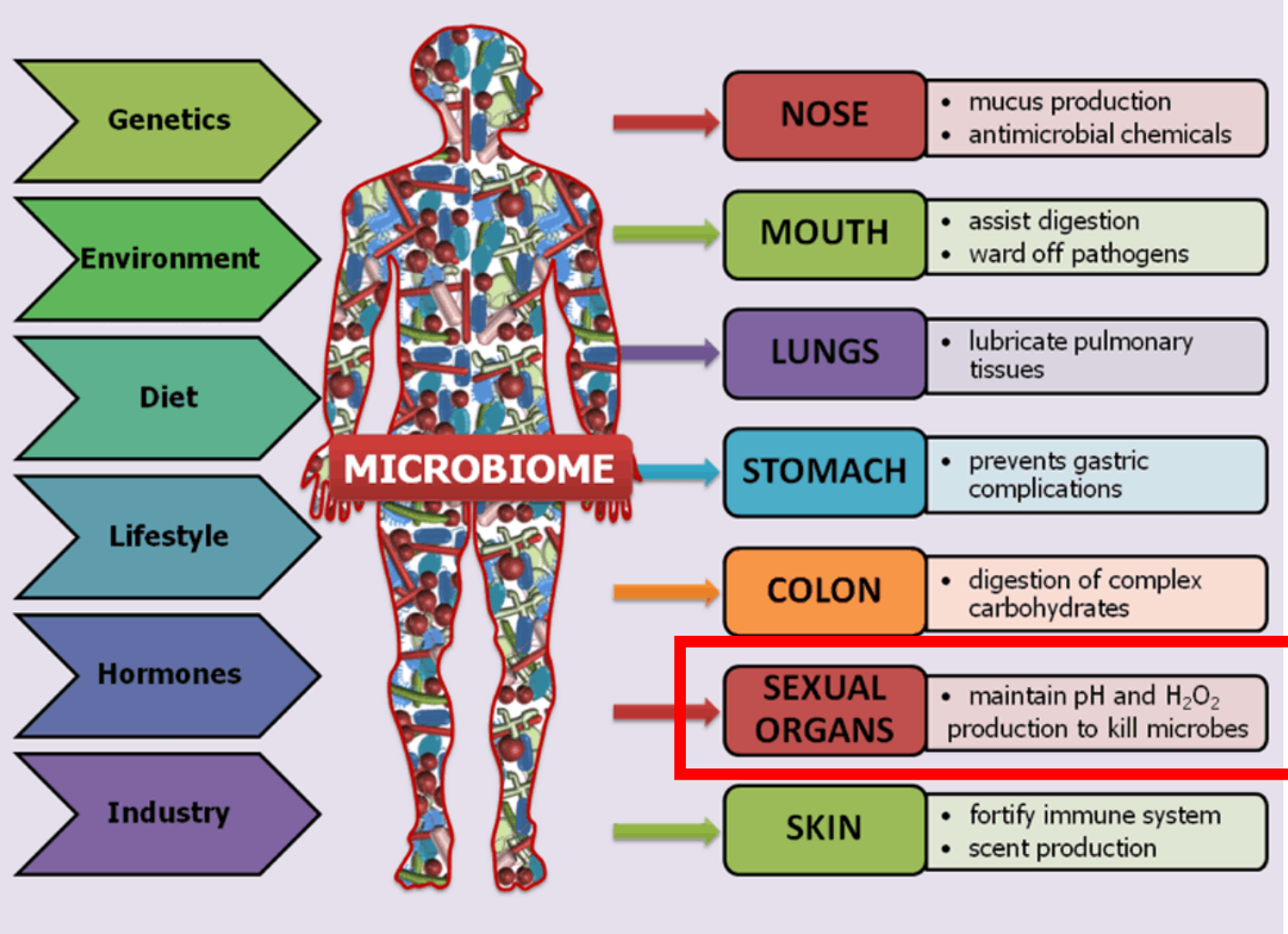
UNIVERSITÀ DEGLI STUDI DI PADOVA
DIPARTIMENTO DI MEDICINA - DIMED
Azienda Ospedale Università Padova
UOC Andrologia e Medicina della Riproduzione
Direttore: Prof. Alberto FERLIN

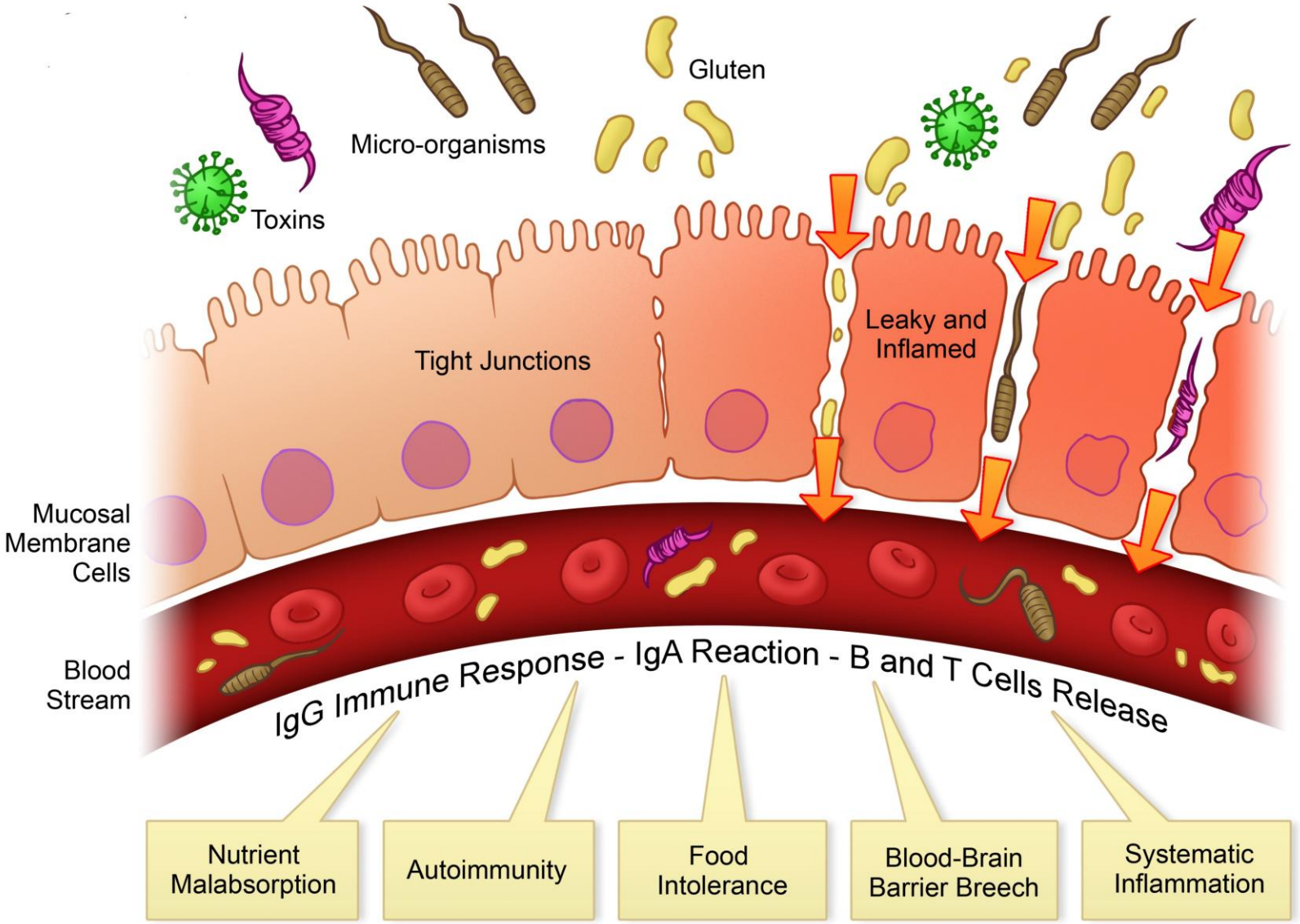
MICROBIOTA E PROBIOTICI:
IMPATTO SULLA QUALITÀ SEMINALE E SULLA FERTILITÀ MASCHILE

Dott. Andrea Graziani
Endocrinologo-Andrologo
Ricercatore Universitario – Dirigente Medico Convenzionato
UOC Andrologia e Medicina della Riproduzione Umana
Dipartimento di Medicina - DIMED
Università degli Studi di Padova
andrea.graziani.1@unipd.it

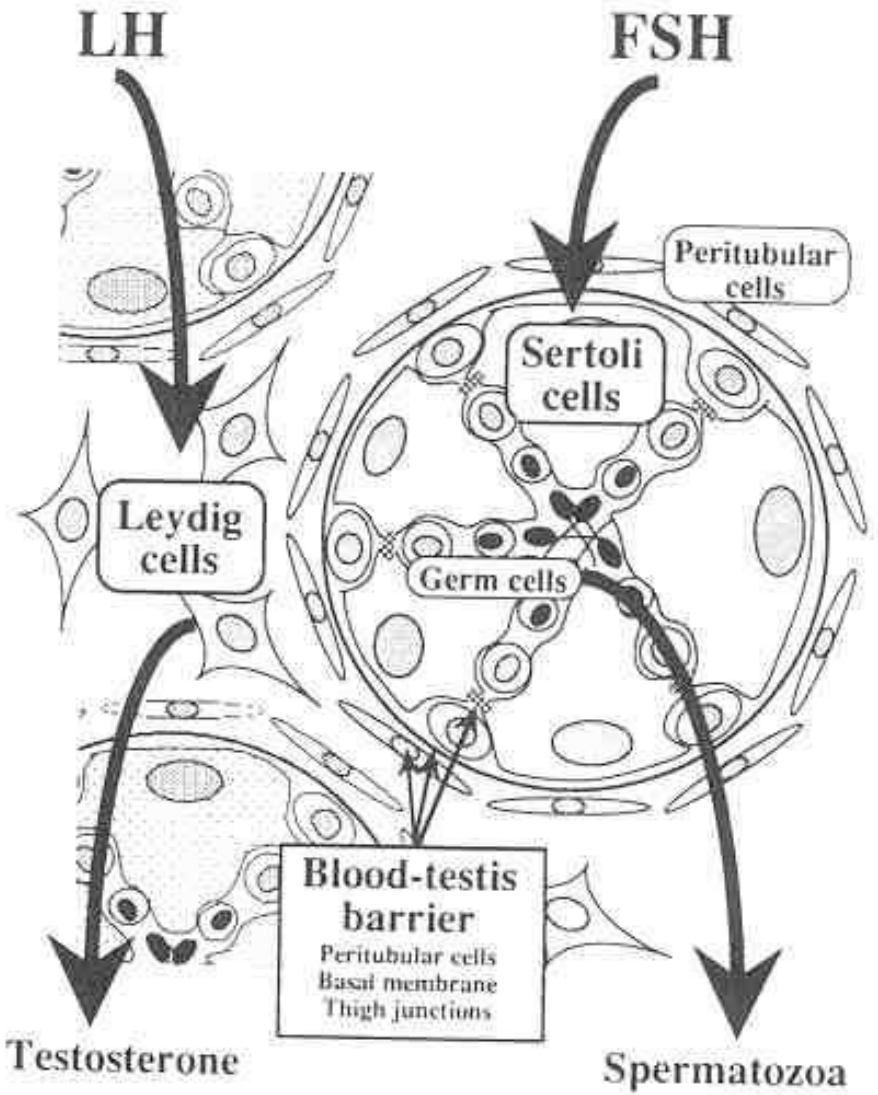
MICROBIOTA(S)



DYSBIOSIS, GUT PERMEABILITY AND DISEASES



ENDOCRINE TESTICULAR FUNCTION AND SPERMATOGENESIS



Dysbiosis, gut permeability and testis function

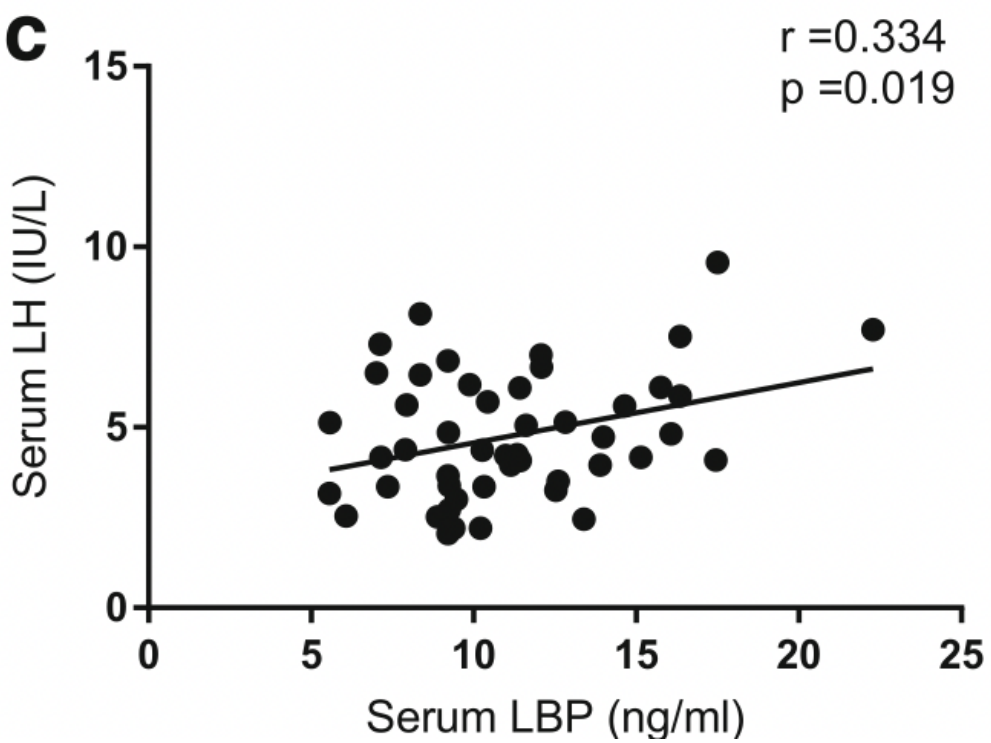
Tremellen *Basic and Clinical Andrology* (2016) 26:7
DOI 10.1186/s12610-016-0034-7

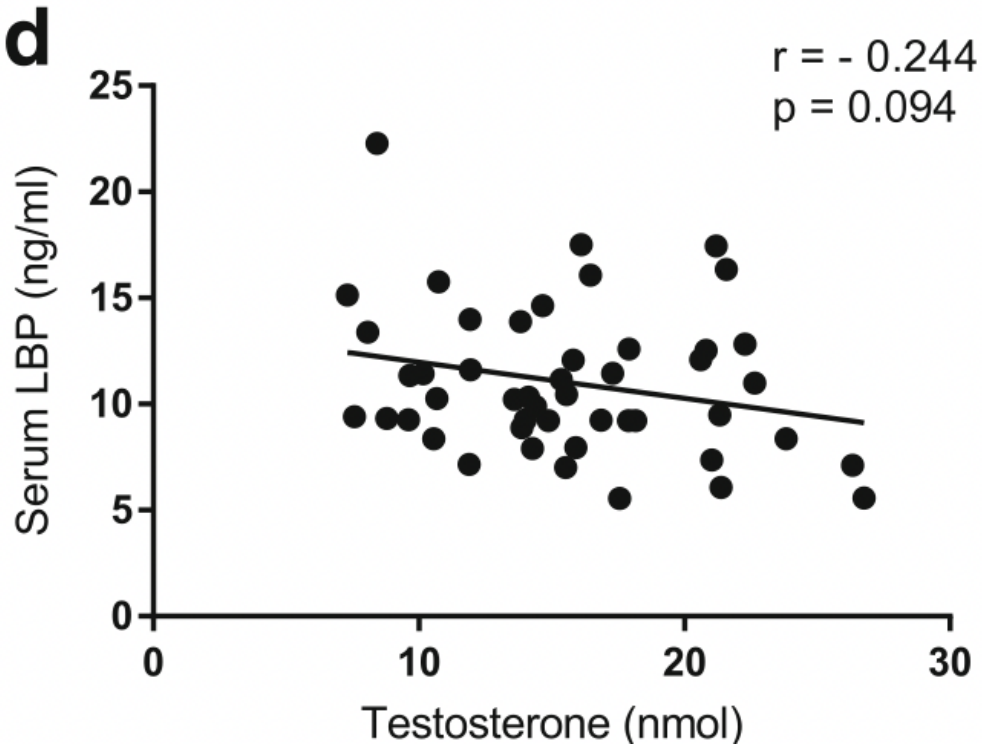
Basic and Clinical Andrology

COMMENTARY Open Access

Gut Endotoxin Leading to a Decline IN Gonadal function (GELDING) - a novel theory for the development of late onset hypogonadism in obese men

