DukeNUS Medical School

PhD Programmes in

- Integrated Biology and Medicine
- Quantitative Biology and Medicine

Advancing Medicine through Scientific Discovery

Messages from our Vice Deans

As a leading medical research and education institution, Duke-NUS offers world-class research programmes that are aimed at making a substantive impact on the biomedical sciences landscape of Singapore and the world. Our faculty, staff and students have access to some of the world's most sophisticated biomedical research facilities and technologies. Our students have the opportunity to work with world-renowned scientists on cutting-edge research projects and major research collaborations. Our researchers are publishing in the top journals and winning fellowships, grants and awards. Duke-NUS researchers have also been involved in medical breakthroughs, including the development of ETC-159 and ETC-206, the first made-in-Singapore cancer drugs currently in clinical trials, and agents targeting dengue and zika viruses. Additional discoveries in each of our five Signature Research Programmes have been translated into novel technologies that form the foundation of a number of start-up companies, and have informed health policy makers and changed medical practice.

As Singapore continues to grow as a biomedical sciences hub, Duke-NUS provides an exciting and dynamic research environment for you to follow your passion in the field of biomedical science, and be at the forefront of advancing science to improve the practice of medicine.

Professor Pat Casey
Senior Vice Dean, Research

In Duke-NUS' short and pioneering history, our students and faculty have championed innovations across clinical service, education and research. We equip our graduates with critical and creative thinking skills so that they are able to ask the right questions, push boundaries and discover ways to meet challenges. As a Duke-NUS student, you will gain strong research, leadership and teamwork skills that will allow you to transform the practice of medicine – not only for your future patients, but also for the healthcare system as a whole.

I invite you to find out more about us and learn how we, as a pioneering and innovative medical school, can help shape your future and ensure that you will have the necessary skills and capabilities that will enable you to transform lives and truly make a difference.

Professor Ian Curran
Vice Dean, Education

Our Story

Duke-NUS Medical School is a landmark collaboration established in 2005 between Duke University in the USA and the National University of Singapore (NUS). It is Singapore's first and only US-style graduate medical school, offering an MD programme, two PhD programmes, and the option to complete a dual MD-PhD degree.

Duke-NUS boasts scientists at the forefront of their fields, leading cutting-edge research groups advancing science to improve medicine. Each of our PhD students has the opportunity to learn from and train with distinguished scientists, to ultimately graduate as competent researchers.

Research at Duke-NUS is organised into five Signature Research Programmes (SRPs) that address the needs for developing treatments in Singapore and the region. The SRPs include: Cancer and Stem Cell Biology, Neuroscience and Behavioural Disorders, Emerging Infectious Diseases, Cardiovascular and Metabolic Disorders, and Health Services and Systems Research. In addition, seven centres further integrate and enhance research and learning at Duke-NUS.

The school shares a partnership with Singapore Health Services (SingHealth), establishing an Academic Medical Centre (AMC) to advance our joint pursuits in clinical care, research and education to transform medicine and improve lives.

Advancing Medicine through Scientific Discovery

Biomedical research is vital for improving disease prevention and treatment. At Duke-NUS, our vision is for our graduates to become experts in the biomedical and clinical sciences, driven by the desire and curiosity to seek answers to important biological questions, potentially leading to new and better treatments.

Duke-NUS offers two PhD programmes designed to train PhD scientists across multiple disciplines, developing their skills to translate basic scientific discoveries into therapies for patients.

Integrated Biology and Medicine (IBM)

The Duke-NUS IBM programme distinguishes itself from others in Singapore and abroad by emphasising training in translational bioscience, preparing cutting-edge researchers to take their research findings from “bench to bedside”.

Quantitative Biology and Medicine (QBM)

The Duke-NUS QBM programme is focused on design and analytic issues in modern biomedical research and on preparing researchers to harness their skills to advance medicine. It is the only such PhD-granting programme in Singapore.

