70th Anniversary Lecture Series

Writing the Introduction Section of a Research Article

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# Parts of the Manuscript

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| **Introduction** | – Why did you do the study?  
|               | – What was your purpose or hypothesis?                                   |
| **Methods**   | – What did you do?                                                        |
| **Results**   | – What did you find?                                                      |
| **Discussion**| – What do your findings mean?                                             |
Introduction

– Why did you do the study?
– What was your purpose or hypothesis?
Objectives

- Understand the structure of an Introduction
- Know which information is important for an effective Introduction
- Feel confident about using the verb tenses required in the Introduction
- Be able to tailor an Introduction to a specific audience
The Introduction sets the stage.
Purposes of the Introduction

- Explains what led to your study
- Identifies your research question
- Identifies the general experimental approach
- Explains why your study is exciting and important
How long should the introduction be?
How long should the introduction be?

10% to 15% of the length of the IMRAD portion of the paper
Parts of the Introduction
Parts of the Introduction

1. Background information
2. Gap in knowledge
3. Hypothesis or purpose statement
4. Strategy for testing hypothesis or achieving purpose
5. Conclusions (optional)
The Funnel Shape

1. Known (background)
2. Unknown (gap in knowledge your study will fill)
3. Hypothesis or purpose statement
4. Strategy for testing the hypothesis
5. Conclusion (optional)
Parts of the Introduction

1. **Background information**

2. Gap in knowledge

3. Hypothesis or purpose statement

4. Strategy for testing hypothesis or achieving purpose

5. Conclusions (optional)
Provide just enough information to make the reason for your study clear

Avoid topics that are not directly relevant

Take into account your readers’ level of knowledge

Convince readers that you know the subject
1. Background information

2. Gap in knowledge

3. Hypothesis or purpose statement

4. Strategy for testing hypothesis or achieving purpose

5. Conclusions (optional)
The background information (what is known) should lead to **the gap in knowledge** (what is not known).
“However, we do not know what effect this treatment will have on patients with stage IV disease.”

“Whether these findings will translate to the clinical setting is not known.”

“Past studies of this issue have resulted in conflicting findings.”

“So far, only qualitative findings have been obtained.”
Emphasize the importance of filling the gap. For example, explain how it could:

- Change medical practice
- Change scientific thought
Although several studies have associated QRS expression with colorectal adenocarcinoma, the direct effects of QRS on established colorectal cancers have not been determined. An understanding of how QRS contributes to tumorigenicity in colorectal cancer cells may enable its use as a prognostic factor or even therapeutic target.
Parts of the Introduction

1. Background information
2. Gap in knowledge
3. **Hypothesis or purpose statement**
4. Strategy for testing hypothesis or achieving purpose
5. Conclusions (optional)
Once the gap in knowledge has been established, the next step is to state your hypothesis or purpose.

A clearly and carefully written hypothesis or purpose statement is the cornerstone of your article. It can also form the basis of other elements of the article.
Three for the price of one!

- State your hypothesis or purpose statement in the **Introduction**.
- Use exactly the same statement in the **Abstract**.
- Use similar words and phrases when you state your main conclusion at the beginning of the **Discussion** section.
In Introduction:
“We hypothesized that the Rb-E2F pathway is one of the critical tumor-suppressor/oncogene pathways involved in regulating telomerase expression and activity in glioblastoma.”

In Discussion:
“We found that the Rb-E2F pathway is involved in regulating telomerase expression and activity in cancer and normal cells…”
Parts of the Introduction

1. Background information
2. Gap in knowledge
3. Hypothesis or purpose statement
4. **Strategy for testing hypothesis or achieving purpose**
5. Conclusions (optional)
What was your overall approach?

“We identified the sequences downstream from the TATA box in basal PolIII snRNA using BLAST searches.”

If necessary, explain your choice of experimental design.
“In this study, we tested the hypothesis that variations in other members of the fibulin gene family are involved in the pathogenesis of macular degeneration by examining the coding sequences of the genes for fibulin 1, 2, 4, 5, and 6 in more than 400 patients with age-related macular degeneration.”
Parts of the Introduction

1. Background information
2. Gap in knowledge
3. Hypothesis or purpose statement
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5. Conclusions (optional)
Conclusions

Should you include them in the Introduction?