Kelton Tremellen



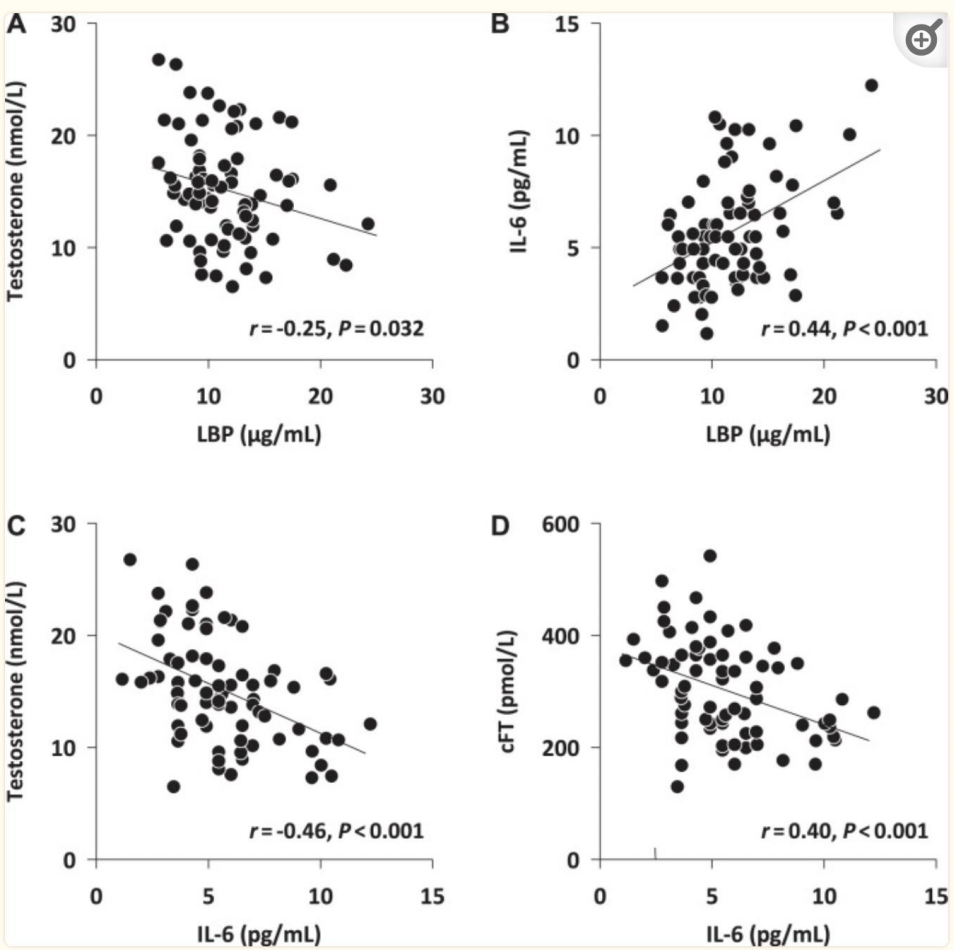


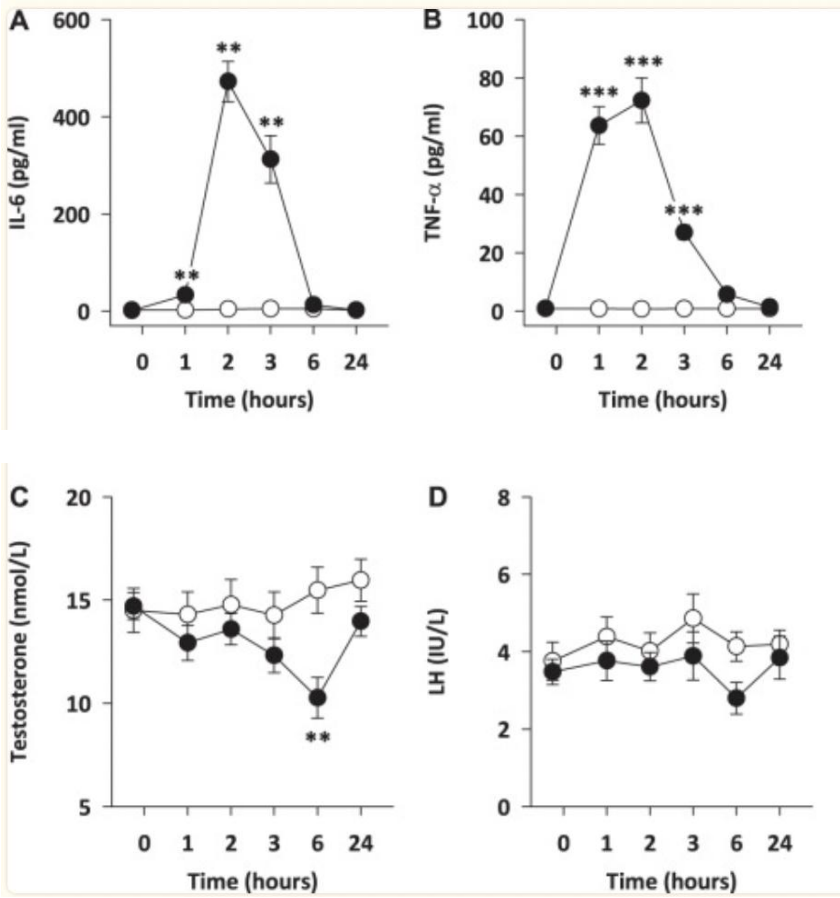
Am J Physiol Endocrinol Metab. 2018 Mar 1; 314(3): E206–E213. PMCID: PMC5899218
Published online 2017 Nov 28. doi: 10.1152/ajpendo.00279.2017 PMID: 29183872

Role of Gut Microbiota and Gut-Brain and Gut-Liver Axes in Physiological Regulation of Inflammation, Energy Balance, and Metabolism

Endotoxin-initiated inflammation reduces testosterone production in men of reproductive age

Kelton Tremellen,[1,2,3] Natalie McPhee,[2] Karma Pearce,[2] Sven Benson,[4] Manfred Schedlowski,[4] and Harald Engler[4]





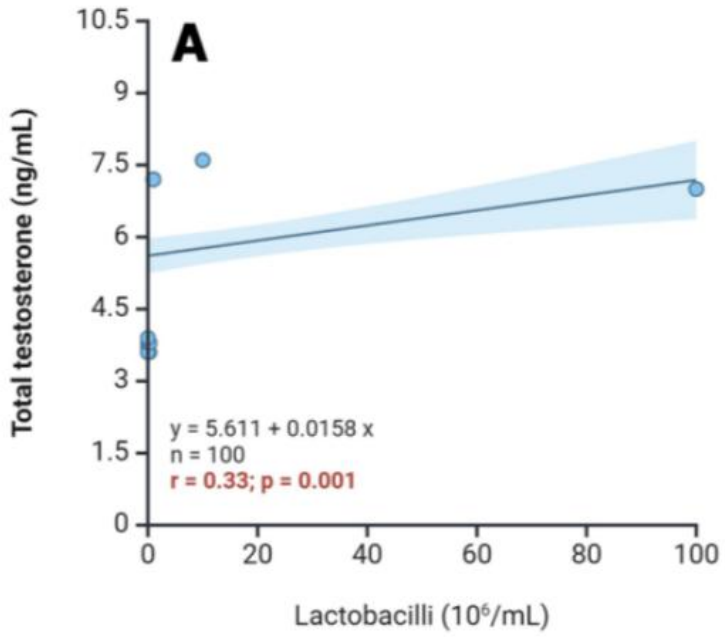
DYSBIOSIS AND TESTIS FUNCTION

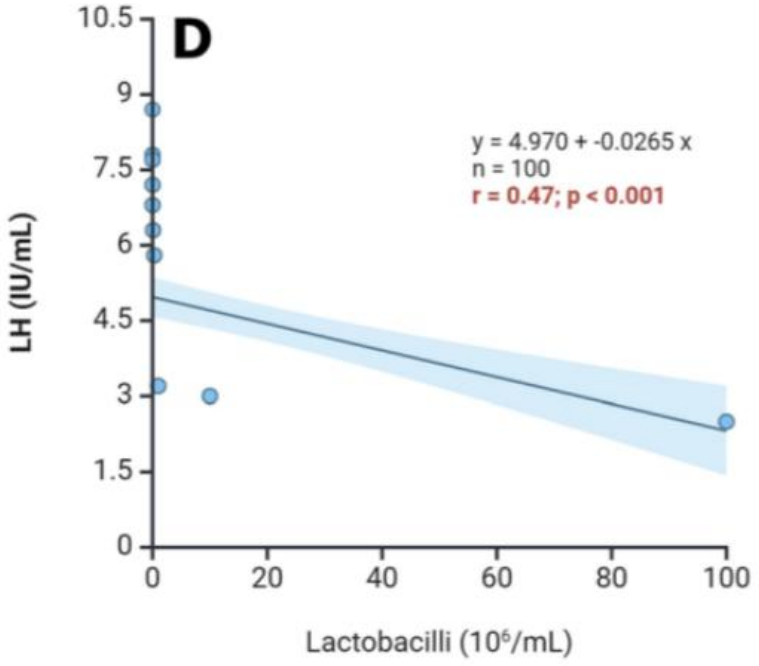
Journal of Assisted Reproduction and Genetics (2025) 42:897–907
https://doi.org/10.1007/s10815-024-03351-y

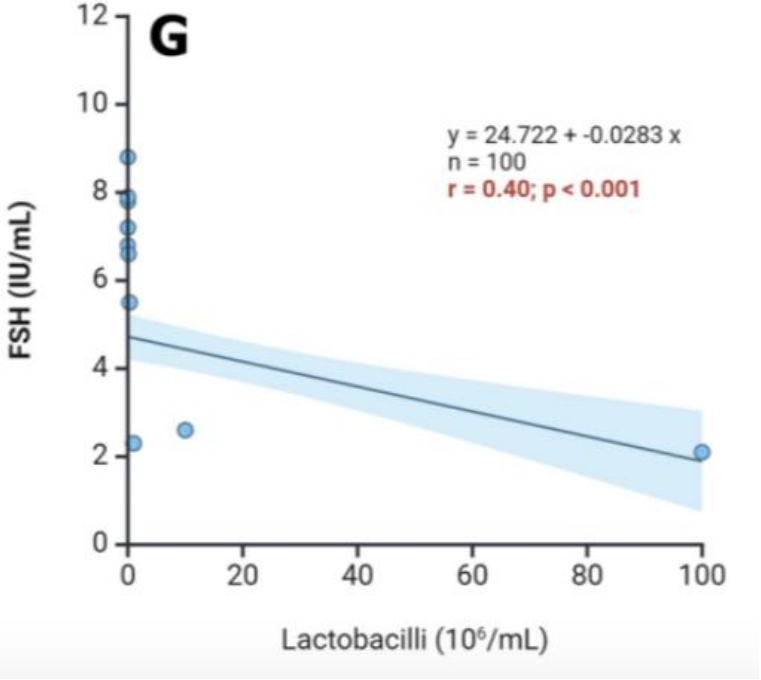
REPRODUCTIVE PHYSIOLOGY AND DISEASE

The influence of seminal microbiota on human testicular steroidogenesis: a prospective study

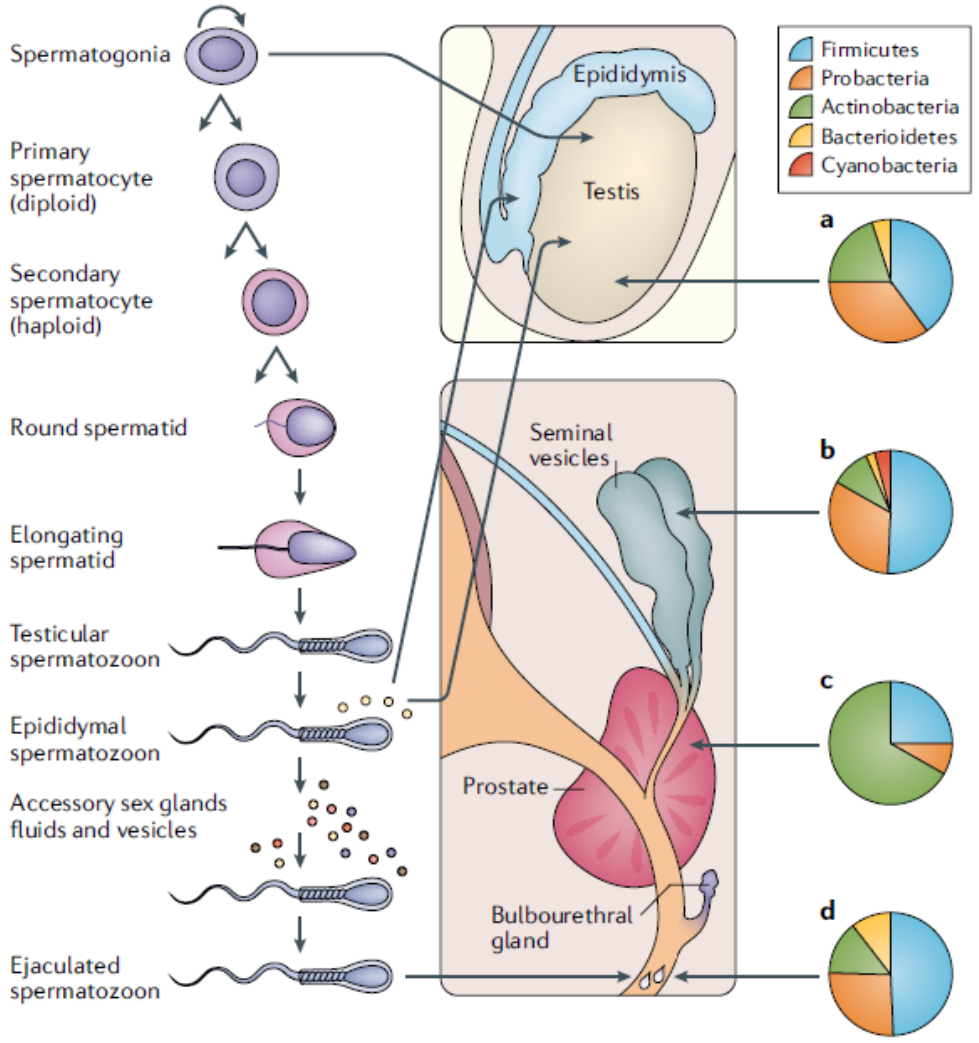
Rossella Cannarella[1,2] · Roberto Curto[1] · Rosita A. Condorelli[1] · Agata Grillo[3] · Antonio Aversa[4] · Aldo E. Calogero[1] · Sandro La Vignera[1]







MALE TRACT MICROBIOTA



TESTICULAR MICROBIOTA

523 RBMO VOLUME 43 ISSUE 3 2021

RBMO

ELSEVIER

ARTICLE

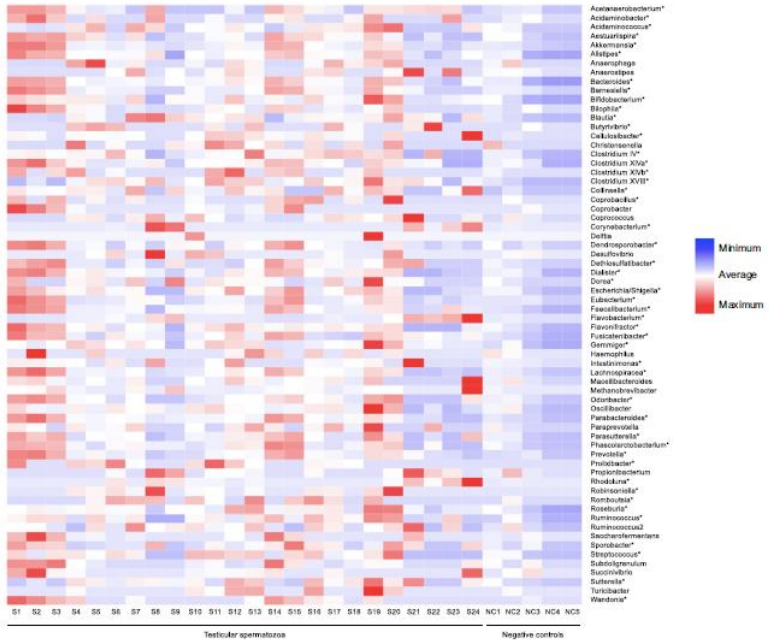
CrossMark

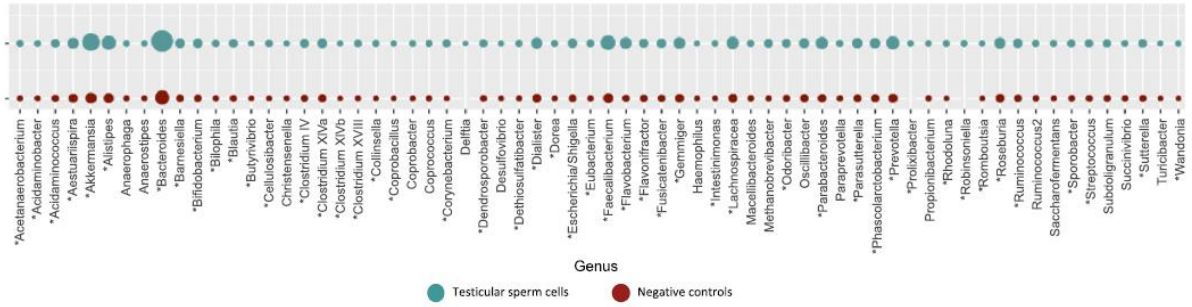
Assessing the testicular sperm microbiome: a low-biomass site with abundant contamination

BIOGRAPHY

Nerea M Molina is a PhD student at the Department of Biochemistry and Molecular Biology, University of Granada, Spain. Her research focusses on molecular aspects of human reproduction, identifying the microbial communities of the human reproductive tract and how these microbes may associate with reproductive parameters in women and men.

Nerea M. Molina[1,2], Julio Plaza-Díaz[2,3,4,5], Ramiro Vilchez-Vargas[6], Alberto Sola-Leyva[1,2], Eva Vargas[7], Raquel Mendoza-Tesarik[8], Maribel Galán-Lázaro[8], Nicolás Mendoza-Ladrón de Guevara[9], Jan Tesarik[8], Signe Altmäe[1,2,10,*]





- ***Testicular microbiome largely resembles semen microbiome***

Blautia
Cellulosibacter
Clostridium XIVa
Clostridium XIVb
Clostridium XVIII
Robinsoniella
Collinsella
Prevotella
Wandonia
Prolixibacter

} Firmicutes

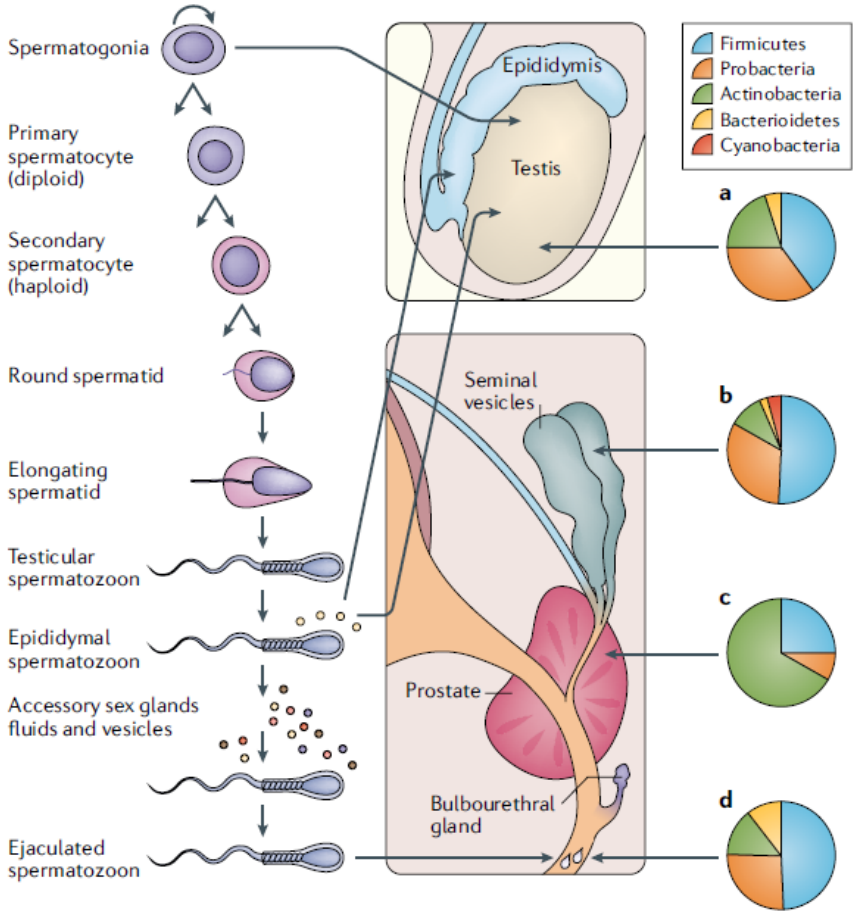
MALE TRACT MICROBIOTA

NATURE REVIEWS | UROLOGY
VOLUME 16 | DECEMBER 2019

REVIEWS

The seminal microbiome in health and disease

Signe Altmäe[1,2,3]*, Jason M. Franasiak[4,6] and Reet Mändar[2,5,6]



Firmicutes and Protobacteria

>50% Firmicutes
small proportion of Cyanobacteria

Actinobacteria

Firmicutes 50%
Protobacteria 25%
Actinobacteria and Bacteroidetes 25%

SEMINAL MICROBIOTA IN INFERTILE PATIENTS

EUROPEAN UROLOGY 79 (2021) 826–836

available at www.sciencedirect.com
journal homepage: www.europeanurology.com

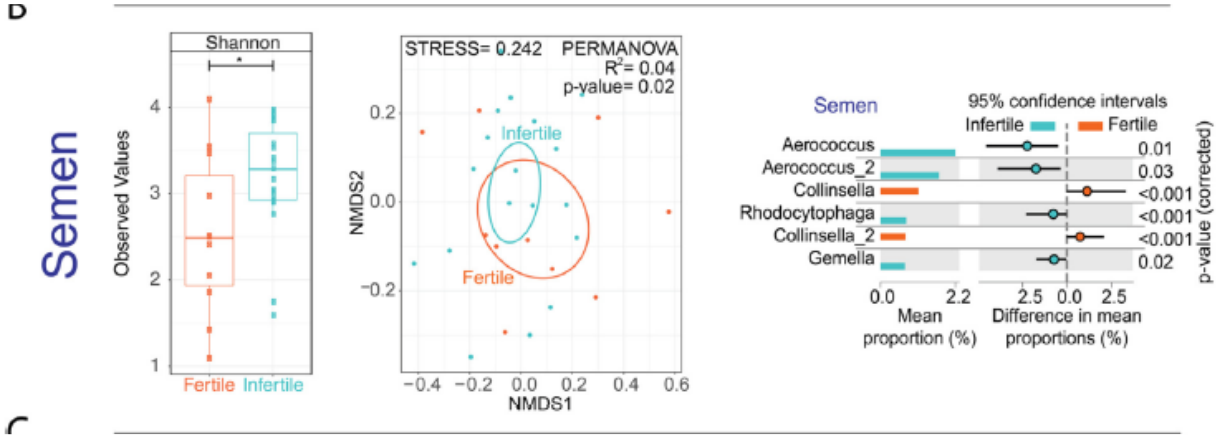
European Association of Urology

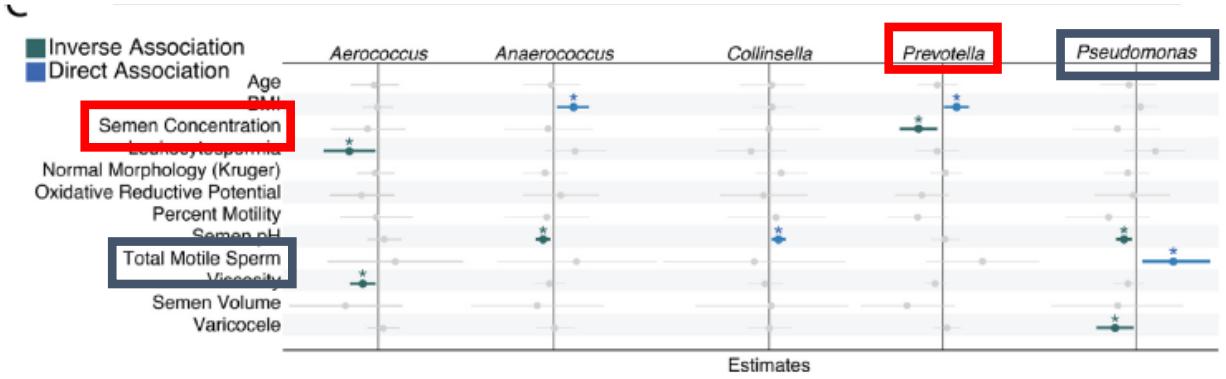
Platinum Priority – Sexual Medicine – Editor's Choice

Editorial by Petar Bajic and Alan J. Wolfe on pp. 837–838 of this issue

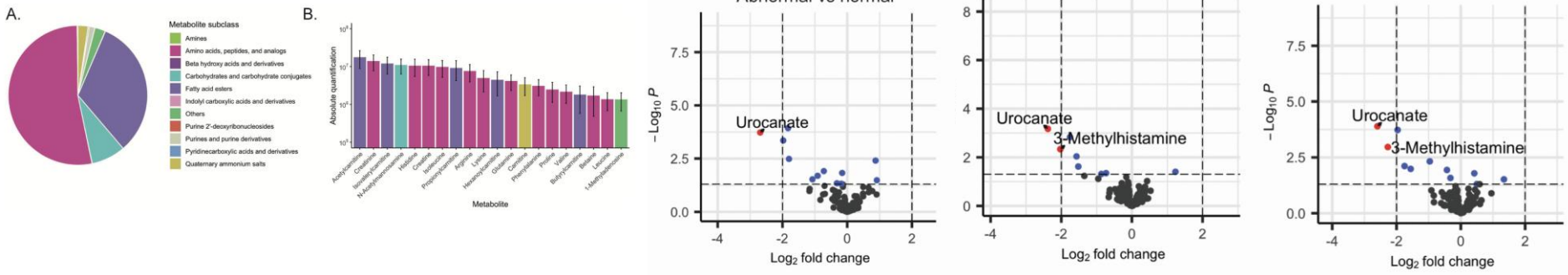
Functional and Taxonomic Dysbiosis of the Gut, Urine, and Semen Microbiomes in Male Infertility

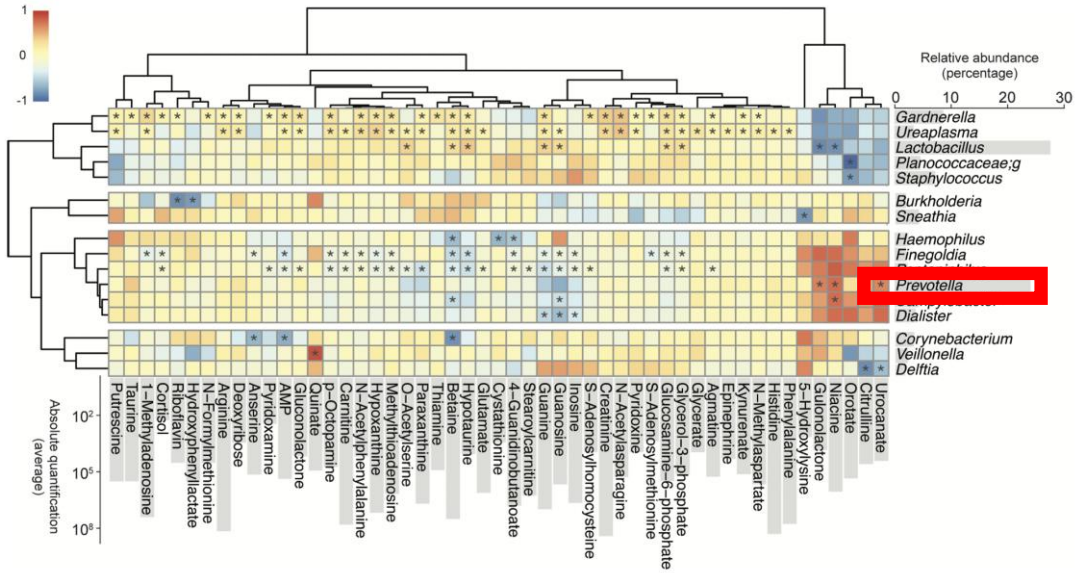
Scott D. Lundy[a,b,], Naseer Sangwan[c], Neel V. Parekh[a], Manesh Kumar Panner Selvam[a], Sajal Gupta[a], Peter McCaffrey[d], Kovi Bessoff[d], Ayin Vala[d], Ashok Agarwal[a], Edmund S. Sabanegh[a], Sarah C. Vij[a], Charis Eng[b,e]*





PREVOTELLA AND SEMEN PARAMETERS





a | Open Peer Review | Host-Microbial Interactions | Research Article

Impact of semen microbiota on the composition of seminal plasma

D. Baud,[1,2] A. Zuber,[1] A. Peric,[3] N. Pluchino,[4] N. Vulliemoz,[5] M. Stojanov[1,2]

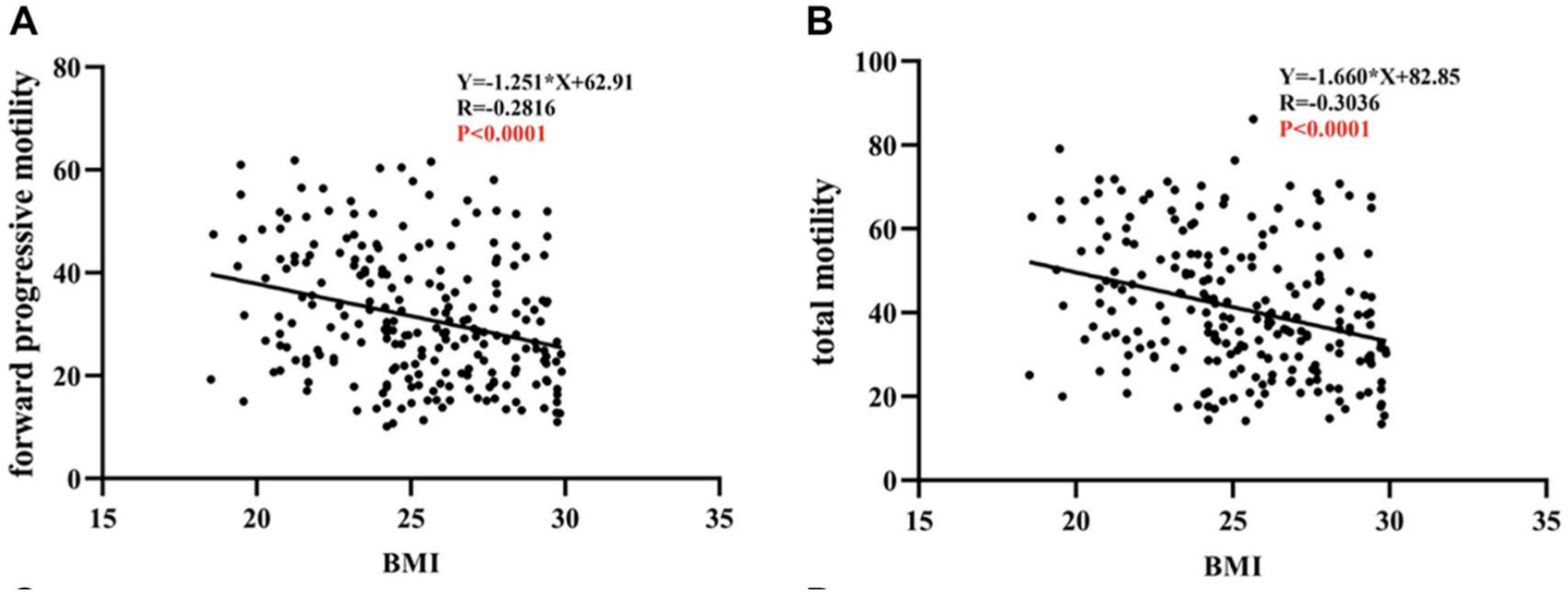
PREVOTELLA AND SEMEN PARAMETERS

scientific reports

OPEN

Enterotypes in asthenospermia patients with obesity

Jiao Jiao[1,2,9], Peng Xu[3,8,9], Xiaobin Wang[1,2,9], Ze Xing[1,2], Sitong Dong[1,2], Gaoyu Li[1,2], Xinrui Yao[1,2], Renhao Guo[1,2], Tao Feng[4], Weifan Yao[5,6], Bochen Pan[1,2]✉, Xuan Zhu[7]✉ & Xiuxia Wang[1,2]✉

