Methicillin Resistant *Staphylococcus aureus* (MRSA) ST 398 and gut microbiota: interspecies interactions into the mucus layer of ascendant colon

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Abstract

Statement of the Problem: Intestinal *mucus* layer may provide a niche for many nosocomial pathogens, including *S. aureus* which can occasionally cause a staphylococcal enterocolitis. Recent exciting researches support the notion that a healthy intestinal microbiota composition can promote resistance to invading pathogenic bacterial species. **The purpose of this study** was to evaluate the survival of MRSA in simulated human ascendant colon conditions and its interaction with gut microbiota into the *mucus* layer. **Methodology & Theoretical Orientation:** The study was performed at ascendant colon environment: body-like temperature (37°C), anaerobiosis (N_2), pH 5.7, constant slow shaking (40 RPM). Mucin agar carriers stand for the intestinal *mucus* layer and a basic feed *medium* represented the intestinal lumen contents. A three-days long *in vitro* study was performed by using microbiota from pooled faeces of healthy individuals that were stabilized simulating ascendant colon conditions and a MRSA strain of animal origin (ST398-t011-SCC*mec*V; 10^7 UFC/mL). Each day we checked the viability of MRSA both into the mucin agar carriers and in the feed medium by using MRSA-SELECT® plates (BioRad). The results were confirmed by quantitative PCR. **Findings:** MRSA population decreased as a function of time during the incubation with luminal colon microbiota where it was not viable after 24 h. Counts of 4 log cfu/g were still obtained in the mucin agar carriers after 72 h of incubation. On the other hand, counts of *Bifidobacterium* and *Akkermansia* increased in the mucin agar carriers as a function of time. **Conclusion & Significance:** The results support the hypothesis that a competitive microbiota may control MRSA intestinal colonization empathizing the important role of specific groups which can inhibit the adhesion of/displace MRSA from the intestinal *mucus layer*.

Recent Publications

1. Barroso E., Cueva C., Pelaez C., Martínez-Cuesta M., Requena T., (2015) Development of human colonic microbiota in the computer-controlled dynamic SIMulator of the GastroIntestinal tract SIMGI. LWT-Food Sci Technol 61:283.
2. Bäumler A.J., Sperandio V. (2016) Interactions between the microbiota and pathogenic bacteria in the gut. Nature 535: 85-93.
3. Gries, D. M., Pultz, N. J. Donskey, C. J. (2005) Growth in cecal mucus facilitates colonization of the mouse intestinal tract by methicillin resistant *Staphylococcus aureus*. J Infect Dis 192: 1621–1627.
4. Jakobsson H.E., Rodríguez-Piñeiro A.M., Schütte A., Ermun A., Boysen P., Bemark M., Somme F., Bäckhed F., Hansson G.C., Johansson M.A.V. (2014) The composition of the gut microbiota shapes the colon mucus barrier. EMBO report 16: 164-177.
5. Liu L., Firrman J., Tanes C., Bittinger K., Thomas-Gahring A., Wu G.D., Van den Abbeele P., Tomasula P.M. (2018) Establishing a mucosal gut microbial community in vitro using an artificial simulator. PLoS ONE 13(7): e0197692.
6. Vesterlund S., Karp M., Salminen S., Ouwehand A. C. (2005) *Staphylococcus aureus* adheres to human intestinal mucus but can be displaced by certain lactic acid bacteria. Microbiology. 152: 1819–1826

Image: 

Biography

Elisa Spinelli is a Veterinarian with a postgraduate qualification in Food safety, Certification and Food Risk Communication. She is a PhD student at University of Foggia (Italy) where she is working on the main topic of antimicrobial resistant bacteria from a food safety perspective, focusing on the detection and prevalence of Methicillin resistant *Staphylococcus aureus* (MRSA) in new ecological niches. She has worked over the last six months as a Visiting PhD student at The Research Institute of Food Science (CIAL-CSIC), Madrid (Spain) on the fate of MRSA along the human gastrointestinal tract and its interaction with gut microbiota.

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Notes/Comment: