allied academies

2nd International Conference on

Biomaterials and Nanomaterials &
Materials Physics and Materials Science

May 20-21, 2019 | Vienna, Austria

# Silvia Todros

*University of Padova, Italy*

## Biocompatibility of synthetic surgical meshes for abdominal wall repair: An integrated experimental-computational approach

Synthetic meshes are frequently adopted for surgical repair of abdominal hernia. Their role should be to strengthen impaired muscles, but without reducing physiological abdominal compliance. Even if mesh surgical procedures are well consolidated, recurrence rate is moderate and adverse effects, including infections, pain and discomfort, are still present. Synthetic meshes are available on the market with different materials and structural characteristics, which affect the interaction with surrounding biological tissues and the consequent biocompatibility of the implant. The research activity presented in this work is aimed at providing experimental and computational tools to support the choice of suitable prostheses for hernia repair, according to patient-specific clinical conditions and, in general, to optimize mesh design for abdominal wall repair. In detail, the proposed research moves from the study of mesh materials and structural properties for a compatibility evaluation, providing criteria to the design of prostheses. For this purpose, physicochemical characterization of polymers used in the manufacturing and mesh morphological analysis are carried out. Mechanical tests are performed, according to suitable protocols selected to mimic in vivo loading conditions. Synthetic meshes follow a non-linear stress-strain behavior, with mechanical characteristics showing different levels of anisotropy, according to the type of mesh. The mechanical response of surgical meshes is described through appropriate constitutive models and parameters, for the implementation in the framework of in silico models. Different numerical models of abdominal wall are developed, including passive and active mechanical properties of abdominal tissues and taking into account different levels of intra-abdominal pressure, corresponding to different motor tasks. Hernia occurrence and surgical repair via synthetic meshes can be simulated. Numerical analyses are carried out to evaluate the biomechanical performance of surgical meshes and their interaction with biological tissues.

### Speaker Biography

Silvia Todros is assistant professor in industrial bioengineering at University of Padova, Italy. She received M.Sc. in materials science from the University of Padova in 2005 and PhD in materials engineering at the University of Brescia in 2010. She has been visiting researcher at Cranfield University (Bedford, UK) in smart materials laboratory. Her research activity is mainly aimed at the evaluation of the functional response of biomedical devices and prostheses based on polymeric material, through the characterization of their physicochemical and mechanical properties. She is the author of more than thirty papers in scientific international journals.

**e:** silvia.todros@unipd.it

*Notes:*