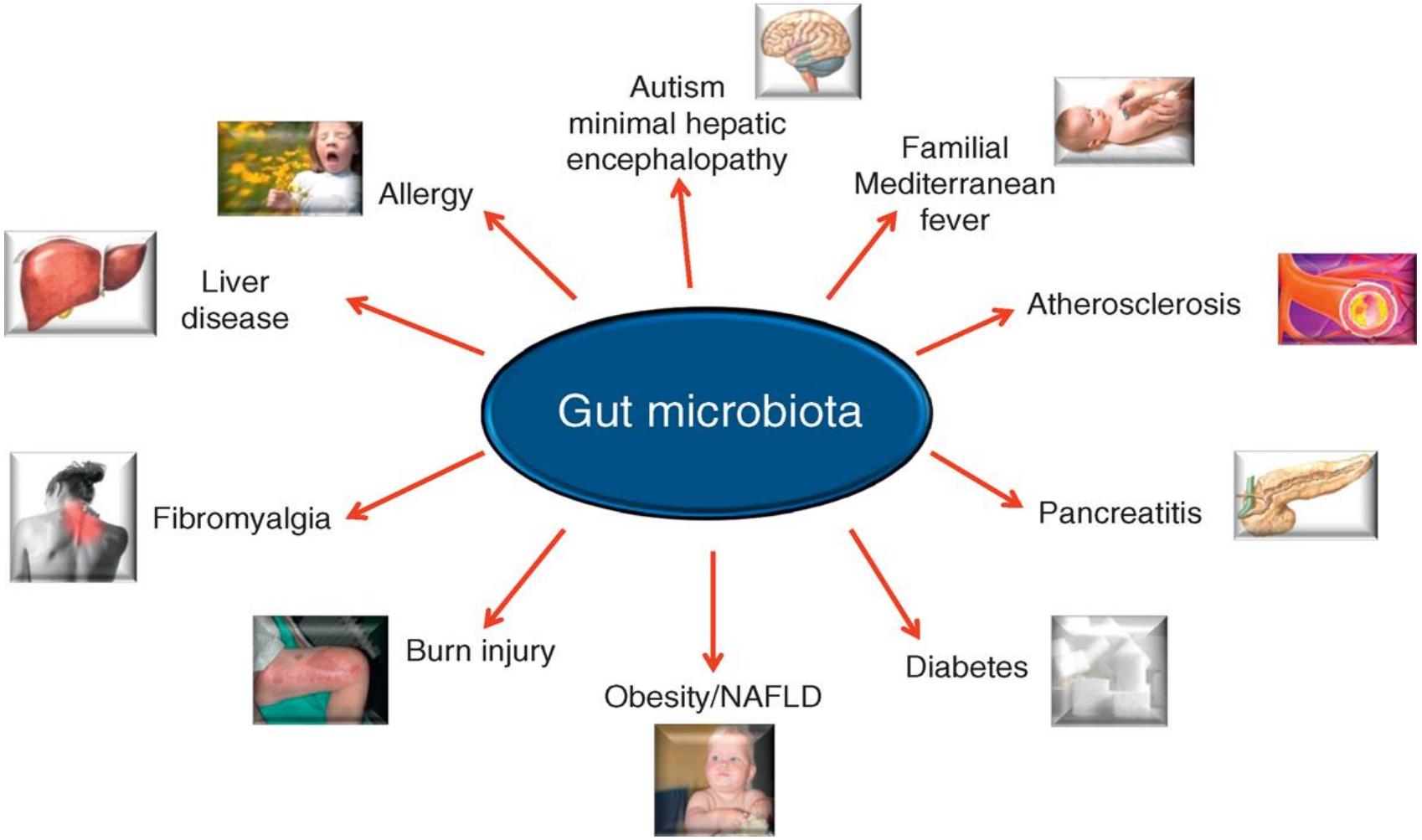
Conclusions Pending conclusive evidence, use of probiotics should be considered with caution in case of active severe inflammatory bowel diseases with mucosal disruption.

9° COMANDAMENTO:

Valutare la sicurezza dei ceppi probiotici e lo stato di salute soggetto prima della somministrazione di probiotici

Il reale rischio nell'utilizzo dei prodotti probiotici sembra essere maggiormente legato allo STATO DI SALUTE dell'individuo piuttosto che all'impiego di un particolare ceppo microbico nel prodotto probiotico.

10° COMANDAMENTO:
Utilizzare ceppi probiotici con una dimostrata efficacia clinica



10° COMANDAMENTO:
Utilizzare ceppi probiotici con una dimostrata efficacia clinica

Prevention of necrotizing enterocolitis with probiotics: a systematic review and meta-analysis

Sonja C. Sawh[1], Santosh Deshpande[1,*], Sandy Jansen[1,*], Christopher J. Reynaert[1,*] and Philip M. Jones[2,*]

Preliminary Results on Clinical Effects of Probiotic *Lactobacillus salivarius* LS01 in Children Affected by Atopic Dermatitis

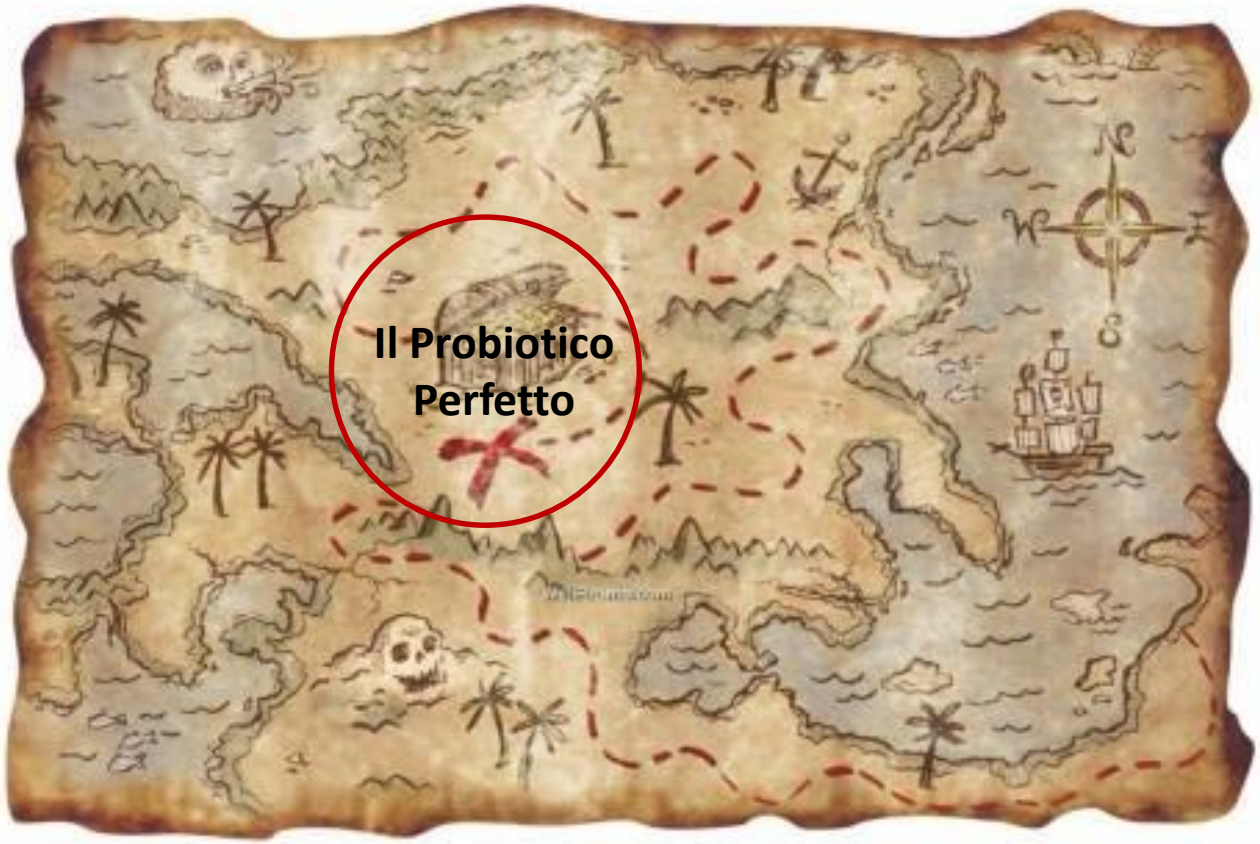
Antonio A. Niccoli, MD, Anna L. Artesi, MD,* Francesco Candio, MD,* Sara Ceccarelli, MD,* Rita Cozzali, MD,* Luigi Ferraro, MD,* Donatella Fiumana, MD,* Manuela Mencacci, MD,* Maurizio Morlupo, MD,* Paola Pazzelli, MD,* Laura Rossi, MD,* Marco Toscano, MSc,† and Lorenzo Drago, PhD†‡*

Review

Effect of probiotics on glucose metabolism in patients with type 2 diabetes mellitus: A meta-analysis of randomized controlled trials

Qingqing Zhang [a,], Yucheng Wu [b], Xiaoqiang Fei [a]*

CONCLUSIONI



Grazie per l'Attenzione!

