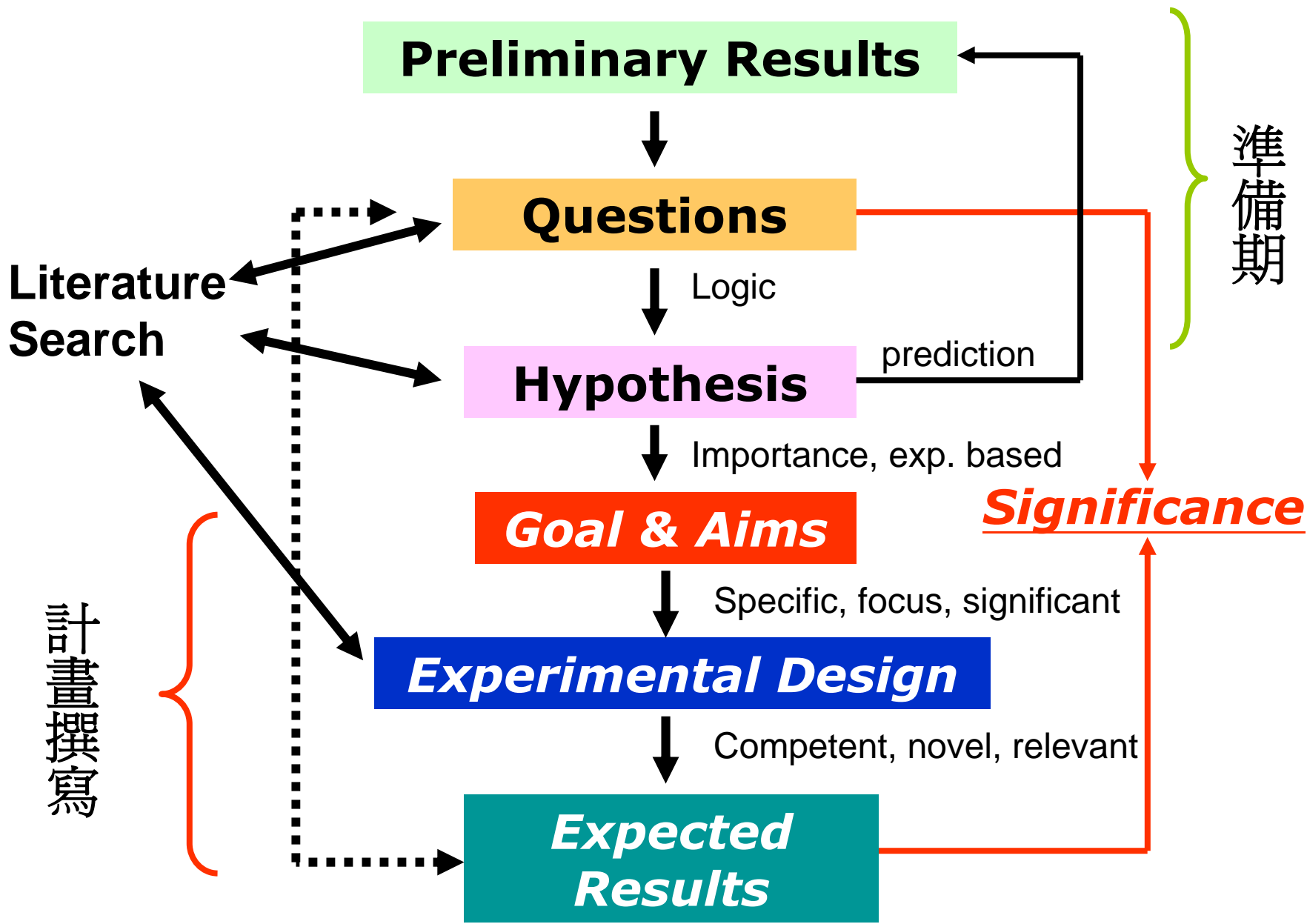# Writing Research Proposal

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Benefits of Writing Proposal

- Fund to support your research
- Allow you to review and critically evaluate your current research program
- Convince yourself and others that your research is worth supporting
- Keep you focused on your research program
- Develop novel ideas during writing proposal