Ashwati Vipin

PhD (IBM) Student,
Entering Class of 2014

BSc (Life Sciences), National University of Singapore

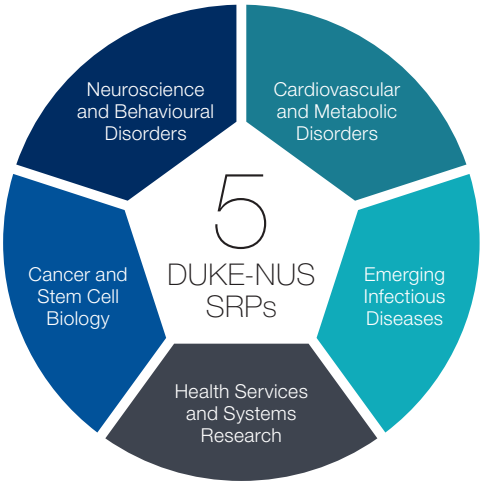
HIGHLIGHTS

- World-class research institution with state-of-the-art research facilities
- Innovative research led by internationally recognised faculty
- Research programmes span from basic science to translational research with the goal to take discoveries from bench to bedside
- A unique PhD degree focusing on specific disease areas
- The IBM PhD programme is a joint degree between NUS and Duke University
- The QBM PhD programme has a unique focus on biomedical data science research

Signature Research Programmes (SRP) & Data Science Centres

Duke-NUS focuses on five Signature Research Programmes that address the research needs for developing treatments in Singapore and the region.

Students in the PhD programmes will complete their advanced training with a thesis mentor from one of the following SRPs or data science centres.



Cancer and Stem Cell Biology (CSCB)

Carries out basic cancer biology and clinical-translational studies, with particular interest in cancers that affect the Asian community.

Cardiovascular and Metabolic Disorders (CVMD)

Studies the clustering of metabolic syndrome, diabetes, hypertension, hyperlipidemia and cardiovascular disease, so as to unravel mechanisms underlying these disorders, and make translational discoveries that can impact clinical care.

Emerging Infectious Diseases (EID)

Aims to develop and discover effective methods to diagnose, treat, prevent and control new and emerging infectious diseases.

Health Services and Systems Research (HSSR)

Focuses on the organisation, funding and delivery of health services for effective and sustainable healthcare.

Neurobiology and Behavioural Disorders (NBD)

Investigates molecular, developmental, systems and cognitive neuroscience and seeks to translate discoveries into diagnostic and therapeutic strategies.

Visit *www.duke-nus.edu.sg/research/signature-research-programmes* for more details.

During the course of my research on the role of the Arc protein in memory consolidation, I've had the privilege of discussing research ideas with my lab mates and PI, and consulting with various people from other labs. I really appreciate the collaborative and supportive environment at Duke-NUS, which makes doing research here enjoyable.

Jiang Yuheng MD-PhD Student, Entering Class of 2013
BA (Natural Sciences), University of Cambridge

Centre for Computational Biology

Provides expertise in computational biology and integrated analyses for systems biology approaches.

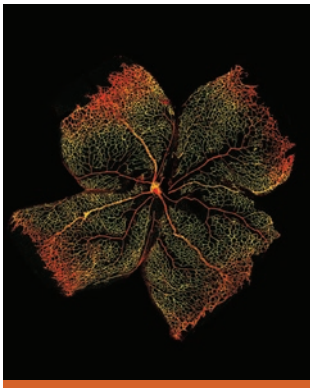
Visit *www.duke-nus.edu.sg/research/centres/centre-computational-biology*

Centre for Quantitative Medicine

Serves as an academic centre for quantitative scientists in the medical field and a point of contact for biomedical researchers from Duke-NUS partners requiring quantitative expertise.

