

BIOENGINEERING AND MEDICAL-SURGICAL SCIENCES

The OR GOES GREEN

Funded By	UNIVERSITA' DEGLI STUDI DI TORINO [P.iva/CF:02099550010]
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Context of the research activity	<p>The problem being addressed is the growing accumulation of single-use surgical plastic waste, imposed by law to prevent cross-contamination and infections. Surgical waste is a growing phenomenon worldwide, which leads to an increase in waste costs for hospitals, but also has a negative impact on CO2 emissions. Each surgical operation generates between 3.5 - 8.4 kg [Wyssusek et al. 2019] of plastic waste of which 30% is represented by high quality polypropylene (PP). In addition, surgical waste causes a significant financial burden for hospitals (up to € 2 per kg). Due to the lack of knowledge on circular waste management in healthcare, the problem of waste accumulation is rarely addressed [Voudrias E et al, 2018]. As a result, technical innovations are needed for optimal monitoring of the recycling of single-use surgical plastic waste, the redesign of single-use reusable plastic products and socio-economic analysis to accelerate the circular transition in the healthcare sector.</p>
	<p>The goal of the project is the development and implementation of innovative strategies to reduce the amount of waste currently destroyed by incinerators, identifying those products suitable for reprocessing and proposing solutions to treat them effectively. The project will focus in particular on products made of plastic, comparing the costs and environmental impact of their current disposal, against the proposed reprocessing solutions.</p> <p>This is a pilot study aimed at evaluating which strategy is best suited to different types of waste, based on their material composition and intended</p>

<p>Objectives</p>	<p>use, in terms of reducing the CO2 footprint and saving money for hospitals. The project will also provide strategies for implementing the proposed solution in different types of hospitals or in a consortium of hospitals, based on the annual volume and type of waste. Finally, guidelines will be written and courses will be organized to disseminate the proposed innovations.</p> <p>We aim for a substantial reduction of the ecological footprint through the recycling of surgical PP waste, recycled into raw granules for injection molding products, such as disposable sterile containers for surgical instruments, thus generating a true circular economy. The technical innovation we develop for optimal recycling of PP surgical waste will create new sustainable business models that will be competitive with current combustion waste treatment. In other words, the recycled PP granules will act as a raw material to make new products that will have a higher commercial value than the burning of waste.</p> <p>The progress represented by this project focuses on the circularity of large quantities of PP made for single-use operating room materials (eg surgical drapes). We aim to develop a processing line that does not exist today, of PP waste transformed into PP granules ready for injection molding. To this end, we develop a monitoring method to feed a computational model of the processing pipeline and optimize the process parameters to reduce the ecological footprint and verify the quality of the PP granules. The project results will contribute to computational models to model and evaluate the effects of Life Cycle Assessment (LCA), the development of monitoring systems and the integration of materials, as well as LCA methods and other requirements in product design.</p>
<p>Skills and competencies for the development of the activity</p>	<p>Specialist in General Surgery, extensive activity inside the operating room, knowledge of infection risks with contaminated materials</p>