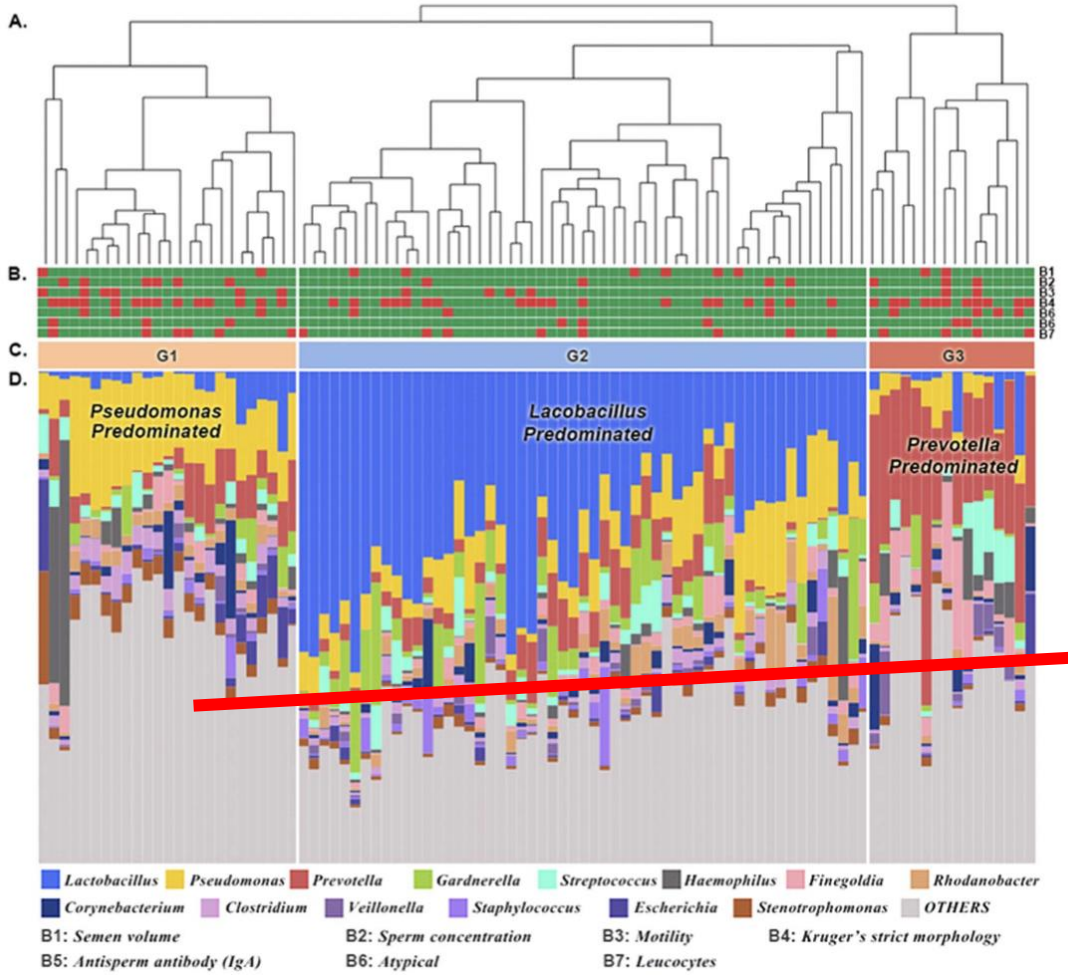


SEMEN MICROBIOTA: 3 MAJOR CLUSTERS

OPEN ACCESS Freely available online PLOS ONE

Bacterial Communities in Semen from Men of Infertile Couples: Metagenomic Sequencing Reveals Relationships of Seminal Microbiota to Semen Quality

Shun-Long Weng[1,2,3,4,5], Chih-Min Chiu[1], Feng-Mao Lin[1], Wei-Chih Huang[1], Chao Liang[1], Ting Yang[1], Tzu-Ling Yang[1], Chia-Yu Liu[1], Wei-Yun Wu[1], Yi-An Chang[1,6], Tzu-Hao Chang[7]*, Hsien-Da Huang[1,2,8,9]*



Pseudomonadota

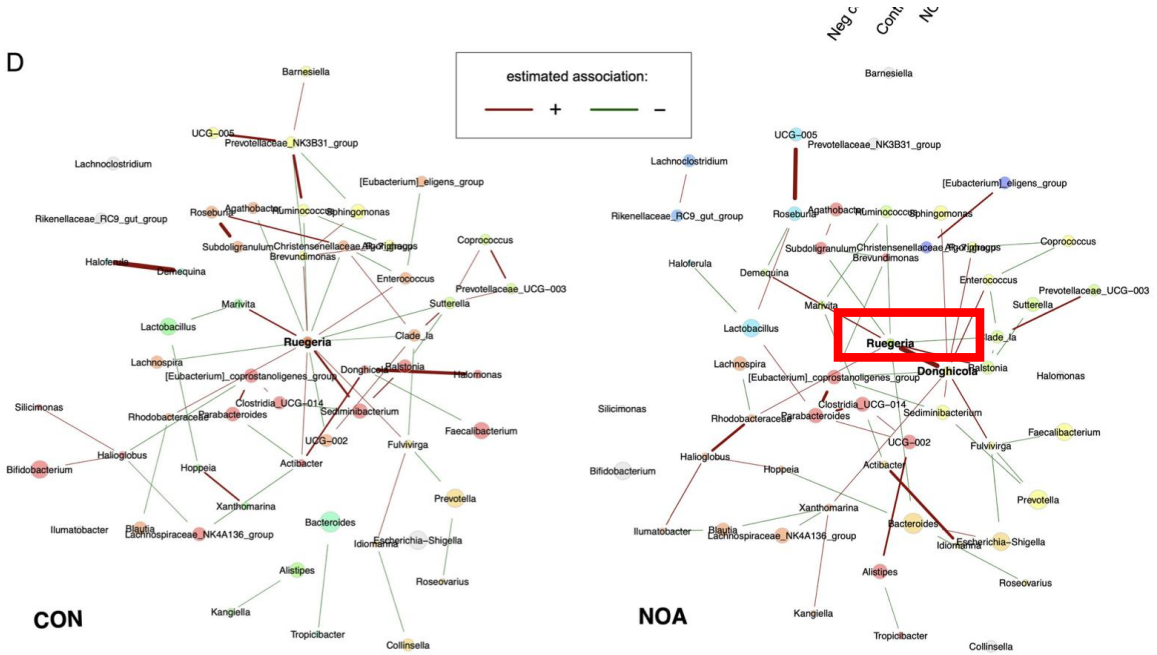
PSEUDOMONADOTA - DOMINANT

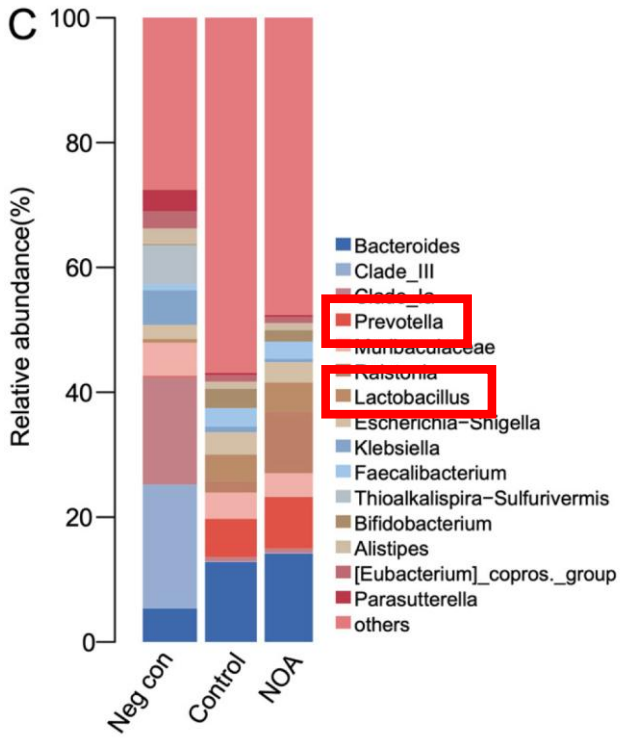
AMERICAN SOCIETY FOR MICROBIOLOGY | Microbiology Spectrum

RESEARCH ARTICLE

Interaction between Host and Microbes in the Semen of Patients with Idiopathic Nonobstructive Azoospermia

Peigen Chen,[a,b] Yanqing Li,[a,b] Xinning Zhu,[a,b] Menghui Ma,[a,b] Haicheng Chen,[a,b] Junxian He,[a,b] Xiaoyan Liang,[a,b] Guihua Liu,[a,b] Xing Yang[a,b]





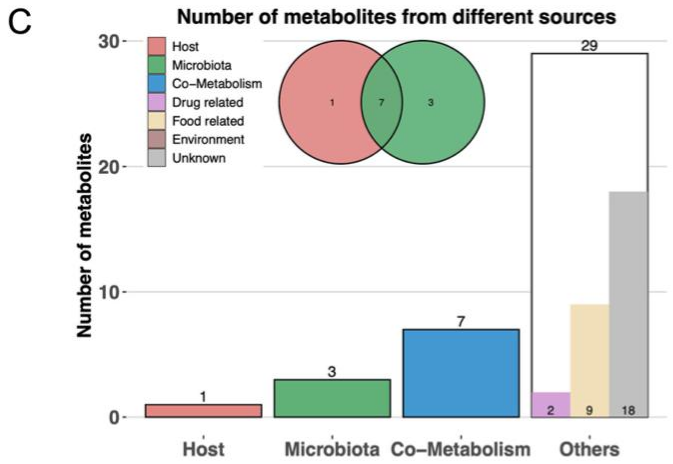
Pseudomonadota – Effect on host metabolisms

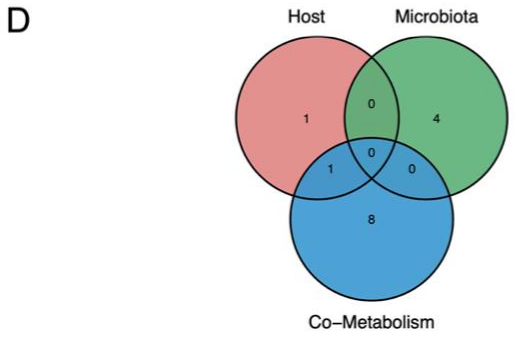
AMERICAN SOCIETY FOR MICROBIOLOGY | Microbiology Spectrum

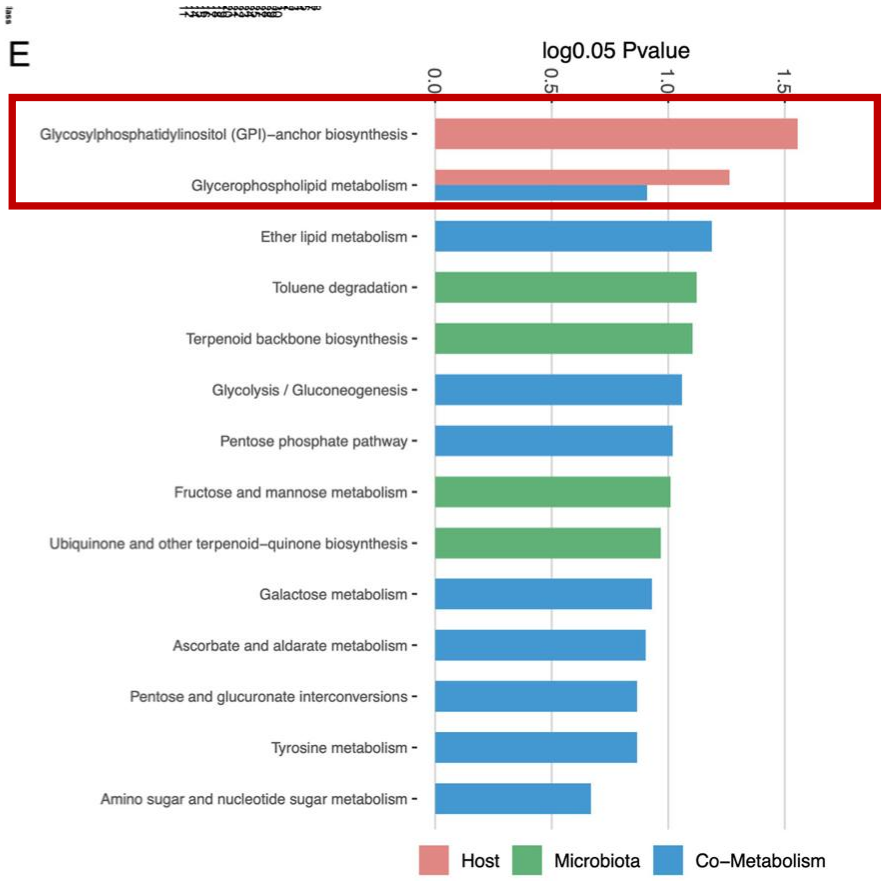
RESEARCH ARTICLE

Interaction between Host and Microbes in the Semen of Patients with Idiopathic Nonobstructive Azoospermia

Peigen Chen,[a,b] Yanqing Li,[a,b] Xinning Zhu,[a,b] Menghui Ma,[a,b] Haicheng Chen,[a,b] Junxian He,[a,b] Xiaoyan Liang,[a,b] Guihua Liu,[a,b] Xing Yang[a,b]





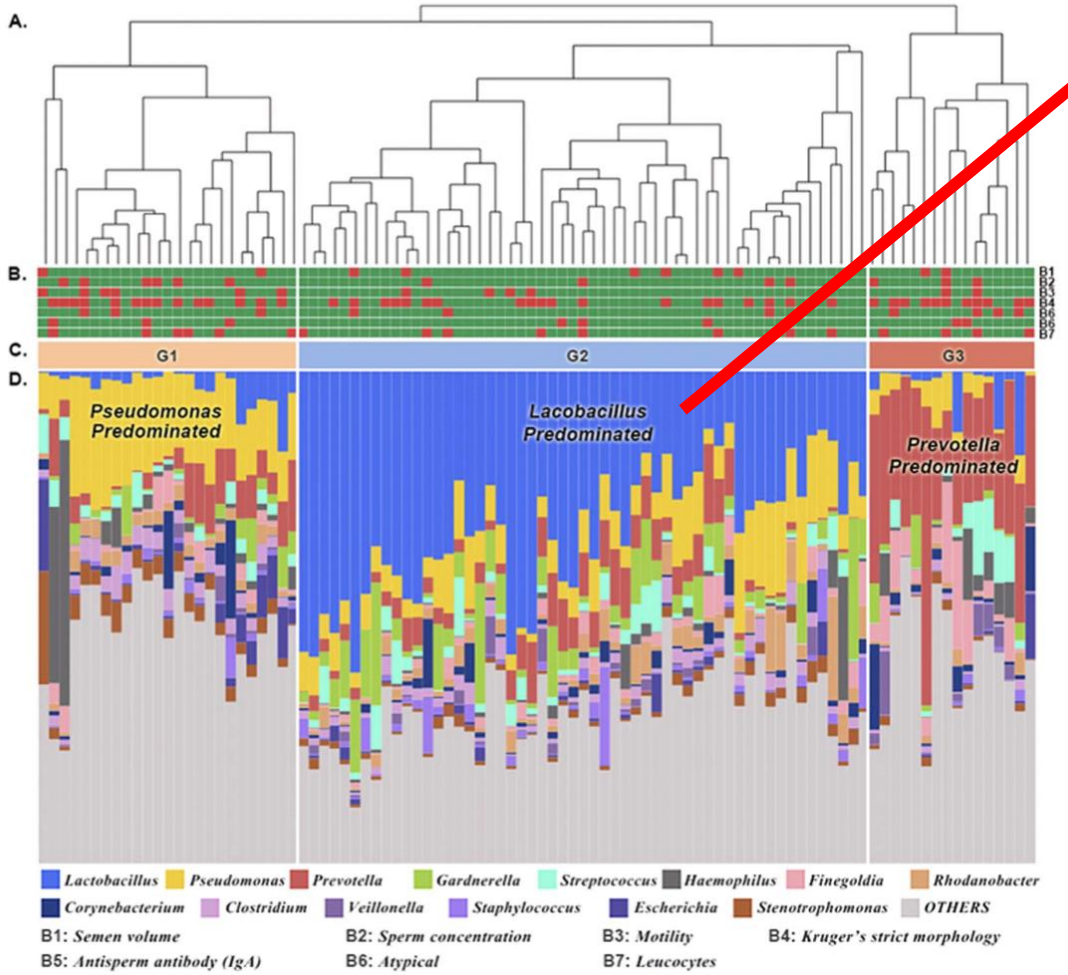


SEMEN MICROBIOTA: 3 MAJOR CLUSTERS

OPEN ACCESS Freely available online PLOS ONE

Bacterial Communities in Semen from Men of Infertile Couples: Metagenomic Sequencing Reveals Relationships of Seminal Microbiota to Semen Quality

Shun-Long Weng[1,2,3,4,5], Chih-Min Chiu[1], Feng-Mao Lin[1], Wei-Chih Huang[1], Chao Liang[1], Ting Yang[1], Tzu-Ling Yang[1], Chia-Yu Liu[1], Wei-Yun Wu[1], Yi-An Chang[1,6], Tzu-Hao Chang[7]*, Hsien-Da Huang[1,2,8,9]*



>80% of normozoospermic subjects

Increased seminal parameters

LACTOBACILLI

PORTO BIOMEDICAL JOURNAL
WHERE SCIENCE MEETS KNOWLEDGE

Review Article

OPEN

Seminal and testicular microbiome and male fertility

A systematic review

Pedro Brandão, MD[a,b,*], Manuel Gonçalves-Henriques, MD[c], Nathan Ceschin, MD[a]

Abstract

Microbiome is of upmost importance for the well-being of the human body. Based on culture and PCR methods, seminal flora has been pointed as a potential cause for some of the unexplained male infertility.

This is a systematic review about the effect of seminal microbiota studied by Next Generation Sequencing techniques on sperm quality and male fertility, performed according to PRISMA statement.

Nine articles were included. Results of different studies are diverse. It seems that microbiota may a play a role in seminal quality and further male fertility, but the way this effect is modulated is still to be unknown. *Lactobacillus* spp seemed to play a beneficial role in semen quality, but the role of the remaining bacteria is unclear.

Due to the lack of research and the incongruence of the results so far, the effect of microbiota on seminal quality is still unclear.

Keywords: assisted reproductive techniques, male infertility, microbiome, semen, testicle

Lactobacillus spp

Lactobacillus spp revealed a positive association with male fertility and seminal parameters.

