



**QUEEN'S  
UNIVERSITY  
BELFAST**

## **Multifunctional hydrogel coatings for the prevention of catheter-associated urinary tract infections**

Yao, C., & Zhang, S. (2024). *Multifunctional hydrogel coatings for the prevention of catheter-associated urinary tract infections*. Paper presented at NIBES Spring Symposium, Belfast, United Kingdom.

### **Document Version:**

Publisher's PDF, also known as Version of record

### **Queen's University Belfast - Research Portal:**

[Link to publication record in Queen's University Belfast Research Portal](#)

### **Publisher rights**

Copyright 2024 the Author.

### **General rights**

Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

### **Take down policy**

The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact [openaccess@qub.ac.uk](mailto:openaccess@qub.ac.uk).

### **Open Access**

This research has been made openly available by Queen's academics and its Open Research team. We would love to hear how access to this research benefits you. – Share your feedback with us: <http://go.qub.ac.uk/oa-feedback>

# MULTIFUNCTIONAL HYDROGEL COATINGS FOR THE PREVENTION OF CATHETER-ASSOCIATED URINARY TRACT INFECTIONS

Yao, C.Y<sup>1</sup>, Zhang, S.Z<sup>1</sup>

<sup>1</sup>School of Pharmacy, Queen's University Belfast, 97 Lisburn Road, Belfast, UK

email: shuai.zhang@qub.ac.uk

## INTRODUCTION

Catheter-associated infections are one of the most common causes of nosocomial infections, and it has been estimated that the global cost of catheter-related infections exceeds \$1 billion annually (1). To address this problem, hydrogel coatings with antifouling and bactericidal properties were promising to prevent bacterial attachment from the catheter surfaces (2).

Zwitterionic monomers with strong resistance to biofoulants are potential to form hydrogel coatings on implantable medical device. However, their high water-absorption ability often lead to poor mechanical properties. To address this issue, functional hydrophobic monomers can be incorporated to enhance mechanical properties and introduce additional functionalities, resulting in the development of multifunctional hydrogel coatings.

## MATERIALS AND METHODS

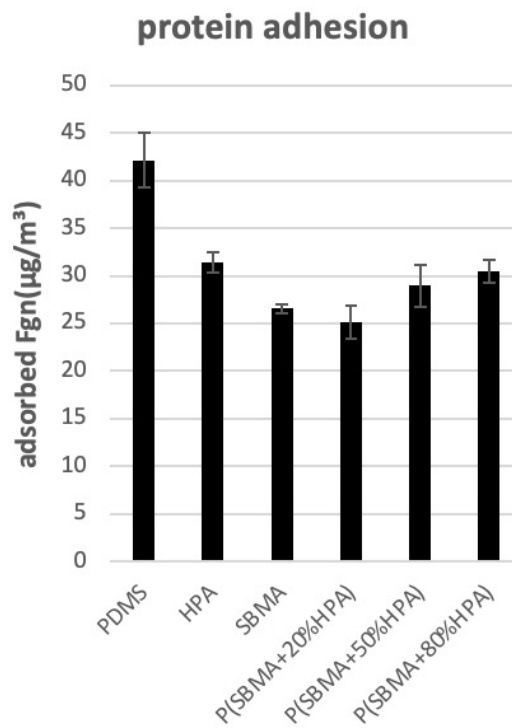
### Materials

2-Hydroxy-4'-(2-hydroxyethoxy)-2-methylpropiophenone (Iragure 2959), 2-Hydroxy-1-3-phenoxypropyl acrylate (HPPA), [2-(Methacryloyloxy)ethyl]dimethyl-(3-sulfopropyl) ammonium hydroxide (SBMA), fibrinogen (Fgn) were purchased from Sigma-Aldrich (Gillingham, Poole, UK). Phosphate buffered saline (PBS) was obtained from Oxoid Ltd (Hampshire, UK).

### Protein adsorption

Hydrogel-coated PVC were cut into 1 cm<sup>2</sup> square samples. After rinse with absolute ethanol, the samples were placed into a 24-well plate, followed with addition of 1 mL of 2.6 mg/mL Fgn solution. After 24 hours of incubation at 37°C, samples were removed from the plate, washed with PBS three times, and transferred into a new 24-well plate before sonication with 5% w/v SDS for 20 mins. The amount of adsorbed protein was measured through the BCA method.

## RESULTS



## DISCUSSION

The results indicate that the incorporation of hydrophobic monomers did not significantly impact the antifouling properties of the hydrogel coatings. In fact, hydrogel coatings containing 20% hydrophobic monomers exhibited better resistance to protein adhesion compared to zwitterionic hydrogel coatings without hydrophobic components.

## CONCLUSION

The incorporation of a hydrophobic monomer, such as HPA, does not compromise the fouling resistance of zwitterionic hydrogel coatings. Moreover, HPA exhibits inherent anti-swarming properties. Therefore, the development of multifunctional hydrogel coatings, combining both antifouling and anti-swarming abilities, holds promise for preventing medical device-associated infections.

## REFERENCES

- (1) Werneburg (*et al.*), Research and Reports in Urology:14, 109-133,2022.
- (2) Liu (*et al.*), Gels: 8 (1), 46, 2022.