Visit *www.duke-nus.edu.sg/research/centers/centre-quantitative-medicine*

PhD in Integrated Biology and Medicine (IBM)



Our research at Duke-NUS identified Major Facilitator Superfamily Domain Containing 2a (Mfsd2a) protein as the primary lysolipid transporter for the uptake of omega-3 fatty acid across the blood-retinal barrier into the eye. This study helped pave the way for developing novel therapeutics for eye diseases. This image shows a developing mouse eye. The eye was opened and flattened into a petal-shaped form, allowing a full view of the inside of the eye. It shows the Mfsd2a protein (green) overlapping with the vascular endothelial marker protein CD31 (red) in mature capillaries (yellow).

Bernice Wong

Research Fellow, Programme in Cardiovascular and Metabolic Disorders

PhD in Integrated Biology and Medicine, Class of 2018, Duke-NUS Medical School

The Duke-NUS PhD programme in Integrated Biology and Medicine (IBM) focuses on the study of disease mechanisms and translational concepts. It prepares students for a career in translational and biomedical research, covering a broad spectrum of disciplines, including cell and molecular biology, biochemistry, physiology and health policy. Students take between four and five years to complete the programme and are awarded a joint PhD degree by NUS and Duke University.

CURRICULUM

YEAR 1

Students will attend the IBM core class “Molecules to Medicines” in the first semester, which provides a foundation in biochemistry, biomedical research and experimental models, methods and mechanisms that drive current research investigations.

Concurrently, students undergo three six-week lab rotations from among the five Duke-NUS SRPs. From these rotations, students will commit to a thesis mentor affiliated with one of the SRPs for their thesis research.

In the second semester, students will also start participating in the Student Research Seminar designed to help in developing and improving communication skills, evaluation of scientific literature and sharing their own research progress.

Each student forms a Thesis Advisory Committee (TAC) that provides guidance and mentorship to the students during their tenure in the PhD programme.

YEAR 1			
Semester 1			Semester 2
Lab Rotation 1	**Lab Rotation 2**	**Lab Rotation 3**	**Start of Thesis Research**
IBM Class: Molecules to Medicines			SRP Specific Courses
			Student Research Seminar

YEAR 2

Students continue to develop their thesis projects and engage in class work pertaining to their respective SRPs.

During their PhD qualifying exam, students will defend a mock grant proposal, whereby a faculty committee evaluates their fundamental scientific knowledge and ability to formulate hypothesis-based research.

YEAR 2	
Semester 1	Semester 2
Thesis Research	Thesis Research
SRP Specific Courses	PhD Qualifying Exam (PQE)
Student Research Seminar	Student Research Seminar

YEARS 3 to 5

Students are immersed in research and are expected to actively participate in research seminars and journal clubs.

The programme culminates in the completion of a written thesis and an oral thesis defence. Students are strongly encouraged to publish prior to their graduation.

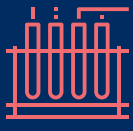
YEARS 3 TO 5		
Semester 1	Semester 2	Completion of PhD
Thesis Research	Thesis Research	Successful Dissertation Defence
Student Research Seminar	Student Research Seminar	

Visit *www.duke-nus.edu.sg/education/phd-integrated-biology-and-medicine-ibm* for more details.

Making an Impact

Duke-NUS aims to train PhD students across multiple disciplines with the skills to translate scientific discoveries into useful therapies for patients. Discover how our researchers and PhD students are channeling their curiosity and commitment to achieve research excellence.