Preliminary Results

Questions

Logic

Hypothesis

prediction

Importance, exp. based

Goal & Aims

Specific, focus, significant

Experimental Design

Competent, novel, relevant

Expected Results

Literature Search

Significance

準備期

計畫撰寫

Key Points of Your Proposal

What are your objectives

Why is your study important

How are you going to do it

Keys to good proposal writing

→ *Clarity, Understandable*

→ *Evidence-based*

→ *Conciseness*

→ *Relevancy; to the point*

→ *Logic*

Keys to writing a successful proposal

- Interesting and/or important problem
- Clear Concept and Rationale; *Innovation*
- Reasonable and achievable aims
- Easy to understand
- Appropriate experimental designs with feasible and up-to-date techniques
- Interesting preliminary/progress results and previous publications relevant to this proposal
- **Competence of PI and record of publication**

How to start writing proposal(1)

Write Only Outline at the first draft; do not start by writing full proposal

Write Abstract at the end

Write Title of Proposal when the proposal is finished

Writing technique: from ideas to paragraphs to sections to full proposal

Subtitle 1 → Paragraph

Subtitle 2

Subtitle n

logic

Title1

Title 2

Title n

Ideas

logic

Sections
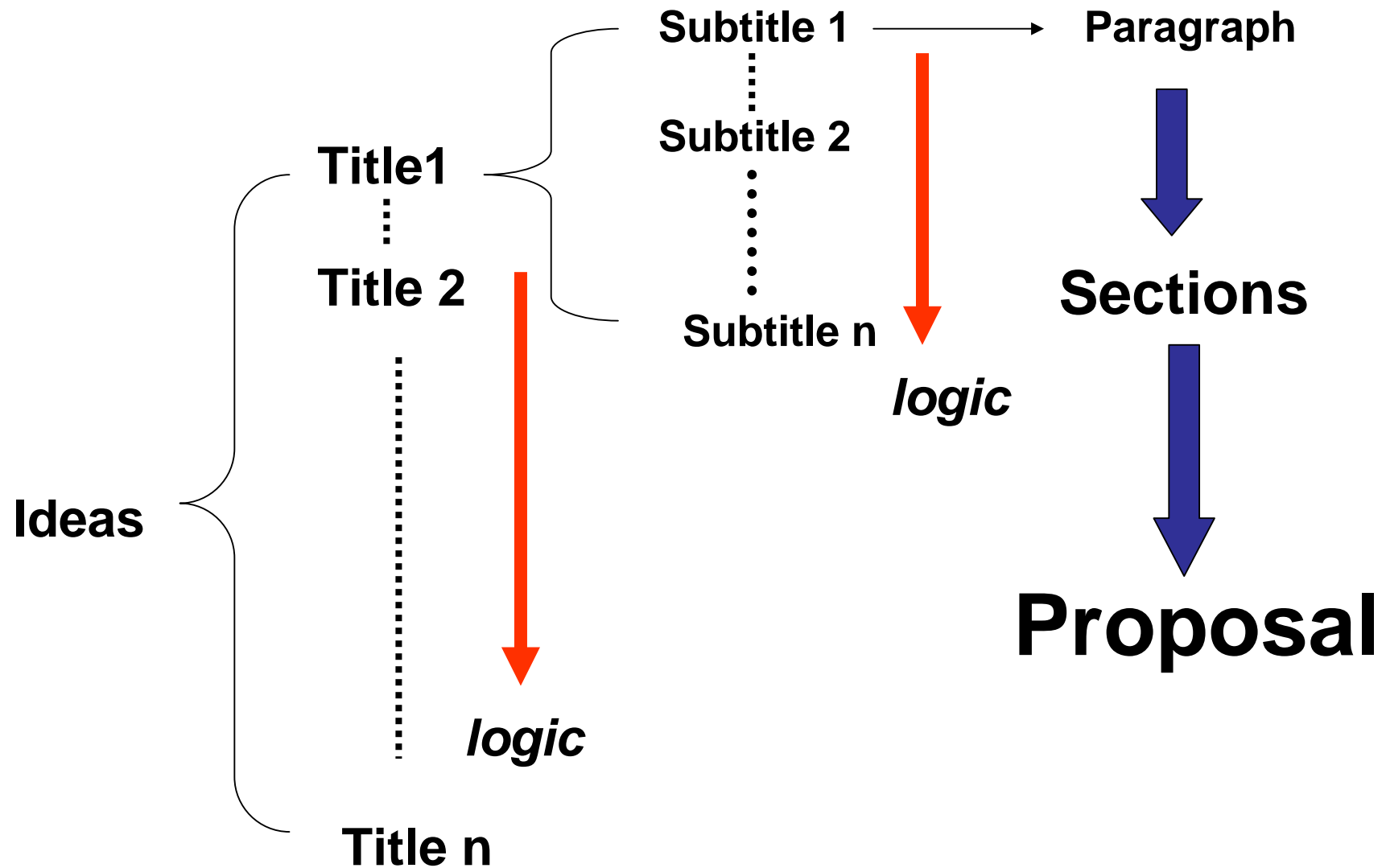
Proposal

Writing a Proposal(1)

- Title(**8**)
- Abstract(**7**)
- Background and Rationale(**2**)
- Overall Goal and Specific Aims(**1**)
- Significance(**3**)
- Preliminary Results (*relevant ones*)(**4**)
- Experimental Design(**5**)
- Expected Results(**6**)
- Budget(**9**)
- *Check list (for your own use)*

Writing a Proposal(2)

Initial Planning: start early!

- Ideas, Ideas, Ideas! Write them done any time in a file or a small notebook!

- Based on *facts* ; <u>no</u> speculations

- Checking in literatures for similar ideas (usually in Introduction and Discussions) done in other systems---Key words

- *Evolution* of ideas → Hypothesis

- Obtain preliminary results to support your hypothesis

How to start(1): Ideas first

Problems and *Hypothesis:* evidence-based

Overall Goal and *Specific Aims*

Rationale: why your proposal is *important/interesting* that deserves to be supported: Extensive literature search；Convince yourself the significance and contribution of your proposal

How to solve problems posed

Make a computer file and enter thoughts come up through the preparation period; modify the thoughts

