4TH ANNUAL CHAIR SUMMIT
Master Class for Neuroscience Professional Development
NEW DIMENSIONS IN GRADUATE MEDICAL EDUCATION

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Duke University Medical Center
Durham, NC
Research/Grants: None

Speakers Bureau: None

Consultant: Corcept Therapeutics; Eisai Inc.; Grethe Lundbeck Foundation; Orexigen Therapeutics, Inc.; Sonexa Therapeutics

Stockholder: Corcept Therapeutics; Orexigen Therapeutics, Inc.; Sonexa Therapeutics

Other Financial Interest: Indirect holding CeNeRx; multiple patents

Advisory Board: CeNeRx
LEARNING OBJECTIVE
Evaluate a novel approach to graduate medical education.
HISTORY OF DUKE-NUS

2000
Singapore launches Biomedical Science Initiative

2002
Partnership agreement signed between Duke University and NUS

2005
Pioneer class of MD students started school

2007
3 Duke-NUS researchers garnered nation’s highest research awards

2007 – 2010
Competitive Research Funding: $99.3m
No. of Publications: 185
Patents Filed: 5

2008

2009
School officially opened by PM Lee Hsien Loong

2011
Pioneer batch to graduate
DEVELOPING A NEW BREED OF DOCTORS

Clinician-Scientists

- Well-trained specialists to care for patients
- Clinician-Scientist: Able to contribute to the advancement of medical knowledge
- Critical thinker
- Looks at old problems in new, creative ways
- Has a pioneering spirit, willing and interested in blazing a new trail in science & in one’s professional career
DUKE’S VISION FOR DUKE-NUS GRADUATE MEDICAL SCHOOL

- Duke-quality medical school in Asia
- Cross flow of faculty and students
- Worldwide leadership in biomedical research and medical education
OUR EDUCATION MISSION

Duke-NUS Medical School

Science Knowledge
Communication
Professionalism & Ethics
Clinical Experience

Research
Teamwork
Critical Thinking
Creative Thinking

Leadership

Medical Practice

Improve Medical Practice
PLANNING THE APPROACH
STUDENTS HAVE CHANGED
Retention$^1$:
1st 10 mins: 70%
last 10 mins: 20%

Paying attention$^2$:
40%

15,000-17,000 medical journals!!!
The time course of forgetting

Source: Hermann Ebbinghaus, Memory: A Contribution to Experimental Psychology, 1985

NEW INSTRUCTIONAL STRATEGY:

TeamLEAD

(Learn, Engage, Apply, Develop)
TEAM LEAD (LEARN, ENGAGE, APPLY, DEVELOP)

- Goals and Objectives
- Learning Materials

- Independent/Team Learning

- In-Class Student Teams
  - Readiness phase
  - Application phase

- Peer Evaluation
REINFORCEMENT OF CONTENT WITH MEDIA
TEAMWORK, CREATIVE AND CRITICAL THINKING
• Efficient use of faculty time
• Duke and local faculty partnership
GROUP READINESS ASSESSMENT
IF/AT FORMS
13. The clinical history of bloodshot eyes & poor coordination fits with Ataxia-telangiectasia as well. ATM is also involved in DNA damage repair.

18. What is so urgent about this HSV reactivation (??) that constitutes IV?
APPLICATION PHASE
APPLICATION PHASE
Current Student Population: 186

59% are females; 41% are males

Average age: 24.5 years

Countries Represented:

1. Singapore
2. United States of America
3. India
4. Indonesia
5. Malaysia
6. Bangladesh
7. Britain
8. Vietnam
9. Taiwan
10. Canada
11. China
12. Philippines
13. Sri Lanka
14. South Korea
15. Poland
16. Pakistan
17. Zimbabwe
18. Nepal
19. Japan
20. Greece
21. Myanmar
## OUR STUDENT PROFILES
### Academic Background

<table>
<thead>
<tr>
<th>Class of 2011</th>
<th>Class of 2012</th>
<th>Class of 2013</th>
<th>Class of 2014</th>
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</thead>
<tbody>
<tr>
<td><strong>Undergraduate Degrees</strong></td>
<td><strong>Undergraduate Degrees</strong></td>
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<tr>
<td>Biology/Life Sciences (14)</td>
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<td>Biology/Life Sciences (37)</td>
<td>Biology/Life Sciences / Chemistry (29)</td>
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<tr>
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<tr>
<td>Pharmacy/Pharmacology (4)</td>
<td>Pharmacy/Pharmacology (3)</td>
<td>Chemistry (3)</td>
<td>Neuroscience and Neurobiology (4)</td>
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<tr>
<td>Computer Science (2)</td>
<td>Anthropology (2)</td>
<td>Psychology (1)</td>
<td>Nursing (2)</td>
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<tr>
<td>Chemistry (1)</td>
<td>Chemistry (1)</td>
<td>Kinesiology (1)</td>
<td>Pharmacy/Pharmacology (2)</td>
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<tr>
<td>Biopsychology &amp; Cognitive Science (1)</td>
<td>Nutrition (1)</td>
<td>Dentistry (1)</td>
<td>Arts (History, East Asian Lang, Music) (2)</td>
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<tr>
<td>Nutrition (1)</td>
<td></td>
<td>Statistics (1)</td>
<td>Business /Economics (2)</td>
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<tr>
<td><strong>Higher Degrees</strong></td>
<td><strong>Higher Degrees</strong></td>
<td><strong>Higher Degrees</strong></td>
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<td>Masters Degree (4)</td>
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<td>Masters Degree (8)</td>
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<tr>
<td>PhD (1)</td>
<td>PhD (2)</td>
<td>PhD (1)</td>
<td>PhD (2)</td>
</tr>
</tbody>
</table>
OUR STUDENT PROFILES
Key Universities Attended

