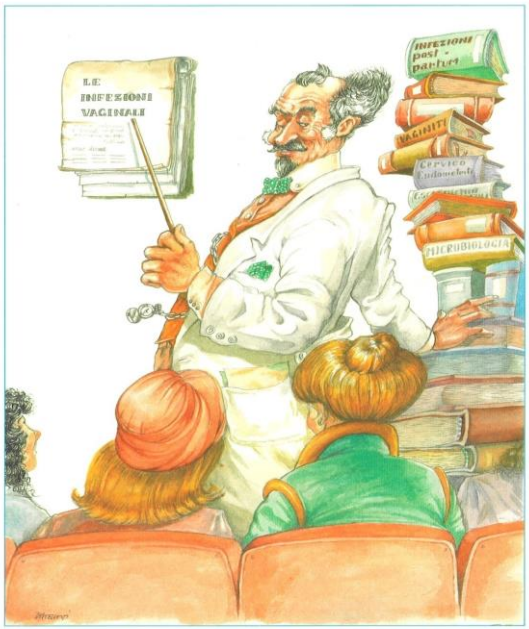
top ten
in gastroenterologia

9ª EDIZIONE
2·3 MARZO 2018
BERGAMO Hotel Excelsior S. Marco
Piazza della Repubblica, 6

Disbiosi intestinale e patologia uroginecologica



Contagi intimi

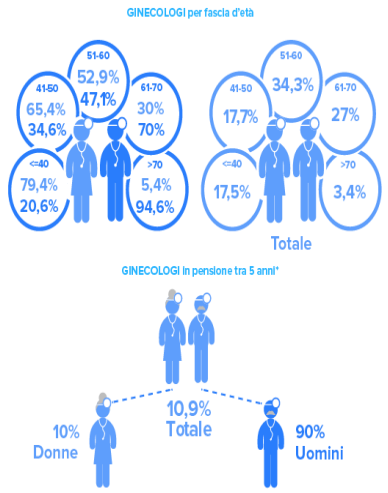
franco vicariotto

COME CAMBIA LA GINECOLOGIA IN ITALIA

in futuro gli atteggiamenti e le prescrizioni dello specialista ginecologo si declineranno al femminile.
Su 10 ginecologi che andranno in pensione tra cinque anni 9 saranno uomini.
già oggi nelle scuole di specialità e tra gli specialisti le donne sono otto su dieci.

Domani chi sarà accanto alla donna nelle scelte di salute legate alla sfera femminile sarà dunque una donna.
La ginecologa sara' meno ***tradizionale allopatica..***

la Medicina si sta progressivamente allontanando da una visone separatistica delle funzioni organiche con una interpretazione ***naturale\olistica*** *una Medicina centrata sulla persona che considera la paziente nella sua globalità mente-corpo e nella sua individualità.*



La ***medicina olistica*** *è prima di tutto un Modo, cioè* ***una metodologia clinica****.*
Essa ***riguarda il modo di essere del medico****, del paziente e della loro relazione*

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Dysbiosis in the vaginal microbiome

Bacterial Vaginosis (BV)	• 10-29% of the female population • underlying inflammation increase the risk for preterm labor and the acquisition of STIs
Yeast Vaginitis (Vulvovaginal Candidiasis)	• experienced at least once by 75% of women
Urinary Tract Infections (UTI)	• 25-30% of women between the ages of • In 85% of cases, the bacteria responsible for a UTI originate in a woman's own intestine or vagina

grandi numeri
prima causa di visita ginecologica
problema economico,psicologico e sociale

antibiotici o probiotici?

Vaginal flora

Vaginal health involves microbial competition and adaptation. Over time symbiotic relationships were formed that allow beneficial vaginal microbiota to competitively inhibit pathogen growth, adhesion and colonisation via a number of mechanisms, including: pH maintenance, hydrogen peroxide production, enzyme inhibition, immune system interaction and bacteriocin generation.

Lactobacilli produce	Function
Lactic acid	Help to maintain vaginal pH, inhibiting the proliferation of pathogenic bacteria
Hydrogen peroxide	Toxic to anaerobic pathogens, directly destroy pathogenic anaerobic bacteria
Bacteriocins	Proteins that inhibit the growth & reproductive success of competing pathogens
Biosurfactants	Reduce surface tension and have the ability to disrupt and dislodge pathogenic biofilms

Nunn 2016
Petrova 2016, Bruce 2010, Saunders 2007

ipa WORLD CONGRESS + PROBIOTA 2018
BARCELONA • 7-9 FEBRUARY

CONNECTING THE BUSINESS AND SCIENCE OF PRE AND PROBIOTICS

POSITION PAPER

EARLY ASSEMBLY OF THE MICROBIOME:

The importance of a woman maintaining a healthy microbiome

Author: Professor Franco Vicariotto, MD.

Prof. Vicariotto is Chair of the Life-Space Probiotics Advisory Board.

Prof. Vicariotto is a specialist consultant in Obstetrics and Gynaecology at HUMANITAS-S.PIO X Hospital of Milan and at the Lower Genital Tract Disease Unit, V. Buzzi Hospital – University of Milan. His major interest and experience is in the use and research of oral and vaginal probiotics in obstetrics and gynaecology. He is the founder and on the Board of SIFIOG – Italian Society of Supplements in Obstetrics and Gynaecology.

Human microbiome

The human microbiome is defined as 'the ecological community of commensal, symbiotic, and pathogenic microorganisms that literally share our body space.'[1] The microbiota is composed of microorganisms including bacteria, viruses, fungi and protozoa that reside on and in the human body and contains approximately 38 trillion microbial cells.[1,2] The microbiome is defined as the community of all microorganisms and their genes.[1]

The microbiome is mostly located at entrance points to the body, which are directly exposed to the external environment e.g. skin, gastrointestinal (GI), respiratory and urogenital tracts.[3] A healthy microbiota is one that contains a highly diverse variety of different bacteria. A low amount of bacterial diversity has been associated with the development of chronic disease.[4]

362.385.000 euro (2017) +6,3%

Minimising disruptions to the vaginal microbiome with probiotics

Bacterial vaginosis is the most common cause of vaginal infection in women of childbearing age. It is predominantly caused by pathogenic Gardnerella. About 50% of women with this condition have no symptoms at all and the prevalence rate in apparently healthy women is around 10%.[18]

The dominance of lactobacilli in healthy vaginal microbiota and its depletion in bacterial vaginosis has given rise to the use of probiotic *Lactobacillus* strains as well as *Streptococcus thermophiles* for its treatment and prevention, by lowering intravaginal pH with the production of certain acids and hydrogen peroxide, thus establishing a barrier effect against many pathogens.[18-21]

Ecosistema vaginale

I PRIMI PASSI ……vaginocentrici

La vagina può essere considerata uno dei modelli più completi ed interessanti per lo studio dei rapporti tra ospite e flora microbica residente

La simbiosi mutualistica
tra ospite e flora lattobacillare
è l'aspetto caratterizzante l'ecosistema vaginale

L'equilibrio dell'ecosistema vaginale
costituisce il principale fattore di difesa
contro le infezioni delle basse vie genitali