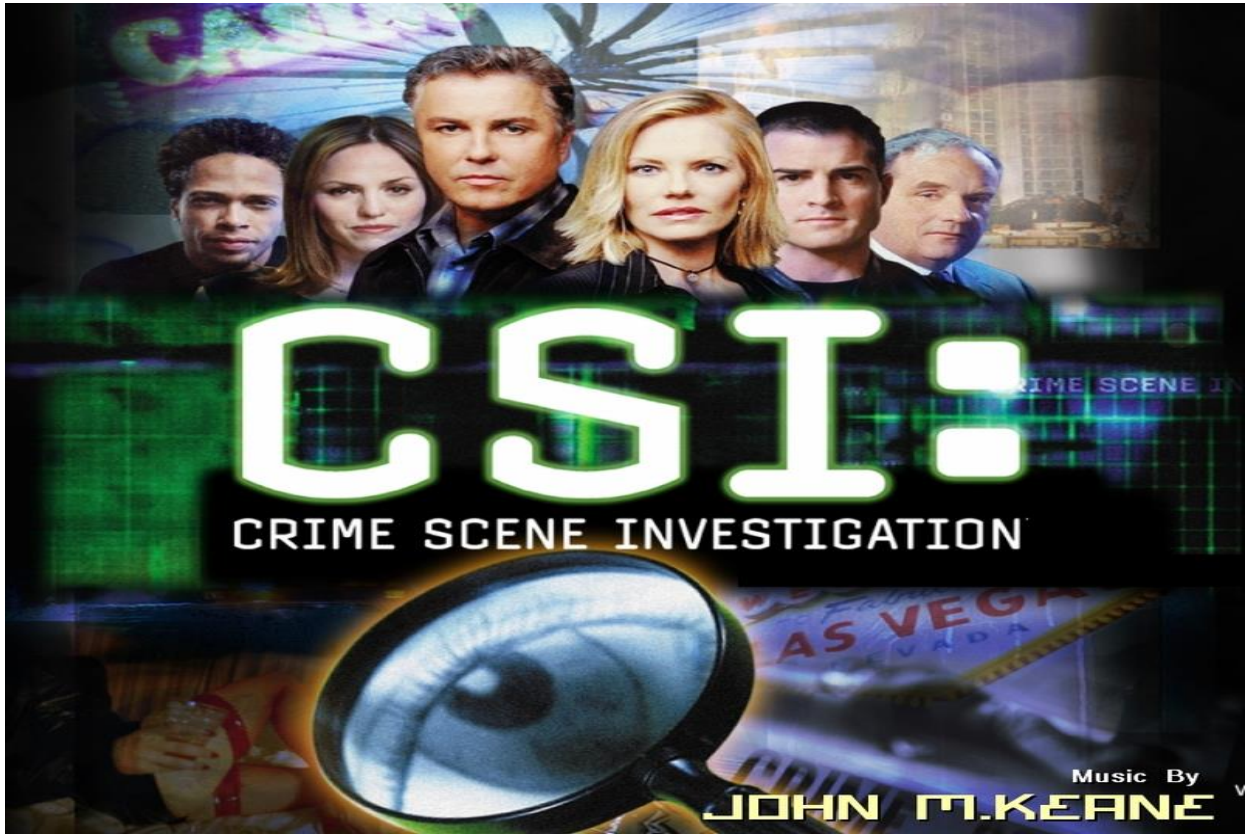
I "10 comandamenti" dei probiotici

1. Usare la corretta definizione di “probiotico”
2. Identificare correttamente il ceppo probiotico
3. Evitare la presenza di geni di antibiotico-resistenza nei ceppi probiotici
4. Evitare prodotti probiotici contenenti microorganismi portatori di geni conferenti antibiotico-resistenza
5. Prodotti monoceppo o multiceppo: come effettuare la scelta corretta
6. Scegliere ceppi probiotici resistenti all’ambiente gastrointestinale
7. I ceppi probiotici devono essere in grado di colonizzare l’ambiente gastrointestinale
8. Scegliere probiotici in grado di interagire positivamente con il microbiota intestinale
9. Valutare la sicurezza dei ceppi probiotici e lo stato di salute soggetto prima della somministrazione di probiotici
10. Utilizzare ceppi probiotici con una dimostrata efficacia clinica

Characterised fully (complete genome)

Safe (no toxins, virulence factors, antibiotic production or mobile ATBR)

Identifiable (International Code of Nomenclature & strain deposit)



Antimicrobial Original Research Paper

Microbiological and genetic identification of some probiotics proposed for medical use in 2011

Marco Toscano[1], Elena de Vecchi[2], Valentina Rodighiero[1], Lorenzo Drago[1,2]

