

WRITING MANUSCRIPTS FOR BIOMEDICAL PUBLICATIONS

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LEARNING OBJECTIVES

Discuss how to write original articles and reviews.

Provide tools necessary to successfully write, submit, and publish a manuscript.

Provide you with at least one piece of new information.

DID YOU KNOW...

- That less than half of the abstracts presented at professional meetings are later published as full articles, even though most are suitable for publication?

Source: Pierson, D. J. (2004). The top 10 reasons why manuscripts are not accepted for publication. *Respiratory Care*. 2004 Oct;49(10):1246-52.



Lack of Time

Research is ongoing

Authorship problems

Negative results

Lack of experience

Poor writing skills

THE SCIENTIFIC PAPER

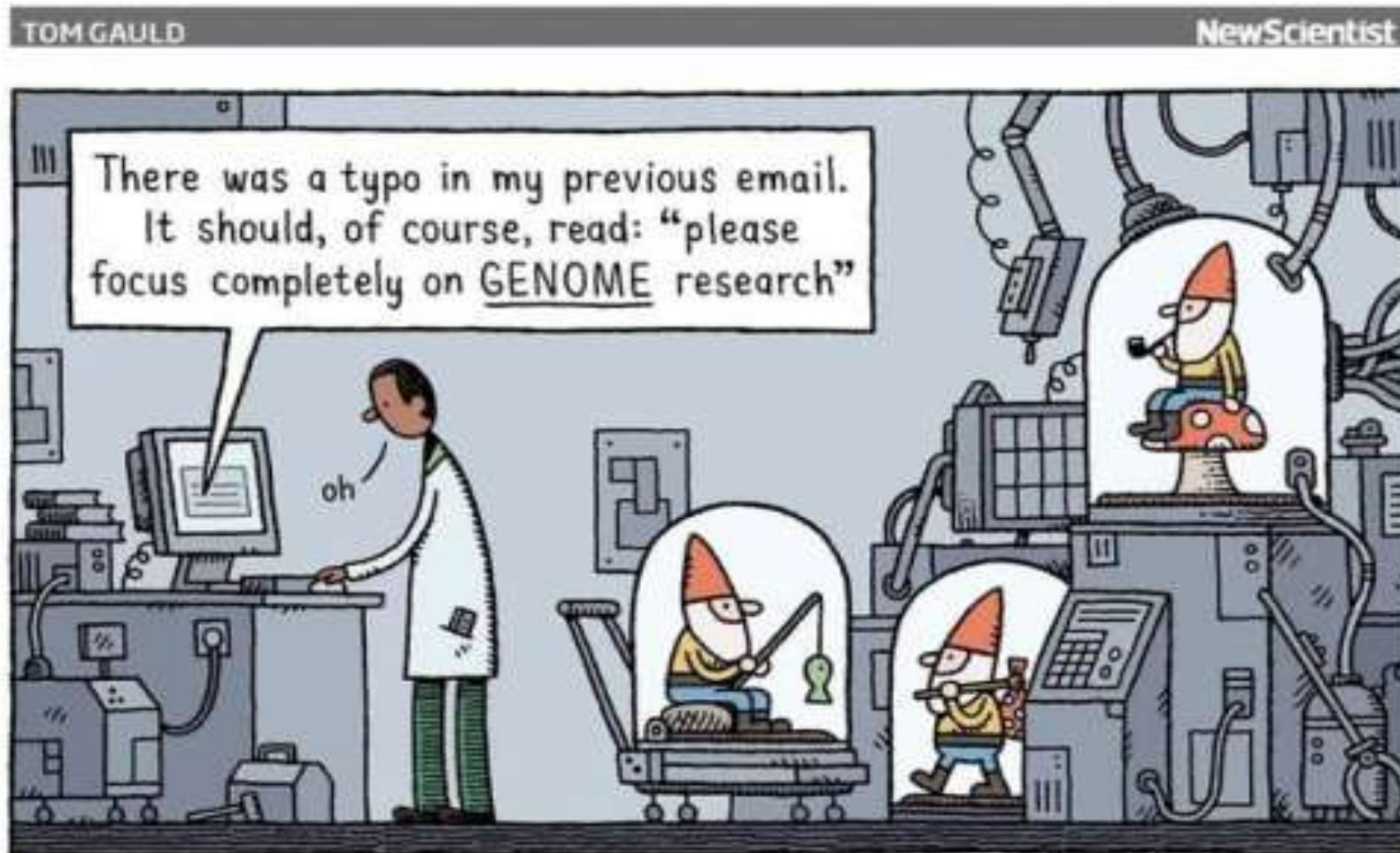
A well-written scientific paper explains the scientist's motivation for doing an experiment, the experimental design and execution, and the meaning of the results.

