PREPARING THE WORKFORCE IN REGENERATIVE MEDICINE: A PERSPECTIVE FROM ACADEMIA

Challenge: how best to train PhD and postdoc scientists who will enter the RM workforce **as leaders of research groups in academia; founders of biotech companies; leaders/members of research teams in biotech; clinician-scientists running clinical trials; scientific program managers in philanthropy; experts in corporate development and licensing ……etc**

One pipeline: **NIH T32 training programs for PhD and/or postdoctoral fellows**

Development and Stem Cell Biology Training Program at Duke School of Medicine Funded by National Institute for Child Health and Human Development Direct cost ~ $5 million over 5 years

Currently training 40 PhD students (intake: 6 - 8/year) 30% are URM; 70% female
Average time to graduation ~ 5 years

Brief outline of core curriculum

- Targeted foundational coursework in embryonic development, organogenesis, stem cell biology and regeneration
- Development of skills in critical thinking; experimental design; writing and communication; research ethics
- How to use practical tools in genomics (including gene editing); proteomics; transcriptomics; bioinformatics; statistics, quantitative biology, confocal and live cell imaging; genetic animal models of disease and regeneration; cell culture, including organoids; cell transplantation; immunology; HTP screening etc

After 3 rotations students join a research lab.
Currently 51 NIH funded faculty in 12 basic and clinical departments
e.g Cell Biology, Biomedical Engineering, Genetics, Immunology, Orthopedics, Neurobiology
Many of these faculty collaborate on interdisciplinary projects

Mentoring and support

A critical component of the program is ongoing support and mentoring of both the faculty and the students, provided by the **Office of Biomedical Graduate Education (OBGE)**

Faculty in the program receive training specifically in **mentoring**, as well as the usual training in research integrity, and diversity, equity and inclusion that all faculty receive

OBGE also provides **continuing** support and career advice to all the **students**. A very active **BioCoRE** (**Bio**Sciences **Co**llaborative for **R**esearch **E**ngagement) program provides additional mentoring and support for students with a diverse background (racial and ethnic; disability; life experience; LGBTQ etc)

High success rate: judged by student retention, especially URMs; times to graduation; individual student F31 training grants; publications; posters; awards; jobs

Success is monitored by both Duke OBGE and NIH. Highly competitive renewal of grant depends on success

Weaknesses of T32 program as an efficient pipeline for future RM workforce

Very few T32 training grants related to RM are available, even though there are > twice as many applicants as slots

Only open to US citizens and permanent residents

More time could be given to topics such as patenting; regulatory processes; entrepreneurship

Emphasis still tends to be on careers in academia. Some visits are made by scientists working in biotech related to RM, but more of them would broaden student horizons. Currently no internships with industry.

Other training mechanisms related to RM

Individual NIH F31 (PhD) or F32 (postdoctoral) training grants; individual postdoctoral fellowships from organizations like the New York Stem Cell Foundation; collaborative awards for trainees within NIH consortium grants (NHLBI)

Cold Spring Harbor Practical/lecture course in **Mouse Development, Stem Cell and Cancer** (3 wks); Woods Hole MBL (Marine Biology Lab) **Embryology: Concepts and Techniques In modern developmental biology** (6 wks); EMBO Practical Course **Developmental Biology Frontiers in Stem Cells and Regeneration** (1 wk)

CIRM COMPASS program **C**reating **O**pportunities through **M**entorship and **P**artnership **A**cross **S**tem cell **S**cience "Objective: prepare a diverse cadre of **undergraduates** for careers in RM through novel recruitment and support mechanisms that identify and foster talent within URM populations and combine hands-on research with mentorship experiences to enhance transition to successful careers" $46 million investment across 16 institutions