How to start(2): how to get ideas

Goal/Specific problems

Rationale

Rationale

Preliminary data

Hypothesis

Literature search

How to solve problems
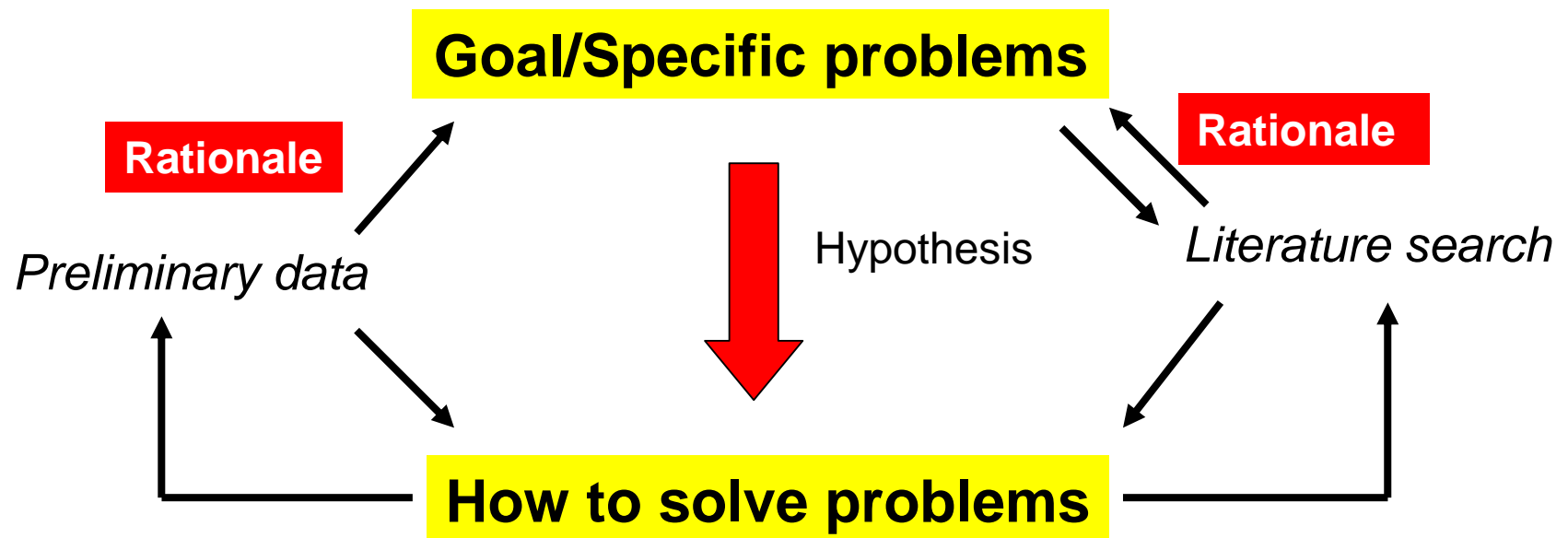
Introduction

- **Previous studies**: *General background information; your contribution*

- **Important and interesting problems still outstanding**: *relevant to this work: why it is important; selling points*

- **How the problem will be solved**: *hypothesis and experimental approaches*

- **Summary and significance**

Introduction: *Problems*

- Too little or irrelevant background information; **information not updated**

- Unclear purpose; **no rationale for the study**

- Disorganization in logic

Hypothesis

- Build the case to support the hypothesis with literature and data---*no reinventing the wheel*

- *Seeing is believing*: Use schematic figures or diagrams to help reviewers understand your model and idea

- State your hypothesis clearly in the abstract and specific aims; alternative hypothesis in case

Hypothesis: *Problems*

No hypothesis; Fishing Expedition

Wild speculation

Too complicated, hard to understand

Preliminary Results/ Progress Report

- Show *only* the relevant experiments *supporting* your hypothesis
- The results should not be ambiguous
- Figure and table legends should be clearly written; figure numbers should correspond to the text; be sure to label the figures
- Do not show published results in this section

Figures and Tables

- Simple and Clarity in presentation

- Visualization presentation techniques

- Caption must stand-alone

- Error bars

- Resolution and format

- Figure and Table number consistent with text

Figures and Tables: *problems*

- Complicated figures or tables

- No or Inadequate description in the legends

- Mislabeling

- No markings (units, arrows, mol weight markers etc)

- No correspondence with text

General Goal and *Specific Aims*

- Begin with a statement of long term overall goal
- List the specific aims one by one concisely
- Not too many aims; 2-4 best
- Be *specific*, no general and ambiguous statements