Weng et al found higher rates of this genus in healthy controls (in particular *L crispatus* and *L acidophilus*).[31]

A lower amount of *Lactobacillus* spp was found in azoospermic patients (Controls 6.79%, OA 17.98 and NOA 17.24%), as well as patients with oligoasthenozoospermia, teratozoospermia or seminal hyperviscosity.[27,28,30]

Table 1

Main seminal bacterial phyla and genera

PHYLUM	GENERUM
Actinobacteria	*Atopobium* spp[33]
	Corynebacterium spp[28–30,33]
	Gardnerella spp[31]
	Propionibacterium spp[28]
	Rhodococcus spp[27]
Bacteroidetes	*Cloacibacterium* spp[33]
	Porphyromonas spp[33]
	Prevotella spp[27,29–31,33,34]
Firmicutes	*Aerococcus* spp[33]
	Anaerococcus spp[28,33]
	Bacillus spp[27]
	Clostridium spp[33]
	Enterococcus spp[28]
	Finegoldia spp[30,31,33]
	Gemella spp[33]
	Lactobacillus spp[27,29–31,33,34]
	Peptoniphilus spp[28,33]
	Staphylococcus spp[27,28,30,33,34]
	Streptococcus spp[29–31,33]
	Veillonella spp[27,33]
Proteobacteria	*Acidovorax* spp[33]
	Bradyrhizobium spp[33]
	Burkholderia spp[30]
	Haemophilus spp[30,31]
	Pelomonas spp[33]
	Proteus spp[27]
	Pseudomonas spp[27,31]
	Ralstonia spp[33]
	Rhodanobacter spp[31]
Other	*Ureaplasma* spp[33]

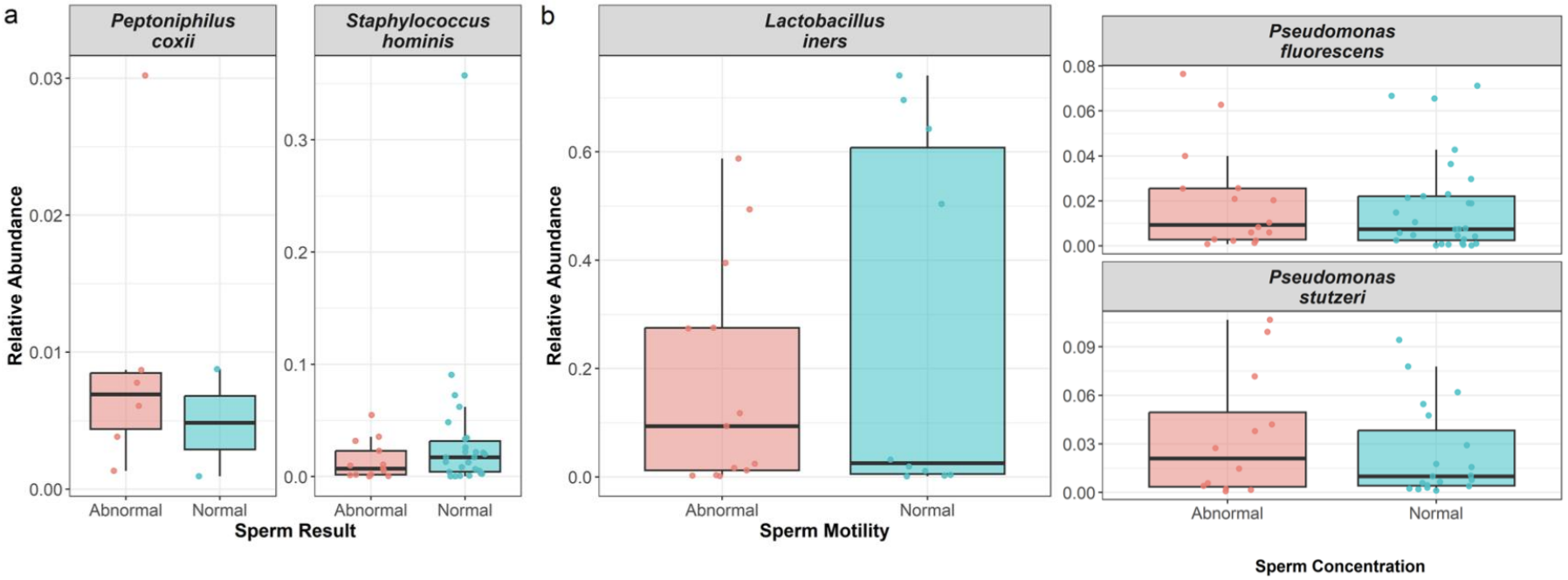
NOT ALL LACTOBACILLI ARE THE SAME

scientific reports

OPEN

Semen microbiota are dramatically altered in men with abnormal sperm parameters

Vadim Osadchiy[1], Andre Belarmino[1], Reza Kianian[1], John T. Sigalos[1], Jacob S. Ancira[2,3], Trisha Kanie[4], Sarah F. Mangum[2], Craig D. Tipton[2,3], Tung-Chin M. Hsieh[4], Jesse N. Mills[1] & Sriram V. Eleswarapu[1,2]



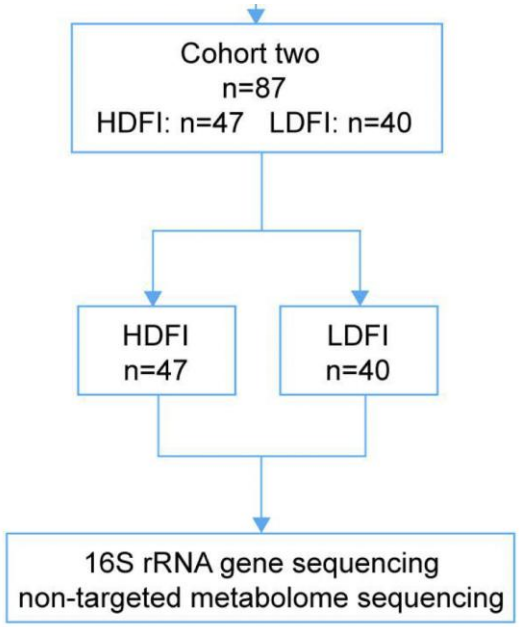
AMERICAN SOCIETY FOR MICROBIOLOGY | Microbiology Spectrum

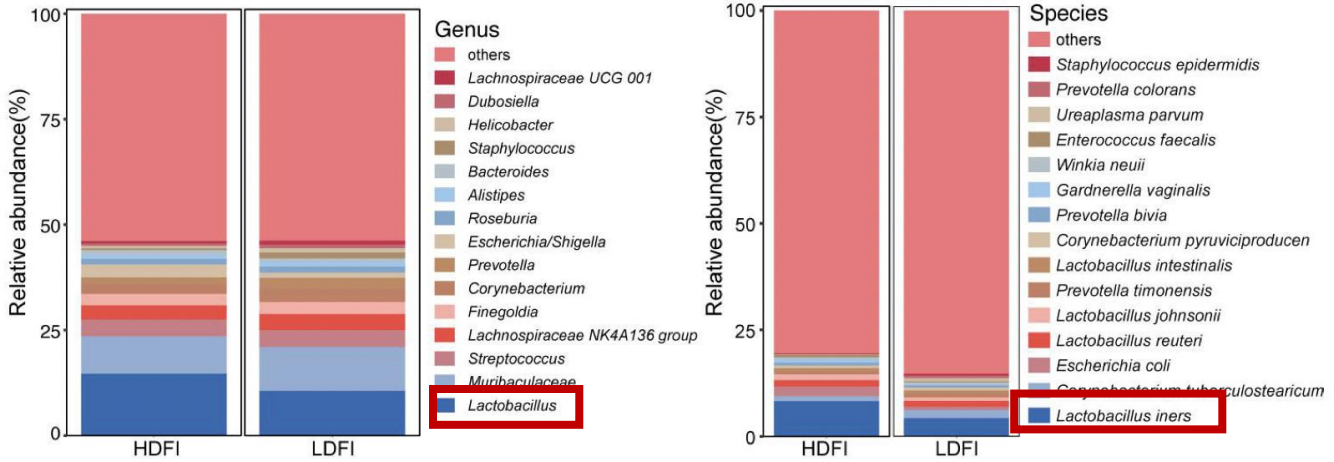
| Clinical Microbiology | Research Article

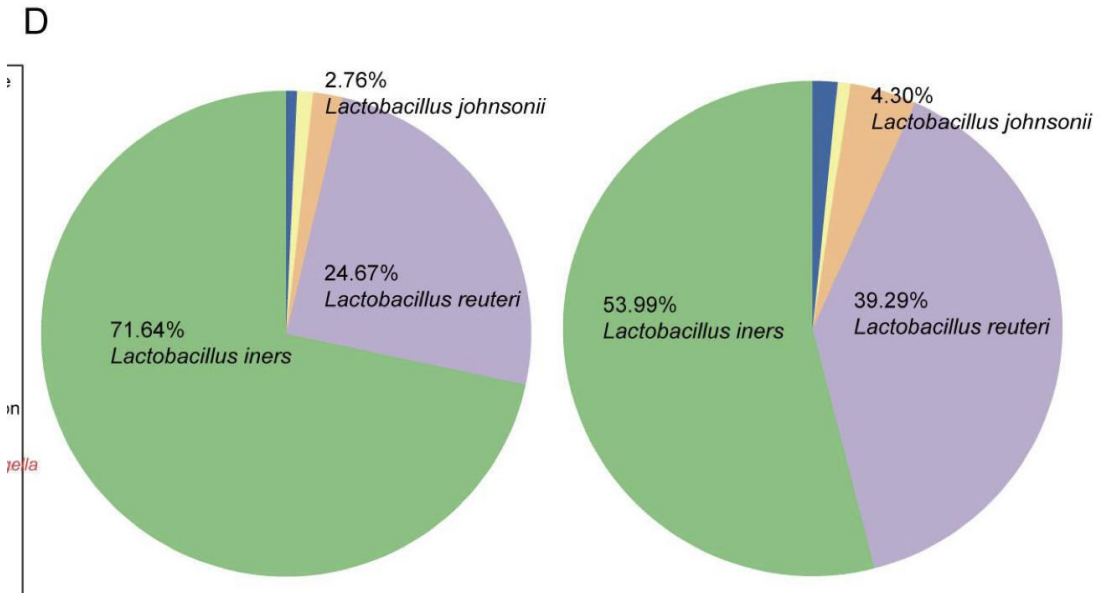
L. INERS

Association between semen microbiome disorder and sperm DNA damage

Junxian He,[1,2,3,4] Menghui Ma,[1,2,3,4] Zhenhan Xu,[1,2,3,4] Jintao Guo,[1,2,3,4] Haicheng Chen,[1,2,3,4] Xing Yang,[1,2,3,4] Peigen Chen,[1,2,3,4] Guihua Liu[1,2,3,4]







Submitted: 06 June, 2023 Accepted: 29 December, 2023 Published: 30 March, 2024 DOI:10.22514/j.androl.2024.006

ORIGINAL RESEARCH

REV INT ANDROL
Revista Internacional de Andrología

The microbiota of sexual intercourse and its effect prostatitis

Yurani Marllely Saldarriaga López[1,†], Valeria Santacruz Restrepo[1,†], Walter Darío Cardona Maya[2], Jenniffer Puerta Suárez[1,*]

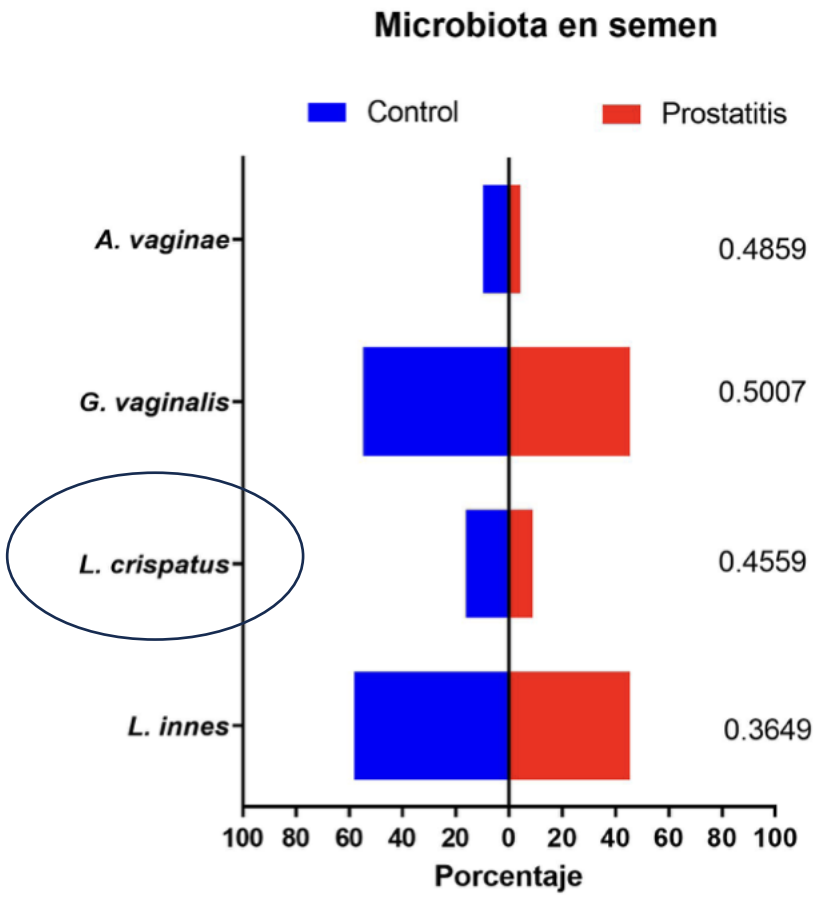


FIGURA 2. Frecuencia de detección de ADN de las bacterias *A. vaginea*, *G. vaginalis*, *L. crispatus* y *L. iners* en las muestras de semen de hombres del grupo prostatitis y control.

PROSTATITIS AND SEMEN MICROBIOTA

INTERNATIONAL JOURNAL OF UROLOGY
International Journal of Urology (2017) 24, 211–216 doi: 10.1111/iju.13286

Original Article: Clinical Investigation

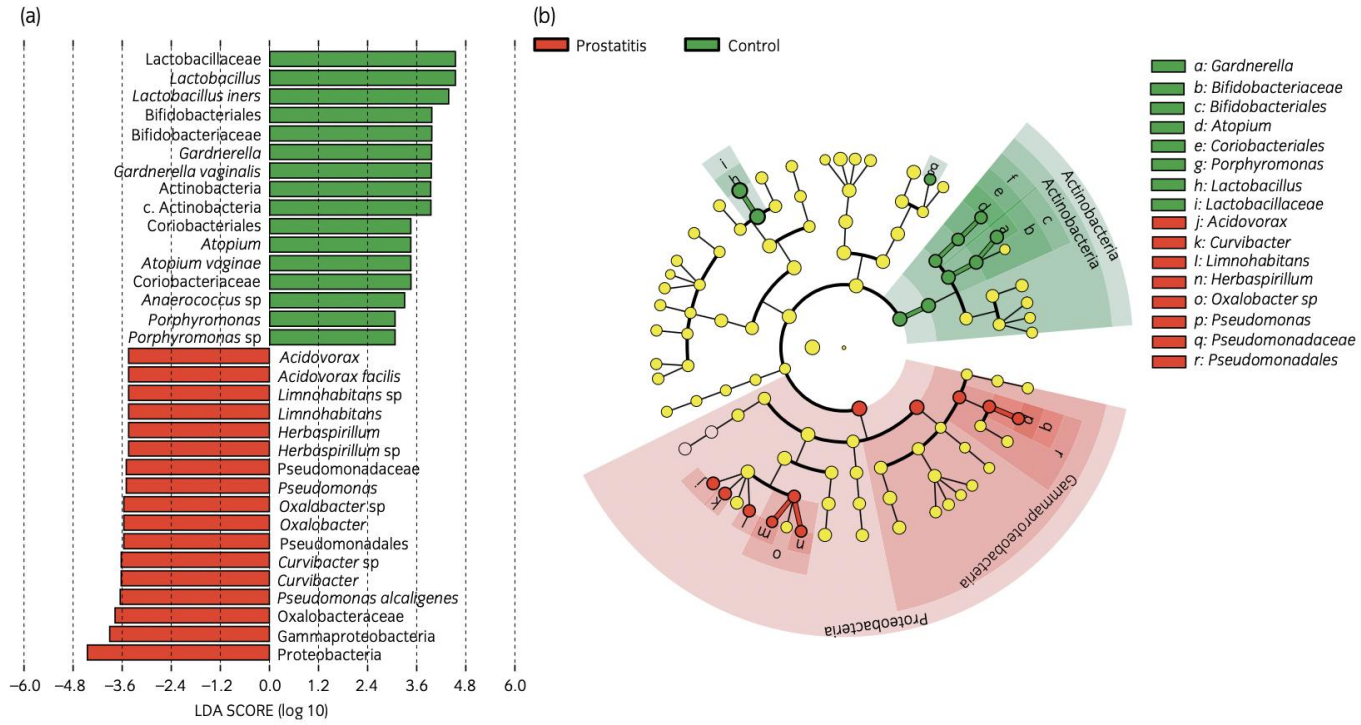
Seminal microbiome in men with and without prostatitis