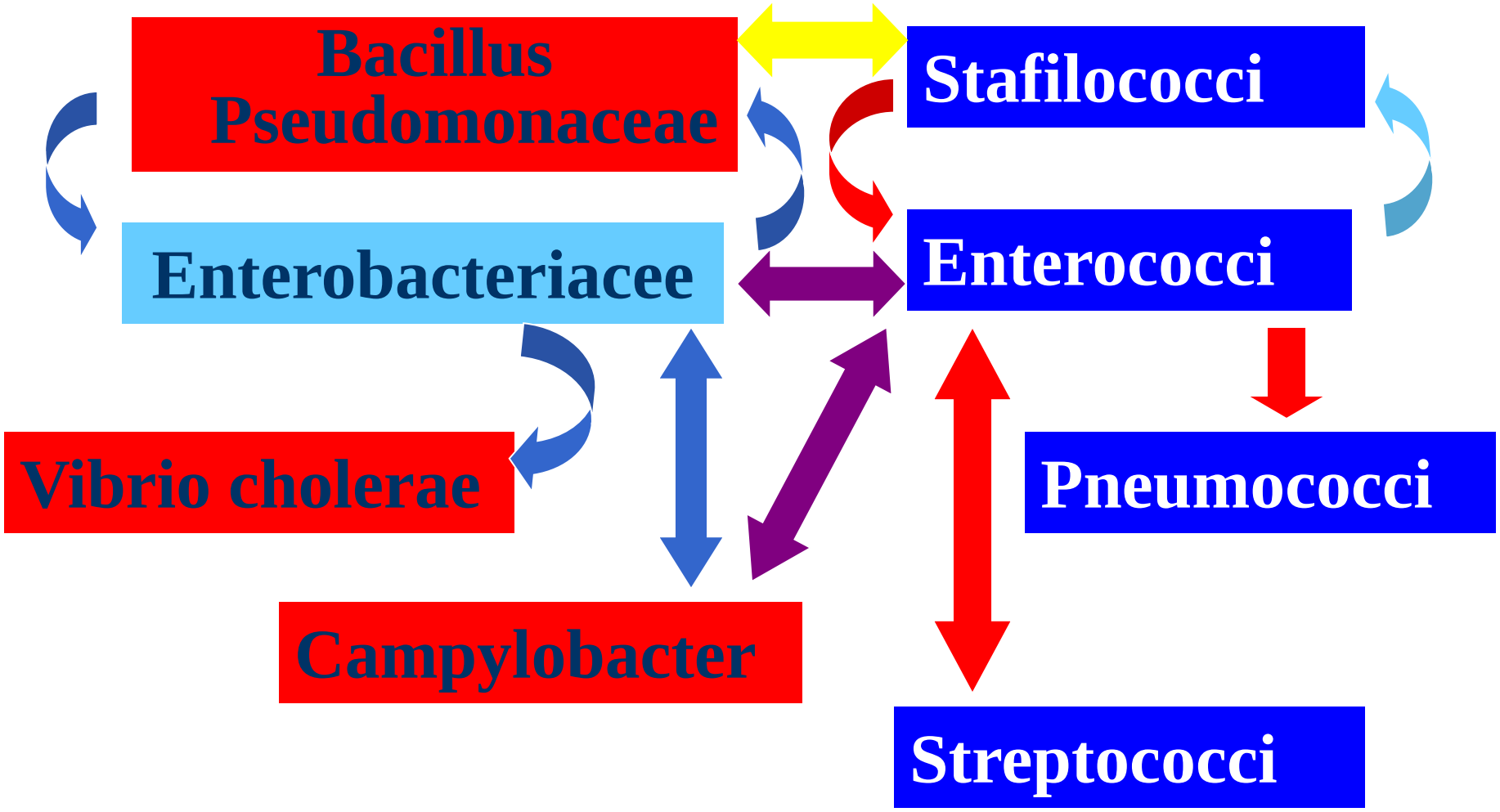
Journal of Chemotherapy 2013

In conclusion, both this study and earlier works have shown that some products on the Italian and European market do not comply with the specific guidelines. There is a need of a clear legislation providing for the accurate testing of all products, as the effectiveness of a probiotic cannot be guaranteed if quality standards are not complied.

