Basic Research in Thoracic Surgery
“Developing the Academic Surgeon”
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University of Virginia
What is “Basic Research”?

• The term “basic science or research” is a misnomer.
• All science today is translational with clear applicability to human diseases.

- Signal transduction
- High-throughput assays
- Transgenic animals
- Novel animal or cell culture model systems
- Science “linked” to clinical databases

- Genomics
- Proteomics
- Nanoparticle technology
- Pharmacogenomics
- Bioinformatics
So You Want to be a Basic Researcher?
The Assumptions

1. You’re curious, committed, and energetic.
2. You have some previous history of doing “bench” research.
3. Your ego is not defined by case numbers.
4. You will have different friends than your colleagues.
5. Your long-term goal is to be an independent researcher.
6. You like to compete.
7. You never give up.
The Scientific Method

Ask a question
(Why do lung cancers metastasize so early?)

Do a background search
(What does the literature say? What’s new?)

Hypothesis

Experimental Design
(Experiments, alternatives, pitfalls?)

Data Analysis

Conclusions & Publication
“Culture of Research”

- Defines the research environment
- Is the Chair/Division Chief/Institution objectively supportive of research?
- Do other faculty have research labs?
- How successful have other young faculty been in their research careers?
- How much time is really given to do research?
- Are surgeon-scientists financially penalized relative to others for doing research?
Beginning your Research Career
What’s Important?

• “Culture of research”
• Scientific mentor
  – Not your Division Chief
  – Almost always a PhD
  – Associate or full Professor
  – “My science” is a work in progress
• The academical village
  – All science is multidisciplinary
  – NIH/others increasingly supportive of cross-disciplinary grant proposals
Beginning your Research Career
What’s Important?

• “Basic” Department/Divisional responsibilities
  – Start-up funds (around 70-100K/yr) for 3-4 years
  – A lab technician or post-doc
  – Competitive salary with annual increases
  – Limitations on clinical and admin responsibilities
  – Consider a research advisory committee

• Continuing surgeon-scientist education
  – Chalk talks
  – Graduate level courses
  – Mini-workshops
  – Be a student (and enjoy it!)
“Basic Research” in Thoracic Surgery
The First Year

• Absolutes
  – Attend and present your science in your scientific mentor’s lab meetings
  – Attend other conferences (Cancer Center, Heart & Vascular Research Center, etc.)
  – Do the work (i.e. put the time in)

• Write grants for institutional and foundation “young investigator awards”
  – AATS, AHA, ACS, AACR, TSFRE, ISHLT

• Consider working with industry

• Be patient; work your plan (walk, then run)
“Basic Research” in Thoracic Surgery
Years 2 & 3

- Generate preliminary data
  - Do “publication ready” experiments
- Write your first major grant
  - K-series (K08 or K23)
  - Consider K99/R00 awards
  - Rarely, an R01
  - American Cancer Society, AHA, VA merit
- Increase scientific cross-fertilization
- Remain scientifically mature
- Remember your commitment to the Department
Thoracic Surgeon-Scientist
Five Common Misconceptions

• Surgeon-scientists can’t operate
• Collecting human tissue is doing science
• NIH won’t fund cardiothoracic surgeons
• “I’ll establish my clinical reputation first”
• Protected time
“Basic Research” in Thoracic Surgery
Measurements of Success

- Beautifully simple and universally accepted
  - Quality publications (IF, “science” journals)
  - Successful grantsmanship
- Meritocratic and binary
- A culture familiar to surgeons
CT Surgery and NIH Funding
The Numbers Game

Ratcliffe MB, *JTCVS* 2008
University of Virginia
CT Surgery and NIH Funding
The Numbers Game

• CT Surgery submits 0.3% (110/35,000) of all grants received by the NIH
• CT Surgery submits 5% of all surgery grants received by the NIH
• Funding success rates:
  – CT Surgery: 14%
  – All NIH: 23%

Bottom line is a lower per capita funding rate to CT surgeons compared to whole of NIH

• The problem is that CT surgeons are not submitting enough grants (quality grants?)

Ratcliffe MB, *JTCVS* 2008
Factors that Decrease CT Surgery Applications to the NIH

- Economic pressures
  - Clinical workloads
  - Inability to cost-shift
- Time pressures
  - Resident work hour reductions
- Research training
  - Timing
  - Quality
- Duration of training

Ratcliffe MB, JTCVS 2008
“Fundable Science”

- Avoid descriptive or correlative studies
- Link to clinical cardiovascular or thoracic diseases and problems
- Multidisciplinary collaborators
- Focused specific aims
- Ample preliminary data
- Relevant and current methodology
- Mechanistic studies preferred
- Generate novel model systems
“Fundable Science”
What Are the Criteria?

• Career Development Awards (K series, TSFRE, AHA, VA merit, etc.)
  – Environment, scientific mentor, applicant, research proposal
  – Basically it always comes down to the quality of the science

• Independent awards (R series, DOD)
  – Publications (number and quality)
  – Novel ideas
  – Some measure of seniority/commitment
“Fundable Science”
Who is the Competition?

• Almost exclusively PhDs, but some “hard-core” MD or MD/PhD scientists
• They are on your study sections
• Have no little to no clinical responsibilities
• Surgeons can’t learn these molecular or genomic techniques – the “We are MDs, not PhDs” argument
• Remember: Academically, we almost always beat these guys soundly from elementary school on. They are not smarter than you.
You will need to write grants.

Most of those grants will not be funded, but......
It’s like qualifying for the Boston Marathon
Persistence ultimately pays......
“Basic Research” in Thoracic Surgery

Conclusions

• CT surgery needs basic researchers now more than ever
• Funding opportunities are ripe for well trained, committed, hypothesis-driven thoracic surgeon-scientists
• Rewards are real
• Leaders in Thoracic Surgery will continue to include thoracic surgeon-scientists
• Nothing easy is worth doing ……