DISBIOSI

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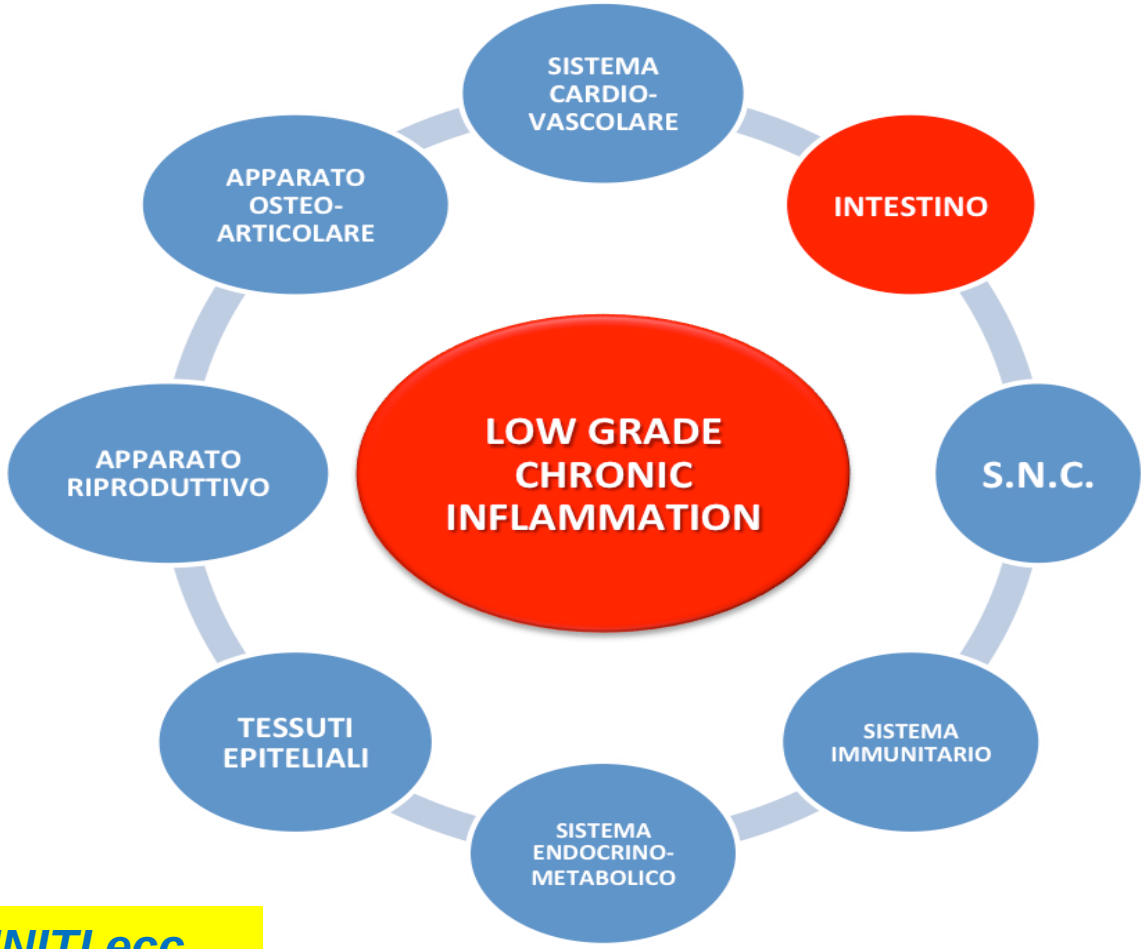

VAGINA E VAGINITI ecc.

INFIAMMAZIONE madre di tutte le patologie

DISBIOSI

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Low grade chronic inflammation

Ginecologia

VVC-VB-AV (microbioma vaginale)

Vulvodinia

Il dolore pelvico cronico

UTI……Dolore Vescicale

Infertilita'…..

Gravidanza ……..

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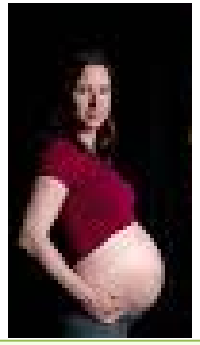
Microbioma in relation to Women Health

Gynec

- STD
- Vaginitis
- Vaginosis
- Metabolic disorders

Fertilization

- Pro-inflammatory cytokines
- Sperm motility and viability



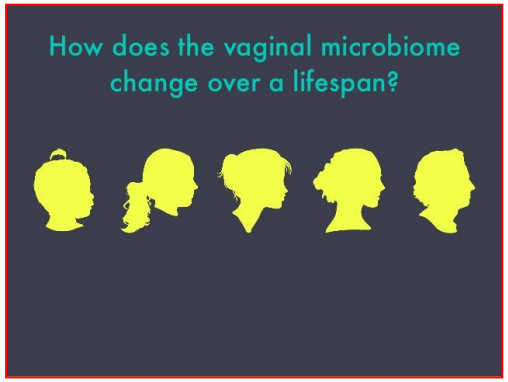
Pregnancy

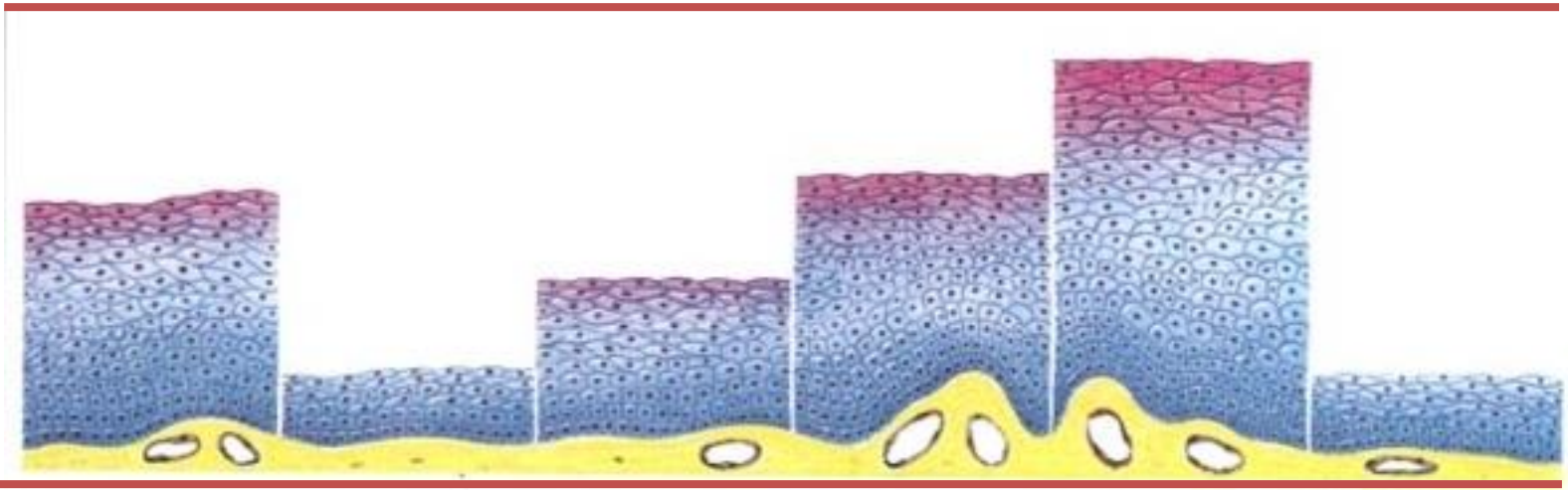
- Preterm delivery
- Eczema-Allergy
- Breastfeeding