>S$500 MILLION
in research funding



>4,000 PAPERS
published in international peer-reviewed journals

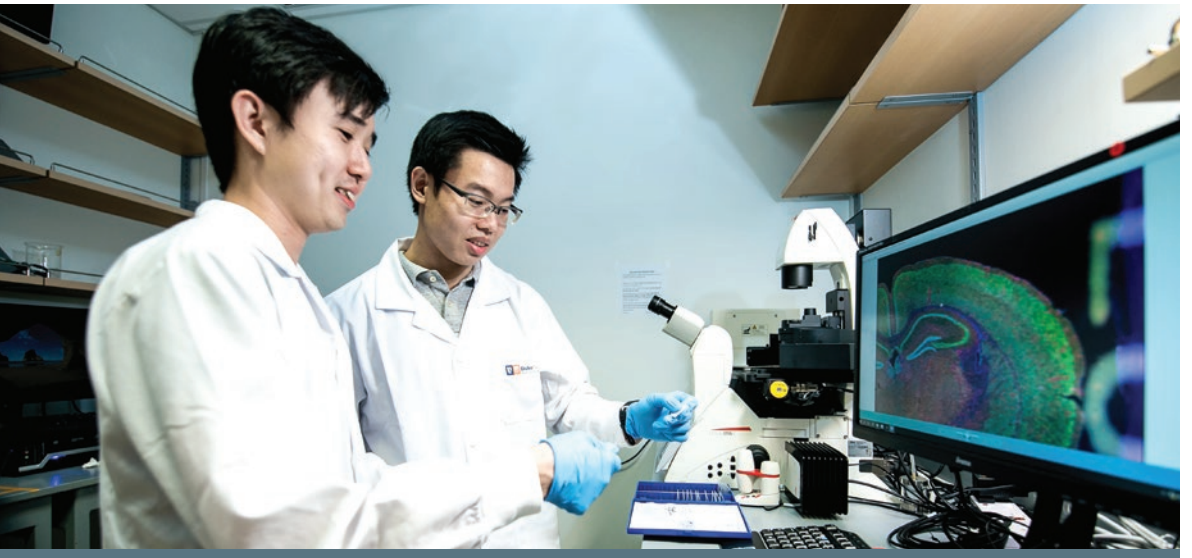
Duke-NUS Research Achievements

>130
synergistic research alliances

128
patents filed

18
licences awarded

14
biotech companies started up by Duke-NUS investigators



Careers of our 42 PhD graduates

Our PhD Students

70
students currently enrolled across two PhD programmes

30%
of PhD students are MD-PhD candidates

42
students have graduated

>160
papers published including **62 first author papers** in international peer-reviewed journals

(Statistics as at Dec 2018)

PhD in Quantitative Biology and Medicine (QBM)

The PhD programme in Quantitative Biology and Medicine (QBM) offers a research-focused curriculum with foundation courses, discipline-specific courses and research seminars. Students will graduate with expertise that is in high demand and essential for biomedical research and health data science.

Students in the QBM programme will select a concentration in either Computational Biology or Biostatistics and Health Data Science.

Computational Biology integrates data analytics, statistics, machine learning, modelling, software engineering and computer science to answer questions in basic and translational biomedical research. The Computational Biology concentration prepares students for careers in computational and data-driven biomedical research. It comprises all areas of current bioinformatics practice and research, including genome informatics, bioinformatics for next-generation sequencing, modelling of biological processes, and image analysis for biology, including neuroimaging.

Biostatistics and Health Data Science aims to advance biomedical and health sciences through the development and application of innovative quantitative methods, including biostatistics, statistical learning, and artificial intelligence. The concentration focuses on study designs and analytic methods for answering questions in genomics, clinical, epidemiological and health services research. Students in the programme will master specialised areas in data science and their applications in biomedical and health studies.

BIOSTATISTICS AND HEALTH DATA SCIENCE CONCENTRATION

YEAR 1

Semester 1	Semester 2
Study Designs in Clinical and Population Health Research	Core Concepts in Bioinformatics*
Core Concepts in Biostatistics*	Analysis of Complex Biomedical Data
Journal Club*	
R Programming	

YEAR 2

Semester 1	Semester 2
Thesis Research	**Thesis Research**
Elective	Biostatistical Research Internship
Journal Club*	**PhD Qualifying Exam (PQE)**

YEARS 3 TO 5

Semester 1	Semester 2	Completion of PhD
Thesis Research	**Thesis Research**	**Successful Dissertation Defence**
Journal Club*		

*Modules common to Biostatistics and Health Data Science and Computational Biology concentrations

> The QBM programme provides me with well-rounded exposure to bioinformatics while allowing me to focus my research in biostatistics. The courses taught have been carefully formulated, and have helped build a strong foundation for me as a researcher and biostatistician.

