

# IN VITRO STUDY OF AEROSOL DROPLET IMPACT ON THE PERITONEAL SURFACE AFTER NEBULIZATION USING THE CAPNOPEN DEVICE

Mohammad Rahimi-Gorji<sup>1,2,3</sup>, Stéphane Dorbolo<sup>4</sup>, Sarah Cosyns<sup>1,3</sup>, Charlotte Debbaut<sup>2,3</sup>, Ghader Ghorbaniasl<sup>5</sup>, Wouter Willaert<sup>1,3</sup>, Wim Ceelen<sup>1,3</sup>

<sup>1</sup>Laboratory for Experimental Surgery, Department of Human Structure and Repair, Ghent University, Ghent, Belgium

<sup>2</sup>IBiTech – Biommeda, Department of Biomedical Engineering, Ghent University, Ghent, Belgium

<sup>3</sup>CRIG – Cancer Research Institute Ghent, Belgium

<sup>4</sup>FNRS, GRASP Iap, CESAM Research Unit, University of Liège, Liège, Belgium

<sup>5</sup>Department of Mechanical Engineering, Vrije Universiteit Brussel (VUB), Brussels, Belgium

## BACKGROUND

Pressurized IntraPeritoneal Aerosol Chemotherapy (PIPAC) is a drug delivery strategy to treat peritoneal cancer. The efficacy of PIPAC ultimately depends on the interaction between the aerosol droplets and the cancerous peritoneal surface. Here, we investigated this interaction using high speed imaging in an experimental setup.

## METHODS

The CapnoPen nebulizer was positioned 30 cm above a 50 cm<sup>2</sup> fragment of porcine abdominal wall with the mesothelial surface facing the nebulizer. Saline solution was nebulized at flow rates of 0.5, 0.8, and 1 mL/s. The impaction of droplets on the surface were imaged in one plane using a high-speed camera (10.000 fps, Phantom MIRO M310). Ten droplets were selected randomly to calculate their average velocities.

## RESULTS

Image analysis showed that the large majority of droplets stick to the surface after impaction. A liquid film was rapidly formed on the tissue surface, which affected the impaction pattern. Some large droplets fragmented after impaction, and were rarely bounced back. Higher flow rates caused more turbulence. The average velocity just before impaction was calculated 2.29, 2.71 and 3.43 m/s for flow rates of 0.5, 0.8 and 1 mL/s, respectively.

## CONCLUSIONS

Most droplets stick to the surface after impaction. The average velocity of droplets before impaction increases with flow rate but is much lower compared to the initial velocity. These results may allow to improve droplet behavior and tissue interaction during PIPAC.