Menopause

- UTI
- ATROPHY

variazioni cicliche e ormonali

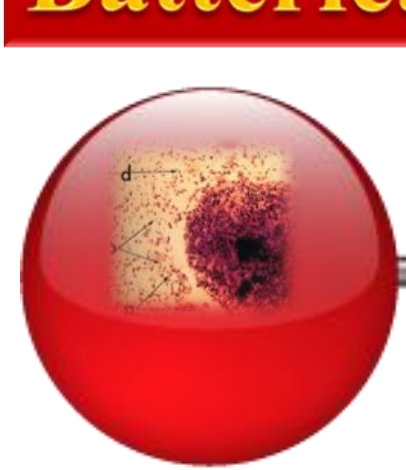


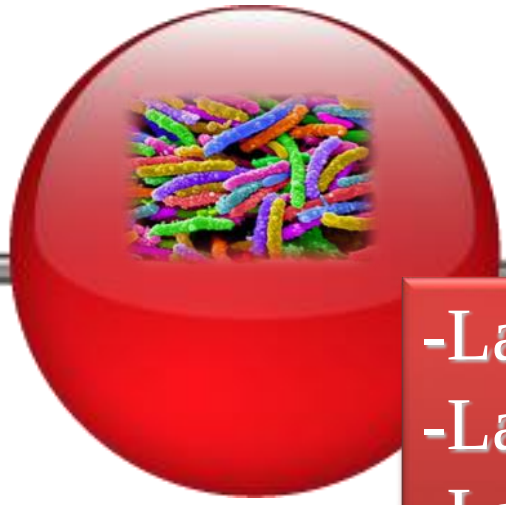
	neonata	1 mese	pubertà	maturità sessuale	gravidanza	dopo la menopausa
estrogeni	++	-	+	++	+++	-
epitelio						
glicogeno	+	-	- → +	+	++	-
pH	4-5	7	7→5	4 -5	3,5-4,5	6-7
presenza microrgan.	sterile Lattobacilli	scarso	misto	Lattobacilli		misto

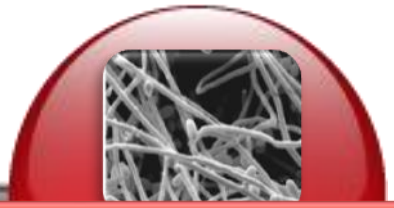
Infezioni Vulvo-Vaginali (Ricorrenti)

Vaginosi Batterica

Candidosi







- Lactobacillus Crispatus
- Lactobacillus Jensenii
- Lactobacillus Gasseri
- Lactobacillus Vaginalis

Flora Lattobacillare

Candidosi Vulvo-Vaginale

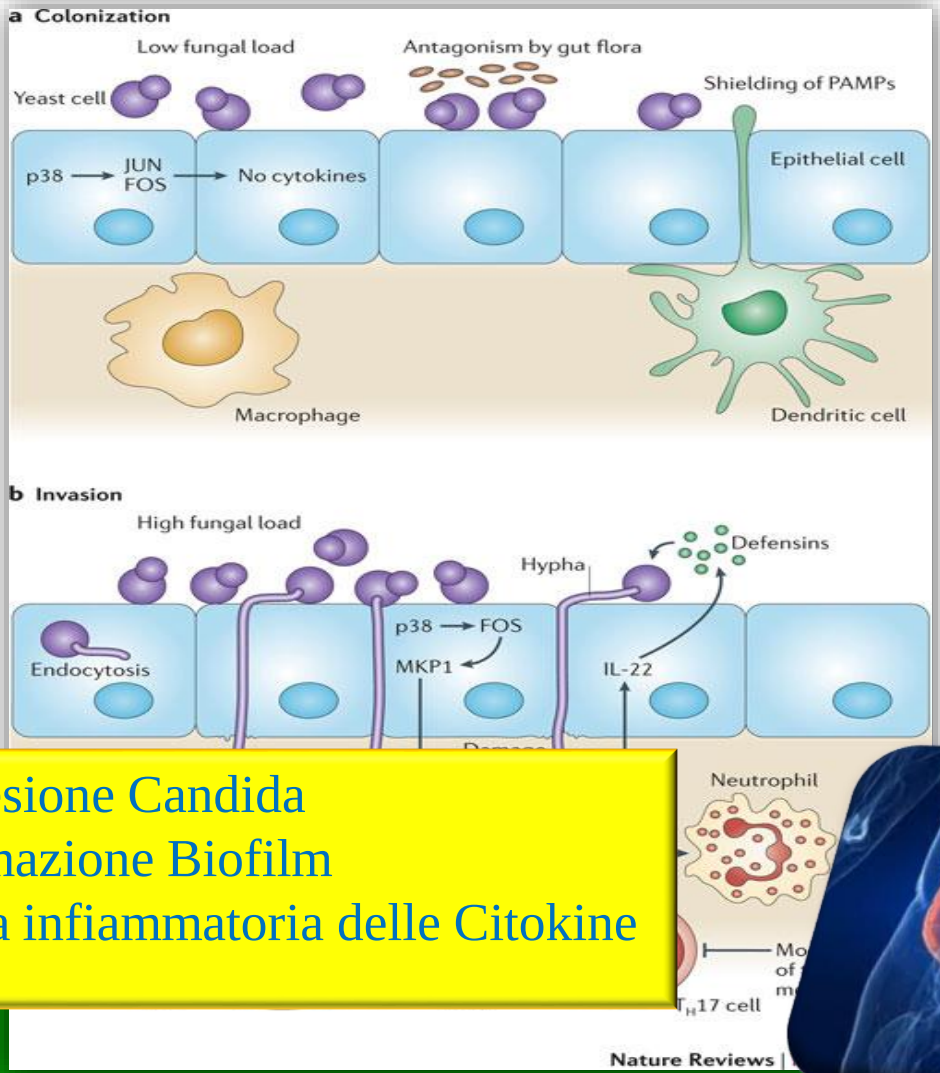
Cassone A. Vulvovaginal Candida albicans infections: pathogenesis, immunity and vaccine prospects. BJOG 2014
Cassone A. NATURE REVIEWS | MICROBIOLOGY -2013

Candidosi Vulvo-Vaginale

Vagina

-Cellule epiteliali

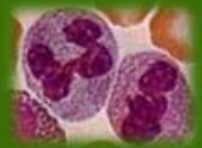
-Biofilm vaginale



Immunita'

-No rilevante risposta sistemica

- Importante attività infiammatoria



-Adesione Candida

- Formazione Biofilm

- Accentuata risposta infiammatoria delle Citokine

Neil A. et Al. Candida albicans morphogenesis and host defence: discriminating invasion from colonization. Nature Reviews | Microbiology Volume 10 | February 2012 | 113

Vaginosi Batterica (*LA DISBIOSI!*)

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ETIOLOGY OF BACTERIAL VAGINOSIS (B

BV is the most common vaginal disorder in women reproductive age and the cause of several symptom such as homogeneous malodorous vaginal dischar overgrowth of anaerobes, and increased production amines (putrescines, cadaverines, and trimethylamine) that contribute to a higher vaginal pH and presence clue cells [1]. BV is responsible for >60% of vulvova nal infections and has been linked to serious pub health consequences, including pelvic inflammato disease [2], postoperative infections [3], acquisiti and transmission of the human immunodeficien virus [4], preterm birth, and several adverse outcon in pregnancy [5].

