



**Seminar Topic:
Turning Disgusting Hair Waste into Valuable Biomaterials**

Associate Professor Ng Kee Woei

Abstract

The potential of using proteins derived from human hair for biomedical applications and beyond is well described in literature. The heterogeneous pool of hair proteins, including keratin intermediate filament proteins and keratin associated proteins, is demonstrated to be versatile in fabricating a range of templates which can be used as drug carriers or scaffolds for tissue regeneration. Of note, our group has demonstrated the ability of synthesizing a keratin-alginate sponge to induce efficient tissue ingrowth and vascularization in a rodent subcutaneous implantation model. In a preliminary burn model in pigs, we found the efficacy of these sponges to be comparable to commercially available collagen-based dermal equivalents. On top of functional studies, we are keen to establish fundamental understanding of the behaviour of this material and its potential to assemble into novel structures for new applications. We showed that protein fractions extracted from hair can act as antioxidants to protect cells in oxidizing environments. Purified keratin intermediate filament proteins could also self-assemble or interact with partner materials to produce novel 2D and 3D structures. This presentation will describe the background of this field and some of our recent work.

Biography

Associate Professor Ng Kee Woei was one of the first recipients of the prestigious National Science Scholarships – Local Graduate Scholarship (PhD) awarded by the Agency for Science, Technology and Research (A*STAR). In 2010, he began his tenure-track Assistant Professor position at the Nanyang Technological University, Singapore. He was promoted to the position of Associate Professor with tenure in 2015. His research interests are highly interdisciplinary in nature. In the area of biomaterials development, Associate Professor Ng is recognized for developing novel human hair keratin based platforms for various applications. His group has developed the expertise to extract and process human hair keratin into various 2D and 3D templates, including coatings, gels, sponges and electrospun mats. Among the number of different potential applications, the group is currently studying the feasibility of using a patented keratin-alginate sponge as dermal substitutes. In the area of sustainable nanotechnology, Associate Professor Ng is interested in understanding the nanotoxicological implications of engineered nanomaterials, especially in the context of dermal exposure. Through understanding nanomaterial behaviour and interactions, his group targets to develop nanotechnologies which are safe for both humans and the environment.

His strength in research lies in his ability to engage in highly interdisciplinary work, which is demonstrated by his ability to secure funding from agencies across various disciplines, including the Ministry of Education, Ministry of Defence, Ministry of Home Affairs, Ministry of Health, Jurong Town Corporation, Agri-Food & Veterinary Authority of Singapore and the Skin Research Institute of Singapore. He is the Programme Director for the NTU-Harvard School of Public Health Initiative for Sustainable Nanotechnology. In 2016, he was elected as the Treasurer of the Tissue Engineering and Regenerative Medicine International Society – Asia Pacific Chapter. In addition, he serves as the Deputy Chairman, Health and Safety Engineering Technical Committee, Institution of Engineers Singapore (IES). He is also a member of the Technical Committee on Nanotechnology within the Chemical Standards Committee commissioned by Enterprise SG. Associate Professor Ng further serves as a Subject Expert (Nanotechnology) in the SingHealth Institutional Biosafety Committee and as an A*STAR Pathway Advisor, where he advises A*STAR scholars on career development.

Wednesday, 31 October 2018 || Time: 2:00 pm – 3:00 pm
Venue: MSE Meeting Room (N4.1-01-28)
Hosted by: Associate Professor Cho Nam-Joon