Reet Mändar,[1,2] Margus Punab,[1,4] Paul Korrovits,[1,2,4] Silver Türk,[2] Kristo Ausmees,[4,5] Eleri Lapp,[1,2] Jens-Konrad Preem,[1,3] Kristjan Oopkaup,[1,3] Andres Salumets[1] and Jaak Truu[1,3]

[1]Competence Center on Health Technologies, [2]Department of Microbiology, Faculty of Medicine, University of Tartu, [3]Faculty of Science and Technology, University of Tartu, [4]Andrology Center, Tartu University Hospital, and [5]MediTA Clinic, Tartu, Estonia

In pts with prostatitis:

- Reduction in Firmicutes
  - Severe reduction of Lactobacilli
- Increase in Protobacteria



Infections: not only antibiotics

Prostatic calcifications are associated with a more severe symptom burden in men with type II chronic bacterial prostatitis

Konstantinos Stamatiou [1], Vittorio Magri [2], Gianpaolo Perletti [3], Alberto Trinchieri [4], Richard Lacroix [1], Nektaria Rekleiti [1], Hippocrates Moschouris [1]

Outcome	Group 1
Pathogen eradicated (%)	26/41 (63%)
Pathogen not eradicated	10/41
Superinfection	5/41
Clinical resolution	23/41 (56.9%)
No clinical resolution	18/41
Uncertain clinical resolution	-

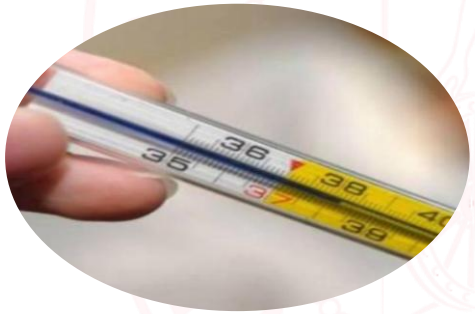
45% OF PATIENTS WITH RECURRENT INFECTIONS

SEMEN EVALUATION AND (IN)FERTILITY

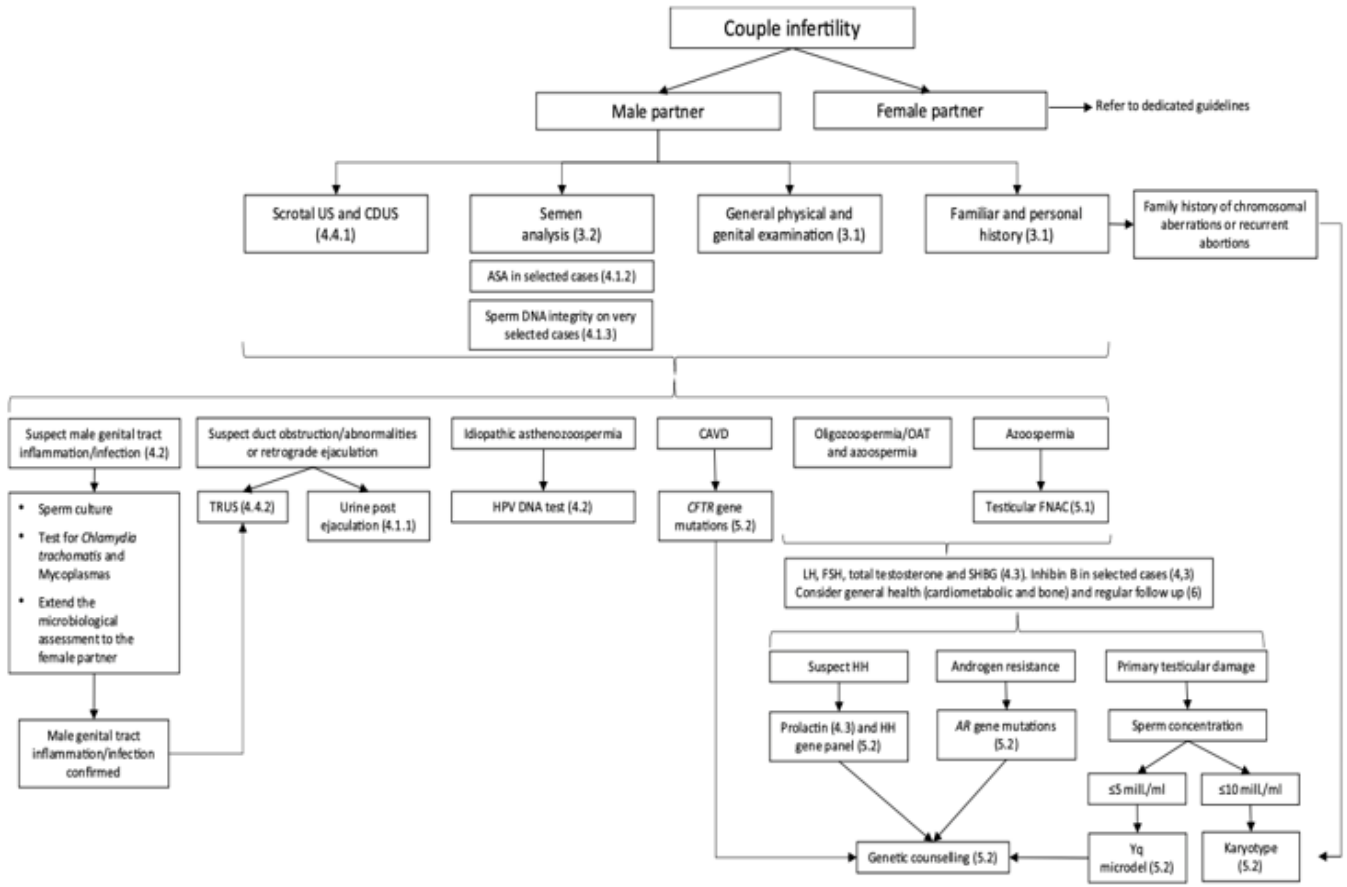
The evaluation of semen should be the first – not the last – diagnostic evaluation of the diagnostic work-up of male factor infertility (MFI)

(WHO, VI edition, 2021; Ferlin et al, 2021; Grande et al, 2025; Graziani et al, in preparation)

"AN ALTERATION IN SEMEN ANALYSIS IS LIKE FEVER, ABDOMINAL PAIN OR EKG ABNORMALITY: IT IS JUST A SIGN OF AN UNDERLYING DISORDER WHICH HAS TO BE DEEPLY STUDIED"



Therefore, **the diagnosis of MFI is difficult** and requires **a complete and accurate evaluation of the male partner** (as it happens, indeed, for the female partner)



Journal of Endocrinological Investigation (2022) 45:1085–1113
https://doi.org/10.1007/s40618-022-01741-6

CONSENSUS STATEMENT

Management of male factor infertility: position statement from the Italian Society of Andrology and Sexual Medicine (SIAMS)

Endorsing Organization: Italian Society of Embryology, Reproduction, and Research (SIERR)

A. Ferlin[1] · A. E. Calogero[2] · C. Krausz[3] · F. Lombardo[4] · D. Paoli[4] · R. Rago[5] · C. Scarica[6] · M. Simoni[7] · C. Foresta[1] · V. Rochira[7] · E. Sbardella[8] · S. Francavilla[9] · G. Corona[10]

One semen analysis is not enough to define male fertility/infertility

One altered semen analysis is not enough to define a condition of infertility and address the couple to Assisted Reproductive Techniques

Review > J Endocrinol Invest. 2025 May;48(5):1085-1100. doi: 10.1007/s40618-024-02524-x.
Epub 2025 Jan 13.

Current drawbacks and future perspectives in the diagnosis and treatment of male factor infertility, with a focus on FSH treatment: an expert opinion

D Santi [1], G Corona [2], A Salonia [3 4], A Ferlin [5 6]

PROPOSAL FOR A NEW DIAGNOSTIC-THERAPEUTIC CLASSIFICATION OF MFI

CATEGORY	DESCRIPTION
CATEGORY 1	SEMEN INFECTION/INFLAMMATION
CATEGORY 2	CONGENITAL OBSTRUCTION, CBAVD, POST-SURGICAL OBSTRUCTION, RETROGRADE EJACULATION
CATEGORY 3	PRIMARY TESTICULAR DISEASE: HIGH FSH (3A) AND NORMAL FSH (3B)
CATEGORY 4	HYPOGONADOTROPIC HYPOGONADISM
CATEGORY 5	IDIOPATHIC SEMEN ALTERATIONS
CATEGORY 6	IDIOPATHIC COUPLE INFERTILITY

MALE GENITAL TRACT INFECTION/INFLAMMATION

Received: 8 August 2024 | Revised: 9 January 2025 | Accepted: 22 January 2025

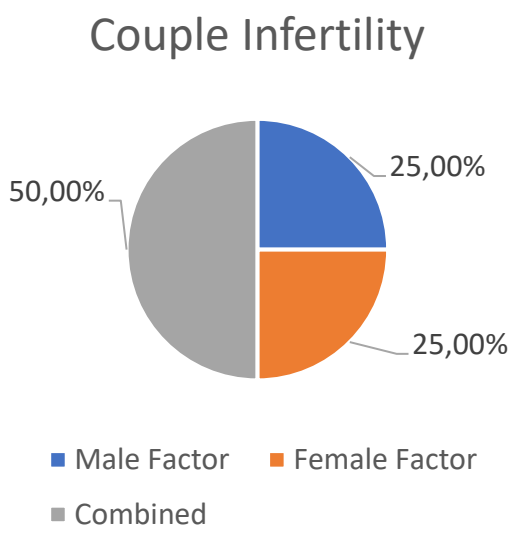
DOI: 10.1111/andr.70006

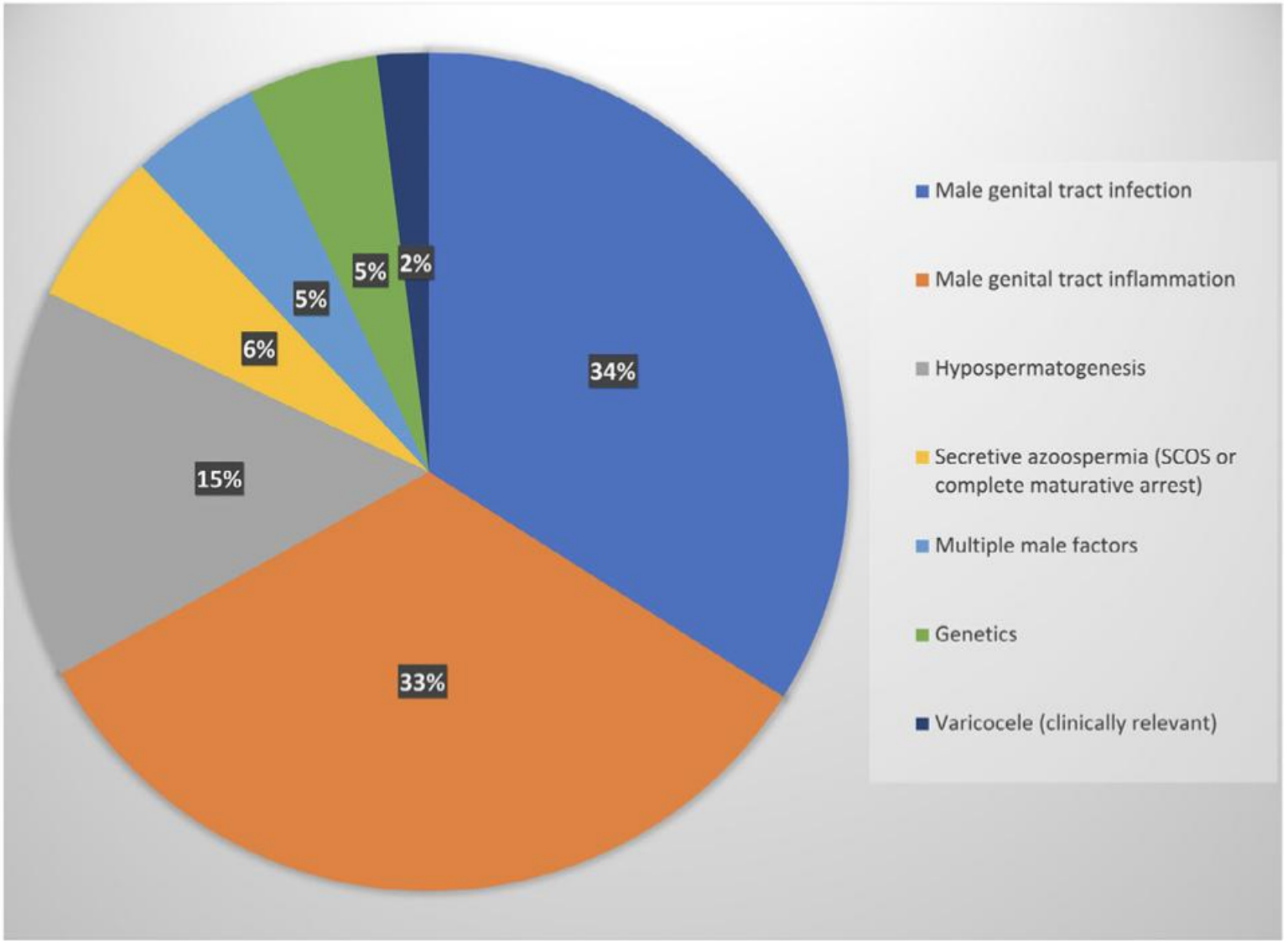
ANDROLOGY WILEY

ORIGINAL ARTICLE

Comprehensive diagnostic and therapeutic approach to male factor infertility aimed at natural fertility: A multicentric retrospective cohort study

Giuseppe Grande[1] | Andrea Garolla[1] | Andrea Graziani[1] | Anna Laura Astorri[2] | Maria Vittoria Cammarota[3] | Annamaria Merola[4] | Maria Pia Polidori[5] | Emanuela Lulli[5] | Enrico Busato[6] | Francesco Pesce[7] | Giuseppina Pompa[2] | Alfredo Pontecorvi[2] | Domenico Milardi[2] | Alberto Ferlin[1]



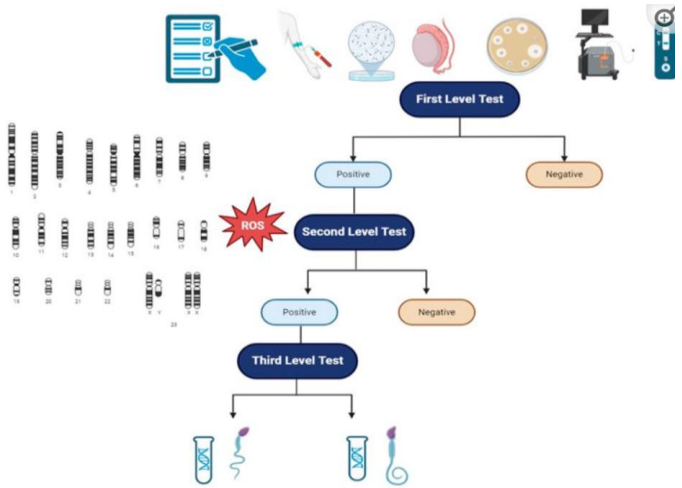


DIAGNOSTIC-THERAPEUTIC CLASSIFICATION OF MALE FACTOR INFERTILITY

AIMS OF THE STUDY

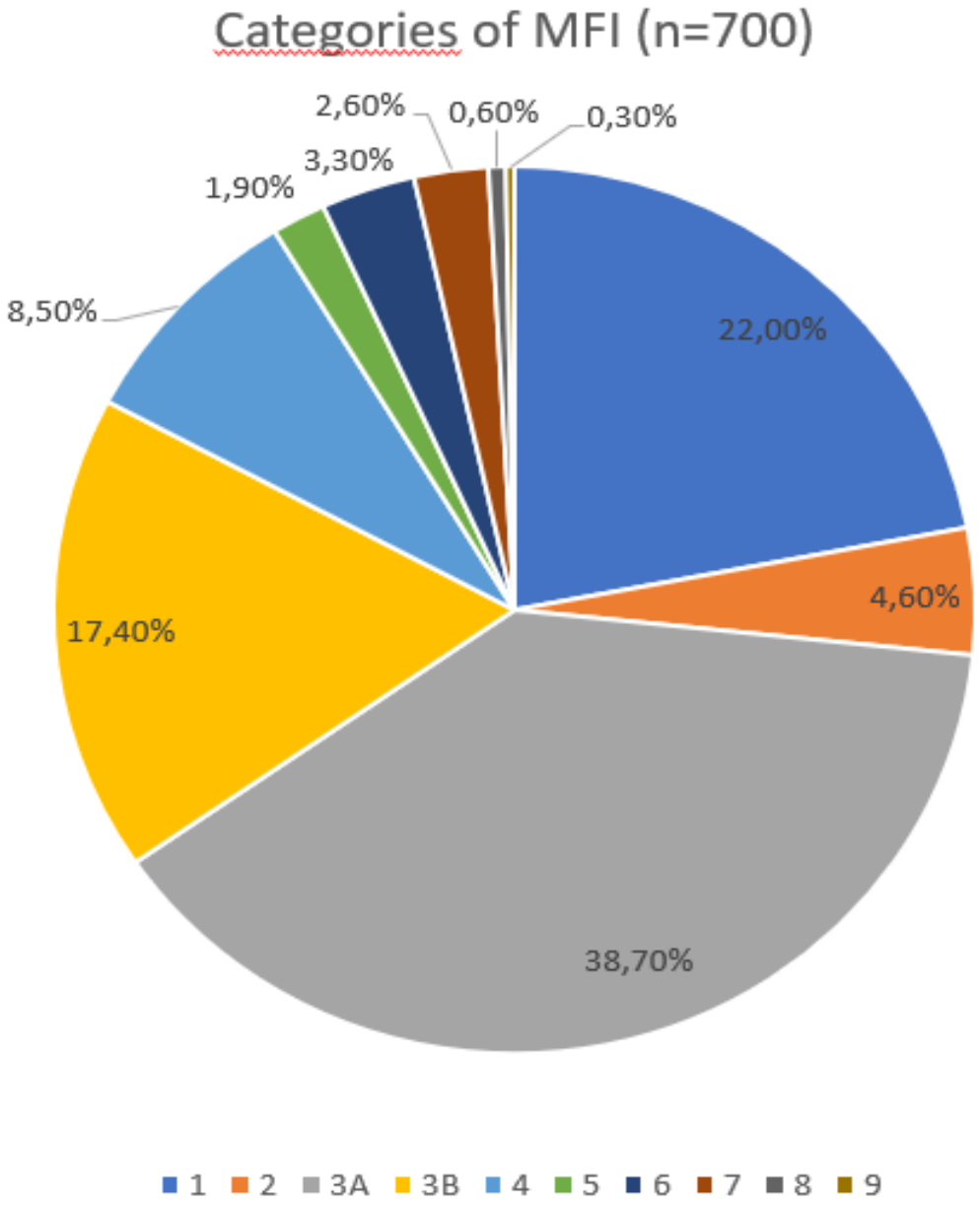
- TO PERFORM AN EVALUATION OF THE CAUSES OF MALE FACTOR INFERTILITY (MFI) ACCORDING TO THE NEW DIAGNOSTIC-THERAPEUTIC CLASSIFICATION
- TO OBTAIN DATA REGARDING THE MANAGEMENT AND THERAPEUTIC IMPACT OF THE NEW CLASSIFICATION