Più comune disordine vaginale nelle donne in età fertile

Leucorrea maleodorante per sovracrescita di batteri anaerobi

Possibili conseguenze
-PID
- Infezioni post-operatorie
- Facilitazione *versus* HIV
- Parto pretermine e sequele neonatali

Concetto chiave:
VB è caratterizzata da un'alterazione numerica, quantitativa e non qualitativa, dei diversi tipi di microrganismi presenti nel microbioma vaginale

SINDROME E DISBIOSI

The vaginal microbiome: rethinking health and diseases

Bing Ma,[1] Larry J. Forney,[2] and Jacques Ravel[1,*]

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[2]Department of Biological Sciences and the Initiative for Bioinformatics and Evolutionary Studies, University of Idaho, Moscow, ID 83844
Bing Ma: bma@som.umaryland.edu; Larry J. Forney: lforney@uidaho.edu; Jacques Ravel: jravel@som.umaryland.edu
*Corresponding author. jravel@som.umaryland.edu, Institute for Genome Sciences, University of Maryland School of Medicine, BioPark II – room 611, 801 W. Baltimore Street, Baltimore, MD 21201

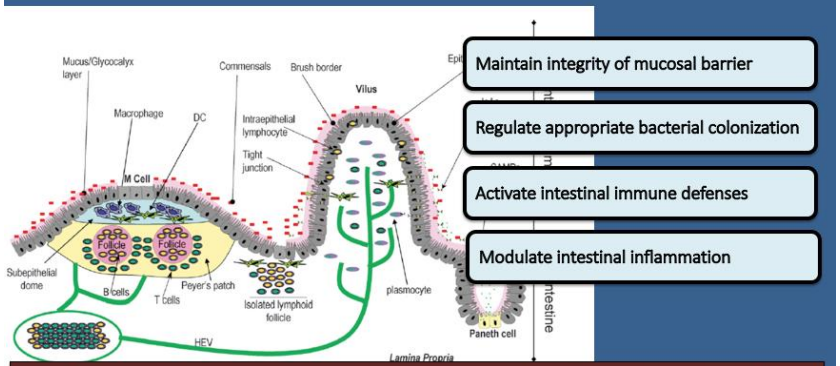
Is bacterial vaginosis a disease?

Gregor Reid[1]

Received: 13 October 2017 / Revised: 15 November 2017 / Accepted: 15 November 2017

Abstract
Bacterial vaginosis (BV) has been described as a disease, a disorder, a vaginal inflammation, an infection, a microbial dysbiosis, a condition, and in some women, a normal situation. In order to fit the definition of a disease, BV would have to be a disorder of function that produces specific signs or symptoms or affects the vagina in an aberrant way. Yet, there is little consistency in patients reporting signs and symptoms when BV is diagnosed, nor the appearance of aberrations to the vagina. If BV is not a disease, there are implications for its management and coverage of treatment costs, and for the conclusions drawn in a multitude of previous studies. It is time for BV to be redefined and for the various subsets to be given a separate terminology with specific methods of diagnosis and appropriate treatment and preventive strategies.

Intestinal Tract: The Largest Immune Organ (70% of the Immune System) & Defense Barrier



Balance between appropriate tolerance & inflammatory attack

- Non-specific intestinal barrier defenses
- Epithelial cell layer
- Gut-associated lymphoid tissue (GALT)

From Magalhaes JG, Tattoli I, Girardin SE. The intestinal epithelial barrier: how to distinguish between the microbial flora and pathogens. Semin Immunol. Apr 2007;19(2):106-115.

Tratto gastroenterico e patologia urogenitale

Razionale e teorie eziopatogenetiche

- Traslocazione

Via ematica

Via linfatica

- Migrazione

GRAVIDANZA

in una gravidanza normale (ossia senza complicanze e con parto a termine): la composizione microbiotica, lattobacillo-dominata, si mantiene inalterata.maggiore abbondanza di L. crispatus, L. gasseri ed L. jensenii

Benefits to Mother

- Immune modulation
- Digestive regulation
- Vaginal flora
- Prevent UTIs & thrush
- Protect against mastitis

Benefits to Baby

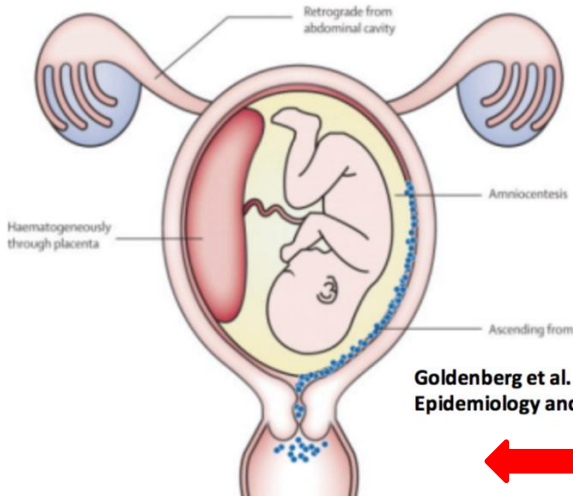
- Immune development
- Prevent eczema and allergy
- Healthy bacterial exposure (birth)
- Breast milk quality

Importance of the maternal microbiome during pregnancy, at birth and after birth

Maternal-Fetal Microbiome. STERILE?...

ILLUSTRATION (FROM ANIMATION) © SCIENCE/AAAS

Potential routes of intra-uterine colonization



Goldenberg et al. 2008, Lancet.
Epidemiology and causes of preterm birth

VB e GBS

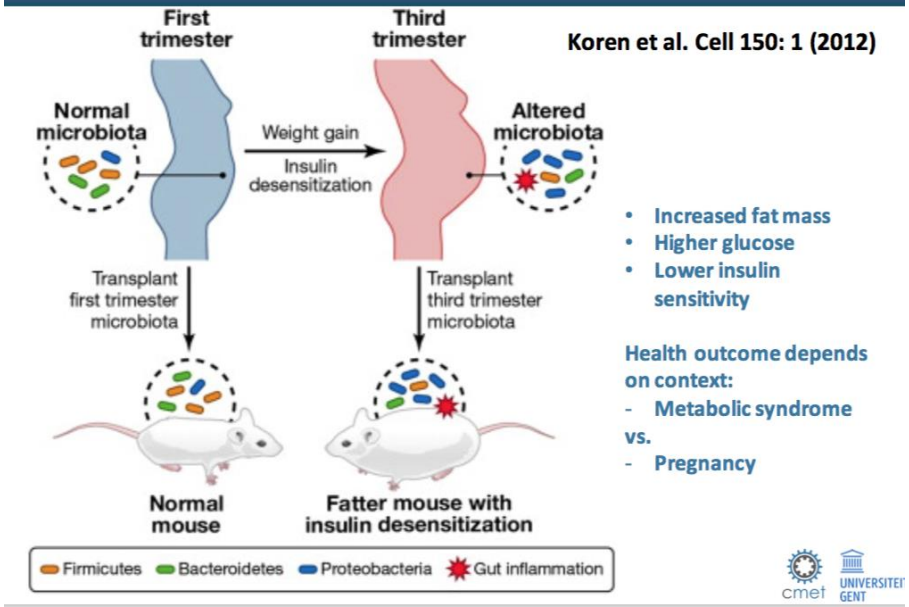
Recent microbiome studies have challenged the dogma that the the Maternal-Fetal unit is sterile.

Placenta harbors a unique microbiome
(Aagaard K et al, Sci Transl Med. 2014)

Analysis of the first meconium reveal microorganisms
(Ardissone et al., Plos one 2014)

Analysis of tracheal aspirates after intubation at birth reveal microorganisms
(Lohmann et al., Pediatric Research 2014)

Health consequences ?



Koren et al. Cell 150: 1 (2012)

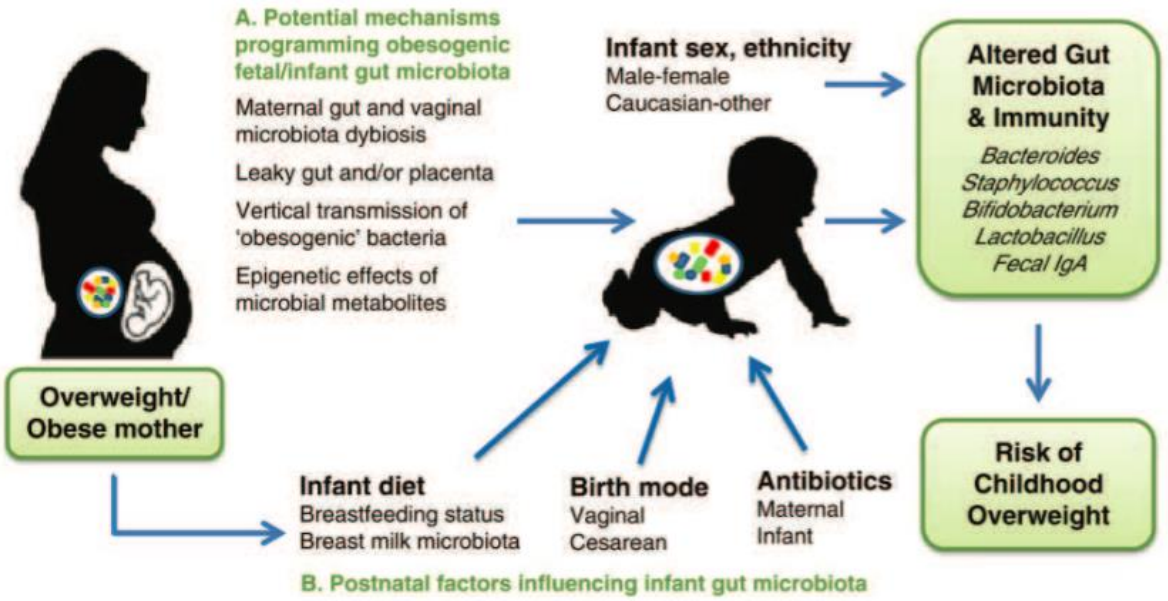
- Increased fat mass
- Higher glucose
- Lower insulin sensitivity

Health outcome depends on context:
- Metabolic syndrome

vs.
- Pregnancy

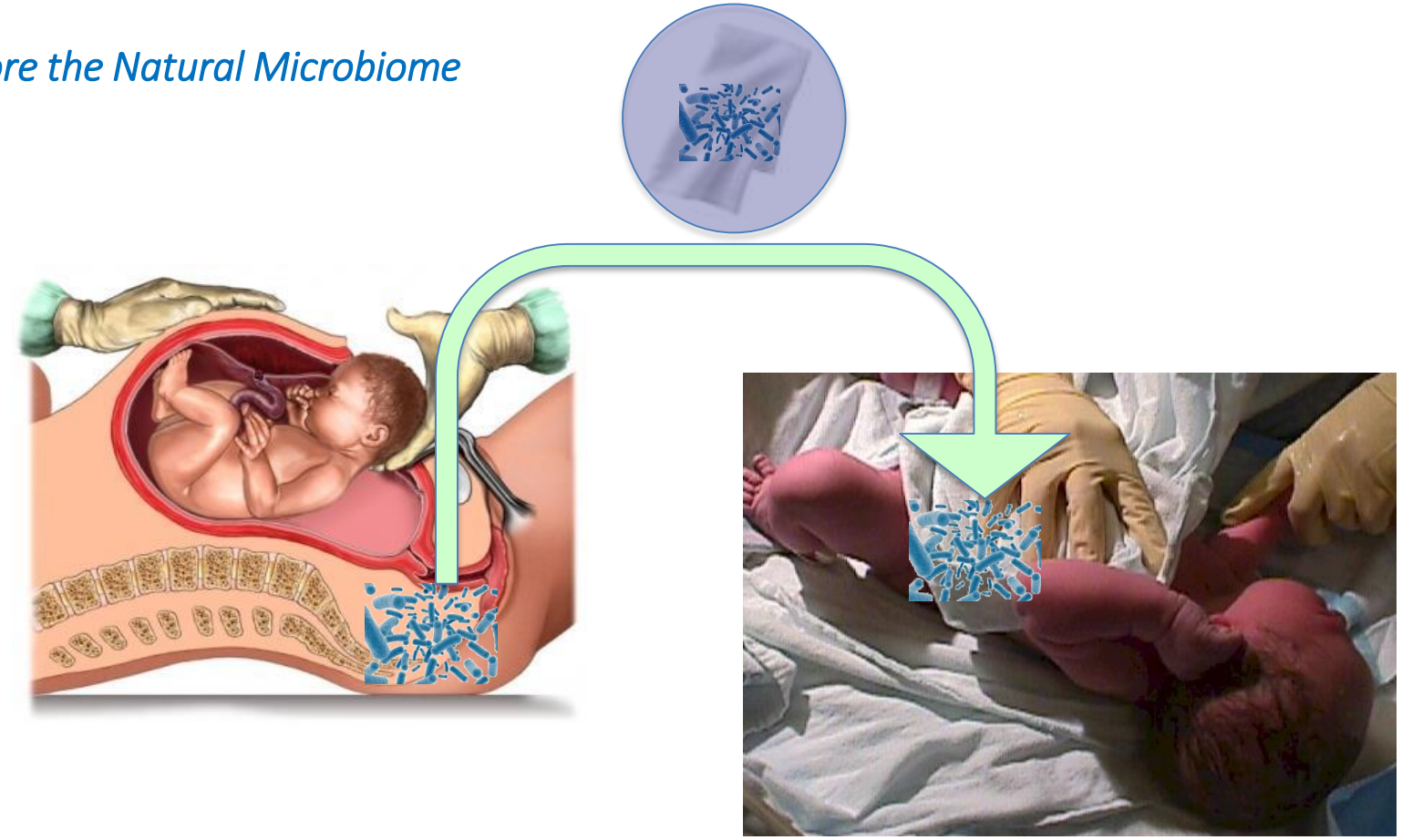
cmet UNIVERSITEIT GENT

Il microbioma materno in gravidanza puo' essere responsabile di patologie materno-fetali e neonatali