Scientific papers are written in a style that is exceedingly clear and concise. Their purpose is to inform an audience of other scientists about an important issue and to document the particular approach they used to investigate that issue.

GENERAL ORGANIZATION

- (1) Abstract
- (2) Introduction
- (3) Methods
- (4) Results / Results and Discussion
- (5) Discussion / Conclusion
- (6) Literature Cited

GOAL: CLEAR COMMUNICATION





CLARITY IS KEY.

Instead of this:

This paper provides a review of the basic tenets of cancer biology study design, using as examples studies that illustrate the methodologic challenges or that demonstrate successful solutions to the difficulties inherent in biological research.

Write this:

- “This paper reviews cancer biology study design, using examples that illustrate specific challenges and solutions.”

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GETTING STARTED

Hypothesis and literature search

HYPOTHESIS & LITERATURE REVIEW

- Use the hypothesis to search the literature for the steps that have been made toward answering this question.
- Reviewers of manuscripts are often peer reviewers. They will notice if important literature is omitted from your review.
- The best way to ensure that you have captured all relevant articles is by searching two or three relevant databases.
 - MEDLINE
 - PubMed (more comprehensive than MEDLINE)
 - Scopus, Web of Science
 - Privately supported databases (Highwire Press)

TIPS FOR THE LITERATURE

- Do not use articles that are more than ten years old.
- Do not rely on abstracts.
 - Obtain the full-text articles.
- Relevant articles published in the journal to which you are submitting should be included.
- Find recently published articles that are similar to the one you wish to submit. You will want to show how your results are new or different.

OTHER CONSIDERATIONS

- Target journal
 - Electronic
 - Open-access
 - Impact factor
 - Read the instructions to authors!
- Authorship
 - ICMJE criteria:
 - substantially contribute to conception and design of the study, acquisition of data, or analysis and interpretation of data;
 - draft the article or revise it critically for important intellectual content;
 - and approve the final version



The background features a dynamic, abstract design with flowing, wavy bands of color. The top band is a vibrant red that transitions into a bright yellow. Below this, there are more complex, layered waves in shades of red, orange, and yellow, creating a sense of movement and depth. The overall aesthetic is modern and energetic.

ABSTRACT

Purpose, approach, common mistakes

THE ABSTRACT...

- **Introduces** the article
- **Informs** readers about the article's content
- Helps readers **make decisions** about whether to read the article
- Must have the **greatest impact** in as few words as possible

PURPOSE

- To provide an overview of everything in the manuscript that is “important, novel, and new”, and by doing so, inspire readers to read the manuscript.
- In other words, the purpose of the abstract is to show readers that the information contained in your manuscript is **important**.

APPROACH


- To fulfill this purpose, the abstract must be easily understandable.
- This can be achieved by ensuring that your abstract answers six key questions.




KEY QUESTIONS

1. Why was there a need to do the study?
2. How was the study conducted?
3. What were the key aspects/limitations?
4. What exactly was done?
5. What were the findings?
6. How does the new knowledge that was gained advance the field?

EFFECTIVE ABSTRACTS




- Are one or more well-developed paragraphs, which are unified, coherent, concise, and able to stand alone (200-300 words)




- Use an introduction-body-conclusion structure in which the parts of the report are discussed in order: purpose, research questions, methods, findings, conclusions, recommendations




- Follow strictly the chronology of the report



- Add no new information - merely summarize report



- Can stand alone - the abstract can be understood without reading the paper



- Are intelligible to a wide audience

WRITING AN ABSTRACT

1. Remember that an abstract typically contains: **topic, research question, methods, results, and conclusion.**



2. Read your paper in its entirety. Keep the above categories in mind and **underline key points** (outlined in #1) as you read.



3. After you finish reading, **create your abstract step-by-step** based on your underlined material.

WRITING THE PARTS OF THE ABSTRACT

Step-by-Step Process:

1. Write **1-2 introduction sentences** that explain topic, purpose, and research question(s).
2. Write **1-2 sentences describing your research methods** (this may also include the type of data analysis you used).
3. Write **1-2 sentences describing the results / findings**.
4. Write **1-2 sentences** containing **your conclusions** and recommendations.

REVISING THE ABSTRACT

- Read your abstract all the way through:
 - add transition words to tie ideas together,
 - eliminate unnecessary content and add in things that are missing,
 - correct errors in mechanics, and proofread.