USA
- Amherst
- Case Western Reserve
- Columbia
- Cornell
- Dartmouth College
- Duke
- Emory
- Harvard
- Johns Hopkins
- Northwestern University
- Pomona College
- Smith College
- UC Berkeley
- UC Irvine
- UC Los Angeles
- UC San Diego
- Univ. of Michigan
- Univ. of Pennsylvania
- Univ. of Washington, Seattle
- Yale

Singapore
- NUS
- NUS-MIT
- NTU

India
- Univ. of Mumbai

Philippines
- Univ. of Philippines

Australia
- Monash
- Univ. of Melbourne
- Univ. of Sydney

Canada
- Simon Fraser University
- Univ. of Toronto

China
- Fudan University
- Huazhong Agricultural University
- Peking University
- Shanghai Jiao Tong University

Europe
- University of Birmingham
- University of Cambridge
- University of London
- University of Oxford
- University of York
Inaugural Class of 2011:

- 96% passed USMLE Step 1 Basic Science Exam on first try and 100% passed by end of year 3
- 100% passed USMLE Step 2 Clinical Knowledge Exam
- Class mean was higher than US national mean for both exams
- 96% passed CPXY2 on first try (100% by end of year 3)
Class of 2012 students:

- 44 took iFoM exam at end of year 2
- All scored above “competent”; 36% achieved a certificate of excellence (top 10% of scores) with a mean of 562
- 2 students recognized as top 10 scores of all test takers (almost 2,000 students)
HIGHLIGHTS AND ACHIEVEMENTS EDUCATION

- LEAD approach has gained global attention
- Students performance on standardized test similar and in cases better than Duke students
- 20 of our first batch of students presented poster, abstract, or presentation in meeting and 11 published in international journal; 2 were published in local medical journal
PHD PROGRAM IN INTEGRATED BIOLOGY & MEDICINE

Assoc. Prof. Scott Summers
Principal Investigator, Program in Cardiovascular & Metabolic Disorders
Director, Graduate Studies Duke-NUS

- First class of 12 students entered in August 2010
- Approved by NUS Senate; process underway for approval of joint degree with Duke University
- Designed as a 4-year program that incorporates the innovative Team-Based Learning strategies
- Includes a foundation course and discipline-specific courses
- Has separate tracks that follow each of the Signature Research Programs
TEAM LEAD AND NEXTGEN EDUCATION

- New method of delivery of education
- Effective applied learning
- Next generation learning tools
- On time anytime anywhere
- Short duration, information packed
- Forum maybe online
- Information Exchange
1. Geographically constrained: Attend lectures (start to finish)

2. Portable:
   At Duke-NUS, package lectures on USB drive
   At Duke-NUS, TeamLEAD access via DimDim
   Student – faculty interaction via DimDim, WebEx, Teleconferencing

3. Delivery non-medical content
SCENARIO #1
What if TeamLEAD Delivered Math? – Animated notes, active learning via applications

TeamLEAD Notes:
- Investigative Methods and Tools
- *Core Statistical Concepts

TeamLead Application:
Breathing life into equations with Excel exercises
- Data Management with Excel

Animation of the Central Limit Theorem: Sums of random variables are asymptotically normally distributed.
SCENARIO #2
Random access to slides of interest

PERIPHERAL NEUROPATHY
Inflammatory/ Infectious Causes

- Guillain-Barré syndrome, acute
- Chronic inflammatory demyelinating polyradiculoneuropathy (CIDP)
- Leprosy
- Diphtheria
- Varicella-Zoster (Shingles)
SCENARIO #3
Mobile Learning Clinical Skills – procedure show-and-tell
WE CAN MIMIC VIRTUAL TeamLEAD

- Testing (online)
- Group meeting (access via DimDim, WebEx & teleconferencing)
- Group testing (access via DimDim, WebEx & teleconferencing)
- Application by content
THE FUTURE OF LEARNING – REPLACING POINT-TO-POINT INFRASTRUCTURE WITH A TELCO VOICE/DATA EXCHANGE
SIGNATURE RESEARCH PROGRAMS