- Be *realistic*, no unachievable aims; best if supported by preliminary results
- Aims should be logically linked and arranged accordingly; testing your hypothesis
- *Link to experiments in Experimental Design*

Specific Aim 1. *To determine the role of nucleosomes in the regulation of Igk locus rearrangement.* Our preliminary results showed that the V(D)J recombinase could not recognize RSS targets if they were arranged into a nucleosome structure. We propose experiments to extend these observations by 1) determining what fraction of the Jk gene segments are in the nucleosomal structure in cells undergoing rearrangement as compared with non-lymphoid cells, 2) determining if nucleosomes are phased across the Jk locus, 3)determining whether nucleosome remodeling complex can alter the accessibility of the Jk cluster in native or reconstituted chromatin. This analysis will give us insight of the mechanism of Igk gene rearrangement.

Experimental Design(1)

- *Do not write as Materials and Methods*
- *Design the experiments to solve the problems* posed in the specific aims in logical order
- Be *realistic*, do not plan too many experiments or out of your expertise; manageable; focus!
- Be *logical*; step-by-step leading to your goal

Experimental Design(2)

- Updated technologies; Do not re-invent the wheel

- Competence in using techniques proposed

- Evaluate the design critically; alternative approaches, pros and cons

- *Control! Control! Control!*

- A schematic diagram for the overall design will help the reviewers understand

Results Evaluation and Expectation

- State clearly why good results will be expected because of previous studies, your expertise, novel technology etc

- Reasonable time table for achieving results

- Alternative Interpretations critically evaluated

- How the results will support your hypothesis

- Perspectives

Significance

- State *concisely* and *clearly* the importance of your study for the advance of the field or to the benefit of society etc
- List potential contributions in short sentences
- Innovations