I probiotici Italiani

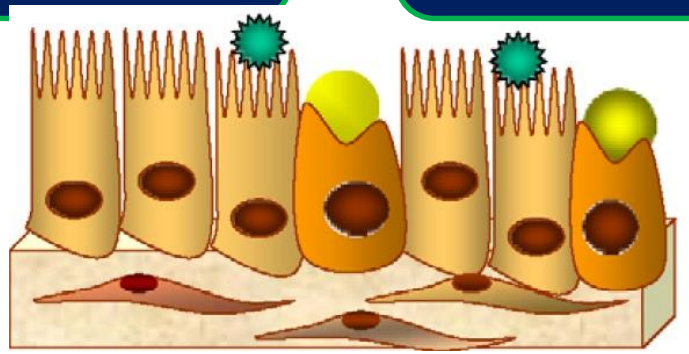
†J (vials)	$1.5*10^{10}$	*Lactobacillus acidophilus*	$4.6*10^{9}$	$3.1*10^{9}$	$1.3*10^{9}$	$6.7*10^{8}$	-	*L. acidophilus*
		Lactobacillus rhamnosus	$9.8*10^{7}$	$5.9*10^{7}$	$4.9*10^{7}$	$4.1*10^{6}$		*L. rhamnosus*
†K (sachet)	$> 5*10^{10}$	*Streptococcus thermophilus*	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$	*E. faecium* $1.1*10^{8}$	-
	10^{9}	*Lactobacillus acidophilus*	$4.1*10^{8}$	$1.7*10^{8}$	$1.6*10^{8}$	$7.6*10^{7}$		*L. acidophilus*
	$2*10^{9}$	*Lactobacillus rhamnosus*	$2.1*10^{9}$	$4.4*10^{8}$	$4.3*10^{8}$	$5.8*10^{7}$		*L. rhamnosus*
	$5*10^{9}$	*Lactobacillus plantarum*	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$		*L. plantarum* *
	10^{9}	*Lactobacillus salivarius*	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$		*L. salivarius* *
	$2*10^{9}$	*Lactobacillus gasseri*	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$		-
	10^{9}	*Bifidobacterium infantis*	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$		-
	10^{9}	*Bifidobacterium longum*	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$	$< 10^{2}$		*B. longum* *
	-	-	$8.7*10^{7}$	$2.3*10^{7}$	$2.1*10^{7}$	$7.4*10^{6}$		*Bifidobact.* spp
	10^{9}	*Lactobacillus sporogenes*	$2.7*10^{8}$	$7.5*10^{7}$	$7.4*10^{7}$	$1.0*10^{7}$		*B. coagulans*
L1 (capsule)	10^{9}	*Lactobacillus acidophilus*	$5.8*10^{8}$	$3.3*10^{8}$	$2.1*10^{8}$	$3.3*10^{7}$	-	*L. acidophilus*
		Lactobacillus paracasei	$1.0*10^{7}$	$7.0*10^{6}$	$4.0*10^{6}$	$7.2*10^{5}$		*L. paracasei*
		Bifidobacterium BB12	$8.5*10^{7}$	$5.2*10^{7}$	$3.3*10^{7}$	$5.0*10^{6}$		*B. lactis*
		Bacillus coagulans	$5.1*10^{8}$	$3.7*10^{8}$	$3.0*10^{8}$	$6.6*10^{7}$		*B. coagulans*

