

BIOSYSTEMS AND BIOTECHNOLOGY RESEARCH CLUSTER

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RESEARCH CLUSTER CODE	BB
NO. OF PROGRAMME	4
NO. OF GROUP	10
NO. OF RESEARCH CENTRE	1
SYNOPSIS	This research cluster covers multi and transdisciplinary biosystems, bioscience and biotechnology related disciplines. The focus areas are animal vaccine and diagnostic technology, bioengineering and bioprocessing, biorefinery and biomass technology, microbial and cellular technology, and systems biology.
DESCRIPTION (with NABC elements)	<p>Need</p> <ul style="list-style-type: none"> • Focus on collaborative research on focused areas in bioscience and biotechnology, to support the National Biotechnology Policy and National Biomass Strategy. <p>Approach</p> <ul style="list-style-type: none"> • Enhanced networking and collaboration among the researchers and top brains in the focused areas • Leverage on the existing facilities • Established research groups with good international linkages • Closer collaboration with BiotechCorp Malaysia <p>Benefit to UPM</p> <ul style="list-style-type: none"> • Enhanced teamwork and efficient use of facilities • Mentoring of young researchers • Alignment of R&D activities with national policies <p>Benefit to Society</p> <ul style="list-style-type: none"> • Provide showcase (e.g. biorefinery, Serdang Biomass Town) • IP's for commercialisation <p>Competitor</p> <ul style="list-style-type: none"> • The other 4 RU's are also strengthening their image and position in bioscience and biotechnology

Code	Research Programme	Synopsis	Leader of Research Programme	Research Groups
BB01	Animal Vaccine and Diagnostic Technology	Under this research program we are interested in developing improved diagnostics and effective vaccines against animal infectious agents especially emergent infectious agents, zoonotic infectious agents and drug resistant pathogens, through advances in diagnostics and vaccine design. Our primary focus is to develop automated diagnostic tools for rapid detection and to improve the efficacy and safety of vaccines and other therapies including adjuvants added into vaccine formulations. Emphasis are also given on addressing fundamental issues such as gene regulation and cellular mechanisms in immunity and disease resistance based on functional genomics study of infectious pathogens and the host immune responses. Further to this, the sustainable productivity of the animals will also focus on research for ecosystem health addressing various holistic approaches in disease control and prevention	Prof. Dr. Abdul Rahman Omar (IBS) aro@vet.upm.edu.my	1. Vaccines and Diagnostic Technologies – Prof. Dr. Abdul Rahman Omar (IBS) 2. Aquatic Diagnostics and Health Management – Prof. Dr. Mariana Nor Shamsuddin (IBS)
BB02	Bioengineering and Bioprocessing	The research programme encompasses on bioprocessing, biorefinery and biomanufacturing, which are the common operations that links together all the different market sectors of the world's biotechnology industry. It is a diverse field encompassing the massive production scales of the biofuels industry at one end, to the high-quality and highly regulated biopharmaceutical industry at the other. Each market sector has its own needs and drivers, but a common resonating aspect is that to get a product to market, a biological entity must be grown and products harvested from it, in a word it must be "biomanufactured." We define bioprocessing, biorefinery and biomanufacturing as the production of biomaterials or performing industrial bioprocesses, using enzymes and biological cells (microorganisms, plant and animal cells) or their physiological bioprocesses. The biorefinery and biomanufacturing technologies are making an increasing impact in the chemical sector, enabling both the conversion of renewable resources and biomass, such as celluloses, starches, sugars and vegetable oils, and the more efficient conversion of conventional raw materials using biotechnological processes (including biocatalysis) into a wide variety of chemical substances and biotechnology products. These bioproducts include fine and bulk chemicals, pharmaceuticals, biocolorants, solvents, bioplastics, vitamins, food additives, biopesticides and biofuels such as bioethanol, biodiesel and biohydrogen. Biorefinery and biomanufacturing needs to be designed and developed to overcome a number of challenges before its full potential can be realised. These challenges include, the integration of scientific disciplines such as biochemistry, microbiology, molecular genetics and bioprocess technology to develop useful processes and products, based on microbial, animal, plant cells, seaweed or microalgae, their organelles or enzymes as biocatalysts. The issues currently restrict the development of bioprocessing, biorefinery and biomanufacturing include high cost of raw materials, inefficient process, low yield and productivity and biosafety requirements.	Prof. Dr. Arbakariya Ariff (FBSB) arbarif@biotech.upm.edu.my	1. Biomass & Biorefinery - Prof. Dr. Mohd. Ali Hassan (FBSB) 2. Biomanufacturing Design - Prof. Dr. Arbakariya Ariff (FBSB)
BB03	Microbial and Cellular Technology	The focus of the research is on the application of enzyme/s in their free form or within their cellular compartments for the catalysis of value added products from raw biomaterials. Whole cells can be used in the productions of useful products such as antibiotics, probiotics and enzymes using enhanced molecular technology. Designer enzymes are also developed based on structural and functional studies. Specific enzymes are used to produced value added products from palm oil based substrates. Use of enzyme as bioreceptors are also investigated in biosensor development. The group has also been working on the of microbial consortia for the biodegradation petroleum based pollutants. enzyme enriched-detergent formulation and production of bioethanol via protoplast hybridization approach	Prof. Dato' Dr. Abu Bakar Salleh (FBSB) abubakar@biotech.upm.edu.my	1. Lactic Acid Bacteria and Biosystems - Prof. Dr. Raha Abdul Rahim (FBSB) 2. Enzyme and Microbial Technology Research Centre (EMTech) – Prof. Dato' Dr. Abu Bakar Salleh / Prof. Dr. Raja Noor Zaliha Raja Abd Rahman (RC / FBSB /FS) 3. Bioremediation – Assoc. Prof. Dr. Mohd Yunus Abd Shukor (FBSB)
BB04	Systems Biology and Molecular Systematics	The research programme encompasses multidisciplinary research that generate, analyze and integrate molecular data (DNA, RNA, proteins and metabolites) to determine the relatedness of organisms (systematic), and to develop a system-level understanding of biological systems (systems biology). An in-depth understanding on the intrinsic functions of biological systems against various disturbances is critically important to find cures to human diseases and solutions to problems in agriculture. Meanwhile, molecular systematic enables analyses on biological variation (biodiversity) and predictions about behavior, morphology, physiology, biomolecular structure and other biological attributes, that are particularly important in medicine and other fields.	Assoc. Prof. Dr. Ho Chai Ling (FBSB) clho@biotech.upm.edu.my	1. Functional Genomics and Bioinformatics – Assoc. Prof. Dr. Ho Chai Ling (FBSB) 2. Molecular Systematics – Prof. Dr. Tan Soon Guan (FBSB) 3. Molecular Aquatic – Biodiversity – Prof. Dr. Fatimah Yusuf (FP)