Abstract

- *First impression* to the reviewers
- **Summarize key points in the proposal:** Importance and Rationale, Hypothesis, Aims, Approaches (brief), Innovation, Preliminary Results supporting the proposal, Expected Results, Significance
- *Write it last*, following the logic of the proposal
- Give possible answers to the problems you want to study
- Do not use this section to write long background or discussions

Importance	Early onset breast cancer has been the unique and major health problem in Taiwan with annual increase-----
Outstanding problems	The etiology and mechanisms of breast cancer in young women is unknown. It has been suggested that carcinogenesis in utero may account for the early-onset of this cancer------------
Hypothesis	To test this hypothesis, we have used fed pregnant mice with fatty diet and found increase in incidence of mammary tumors in the new born mice.---------------------
Experimental approaches	In this proposal, we will examine the alteration of mammary gland differentiation pathway in the mammary tumors derived from the new born mice using microarray, SAGE (serial analysis of gene expression) as well real-time PCR techniques ------------
Summary *Answers*	This study of alterations in mammary gland differentiation in the mammary tumor of new born mice will allow us to identify the genetic and molecular mechanisms involved in the early-onset breast cancer.
Significance	This information could be useful for diagnosis/treatment of early-onset breast cancer in Taiwan--------------------------

Title

- Choose title carefully—must reflect the central theme: *selling point*
- Attractive and easy to understand
- Concise and *Informatiive*: no non-informative words like " A study of---"
- *Avoid acronyms*
- English and Chinese titles should be consistent

References

- *Should correspond to the text*
- *Updated; don't miss the most relevant ones*
- Consistent format; numbering will help
- Title of article will help the reviewers

Budget

- Be reasonable
- State the *rationale* for unusually large request for fund
- State the *justifications* for purchasing the equipment needed
- Too many personnel to be hired is no good

Program Project

- *Focused* on a common goal of all the sub-projects
- Cohesiveness among the sub-projects
- Complementary approaches
- Synchrony among the sub-projects
- *Rationale* and *advantages* for forming a research team for solving the particular scientific problem; significance

Reasons Why Proposal is *Rejected(1)*

- Importance and rationale not clearly stated
- The problem is outmoded or trivial
- No specific aims! Aims too diffuse or general
- Similar experiments have already been done
- No evidence for competence to carry out the proposal
- Not realistic; overly ambitious plan

Reasons Why Proposal is *Rejected(2)*

- No experimental design! Or no correlation with the specific aims; poor design
- Too many factors or variables; No hypothesis; technique looking for problem
- No Controls
- Proposed study will not give useful information or new contributions
- Proposal depends on a key experiment with uncertain outcome

Acronyms, unclear meaning

We will use **CRTT** technique to examine the effect of **drugs** on the gene expression of **TOT** cells by Microarray. **Genes that respond most strongly** to the treatment will be analyzed by real-time PCR.

Too vague

Lack hypothesis and fail to point out the importance

Problems with Writing (1)

- Too long sentences and paragraphs
- Look out for long and dubious parentheses
- No logical connection among paragraphs
- Not explain specific terms clearly (reviewers probably are not in your field)
- ***acronyms and jargons***
- Misspelling; check with Word program
- Grammar; check with Word program
- Chaotic format

Problems with English (1)

Inconsistency:

The result of all the molecular events and regulatory processes in the cells are reflected in the phenotypes of the organism

Shining with green color and excited by the light, Dr. T. F. Tsai showed the transgenic mice to the public.

The company brought legal actions and counterclaims, and lodged an appeal.

After extraction RNA precipitated with alcohol.

After separated in the gel electrophorsis the scientist eluted the proteins by electroporation.

Problems with English (2)

Logic:

The cells were grown overnight and treated with the drug, but the RNA extracted is found to be transcribed from the alternative promoter.

The cells were grown overnight and treated with the drug, but the cells failed to grow.

The cells were grown overnight and treated with the drug. The RNA extracted was found to be transcribed from the alternative promoter

謝謝聆聽

祝您成功！