Per ovviare alla mancanza di batteri dei bambini nati con taglio cesareo, uno studio con lo scopo di verificare se una semina artificiale, tramite una garza che viene incubata un'ora prima dell'intervento nel canale vaginale della madre e poi strofinata sulla bocca, sul viso e sul resto del corpo del bambino dopo la nascita, possa contribuire ad una formazione più naturale del microbioma

Restore the Natural Microbiome



www.brooksidepress.org

Dr. Maria Gloria Dominguez-Bello, associate professor in the Human Microbiome Program at the NYU School of Medicine

http://commonhealth.wbur.org/2014/06/birth-canal-bacteria-c-section

MICROBIOMA E MENOPAUSA NEL TRATTO UROGENITALE

INCREMENTO DEGLI ANAEROBI *INCREMENTO DI E.COLI*
RIDUZIONE LATTOBACILLI. *SQUILIBRIO IMMUNOLOGICO*
ALTERAZIONI TESSUTALI *ALTERAZIONE DEL MICROBIOMA UROGENITALE*

2° CONGRESSO NAZIONALE AIGEF

Differences in the vaginal lactobacilli of postmenopausal women and influence of rectal lactobacilli

*L. Petricevic , K. J. Domig * , F. J. Nierscher , M. J. Sandhofer , I. Krondorfer * , W. Kneifel * and H. Kiss*

The influence of estrogen and progesterone on anal function in women may be mediated by changes in collagen levels and/or the number of blood vessels in the submucosa of the anal canal. The decrease of female sex hormones associated with menopause not only induces genitourinary atrophy, it may also influence the normal function of the gastrointestinal tract.

In summary, our data indicate that rectal lactobacilli may affect the intermediate vaginal flora of postmenopausal women, suggesting that atrophic colpitis with depleted numbers of lactobacilli in postmenopausal women may effectively be treated by oral application of probiotics.

CLIMACTERIC 2013;16:356–361

MENOPAUSA MICROBIOMA E INFIAMMAZIONE

cessazione della attività ovarica le caratteristiche dei tessuti si modificano.

- ***l'epitelio si assotiglia a causa della progressiva carenza estrogenica con il caratteristico quadro dell'atrofia***
- ***l'epitelio è costituito soprattutto dagli strati basale e para- basale, a scapito dello strato superficiale con cellule contenenti glicogeno***
- ***riduzione dei bacilli di Doderlein e aumento del Ph***

Table 1. A Comparison of Bacterial Vaginosis and Aerobic Vaginitis.

Clinical Characteristics	Bacterial Vaginosis	Aerobic Vaginitis (1)
Lactobacilli	Displaced	Displaced
Pathogen	*Gardnerella vaginalis*, *Atopobium vaginae*, *Megasphaera* species, BVAB2	*Escherichia coli*, Group B Streptococcus, *Staphylococcus aureus*, *Enterococcus faecalis*
Vaginal epithelial inflammation	None	Present
Elevation of pro-inflammatory cytokines (IL-1β, IL-6, IL-8)	Moderate elevation	High elevation
Immune reaction (cytotoxic leukocyte)	Non-reactive	Reactive
pH [Normal = 3.8 – 4.2]	T= 4.2-4.5 BV ≥ 4.5	> 4.5; usually >6
Shed vaginal epithelial cells	Clue cells	Parabasal cells
Vaginal discharge characteristic	White, homogenous	Yellowish
10% KOH Whiff Test (fishy amine odor)	Positive	Negative
Treatment	Metronidazole [b] Clindamycin [b]	Kanamycin ovule. (5) 2% clindamycin topical. (3) Fluoroquinolones are reported to have clinical success. (5) GBS is uniformly sensitive to penicillin, ampicillin, amoxicillin, amoxicillin/ clavulanic acid. (7) *E. faecalis* is traditionally treated with ampicillin. (8)

VA
Vaginite aerobica

MICROBIOMA VAGINALE E INFERTILITA?

"l'abbondanza relativa di alcune specie di Lactobacilli, quali il L. iners, L. crispatus e L. gasseri distingueva la flora vaginale delle ***donne infertili sine causa dalle donne infertili con causa nota e dalle donne fertili.***
Le specie L. iners e L. crispatus erano sottorappresentate nelle donne infertili sine causa, *mentre si osservava una considerevole colonizzazione di L. gasseri.*

Questo profilo microbico sembra aumentare la suscettibilità all'invasione e colonizzazione di batteri quali Atopobium, Prevotella, Veillonella, Ureaplasma ed Escherichia che ***mimano un microambiente simile a quanto osservato nelle donne con vaginosi,*** *con caratteristiche etio-patogenetiche associate a complicanze durante il periodo del concepimento o del periodo gestionale.*

La conoscenza approfondita del profilo microbico con tecniche di ultima generazione sembra rappresentare un elemento importante nella ***determinazione*** *della precisa* ***causa dell'infertilità femminil****e senza ricadere nella vaga nozione di "infertilità idiopatica" e apre la strada per interventi terapeutici personalizzati atti al ripristino di un habitat vaginale ottimale."*

Subclinical alteration of the cervical–vaginal microbiome in women with idiopathic infertility
Authors Giuseppe Ricci Francesco De Seta, Manola Comar. ***First published:*** *16 February 2017*

LA TERAPIA…..ARRIVANO I GINECOLOGI……..

PARTIAMO DALLE LE BASI….LA COLONIZZAZIONE VAGINALE.

J Clin Gastroenterol. 2004 Jul;38(6 Suppl):S107-10.

Utilization of the intestinal tract as a delivery system for urogenital probiotics.

Morelli L, Zonenenschain D, Del Piano M, Cognein P.
Istituto di Microbiologia, Facoltà di Agraria, U.C.S.C., Piacenza, Italy. Lorenzo.morelli@unicatt.it

Abstract

Orally consumed viable bacteria with proposed beneficial health effects, the so-called probiotics, are increasingly used to treat disorders of the gastrointestinal tract. It has been recently suggested that specifically selected lactobacilli could have a therapeutic role in female urogenital tract infections. It has been also suggested that some of these bacteria could be not intravaginally instilled, but also orally delivered. The authors investigate the ability of lactobacilli isolated from the vagina to survive gastrointestinal tract transit, and establish a link between the rate of intestinal survival and vaginal colonization.