- Check the target journal
- What do you prefer?
- Usually not included in reports of clinical studies
- Intrigue your readers, but don’t reveal all your important findings!
“To test this hypothesis, we examined B-cell lymphomas that carried specific chromosomal translocations. In each case, a varying proportion of the microvascular endothelial cells of the lymphoma exhibited the lymphoma-specific genetic aberration, suggesting a close relationship between the two types of cells.”
Parts of the Introduction

1. Background information
2. Gap in knowledge
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5. Conclusions (optional)
Verb Tense in the Introduction
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- For the present state of knowledge, use the **present** tense.
  - “X is a component of Y.”

- For specific findings in previous studies, use the **past** tense.
  - “Sausman et al. (2003) **found** that half of the mice **died** when **treated** with Y...”
Verb Tense in the Introduction

- Use **present perfect** for something that began in the past and has continued to the present . . .

  “Several researchers **have investigated** the effects of Y on the survival of mice.”

  . . . and for something that has not happened yet.

  “**It has not yet been determined** whether X is responsible for the decrease in survival seen in mice treated with Y.”
Verb Tense in the Introduction

- To state your hypothesis (first verb), use **past** tense.
- To describe what you expected to find (second verb), use **present** tense.
  
  “We hypothesized that X is fatal to mice at high concentrations.”

- To describe your strategy, use **past** tense.
  
  “We tested the effects of several concentrations of X on the survival of nude mice.”
Past or Present Tense?

Choice of verb tense sometimes indicates the status of an idea.

Using the present tense conveys that you or the scientific community in general believes the statement to be true.

– “Galileo showed that the earth revolves around the sun.”

– “Several research groups have shown that the proteolytic activity necessary for tissue invasion by *Trichromonas mobilensis* is primarily attributable to cysteine proteases.”
Using the past tense can indicate that there is doubt about the statement’s truth or that something previously believed true has been disproved.

“ Aristotle hypothesized that the sun revolved around the earth.”

“Jones et al. reported that drug Q caused cancer, but later studies proved that drug Q has preventive effects.”
The background information presented in your introduction should be designed to meet the expectations of the journal’s audience, whether specialized or more general.

Keeping your audience in mind in this way will help you decide what to include or exclude.
Tailoring the Introduction to Your Audience

Cancer Gene Therapy:

“[The introduction] should assume that the reader is knowledgeable in the field and should therefore be as brief as possible.”
Cancer Research:

“It is not necessary to include all of the background literature in this section. Brief reference to the most pertinent papers generally suffices to acquaint the reader with the findings of others in the field and with the problem or question which the author’s particular investigation addresses.”
Science:

“Text starts with a brief introduction describing the paper’s significance, which should be intelligible to readers in different disciplines.”
Sample Hypothesis:

“We hypothesized that mutations in the promoter of the X gene increase the probability of prostate cancer metastasis.”

- How would you adjust the Introduction to address an audience of molecular biologists as opposed to an audience of physicians?
We hypothesized that mutations in the promoter of the X gene increase the probability of prostate cancer metastasis.

For molecular biologists:
- **Less** detail about the X gene
- **More** detail about prostate cancer

For physicians:
- **More** detail about the X gene
- **Less** detail about prostate cancer
1. Background information
2. Gap in knowledge
3. Hypothesis or purpose statement
4. Strategy for testing hypothesis or achieving purpose
5. Conclusions (optional)
Questions?
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70th Anniversary Events

• Significance and Innovation in R01 Proposals, Joe Munch, September 6

• Techniques for Polishing Your Paragraphs, Mark Picus, EdD, October 11

• What Are Grant Reviewers Really Thinking? An Inside Look at NIH Study Sections, Panel discussion with Michelle Barton, PhD, Sanjay Shete, PhD, and Imad Shureiqi, MD, November 15