ANTIBIOTICO-RESISTENZA



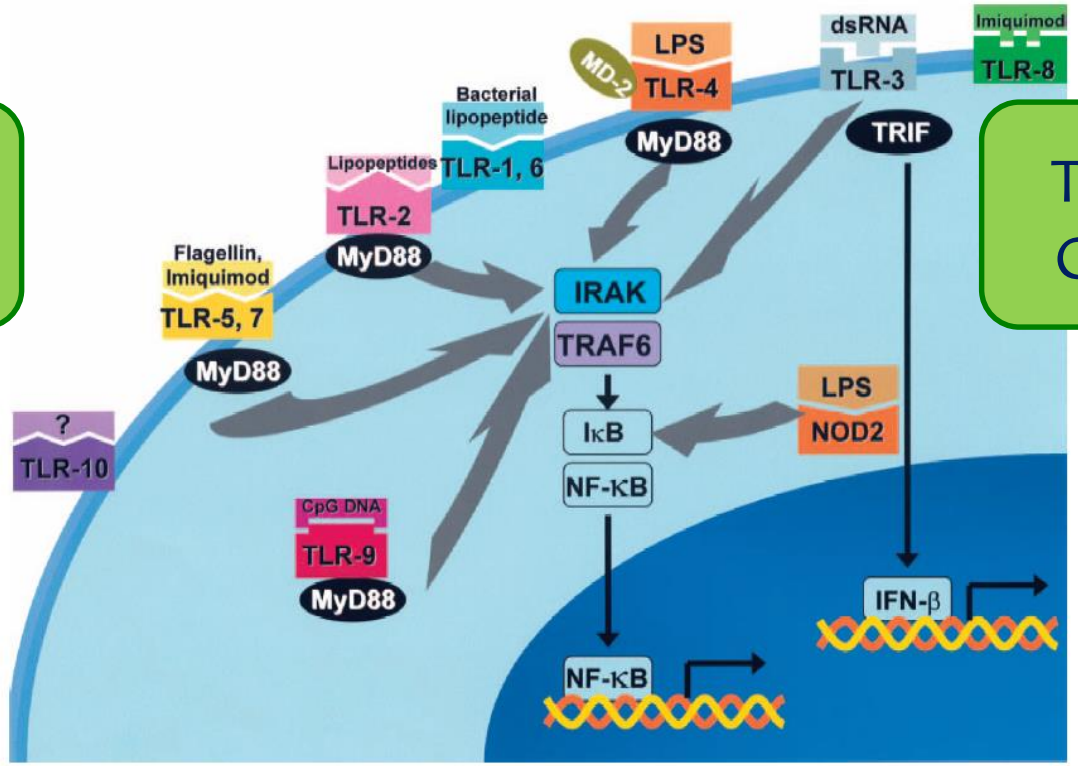
Monoceppo

Multiceppo

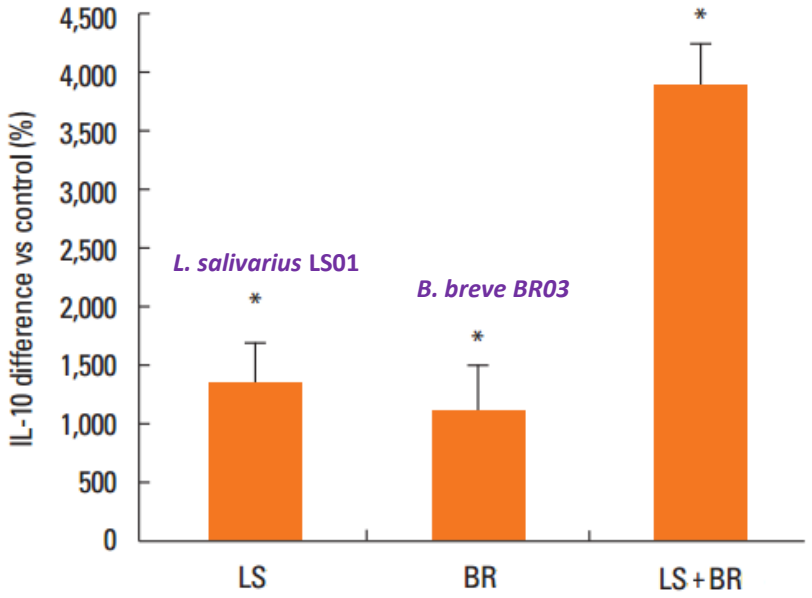


Attivazione TLR

TLR Sinergia o Competizione



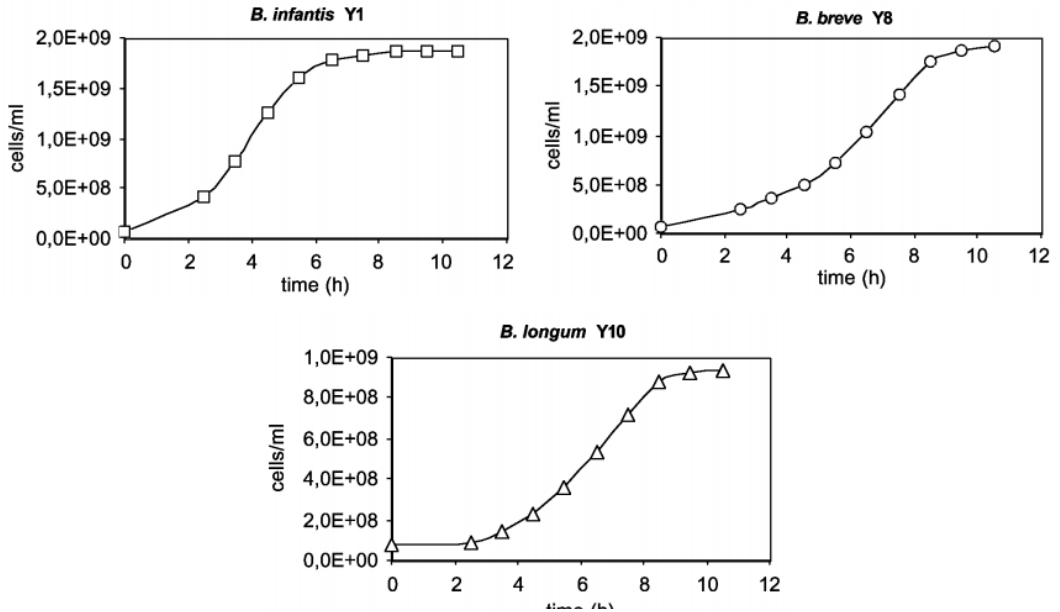