Sono passati 15 anni…..

ELSEVIER

FEMS Immunology and Medical Microbiology 35 (2003) 131–134

FEMS Immunology and Medical Microbiology
www.fems-microbiology.org

Oral use of *Lactobacillus rhamnosus* GR-1 and *L. fermentum* RC-14 significantly alters vaginal flora: randomized, placebo-controlled trial in 64 healthy women

Gregor Reid [a–c,*], Duane Charbonneau [d], Julie Erb [d], Barbara Kochanowski [d], Dee Beuerman [a], Russ Poehner [d], Andrew W. Bruce [a]

PROBIOTICI VAGINALI? (attivi sui biofilms)

J Clin Gastroenterol. 2014 Nov-Dec;48 Suppl 1:S102-5. doi: 10.1097/MCG.0000000000000225.

Can Lactobacillus fermentum LF10 and Lactobacillus acidophilus LA02 in a slow-release vaginal product be useful for prevention of recurrent vulvovaginal candidiasis?: A clinical study.

Murina F[1], Graziottin A, Vicariotto F, De Seta F.

J Clin Gastroenterol. 2014 Nov-Dec;48 Suppl 1:S96-101. doi: 10.1097/MCG.0000000000000224.

Effectiveness of an association of a cranberry dry extract, D-mannose, and the two microorganisms Lactobacillus plantarum LP01 and Lactobacillus paracasei LPC09 in women

ISSN: 2573-9506

Research Article

International Journal of Women's Health Care

Improvement of Bacterial Vaginosis and Vulvovaginal Candidiasis with a New *Lactobacillus* Strains Association: A Pilot Study

Franco Vicariotto[1] and Filippo Murina[2]

Gynaecology Unit, Casa di Cura San Pio X Private Clinic, Milan, Italy

Lower Genital Tract Disease Unit, V.Buzzi Hospital, University of Milan, Italy

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Submitted: 23 Jan 2018; Accepted: 29 Jan 2018; Published: 07 Feb 2018

Io ci credevo…addio al medical device….

Original Article

Oral *Lactobacillus rhamnosus* GR-1 and *Lactobacillus reuteri* RC-14 to reduce Group B *Streptococcus* colonization in pregnant women: A randomized controlled trial

Ming Ho [a], Yin-Yi Chang [a], Wei-Chun Chang [a], Hung-Chih Lin [b], Mei-Hung Wang [a], Wu-Chou Lin [a], Tsan-Hung Chiu [a,*]

[a] *Department of Obstetrics and Gynecology, China Medical University Hospital, China Medical University, Taichung 40402, Taiwan*
[b] *Department of Pediatrics, China Medical University Hospital, China Medical University, Taichung 40402, Taiwan*

PROBIOTICI ORALI (attivi sui biofilms?)

Augmentation of antimicrobial metronidazole therapy of bacterial vaginosis with oral probiotic Lactobacillus rhamnosus GR-1 and Lactobacillus reuteri RC-14: randomized, double-blind, placebo controlled trial

Anukam K, Osazuwa E, Ahonkhai I, Ngwu M, Osemene G, Bruce AW, Reid G.
Microbes and Infection 2006 May; 8 (6): 1450-4.

Studio su 125 donne africane ad elevata incidenza per BV. La terapia è stata: metronidazolo 500 mg bis in die per 7 gg + *Lactobacillus rhamnosus GR-1* e *Lactobacillus reuteri RC-14* bis in die per 30 gg.

L'88% delle donne trattate con l'associazione metronidazolo-probiotico ha ottenuto una risoluzione della patologia rispetto al 40% trattato con antibiotico-placebo (p <0,001), il 30% di questo gruppo non ha risolto la patologia e il restante 30% ha sviluppato una situazione intermedia.

British Journal of Nutrition (2017), **117**, 804–813 doi:10.1017/S0007114517000289

Early pregnancy probiotic supplementation with *Lactobacillus rhamnosus* HN001 may reduce the prevalence of gestational diabetes mellitus: a randomised controlled trial

Kristin L. Wickens[1]*, Christine A. Barthow[1], Rinki Murphy[2], Peter R. Abels[1,3], Robyn M. Maude[4], Peter R. Stone[2], Edwin A. Mitchell[2], Thorsten V. Stanley[1,3], Gordon L. Purdie[1], Janice M. Kang[1], Fiona E. Hood[1], Judy L. Rowden[2], Phillipa K. Barnes[1], Penny F. Fitzharris[5] and Julian Crane[1]

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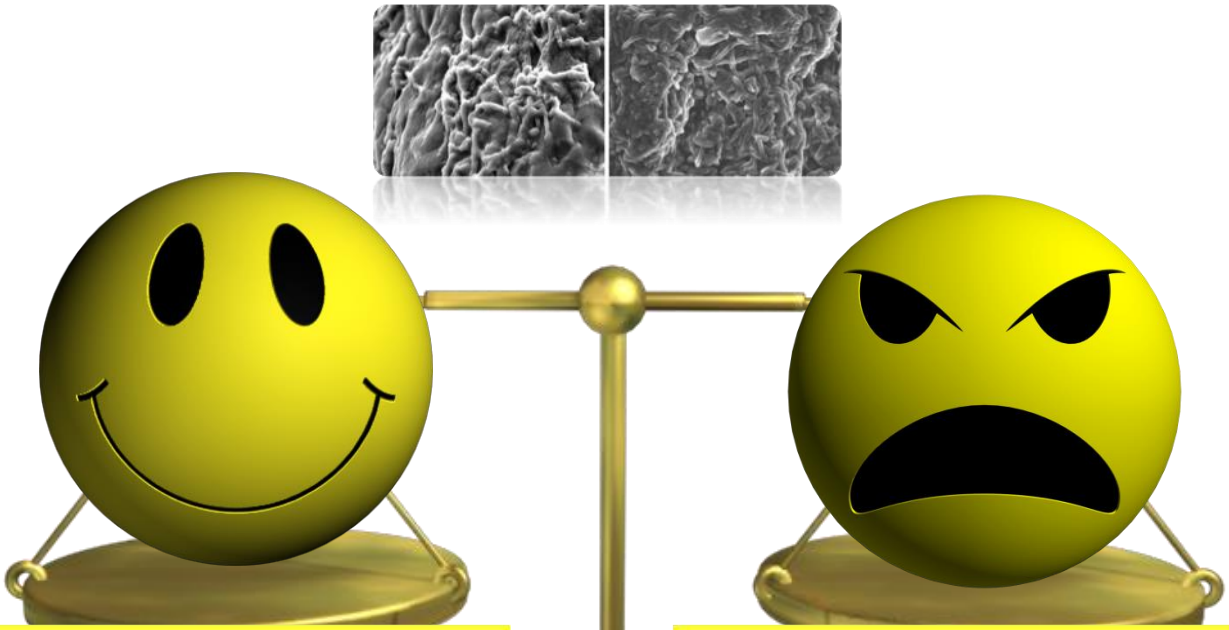
I biofilm permettono la sopravvivenza di microrganismi in un ambiente ostile



Biofilm "buoni" che difendono la vagina

Biofilm "cattivi" che attaccano la vagina

I Lattobacilli sono in grado di produrre un biofilm protettivo che riveste la mucosa vaginale

Harriott MM, Lilly EA, Rodriguez
Candida albicans forms biofilms on the vaginal mucosa. Microbiology. 2010 Dec;156(Pt 12):3635-44

BASIC SCIENCE: GYNECOLOGY

An adherent *Gardnerella vaginalis* biofilm persists on the vaginal epithelium after standard therapy with oral metronidazole

Alexander Swidsinski, MD, PhD; Werner Mendling, MD, PhD; Vera Loening-Baucke, MD, PhD; Sonja Swidsinski, MD, PhD; Yvonne Dörffel, MD, PhD; Jürgen Scholze, MD, PhD; Herbert Lochs, MD, PhD; Hans Verstraelen, MD, MPH

OBJECTIVE: The purpose of this study was to determine the efficacy of standard treatment with oral metronidazole in the eradication of the bacterial vaginosis biofilm.