MATERIALS AND METHODS



- ENROLLMENT OF MALE PATIENTS REFERRING TO THE UNIT OF ANDROLOGY AND REPRODUCTIVE MEDICINE BECAUSE OF COUPLE INFERTILITY
- EXCLUSION OF MALE PARTNERS OF INFERTILE COUPLES WITH KNOWN FEMALE FACTOR INFERTILITY
- COMPLETE AND ACCURATE DIAGNOSTIC WORK-UP OF MFI, INCLUDING:
  1) Accurate medical history and physical examination
  2) Complete semen analysis including semen microbiological evaluation
  3) Biochemical hormonal evaluation
  4) Testicular US and, when needed, transrectal prostatic

Category	Sub-Category	Number of patients	Percentage
I (infection/inflammation) (overall: n= 154/700, 22.0 %)	IA	31/700	4.4 %
	IB	56/700	8.0 %
	IC	67/700	9.6 %
II (CBVAD/obstruction)	n.a.	32/700	4.6 %
III (primary spermatogenic failure) (overall: n=393/700, 59.1%)	IIIA	271/700	38.7 %
	IIIB	122/700	17.4 %
IV (hypogonadotropic hypogonadism)	n.a.	61/700	8.5 %
V (idiopathic semen alterations)	n.a.	13/700	1.9 %
VI (idiopathic couple infertility)	n.a.	23/700	3.3 %
VII (significant varicocele)	n.a.	18/700	2.6 %
VIII (immunity-related semen conditions)	n.a.	4/700	0.6%
IX (genetic qualitative sperm defects)	n.a.	2/700	0.3%



Male tract infections: prevalence

Hindawi Publishing Corporation
International Journal of Endocrinology
Volume 2012, Article ID 649149, 6 pages
doi:10.1155/2012/649149

Clinical Study

Male Fertility and Reduction in Semen Parameters: A Single Tertiary-Care Center Experience

D. Milardi,[1] G. Grande,[2] D. Sacchini,[3] A. L. Astorri,[1] G. Pompa,[1] A. Giampietro,[2] L. De Marinis,[2] A. Pontecorvi,[2] A. G. Spagnolo,[3] and R. Marana[1]

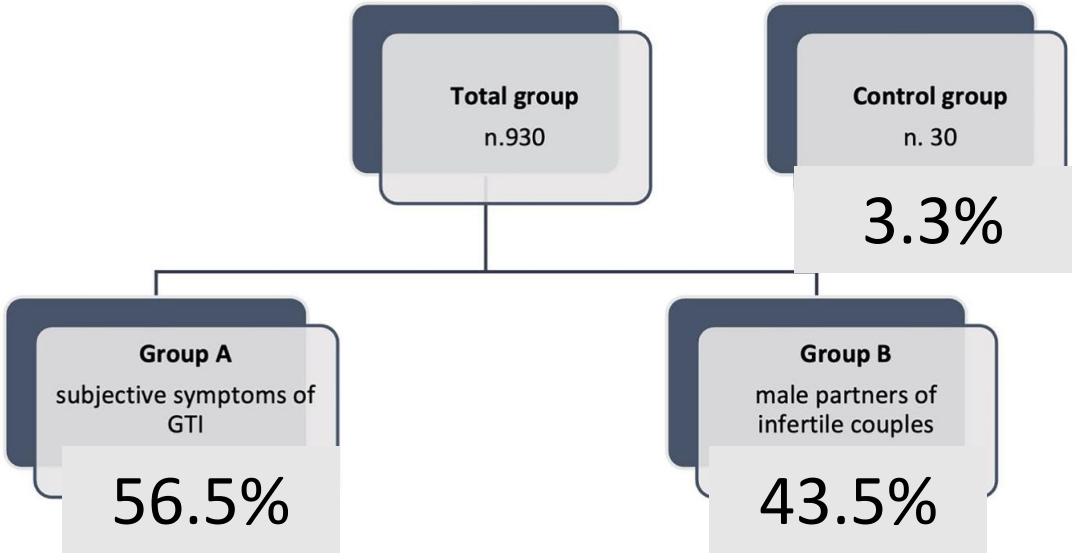
Male tract infections	168	37
Varicocele	113	25
Hormonal disfunction (hypogonadism, dysthyroidism, pituitary disfunction)	72	16
Idiopathic infertility	100	22

International Microbiology
https://doi.org/10.1007/s10123-022-00273-6

ORIGINAL ARTICLE

Sperm culture and bacterial susceptibility to antibiotics in a large andrological population: prevalence and impact on seminal parameters

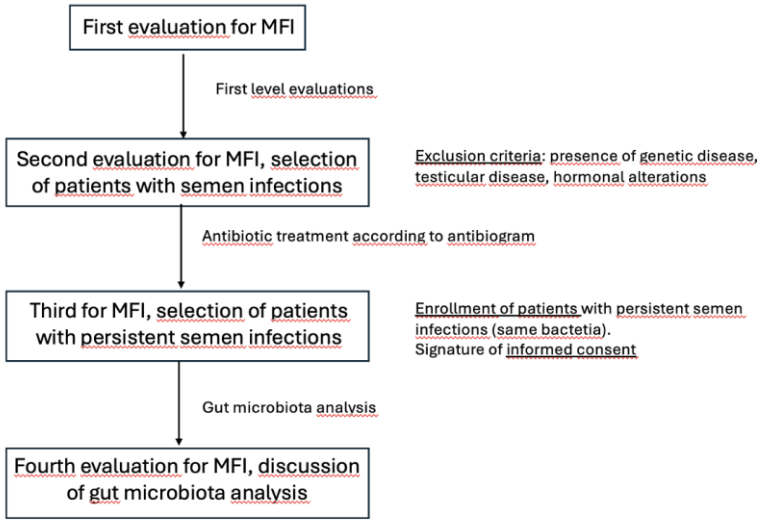
Soraya Olana[1] · Rossella Mazzilli[1] · Iolanda Santino[2] · Daniela Martinelli[3] · Virginia Zamponi[1] · Manuela Macera[4] · Gerardo Salerno[1] · Fernando Mazzilli[1] · Antongiulio Faggiano[1] · Daniele Gianfrilli[5]



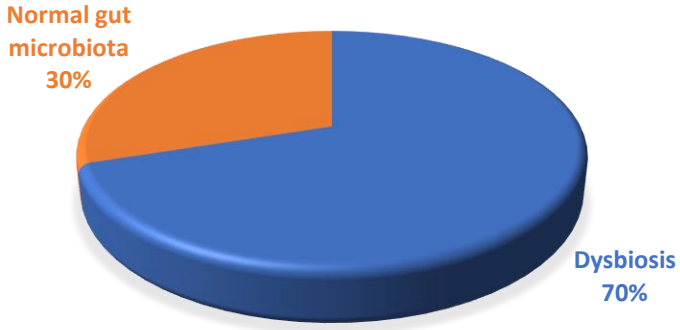
ALTERATIONS IN PATIENTS WITH MALE TRACT INFECTION/INFLAMMATION

- Increase in Prevotella
- Reduction in Lactobacilli
- Increase in Streptococcus

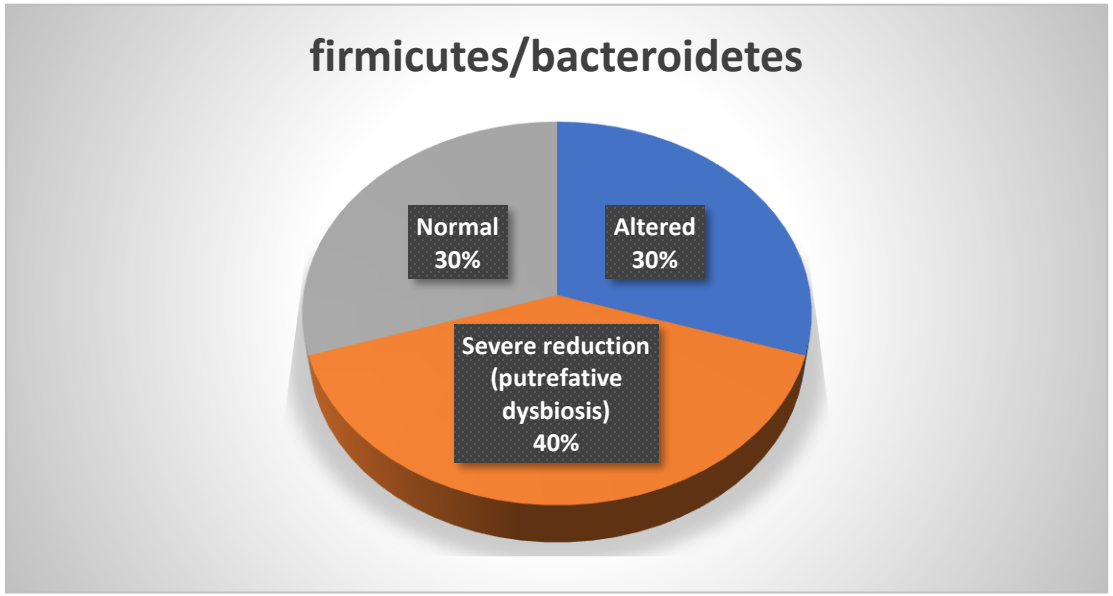
GUT DYSBIOSIS IN PATIENTS WITH RECURRENT MALE TRACT INFECTION



Isolated pathogen	Prevalence [n, (%)]
Ureaplasma urealyticum	7/20 (35%)
Escherichia Coli	5/20 (25%)
Enterococcus faecalis	5/20 (25%)
Citrobacter freundii	2/20 (10%)
Staphylococcus	1/20 (5%)



The 2 most frequent enterotypes were:
- Prevotella-dominant
- Bacteroidetes-dominant



life

MDPI

https://orcid.org/0000-0003-4736-9051

Article

Gut Dysbiosis in Infertile Patients with Persistent Male Accessory Gland Infection

Giuseppe Grande [1,*], Andrea Graziani [2], Raffaele Scafa [2], Luca De Toni [2], Andrea Garolla [1,2] and Alberto Ferlin [1,2]

FROM PROBIOTIC SUPPLEMENTATION TOWARDS A PROBIOTIC PRECISION MEDICINE

Original Article

American Journal of Men's Health
September-October 1–7
© The Author(s) 2022
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/15579883221119064
journals.sagepub.com/home/jmh
SAGE

Association of Probiotic Treatment With Antibiotics in Male Accessory Gland Infections

Giuseppe Grande[1,2,3], Giuseppina Pompa[1,2], Anna Laura Astorri[1,2], Alfredo Pontecorvi[1,2], and Domenico Milardi[1,2]

- Saccharomyces boulardii during antibiotic treatment
- Lactobacillus rhamnosus LR32, Lactobacillus plantarum LP115, Lactobacillus acidophilus LA14 after antibiotic treatment

Table 2. Identified Germs and Prevalence in Our Study Population (N = 104).

Type of germ	No. of patients (*N* = 104)	%
Enterococcus faecalis	57	54.98
Escherichia coli	24	22.64
Klebsiella pneumoniae	10	9.7
Citrobacter	10	9.7
Morganella morganii	3	3.23
Proteus mirabilis	3	3.23
Pseudomonas aeruginosa	3	3.23

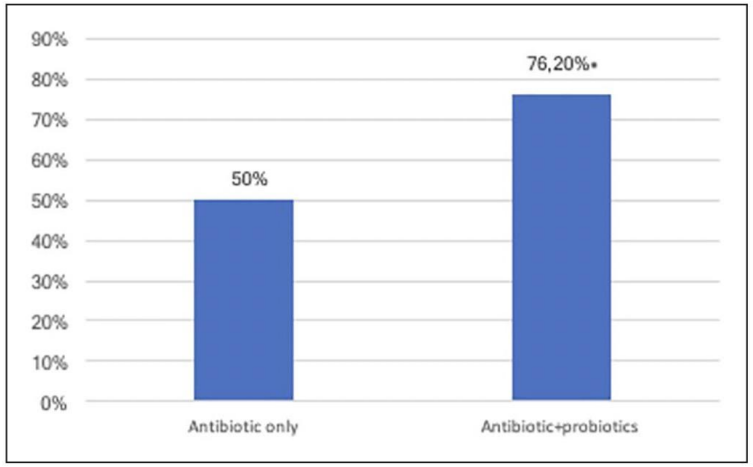


Figure 1. Eradication Rate in Patients Treated With Antibiotics and With Antibiotics Associated With Probiotics (*$p < .005$).

From probiotic supplementation towards a probiotic precision medicine – Preliminary Data

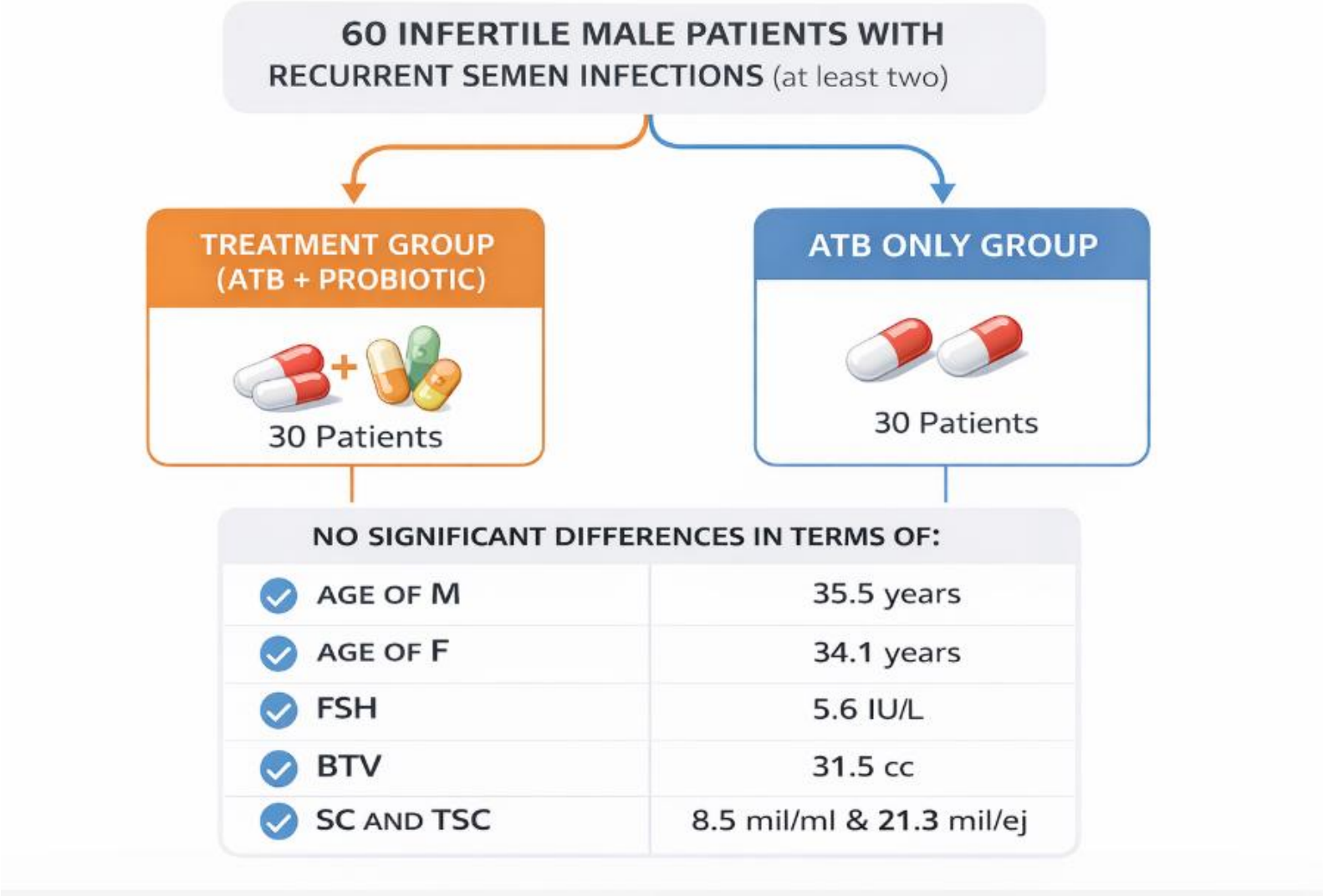
Association of antibiotics + probiotics:

Dopo la terapia antibiotica per 30 gg:

Lactobacillus crispatus LBV88	Frutto-oligosaccaridi (FOS)	1,75 g
Lactobacillus rhamnosus LBV96	Galatto-oligosaccaridi (GOS)	1,26 g
Lactobacillus gasseri LBV150N	Glucomannano	1,00 g
Lactobacillus jensenii LBV116		

Grande G et al, in preparation

From probiotic supplementation towards a probiotic precision medicine – Preliminary Data



Grande G et al, in preparation

From probiotic supplementation towards a probiotic precision medicine – Preliminary Data

ATB+PROTIOBIC GROUP:

ERADICATION RATE: 96.7% (28/30)

INCREASE (>50%) IN SC AND/OR TSC IN 86.7% (26/30)

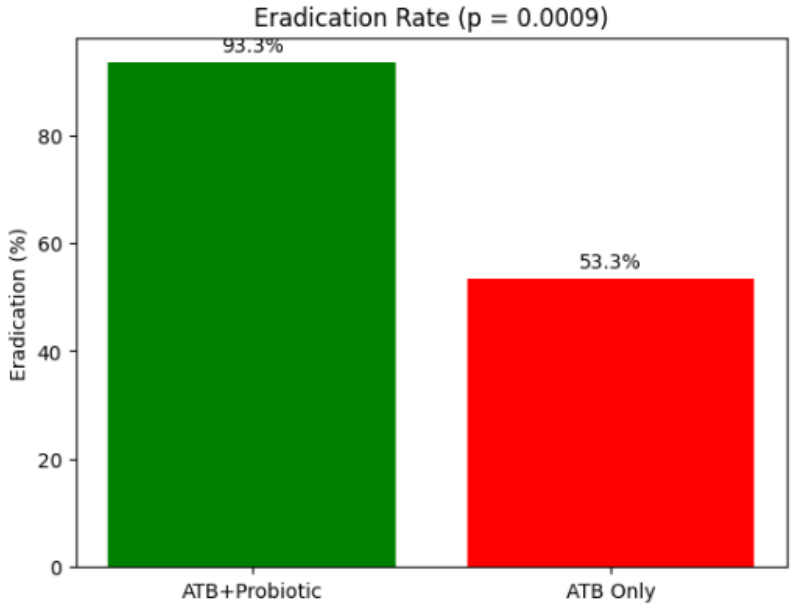
PREGNANCY AFTER TREATMENT IN 10 % (3/30)

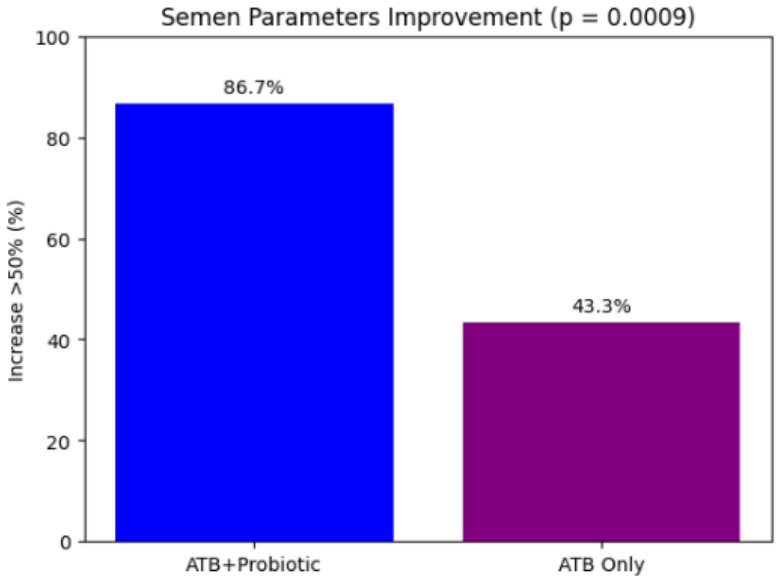
ATB ONLY GROUP:

ERADICATION RATE: 53.3% (16/30)

INCREASE (>50%) IN SC AND/OR TSC IN 13/30 (43.3%)

PREGNANCY AFTER TREATMENT IN 3.3% (1/30)



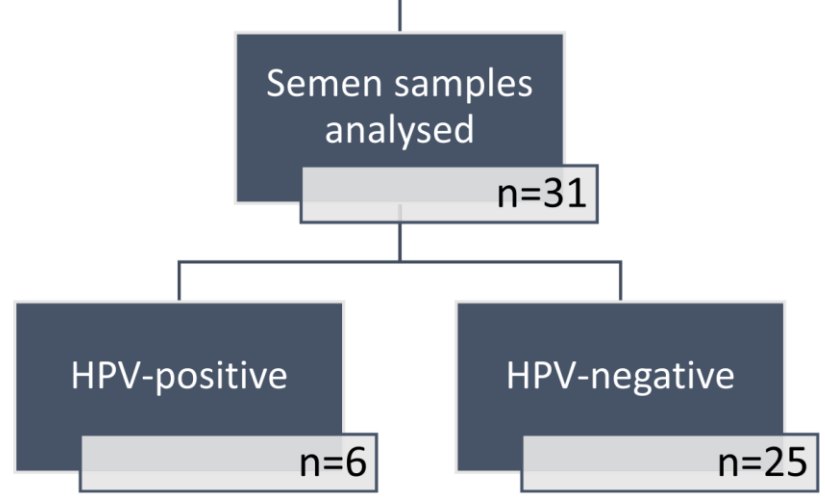


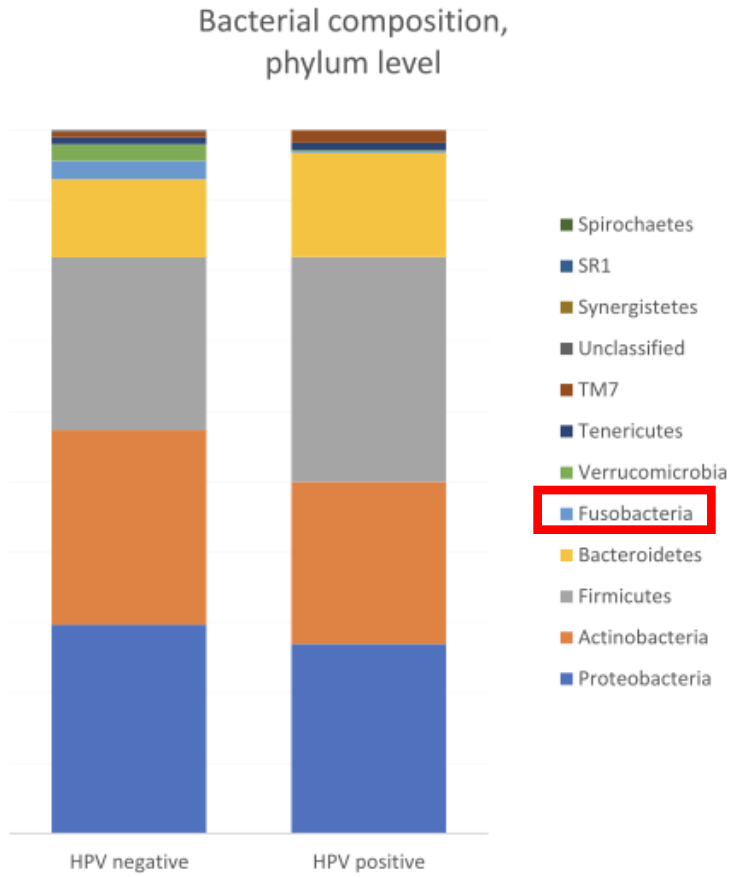
Grande G et al, in preparation

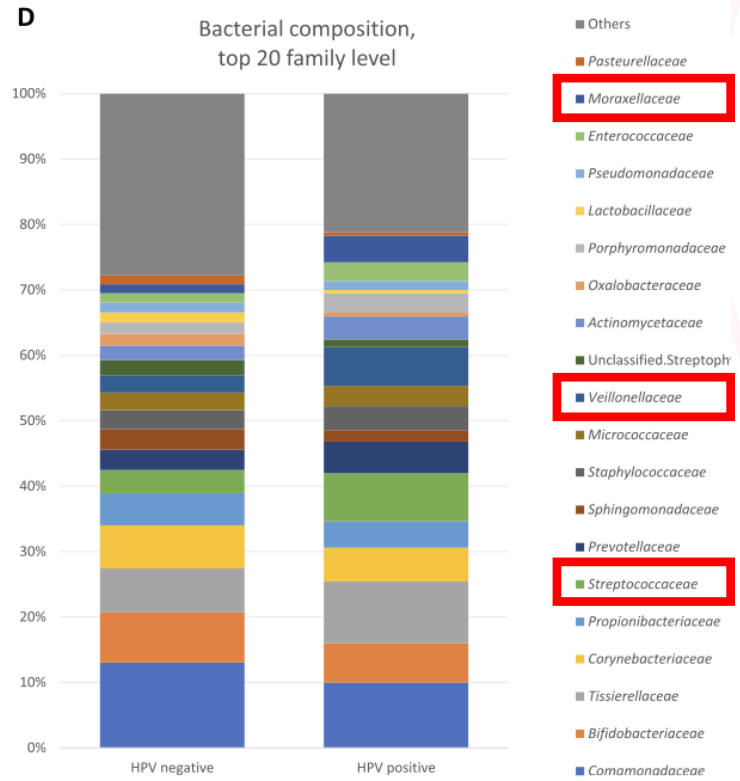
RESEARCH ARTICLE Open Access

HPV infection and bacterial microbiota in the semen from healthy men

Heidi Tuominen[1*], Jaana Rautava[1,2,3], Katja Kero[4], Stina Syrjänen[1,5], Maria Carmen Collado[6] and Samuli Rautava[7,8]







Received: 28 December 2022 | Revised: 6 March 2023 | Accepted: 23 March 2023
DOI: 10.1111/aogs.14598

ORIGINAL RESEARCH ARTICLE

Lactobacillus crispatus-dominated vaginal microbiome and *Acinetobacter*-dominated seminal microbiome support beneficial ART outcome

Kairi Koort[1,2] | Kristiina Sõsa[1] | Silver Türk[2,3] | Eleri Lapp[2] | Elle Talving[4] | Peeter Karits[4] | Karin Rosenstein[2,4] | Madis Jaagura[4,5] | Aire Sekavin[6] | Deniss Sõritsa[2,6,7] | Kai Haldre[8,9] | Helle Karro[6,10] | Paul Korrovits[2,11] | Andres Salumets[2,10,12] | Reet Mändar[2,3]

From genital microbiota to couple microbiota

Community type		Healthy group, *n* (%)	ART group, *n* (%)	ART success rate, *n* (%)[a]
Vaginal communities				
I	*Lactobacillus iners*	4 (33.3)	31 (31.9)	8 (25.8)
II	*Lactobacillus crispatus*	4 (33.3)	25 (25.8)	9 (36.0)
III	BV community	0	19 (19.6)	5 (26.3)
IV	Two lactobacilli (*L. iners* + *L. crispatus*)	2 (16.7)	9 (9.3)	1 (11.1)
V	*Lactobacillus jensenii*	1 (8.3)	3 (3.1)	1 (33.3)
VI	*Lactobacillus gasseri*	0	4 (4.1)	0
VII A	Diverse community A (*Lactobacillus* + *Bifidobacterium*)	0	4 (4.1)	3 (75.0)
VII B	Diverse community B (*Lactobacillus* + *Streptococcus*)	1 (8.3)	2 (2.1)	1 (50.0)
Women with community types with higher success rate (II, V, VII), mean age 34.6 ± SD 4.3				14 (41.2)**
Women with community types with lower success rate (I, III, IV, VI), mean age 34.0 ± SD 4.9				14 (22.2)**
Semen communities				
I	*Acinetobacter* (plus *L. iners*, *Corynebacterium*, *Flavobacterium*, *Prevotella*)	7 (58.3)	48 (49.5)	17 (35.4)*
II	Gram-negative anaerobic/ microaerophilic (*Prevotella*, *Porphyromonas*, *Dialister or Campylobacter*)	1 (8.3)	14 (14.4)	1 (7.1)*
III	Gram-negative + Gram-positive (*Prevotella*, *Acinetobacter*, *Porphyromonas*, *Dialister*, *Campylobacter*, *L. iners*, *L. crispatus*, *Corynebacterium*, *Gardnerella vaginalis*, *Finegoldia*, *Fenollaria*)	1 (8.3)	14 (14.4)	4 (28.6)
IV	*L. iners* + vaginal bacteria (*L. crispatus*, *G. vaginalis*, *Sneathia*, *Corynebacterium*)	2 (16.7)	13 (13.4)	2 (15.4)
V	*Corynebacterium*	1 (8.3)	4 (4.1)	2 (50)
VI	*L. iners*	0	2 (2.1)	1 (50)
	Veillonella-predominated community	0	1 (1.0)	1 (7.1)
	Haemophilus parainfluenzae- predominated community	0	1 (1.0)	0
Men with community type with higher success rate (I), mean age 38.6 ± SD 7.6				17 (35.4)
Men with community types with lower success rate or scarce types (II–VI), mean age 36.4 ± SD 5.8				11 (22.4)

cells

MDPI

Review

Male Tract Microbiota and Male Infertility

Giuseppe Grande, Andrea Graziani, Luca De Toni, Andrea Garolla and Alberto Ferlin *

Unit of Andrology and Reproductive Medicine, Department of Medicine, University of Padova, 35128 Padova, Italy; giuseppe.grande@aopd.veneto.it (G.G.); luca.detoni@unipd.it (L.D.T.); andrea.garolla@unipd.it (A.G.)
* Correspondence: alberto.ferlin@unipd.it

Abstract: In recent years, several studies have analyzed the composition of the male genital tract microbiota and its changes in infertility or in different situations associated with infertility. The aim of this narrative review is to obtain more insight on this topic; in particular, to describe actual evidence about changes in the semen microbiota in patients with infertility, male tract infections, or HPV infections. In semen, an increase in semen *Prevotella* spp. is associated with oligozoospermia and with obesity-associated asthenozoospermia; an increase in *Pseudomonas* is more frequently associated with asthenozoospermia and oligozoospermia; a reduction in *Lactobacilli* spp. (namely in *Lactobacillus crispatus*) may represent a marker of low semen quality. However, an increase in *Lactobacillus iners* is considered a risk factor for a reduced sperm concentration. In patients with prostatitis, there is a reduction in *Lactobacillus* spp. and an increase in *Streptococcus* spp., opening important perspectives about the role of probiotic treatments in these patients. Finally, an increase in *Fusobacteria* spp. was observed in patients with an HPV infection. In the conclusion, we underline the interactions between the seminal and vaginal microbiota, so that further studies should focus on the "couple genital microbiota".

Keywords: microbiome; microbiota; male infertility; gut; prostate; prostatitis

November 27th, 2026

MADRID

RESTORING NATURAL FERTILITY:
OLD CHALLENGES AND NEW PERSPECTIVES

2nd International Meeting on Medical Updates and Ethical Issues in Precision Medicine for Natural Procreation

UNIVERSITÀ DEGLI STUDI DI PADOVA

CHAIR OF BIOETHICS Jérôme Lejeune INTERNATIONAL

FERTILITAS
SER PADRES. NATURALMENTE.

SAVE THE DATE

Centro Regionale Specializzato Sindrome di Klinefelter	Centro Regionale Specializzato Crioconservazione dei Gameti Maschili	Centro di Riferimento Regionale Incongruenza di Genere

UNIVERSITÀ DEGLI STUDI DI PADOVA

AZIENDA OSPEDALE UNIVERSITÀ PADOVA
UOC ANDROLOGIA E MEDICINA DELLA RIPRODUZIONE
Direttore: Prof. Alberto FERLIN

REGIONE DEL VENETO
Azienda Ospedale Università Padova

andrea.graziani.1@unipd.it

andrea.graziani.endocrinologo