Yan Xiaoxi PhD (QBM) Student, Entering Class of 2017
BSc (Medical Physics and Biomedical Sciences) and MSc (Statistics), University College London

COMPUTATIONAL BIOLOGY CONCENTRATION

YEAR 1	
Semester 1	Semester 2
Molecules to Medicines	Student Research Seminars
Lab Rotation 1 / **Lab Rotation 2**	Core Concepts in Bioinformatics*
Journal Club*	

YEAR 2	
Semester 1	Semester 2
Thesis Research	**Thesis Research**
Student Research Seminars	Student Research Seminars
Core Concepts in Biostatistics*	Elective
Journal Club*	**PhD Qualifying Exam (PQE)**

YEARS 3 TO 5		
Semester 1	Semester 2	Completion of PhD
Thesis Research	**Thesis Research**	**Successful Dissertation Defence**
Student Research Seminars	Student Research Seminars	
Journal Club*		

*Modules common to Biostatistics and Health Data Science and Computational Biology concentrations

MD-PhD Track

Duke-NUS offers an integrated MD-PhD programme that is unique in Singapore to students who wish to further their academic training.

The programme combines medical education with research training to develop clinician-scientists who interface between medicine and science.

This programme is most appropriate for students who are committed to research-oriented careers combining biomedical research with the practice of clinical medicine.

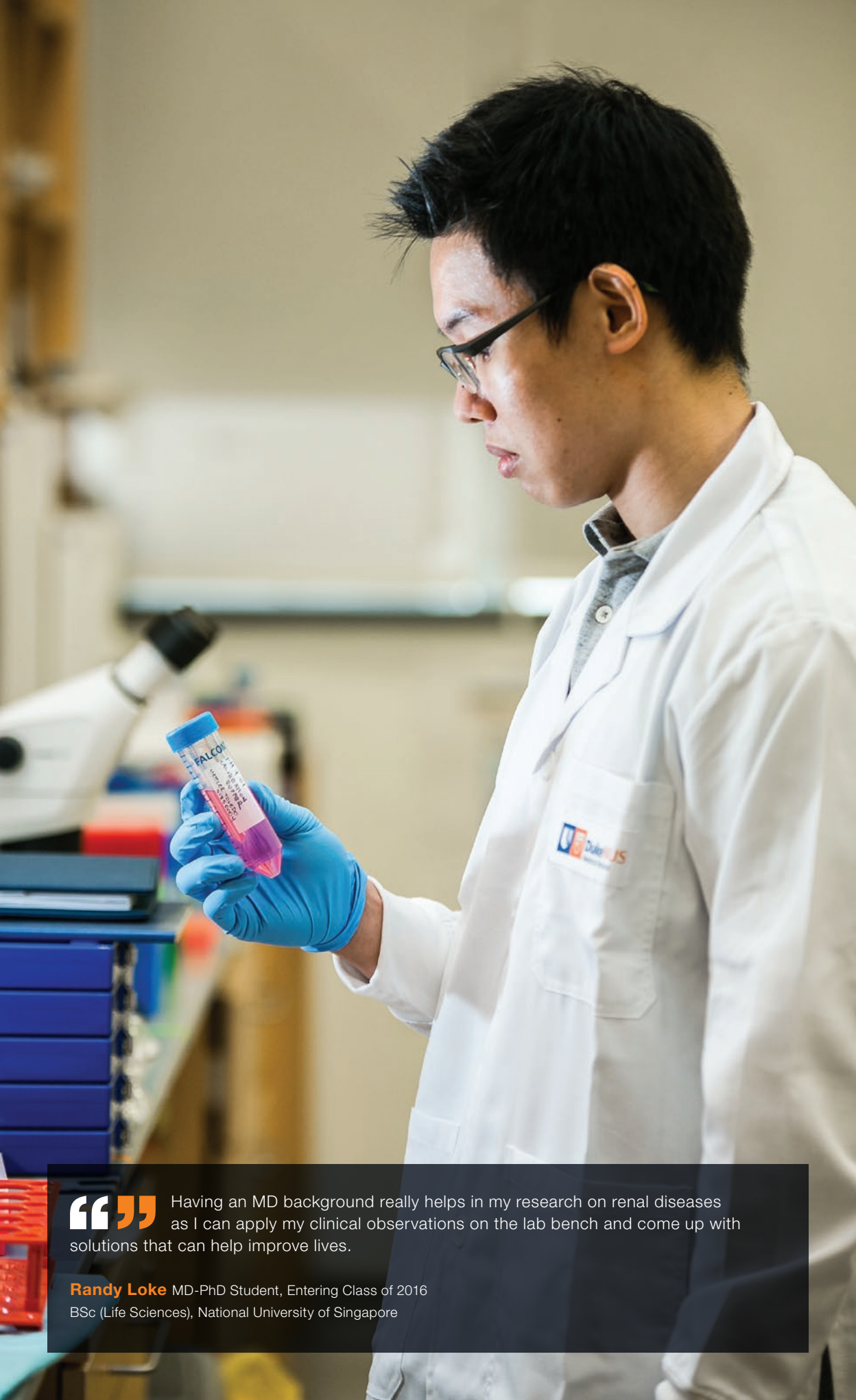
The programme takes a total of 7-8 years to complete. After two years in the MD programme, students embark on the PhD component in either the IBM or QBM PhD programme in lieu of their third-year research programme. Upon completion of the PhD component, students will complete the final (fourth) year of the MD programme.