SINERGIA

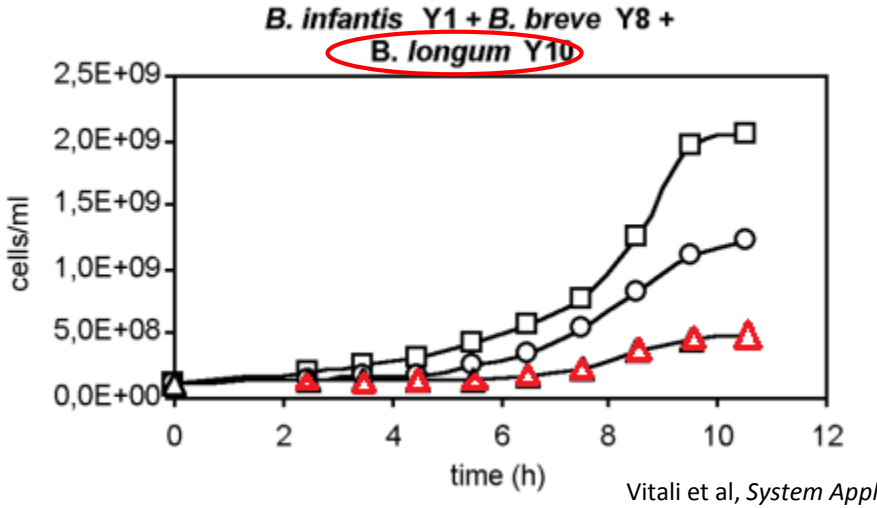


Release of IL-10 by PBMCs. *$P<0.05$ vs control (non-stimulated cells).
Data are means ± SD of the 3 experiments.

Drago et al, *Allergy Asthma Immunol Res* (2015)

