Research Assessment Exercise 2020
Impact Overview Statement

University: The University of Hong Kong (HKU)
Unit of Assessment (UoA): 02 – Pre-clinical studies
Total number of eligible staff of the university in the UoA: 42

1) Context

Research in preclinical sciences incorporates basic and translational programmes in clinical departments and research in the School of Biomedical Sciences. Our 'from bedside to bench and back' strategy is based on an in-depth understanding of disease mechanisms for diagnostics, therapeutics and innovative technologies, focusing on our expertise in metabolic diseases, emerging infectious diseases, cancer biology, and stem cell and development biology. Through **active multidisciplinary collaborations** with our clinical colleagues (UoA03), we deliver commercial, clinical and community impact from our fundamental research. We realised considerable commercial impact through collaborations with **biotechnology companies** (Avalon Biomedical Ltd., Tencent Holdings Ltd.) **and pharmaceutical industries** (Servier Ltd., BioKangTai, United Laboratories) to develop assays for risk prediction for major chronic metabolic and cardiovascular diseases and are developing antimicrobial drugs to novel targets in combating emerging infectious diseases (e.g. H5N1 and H1N1). Furthermore we established **spinout companies** (OrthoSmart Ltd., Acticule Life Sciences Ltd.) providing therapeutic needs to the community and economic benefit to the region. **Patients and healthcare services** are now benefitting from our work on the correction of spinal defects (scoliosis) as novel smart shape-memory alloys developed for a gradual correction are currently in clinical trial. We engage stakeholders (Hong Kong Alliance for Rare Diseases, Hong Kong Food and Heath Bureau), understanding their needs in driving research directions. In partnership with our clinical and commercial collaborators we ensure that our impact is experienced locally, nationally and globally such as the World Health Organization.

2) Approach to Impact

We established a strong research portfolio based on the clear needs of our partners, realizing health and wellbeing, commercial and economic, impacts to their maximum. **Building critical mass and infrastructure in translating basic research for health and wellbeing impact** is key. Three preclinical departments (Anatomy, Biochemistry, and Physiology) merged to form the School of Biomedical Sciences. In enabling impact, this UoA pursues a research strategy of "from bed side to bench and back," forging close collaborations with our clinical colleagues through jointed research chalk talks and seminars to identified specific areas of research (immunology and rare/severe diseases) and co-investment in technology transfer. Through the establishment of joint translational resources for strategic bio-banking of clinical materials and clinical cohorts for validation, we translate our novel findings of disease genes/mechanisms and diagnostic and prognostic biomarkers leading to therapeutic outcomes (biomarkers for metabolic disorders, spinal implant in correcting scoliosis, and a specific antiviral drug). **Ensuring awareness of potential intellectual property and knowledge exchange with industry** provides maximum opportunities for researchers to realize the **commercial and economic** impact. We provide support and encourage researchers to engagement with Technology Transfer Office (TTO) early in their research career planning and discuss potentials for impact. To increase our knowledge on patent and IP matters, the Director and staff from TTO have provided workshops and discussion sessions on procedures for patent applications, matters for awareness in intellectual property, sharing of research data, and establishment of start-up companies. Importantly, TTO is well connected with potential companies and investors for immediate connections. These activities and infrastructure were fundamental in the success of the three case studies presented in this UoA. Knowledge Exchange (KE) excellence is recognized as part of the annual performance assessment, and obtaining competitive KE funding is a strategy to engage non-academic sectors, changing their mind set to instil impact.

3) Strategy and plans

The University's Vision 2016-2025 is to embed impact into all research outcomes. We are making a

paradigm shift to focus on and reward research innovations that benefit communities and transform global technologies. This shift acknowledges material outcomes and leadership in our impact endeavours to add transformational value to the global society. We will benchmark the tangible benefits we bring to local, regional and global communities, by promoting research that generates impact reflected in the strategic and operational plans for this UoA. This will be achieved by:

- providing more opportunities for **outcomes-driven translational research** thorough joint PI appointments with clinical departments, or with industry groups such as the HK government initiative for postdoctoral fellowship scheme for industrial partnership. Full utilization of the newly developed phase 1 clinical trial centre will translate outputs to clinical setting.
- **further development of entrepreneurial skill** in our PIs and develop the next generation of academic scholars in conjunction with our TTO and research postgraduate programmes. We have implemented courses in entrepreneurial skills in the Bachelor of Biomedical Sciences and recruited teachers with the relevant skill sets from the commercial sector.
- **broadening industry partnership,** we will provide new opportunities for sabbaticals in the commercial sector. We are building closer relationships with current industry partners such as Tencent Holdings Ltd. for AI technology development and applications, and identify further opportunities, in particular, Mainland China. Locally, we will established a closer engagement with the management and start up companies at the Hong Kong Science Park, to leverage on opportunities presented in the Hong Kong government's innovation and technology development plan, and the GZ/HK/Macao greater bay project.

Our impact plan is to establish a framework to assess research for clinical translation and commercial impact. We will hold regular research chalk talks and retreats to foster discussion and build collaborations for translational opportunities. Our focus will remain on providing a clear understanding of disease mechanism for common and rare diseases for drug discoveries. Rare genetic diseases can provide clear mechanistic insights for drug design that can apply to similar but less severe common problems. We will invest in talent for impactful research, and innovative technologies will form part of our strategy for young recruits.

4) Relationship to case studies

The **case studies presented illustrate the success of our approach;** outcomes were through the establishment of multidiscipline research groups with critical mass of researchers that are well supported by the translational and entrepreneurial infrastructure provided with UoA.

In the **Influenza A case**, the discovery of a novel "druggable target", nucleozin, demonstrates our strategy and approach for realising commercial and economic impact. Supported by our TTO, patent and IP protection was secured, follow by discussion with investors, and the formation of a spin off company, Acticule Life Sciences Ltd., that facilitated the licensing of the nucleozin IP and IPs on other antimicrobial compounds to the company. Further sponsored R&D funding of 16M HKD for optimization of the lead compound, and identification of additional antimicrobial drugs has been secured. The **Biomarker case** is an excellent example of infrastructure providing the opportunity for targeted translational research. The establishment of the **State Key Laboratory of Pharmaceutical Biotechnology** allowed grouping for a critical mass of interdisciplinary researchers, from which multiple large research grants were leveraged, leading to the discovery of key biomarkers for metabolic and cardiovascular disorders. The recent success of a project under the Areas of Excellence Scheme (AoE) of 77.8M for the "Institute of Metabolic Medicine" for further development in this is a highlight. With the support from TTO and establishment of spin-off companies, has ensured demonstrable commercial and economic impact. The **Shape Memory Alloy case** is a clear example of the "**from bed side to bench and back" strategy** with a clear identifiable problem requiring a specific solution. Through integrative ideas between basic scientists (biologists and engineers) and clinicians, a solution for surgical correction of scoliosis that affects ~4 per 1000 young females in Hong Kong, was formulated. The realization of applying this smart material for clinical application was again through the support of the infrastructure provided in the Faculty of Medicine and TTO for IP protection, and a spinout company, OrthoSmart Ltd., which has raised a further R&D funding of 1.5M USD. This material is currently in phase I clinical trial.