Cancer and Stem Cell Biology
David M. Virshup, MD
Professor
Program Director

Neuroscience and Behavioral Disorders
Dale Purves, MD
Professor
Program Director

Cardiovascular and Metabolic Disorders
Thomas M. Coffman, MD
Program Director

Health Systems & Services Research
David Bruce Matchar, MD
Professor
Program Director

Emerging Infectious Diseases
Duane J. Gubler, ScD, MS
Professor
Program Director
Cumulative Number of Regular Rank Research Faculty
Research KPI Mid-Term Target (2009): 20; Steady-State Target (2011): 40

Footnote: Regular rank research faculty include academic staff from the Dean’s Office, Office of Research and Office of Clinical Sciences.
RESEARCH ACHIEVEMENTS

Awards from Local and Non-Local Funding Agencies as of 14 Mar 2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Local (S$M)</th>
<th>Non-local (S$M)</th>
<th>Cumulative of Local &amp; Non-local (S$M)</th>
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<tr>
<td>FY06</td>
<td>0.61</td>
<td>0</td>
<td>0.61</td>
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<td>FY07</td>
<td>3.6</td>
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<td>32.47</td>
<td>0.64</td>
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<td>FY09</td>
<td>35.88</td>
<td>1.68</td>
<td>74.31</td>
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<td>FY10</td>
<td>23.77</td>
<td>1.05</td>
<td>98.95</td>
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<td>FY11</td>
<td>1.36</td>
<td>0</td>
<td>100.31</td>
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<tr>
<td>Total</td>
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<td>97.51</td>
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</table>
DUKE-NUS GRADUATE MEDICAL SCHOOL SINGAPORE
PUBLICATIONS OF REGULAR RANK AND ADJUNCT FACULTY MEMBERS
(AS OF 31 DEC 2010)
PubMed-indexed published publications (original and review papers only)
with Duke-NUS listed as an institutional affiliation
ISSUES SURROUNDING EID RESEARCH IN SINGAPORE

- Singapore and the region are at high risk and vulnerable to infectious disease epidemics
- Lack of regional leadership
- Lack of comprehensive training in infectious diseases
- Lack of laboratory and epidemiologic capacity
- Lack of technology optimal for pathogen identification & characterization
- New opportunities with industry

Singapore is in the unique position of high risk, but also opportunity
COMPREHENSIVE EID SURVEILLANCE

Infected Patient/Animal

Clinical characterization
Pathogen characterization
Diagnostic screen

Rural & urban areas
Field epidemiology
Clinical & epi surveillance
Pathogen discovery

Early detection and response
RESEARCH ACHIEVEMENTS

Partnership with MOH in Health Services Research
- Eight invention disclosures
- Registered two trademarks
- Filed five patent applications
- Received commercial licensing interest for two patents

Joint R&D with Waseda University

Formed A*STAR and Duke-NUS Neuroscience Research Partnership

Influenced Inviragen (USA) to set up R&D facility in Singapore

Involved in various joint projects with A*STAR and SingHealth institutes

Consulting and research study with Abbott Nutrition R&D Singapore

Collaboration with James Cook University, Australia

Collaboration with AstraZeneca AB, Sweden on ceramide synthases & metabolic disease

Established Singapore Dengue Consortium with DSO National Laboratories and other entities

Multi-agency collaboration on development of Influenza Flu Vaccine (together with SigN, ETC, DSO, Cytos)

Publications
- 340 research papers in peer-reviewed journals over four short years

Faculty Growth
- Headcount grown to 83:
  - 56% hold full time appointments
  - 30% hold dual appointments with Duke

Competitive Research Funding
- Competitive awards from local & non-local funding agencies totaled S$99.3M at January 5, 2011

Joint R&D with Korea Institute of Science and Technology

Generation & analysis of genomic data with Illumina Inc
BRINGING ATTENTION BACK INTO YOUR LIFE

- **Attention Driven Game**
- **A*STAR Technology**
- **BCI Signal Processing Software**

- **Interface Headgear**

**CEREBRO** – Signal Management System (Wired OR Wireless)
INVESTIGATIVE MEDICINE UNIT

- Phase 1, 1b, 2a – 30-bed unit
- Singapore General Hospital (SGH)
  - Block 7, level 7
- Sponsorship:
  - SingHealth – Ministry of Health (MOH)
  - Duke-NUS Graduate Medical School – Ministry of Education
  - SICS (Singapore Institute for Clinical Sciences) – Ministry of Trade
  - NMRC (National Medical Research Council – MOH) – matches the contribution of the above 3 sponsors
“Scientific Collaboration for Research Innovation”
QUESTIONS AND ANSWERS