COMPETIZIONE

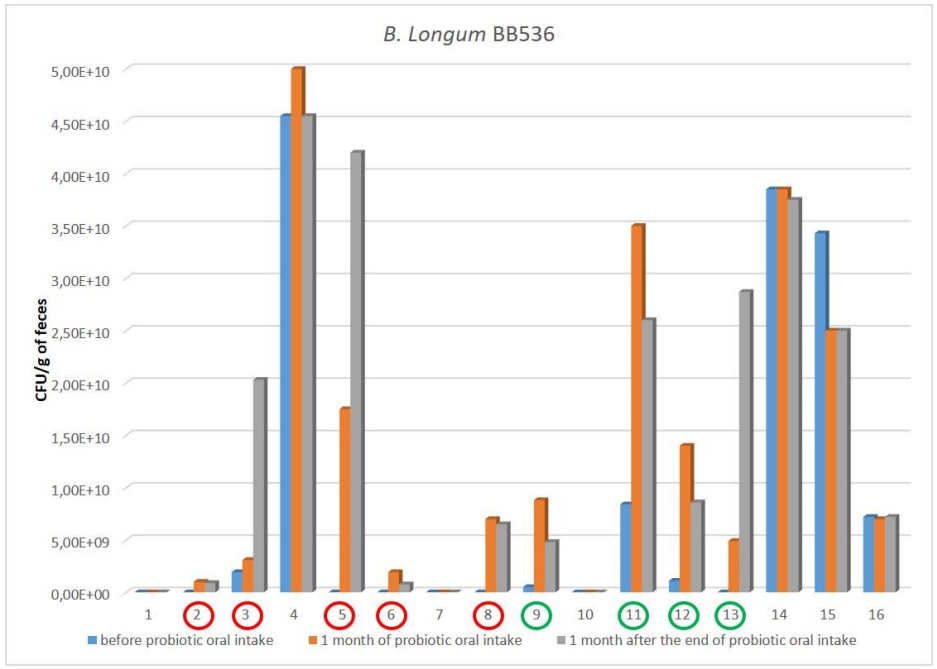


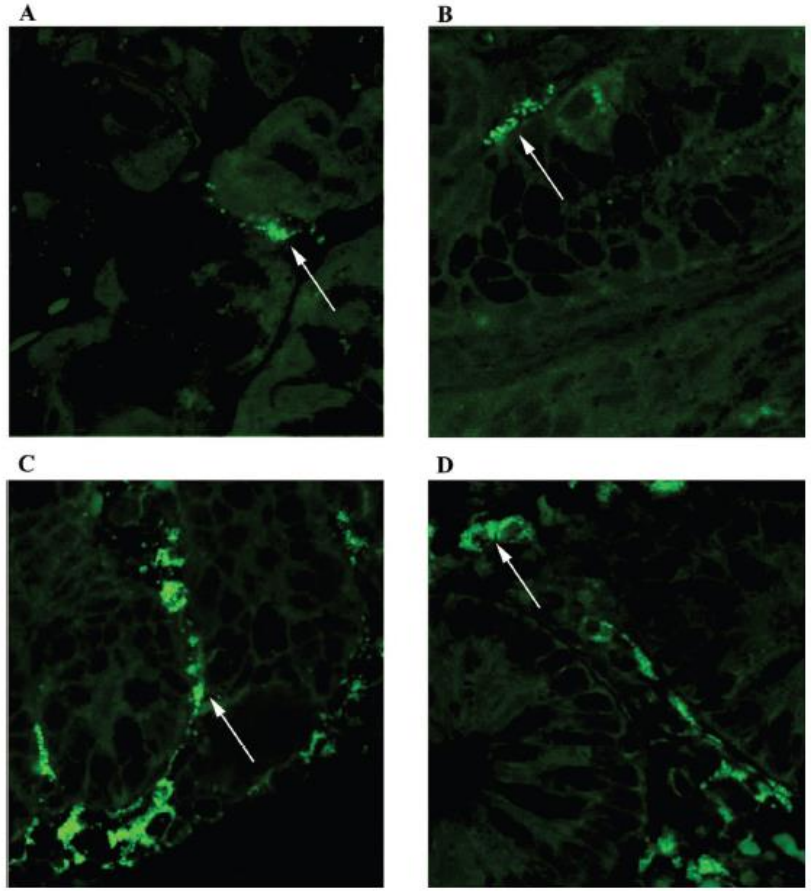


Vitali et al, *System Appl Microbiol* (2003)

6° e 7° COMANDAMENTO:

Scegliere ceppi probiotici resistenti all'ambiente gastrointestinale e in grado di colonizzarlo





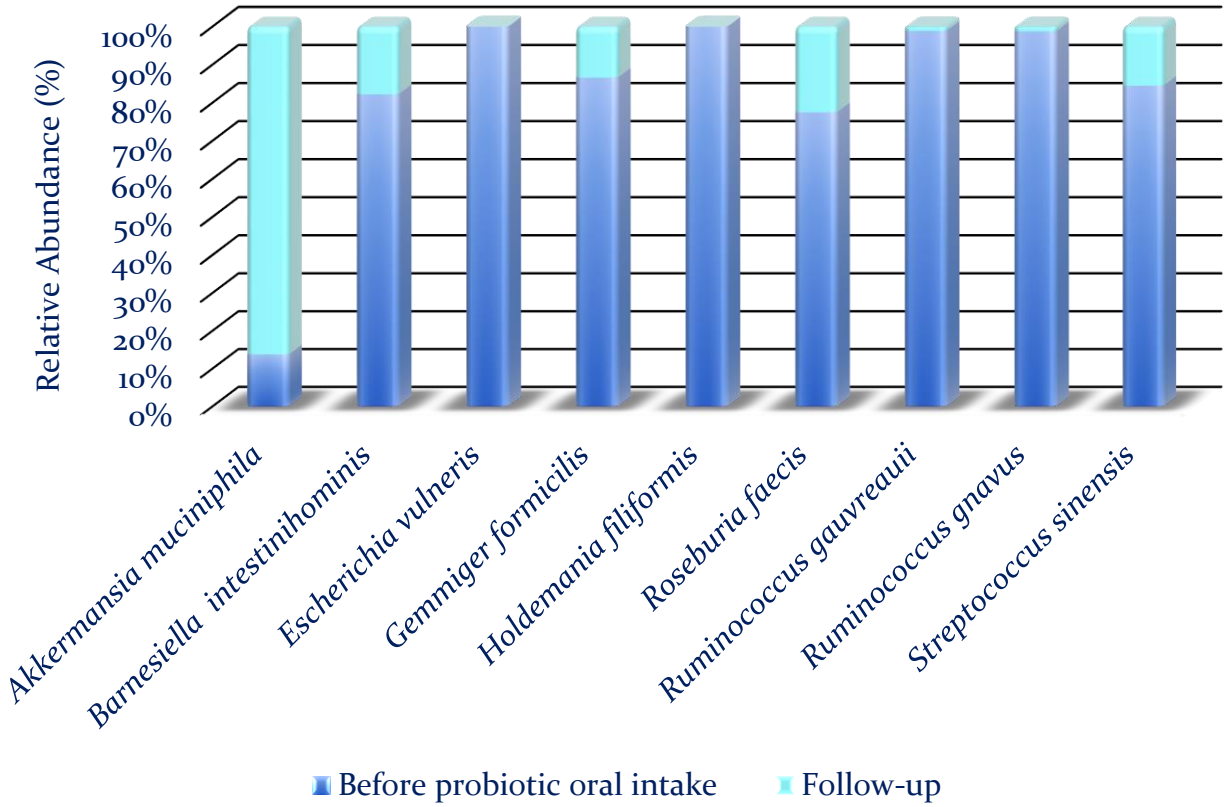
A: **gastric corpus**

B: **gastric antrum**

C: **duodenum**

D: **ileum**

8° COMANDAMENTO:
Scegliere probiotici in grado di interagire positivamente con il microbiota intestinale



Somministrazione di una miscela a base di bifidobatteri e lattobacilli:

Riduzione patogeni e incremento di microorganismi benefici (es. *Akkermansia municiphila*)

10° COMANDAMENTO:
Utilizzare ceppi probiotici con una dimostrata efficacia clinica