STUDY DESIGN: We conducted an interventional follow-up study in which 18 patients with bacterial vaginosis were treated with oral metronidazole during 1 week and subsequently had a single random follow-up assessment at 1-week intervals, up to 5 weeks, with 3 patients representing each point in time. Follow-up assessment included conventional scoring of the vaginal microflora and determination of bacterial biofilm characteristics on a vaginal biopsy through bacterial 16/23S recombinant DNA–based fluorescence-in-situ-hybridization.

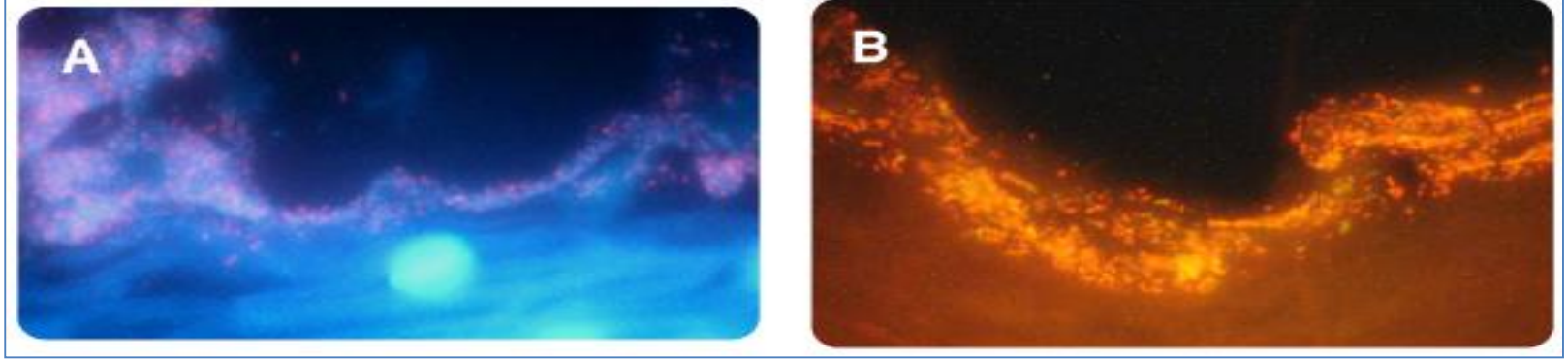
RESULTS: Although all patients recovered, we consistently observed the resurgence with treatment cessation of a dense and active bacterial biofilm on the vaginal mucosa, primarily consisting of *Gardnerella vaginalis* and *Atopobium vaginae*.

CONCLUSION: A large reservoir of the core bacteria to bacterial vaginosis persists as a biofilm after metronidazole treatment.

Key words: Antibiotic resistance, bacterial biofilm, bacterial vaginosis, *Gardnerella vaginalis*, metronidazole

Cite this article as: Swidsinski A, Mendling W, Loening-Baucke V, et al. An adherent *Gardnerella vaginalis* biofilm persists on the vaginal epithelium after standard therapy with oral metronidazole. Am J Obstet Gynecol 2007;197:XXXX.

FISH microscopy of the bacterial biofilm during and after treatment with metronidazole



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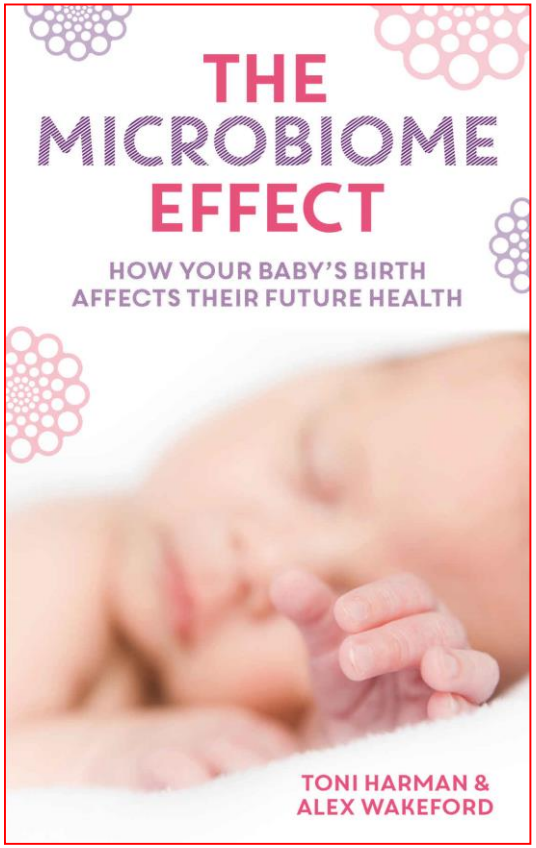
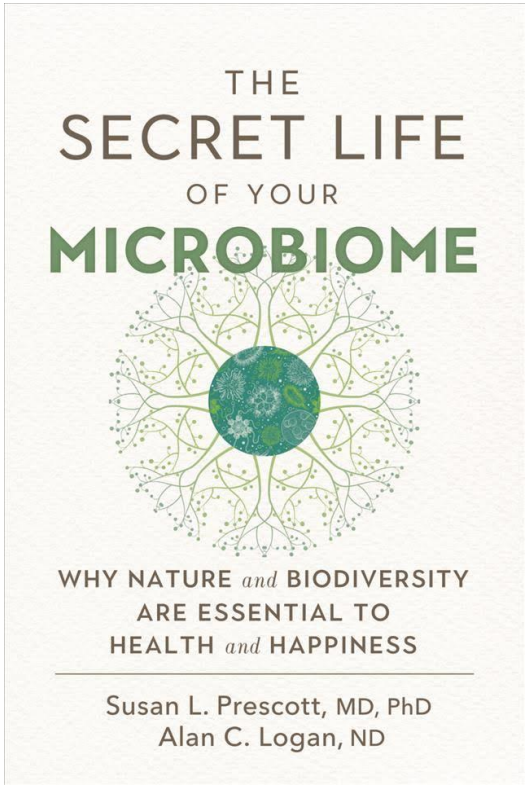
microbioma vaginale e intestinale

Vulvovaginiti Ricorrenti

grazie





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