How to write & publish a scientific paper

Dr. Haytham A. Zakai
Medical Technology Program
Faculty of Medicine & Allied Sciences
Content

- What is scientific writing
- What is a scientific paper
- How to list authors and addresses
- How to prepare the abstract
- How to write the introduction
- How to write materials and methods
- How to write the results
Content

- How to write the discussion
- How to write the acknowledgment
- How to cite references
- How to design effective tables
- How to prepare effective illustrations
- Where and how to submit the manuscript
- The review process
- The publishing process
What is Scientific Writing

“Beauty of style and harmony and good rhythm depend on simplicity”

- Plato
The need for clarity

Clear mind

Clear problem

Clear conclusion

Successful scientific experiment
Scientific writing should be:

- Clear
- Simple
- Well ordered

The purpose of scientific writing is to communicate new scientific findings

NOT TO ENTERTAIN
The IMRD system

I ntroduction
M aterials and methods
R esults
D iscussion
The IMRD system

What problem was studied? Introduction

How was the problem studied? Method

What were the findings? Results

What do these findings mean? Discussion
What is a scientific paper

It is a written and published report describing original research
- Primary scientific paper
- Conference reports
- Meeting abstracts
Criteria of a primary scientific paper

- The 1st publication of original research results
- In the form where by peers of the author can report the experiment and test the conclusion
- In a journal or other source document readily available within the scientific community
How to prepare the title

First impressions are strong impressions
How to prepare the title

The title will be read by thousands of people. Few people if any will read the whole paper.

The fewest possible words that adequately describe the content of the paper.
How to prepare the title

Length of a title

Too short title will not give an idea about what is coming next

Too long titles are often less meaningful and contain many waste words
How to prepare the title

The title should be clear
Action of stryptomycin on *Mycobacterium tuberculosis*

WHAT ACTION?!

Inhibition of growth of *Mycobacterium tuberculosis* by stryptomycin

NOW YOUR TALKING!
How to prepare the title

Importance of the syntax

Most of the grammatical errors in titles are due to faulty word order
How to prepare the title

Importance of the syntax

Mechanism of suppression of non-transmissible pneumonia in mice induced by Newcastle disease virus

What was induced? Mice or pneumonia?
How to prepare the title

Importance of the syntax

Multiple infections among new-born results from implantation with \textit{Staphylococcus aureaus}

\textbf{IS IT THE STAPH OF LIFE?}
How to prepare the title

Importance of the syntax

Preliminary canine and clinical evaluation of a new anti-tumor agent

DOGS EVALUATING DRUGS?
How to prepare the title

Importance of the syntax

Characterization of bacteria causing mastitis by gas liquid chromatography

Isn’t it wonderful that bacteria can use GLC?
How to prepare the title

The title is a label. Words should be selected accurately to represent the context of the paper.

Titles should be in machine indexing system.
How to prepare the title

Abbreviations & Jargon:

Titles should not contain any abbreviation or jargon.

Acceptable well known abbreviations (DNA)
How to prepare the title

Titles and subtitles:
- Not welcomed in many journals
- Each published paper should present results of an independent experiment
How to list Authors and Addresses

There is no agreed upon rule on who’s name goes first.

Usually the person made most of the study

Established senior scientist may give recognition (first place listing) to a younger colleague
How to list Authors and Addresses

Authorship:
The author is defined as the one who takes intellectual responsibilities for the research results being reported.
How to list Authors and Addresses

First name - middle initial - last name

Degrees should be listed after names
It may appear in footnote

Consult a recent issue or instructions to authors
How to list Authors and Addresses

Addresses serve 2 purposes:
- Identify the author
- Provide the mailing address

One author = one address.
If >one author, >one address, give abbreviations
How to write the abstract

“A descriptive summary is a table of content in a paragraph for. It is a general map for readers.”

- Michael Alley
How to write the abstract

The abstract is a miniversion of the paper

It should provide a brief summary for each section:

- Introduction
- Materials & methods
- Results
- Discussion
How to write the abstract

Criteria of a good abstract:

- Enable readers to identify the basic content of the paper quickly and accurately
- Enable the reader to determine the relevance of the paper to his/her work
- Less than 250 words
How to write the abstract

- State principle objectives and the scope of the investigation
- Describe the methodology employed
- Summarize the results
- State the principle conclusion
- No references
How to write the abstract

Hints & ideas:

- The abstract is the 1st part read by reviewers. (Clarity & simplicity)
- A good abstract is usually followed by a good paper
- Read the abstract at several times on different occasions.
How to write the abstract