All students admitted into the programme will be offered a full scholarship for the PhD component as well as scholarships to cover tuition fees for their first two years in the MD programme and their final year of MD training.

CURRICULUM

		In lieu of MD Year 3 Research Year				
YEAR 1	**YEAR 2**	**YEAR 3**	**YEAR 4**	**YEAR 5**	**YEAR 6/7**	**YEAR 7/8**
MD	**MD**	Start **PhD**	**PhD**	**PhD**	**PhD**	**MD**
Basic Science	Clinical Rotations	Coursework, Labs, Choose Mentor	Identify Thesis, Qualifying Exam	Research	Research	Clinical Rotations

Visit *www.duke-nus.edu.sg/education/md-phd-programme* for more details on the MD-PhD track.



"Having an MD background really helps in my research on renal diseases as I can apply my clinical observations on the lab bench and come up with solutions that can help improve lives.

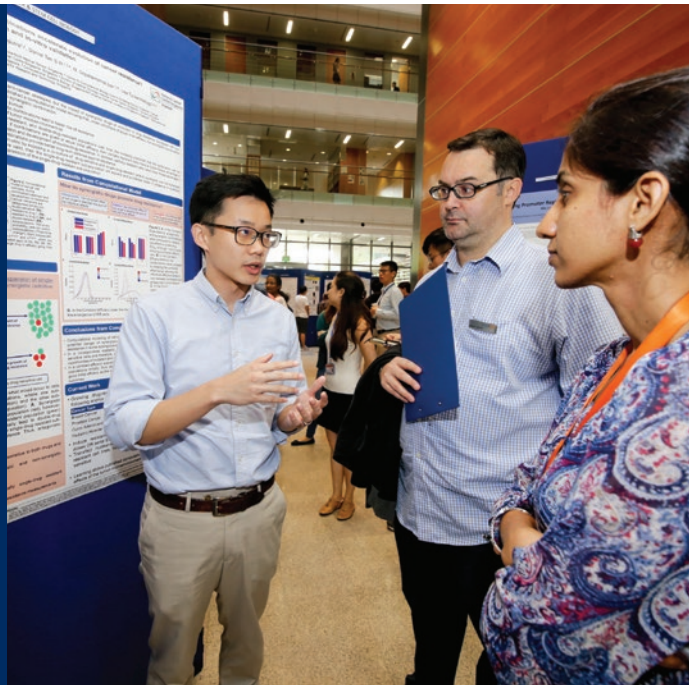
Randy Loke MD-PhD Student, Entering Class of 2016
BSc (Life Sciences), National University of Singapore

An Enriching Student Experience

At Duke-NUS, students can enjoy a wide range of activities, resources and support designed to enhance their academic experience and create a vibrant sense of community. These include local and overseas scientific conferences, an exchange programme at Duke University, various social events, and a career development programme.

