Proper Laboratory and Data Protocols

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Your mission . . .

• Ask an important question
• Develop a hypothesis
• Design experiments to test the hypothesis
• Develop technical skills and execute experiments
• Interpret data
• Communicate findings
  – Meetings, committee, department
  – Manuscripts, thesis
Lab notebook: Purpose

• Establish the authenticity of the work
• Defend patents
• Act as a basis for technical reports
  – Manuscripts
  – Thesis
• Avoid duplication of effort
• Avoid repetition of erroneous procedures
Lab notebook: Purpose

• Should provide a clear record so that you can figure out what you did.
• Should be understandable so that a person with appropriate expertise can understand what you did.

"You do not really understand something unless you can explain it to your grandmother." --Albert Einstein
Lab notebooks: Ownership

• Lab notebooks are the property of NC State University
• Must remain in the primary laboratory at all times

“Somewhere, something incredible is waiting to be known.”--Carl Sagan
Lab notebook: Type and Format

- Must be bound
- 8-1/2 x 11”
- Numbered pages
- Use ink not pencil
- Write legibly
- Mistakes?
  - Cross them out with a single line
  - No white-out or blackening out
Lab notebook: Content

• Table of contents
  – Title, date, page number

• Date of experiment

• Title of experiment
  – Serial knock-down of DIAP1 by RNAi

• Purpose
  – To determine the relationship between the amount of RNA used against DIAP1 and the amount of cell death
Lab notebook: Content

• Materials and methods
  – Show calculations

• Observations and results
  – Everything that happens or doesn’t happen is data
  – Separate sheets, photographs, etc. should be pasted to the notebook page and referred to in an entry
  – Material that cannot be incorporated in the notebook should be keyed to an entry
Lab notebook: Content

- Discussion
  - Discuss results and implications of data
- Conclusions
  - Prepare a conclusion. How did the experiment go?
  - What to do next?

“The best way to have a good idea is to have a lot of ideas.” --Linus Pauling
Lab notebook: Content

- Sign and date all entries at the time they are made
- Have them witnessed
  - By someone who can understand it but had no part in producing it
Lab notebook: Maintenance

- Record everything directly into the notebook ASAP
  - Not on paper towels, back of hand, sticky note
- Weekly check-up
- Create tables and graphs
- Summary for the week
- Complete Table of Contents
- Make plan for following week
You, Your Lab book, and Your Advisor

• Your lab notebook documents your progress
• Your proficiency will be judged in part by notebook
• Your lab notebook will leave a lasting impression on your advisor

“People do not decide to become extraordinary. They decide to accomplish extraordinary things.” -- Edmund Hillary
In the news . . .

• **Within Discredited Stem Cell Research, a True Scientific First** By NICHOLAS WADE A Korean scientist who was found to have fabricated much of his work did achieve a scientific first, though not the one he claimed. August 3, 2007/U.S./NEWSFOREIGN DESK

• **Journal Faulted In Publishing Korean's Claims** By NICHOLAS WADE Fraudulent stem cell reports that shook the scientific world could have been prevented by extra review procedures, according to a panel appointed by the journal Science. November 29, 2006/WORLD/NEWSFOREIGN DESK

• **South Korea: Scientist Admits Faking Stem Cell Data** The disgraced scientist Hwang Woo Suk admitted in court that he fabricated data in a landmark paper on stem cells. July 5, 2006/WORLD/NEWSFOREIGN DESK

• **Disgraced Korean Cloning Scientist Indicted** Prosecutors on Friday indicted a disgraced cloning scientist on embezzlement and bioethics law violations linked to faked stem cell research. May 12, 2006/WORLD/NEWS
The facts

- Burden of proof. (1) The institution or HHS has the burden of proof for making a finding of research misconduct. The destruction, absence of, or respondent's failure to provide research records adequately documenting the questioned research is evidence of research misconduct where the institution or HHS establishes by a preponderance of the evidence that the respondent intentionally, knowingly, or recklessly had research records and destroyed them, had the opportunity to maintain the records but did not do so, or maintained the records and failed to produce them in a timely manner and that the respondent's conduct constitutes a significant departure from accepted practices of the relevant research community.
Resources

• Sponsored Programs and Regulatory Compliance
  – http://www.ncsu.edu/sparcs/

• Contacts
  – **Matthew Ronning**, Associate Vice Chancellor and Director of SPARCS
    • e-mail at matt_ronning@ncsu.edu
    • phone at 919-513-2148
  – **Debra Paxton**, Regulatory Compliance Administrator
    • e-mail at debra_paxton@ncsu.edu
    • phone at 919-515-4514
Research Data in the Digital Age

• National Academies Report
• Integrity
• Accessibility
• Stewardship
• 11 recommendations
• Professional, institutional, individual responsibilities
• http://www.nap.edu/catalog/12615.html
Research Data in the Digital Age

• Recommendation #9: Researchers should establish data management plans at the beginning of each research project that include appropriate provisions for the stewardship of research data.
Your mission (cont)

• Do good work
• Write a good thesis
• Graduate!
QuickTime™ and a decompressor are needed to see this picture.