- Remove any unnecessary words
- Prepare it after writing the whole paper.
- K.I.S.S.
How to write the introduction

“A bad beginning makes a bad ending”
- Euripides
How to write the introduction

Purpose of the introduction:

- Supply scientific background information
- Provide rationale for the present study
- State the purpose of the study
How to write the introduction

Criteria of a good introduction:

- Written in the present tense
- Clearly define the problem investigated
- Review the literature to orient readers
- State methods of the investigation
- State the principle result of the study
How to write the introduction

- State the principle conclusion
- Should not keep the reader in suspense
- Don’t leave the best for the last
- It is a scientific article NOT a detective story.
How to write the introduction

Major rules in the introduction:

- Should have a hook to gain reader’s attention
- Give reasons for choosing such a subject and its importance
- Review the literature
- State the principle results and conclusion
How to write materials & methods

Purpose of this section:
- Why choosing a particular method
- Give full details of the method
- List all materials used.
How to write materials & methods

Criteria of a good M&M

- Written in the past tense
- Describe the experimental design
- Provide enough details to repeat the experiment
How to write materials & methods

RESULTS, TO BE OF SCIENTIFIC MERIT, MUST BE REPRODUCABLE
How to write materials & methods

A good reviewer will read the M&M carefully. If there is serious doubt that your experiments could be repeated, the reviewers will recommend rejection no matter how good your results
How to write materials & methods

When writing this section:

- include the exact technical specifications and quantities
- Include the source and method of preparation
- Avoid using trade names (add manufacturer’s name)
How to write materials & methods

- If human subjects are used, criteria for selection must be described
- Use chronological order
- Be precise. Methods are similar to cook book recipes
- Give sufficient details and references
- Use tables if necessary
How to write materials & methods

Major error in this section:
Mixing some of the results with the M&M
How to write the results

Content of the results:

- Overall description of the experiment
- The data
How to write the results

Dealing with numbers:

- If one or few determinations are to be presented, describe them in the text
- If extensive, use tables or graphs
- Use meaningful statistics
How to write the results

The whole paper must stand or fall on the basis of the RESULTS

Introduction
M&M

Why and how you got the results

Discussion

What does the results mean?
How to write the results

It is clearly shown in table 1 that terbinafine inhibited the growth of *Leishmania* promastigotes.
How to write the results

Terbinafine inhibited the growth of *Leishmania* promastigotes (table 1)
How to write the results

Criteria of a good results section:

- Small number of words
- Results stated clearly and simply
- Don’t describe the method. Give brief overview
- Use the past tense
How to write the results

Be clear, simple and straight.

IF YOU ARE OUT TO DESCRIBE
THE TRUTH, LEAVE
ELEGANCE TO THE TAILOR
How to write the discussion

It is the hardest section to write.

Therefore, leave it till the end
How to write the discussion

Present principle, relationships and generalization shown by the results.

Discuss and do not recapitulate the results

Show agreement and/or contrast between results and interpret it with previously published work
How to write the discussion

Point out any exceptions, lack of correlation
Don’t cover up bad results
Try to find an explanation
State your conclusion clearly
Summarize your evidence for each conclusion
Don’t be shy
How to write the discussion

Swing between present (other peoples work) and past (your work) tense

the primary purpose of the discussion is to show relationships among observed facts.

End with a short summary regarding the significance of the work
The Acknowledgment

- Acknowledge any significant technical help
- Acknowledge source of special equipment and material
- Acknowledge financial assistance
The References

- Include each reference cited in the text
- Cite only good references
- Don’t struggle for a long reference list
- Refer to instructions to authors
- Double check the references
How to design effective tables

When to use tables?

If you must present repetitive data
## How to design effective tables

<table>
<thead>
<tr>
<th>Temp</th>
<th>No. of exprt.</th>
<th>FCS in growth medium</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>5</td>
<td>+</td>
<td>78</td>
</tr>
<tr>
<td>24</td>
<td>5</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>
# How to design effective tables

<table>
<thead>
<tr>
<th>Temp</th>
<th>Growth in 48 hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>-50</td>
<td>0</td>
</tr>
<tr>
<td>-40</td>
<td>0</td>
</tr>
<tr>
<td>-30</td>
<td>0</td>
</tr>
<tr>
<td>-20</td>
<td>0</td>
</tr>
<tr>
<td>-10</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>30</td>
<td>7</td>
</tr>
<tr>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>70</td>
<td>0</td>
</tr>
<tr>
<td>80</td>
<td>0</td>
</tr>
</tbody>
</table>
How to design effective tables

Arrange the tabular material horizontal or vertical?