EXPOSURE TO SCIENTIFIC CONFERENCES

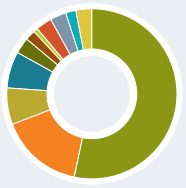
Learning from leaders in research is important to our students' growth. Throughout the year, students can attend almost weekly seminars by faculty researchers. The Annual Student Research Symposium includes a day with a renowned researcher who is invited by the students, and serves as a platform for students to present their research. Students are also eligible for funding to attend major overseas conferences in their research field.



DUKE/DUKE-NUS EXCHANGE PROGRAMME

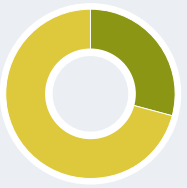
Students can apply for a one-month research exchange programme with Duke University, providing them with a wonderful opportunity to conduct research, broaden their research training and experience different research environments.

Nationalities represented



- 54% Singapore (SC/SPR)
- 16% China
- 7% India
- 7% ASEAN
- 3% Taiwan
- 2% South Korea
- 1% Japan
- 3% America
- 3% Canada
- 2% Great Britain
- 3% Others

Highest qualification held



- 29% Master's
- 71% Bachelor's

STUDENT LIFE

Our student council organises teambuilding activities and many social gatherings. Students can also join any of the many activity clubs that provide an additional outlet to channel their energy and pursue their passion.

CAREER DEVELOPMENT PROGRAMME (CDeP)

The CDeP for PhD students provides support in developing essential competencies and transferable skills to steer them towards career success. The programme offers career seminars, dedicated workshops, one-on-one career counselling and career portfolio support to help students achieve their professional goals and build a network.

Financial Support

All PhD and MD-PhD students will have tuition fees for the PhD component paid for and will receive a stipend for the duration of the PhD programme.

MD-PhD students will also be offered scholarships to cover tuition fees for their first two years in the MD programme and their final year in the MD programme.

There is no service commitment for PhD graduates.

Programme	Deadlines
MD-PhD	1 September for early application 1 January final deadline
PhD	15 January

Admission Requirements

PRE-REQUISITES

PhD in Integrated Biology and Medicine

- Bachelor's degree in any discipline
- Graduate Record Examination (GRE) Test results
- Research experience is looked upon favourably

PhD in Quantitative Biology and Medicine

- Graduate Record Examination (GRE) Test results
- For Biostatistics and Health Data Science concentration: a Master's degree or a Bachelor's degree in a quantitative discipline
- For Computational Biology concentration: a Bachelor's degree in a biological, computational or quantitative discipline

HOW TO APPLY

For both PhD programmes, classes begin in August each year. Applications to the PhD programmes open in June of the preceding year and the application deadline is 15 January.

To apply, candidates must submit the following:

- An online application at ***https://myportal.duke-nus.edu.sg/admissions/***
- At least three recommendation letters
- Official transcripts from Bachelor's (and higher, if applicable) degree programme(s).
- World Education Services (WES) report, where required

Visit ***www.duke-nus.edu.sg/admissions*** for more details on the application process.

Stay Connected

Email:
admissions@duke-nus.edu.sg

Website:
www.duke-nus.edu.sg

Facebook:
www.facebook.com/DukeNUSMedicalSchool

YouTube:
www.youtube.com/user/InsideDukeNUS

Duke University is accredited by the Southern Association of Colleges and Schools Commission on Colleges to award undergraduate and graduate degrees. Duke-NUS is not accredited by the Commission on Colleges and the accreditation of Duke University does not extend to or include Duke-NUS or its students.

DukeNUS Medical School

SingHealth DukeNUS ACADEMIC MEDICAL CENTRE

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