The like elements should read down not across
How to design effective tables

- Avoid using exponents
- Cite tables in numerical order
- Use good, clear, simple and indicative titles
- Prepare camera ready tables
How to design effective illustrations

Golden rule:

USE ONLY IF NECESSARY
How to design effective illustrations

Incidence of hospital acquired infections
How to design effective illustrations

- Use computer graphic software
- Use A4 size sufficient to withstand reduction
- Prepare camera-ready illustrations
- Use well identified symbols
- Attach photographs to a hard copy
- Use colors only if necessary
Where and how to submit the manuscript

Journal(s) publishing this kind of work
The prestige factor
The circulation factor
The frequency factor
Where and how to submit the manuscript

- Don’t staple the manuscript
- Use large paper clips
- Use a strong envelope
- Place the back of the paper pad to add strength
Where and how to submit the manuscript

- Write a covering letter
- Provide the accurate number of copies
- Keep a copy. Originals will not be returned
Dear Contributor,

We are returning your manuscript. It does not suit our present needs.

P.S. We note that you sent your story by first class mail.

Junk mail may be sent third class.
How to deal with the editor

The editor will check if the manuscript in an area covered by the scope of the journal

if not, it is returned with a covering letter
"DEAR CONTRIBUTOR"

"THANK YOU FOR SUBMITTING YOUR STORY TO OUR MAGAZINE"

"TO SAVE TIME, WE ARE ENCLOSING TWO REJECTION SLIPS..."

"...ONE FOR THIS STORY AND ONE FOR THE NEXT STORY YOU SEND US!"
How to deal with the editor

The editor will ask:
- Is the manuscript in a suitable form for consideration?
- Enough copies?
- Are they in double space?
- Complete?
"DEAR CONTRIBUTOR..."

"THANK YOU FOR SUBMITTING YOUR STORY"

"WE REGRET THAT IT DOES NOT SUIT OUR PRESENT NEEDS"

"IF IT EVER DOES, WE'RE IN TROUBLE"
How to deal with the editor

The editor will decide who will review the manuscript (usually 2)

The editor will decide to accept or reject depending on reviewers comments
"Dear contributor",

"We have received your latest manuscript",

"Why did you send it to us?"

"What did we ever do to hurt you?"
How to deal with the editor

The modify letter
The accept letter
The reject letter
<table>
<thead>
<tr>
<th>Instruction</th>
<th>Mark in text</th>
<th>Mark in margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capitalize</td>
<td>Hela cells</td>
<td>cap</td>
</tr>
<tr>
<td>Make lower case</td>
<td>the <em>penicillin</em> reaction</td>
<td>l.c.</td>
</tr>
<tr>
<td>Delete</td>
<td>a very good reaction</td>
<td></td>
</tr>
<tr>
<td>Close up</td>
<td>Mac Donald reaction</td>
<td></td>
</tr>
<tr>
<td>Insert space</td>
<td>lymph node cells</td>
<td></td>
</tr>
<tr>
<td>Start new paragraph</td>
<td>in the cells. The next</td>
<td></td>
</tr>
<tr>
<td>Insert comma</td>
<td>in the cells after which</td>
<td></td>
</tr>
<tr>
<td>Insert semicolon</td>
<td>in the cells however</td>
<td></td>
</tr>
<tr>
<td>Insert hyphen</td>
<td>well-known event</td>
<td></td>
</tr>
<tr>
<td>Insert period</td>
<td>in the cells. Then</td>
<td></td>
</tr>
<tr>
<td>Insert word</td>
<td>in cells</td>
<td></td>
</tr>
<tr>
<td>Transpose</td>
<td>proofreader</td>
<td></td>
</tr>
<tr>
<td>Subscript</td>
<td>CO₂</td>
<td></td>
</tr>
<tr>
<td>Superscript</td>
<td>YP</td>
<td></td>
</tr>
<tr>
<td>Set in roman type</td>
<td>The <em>bacterium</em> was</td>
<td></td>
</tr>
<tr>
<td>Set in italic type</td>
<td>P. aeruginosa cells</td>
<td></td>
</tr>
<tr>
<td>Set in boldface type</td>
<td>Results</td>
<td></td>
</tr>
<tr>
<td>Let it stand</td>
<td>a very good reaction</td>
<td></td>
</tr>
</tbody>
</table>