This ~~aretielle~~ article describes the results of ~~a~~ an investigation of the benefits of playing different ~~kinds~~ genres of music to plants, measuring how well they then



THINGS TO AVOID

- Minimize discussion of past results.
- Avoid abbreviations, particularly those that are less well known.
- Do not include citations.
- The abstract must be able to stand alone.

SAMPLE ABSTRACT

Alcohol consumption during pregnancy can produce adverse outcomes; maternal smoking compounds this risk. We examined prevalence of smoking and associations between smoking and alcohol use in Russian women of childbearing age (N = 648). Smoking was reported by 35% of nonpregnant and 14% of pregnant women. Smoking prevalence was higher (45%) among at-risk drinkers and those at risk for an alcohol-exposed pregnancy (AEP). In a multivariate model, smoking status and city of residence significantly predicted AEP risk. Pregnant women in urban locations were more likely to smoke. Smoking and alcohol misuse often co-occur among Russian women, presenting risk for dual prenatal exposure.

Source: Balachova, T., Zander, R., Bonner, B., Isurina, G., Kyler, K., Tsvetkova, L., & Volkova, E. (2017). *Smoking and alcohol use among women in Russia: Dual risk for prenatal exposure*. *Journal of Ethnicity and Substance Abuse*, 5:1-16. doi: 10.1080/15332640.2017.1328325.

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INTRODUCTION

Purpose, approach, common mistakes

TWO PURPOSES

- **Provide context**

- Let the reader know the problem that will be solved or the question that will be answered in the manuscript.
- Briefly summarize the status of a current field and identify the question or problem.

- **Focus manuscript**

- Justify and describe the approach used to solve the problem/answer the question.
- Briefly review what was actually done, and state hypothesis.

Results/outcome are usually NOT reported in the Introduction.



APPROACH

Write the Introduction to answer the question:

“What is the problem?”

WRITING THE INTRODUCTION

Ideally, the Introduction will not be more than 1.5 pages.

Paragraph
1

Describes the background of the study and lays out the purpose of the study

Paragraph
2

Provides the importance of the problem and what remains unknown

Paragraph
3

States the rationale, hypothesis, main objective, or purpose



THE INTRODUCTION ANSWERS:

What is the research question?

Why ask that research question?

What material or population?

WRITING THE INTRODUCTION

- This section discusses the results and conclusions of **previously published studies**, to help explain why the current study is of scientific interest.
- The Introduction is organized to move **from general information to specific information**. The background must be summarized succinctly, but it should not be itemized. **Limit the introduction to studies that relate directly to the present study. Emphasize your specific contribution** to the topic.
- The **last sentences of the introduction should be a statement of objectives and a statement of hypotheses**. This will be a good **transition to the next section, Materials and Methods**, in which you will explain **how** you proceeded to meet your objectives and test your hypotheses.

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MATERIALS AND METHODS

Purpose, approach, common mistakes



PURPOSE

The two essential elements are:

- a presentation of the **study design** and
- the **identification and description** of the measurement parameters used to evaluate the purpose of the study



APPROACH

Write the *Materials and Methods* section to answer the question:

“How did we solve the problem?”

CONTENT

Note that Results are NOT INCLUDED here.

Materials

- Chemicals (drugs, culture media, buffers, gases)
- What was examined (molecule, cell line, tissue)
- Animals
- Human subjects

Methods (Essential)

- What you did
- In what order
- How you did it
- Why you did it

Other Information

- Preparation
- Assumptions
- Definitions of Indicators

WHAT YOU DID

- Question(s) Asked
 - Independent variable(s) - interventions made
 - Dependent variable(s) – variables measured
- All controls
 - Baseline
 - Control series – sham experiments, placebos
 - Other

STUDY DESIGN

Order

- interventions
- measurements
- experiments

Duration

- interventions
- measurements
- experiments

Sample size

- Unless stated elsewhere

COMMON MISTAKES

Failing to include sufficient data on what was done

Omitting photograph or diagram of setup (device study)

Omitting survey instruments (if used)

Quoting or citing a lab manual

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RESULTS

Purpose, approach, common mistakes



PURPOSE

The Results section objectively presents your key **findings**, *without* interpretation, in an orderly and **logical sequence** using both **text** and **Tables and Figures**.



APPROACH

Write the Results section to answer the question:

“What did we find out?”

WHAT SHOULD BE INCLUDED?

- All measurements described in the Materials and Methods section must be reported in the Results section, **in the same order** as they appear in the Materials and Methods section.
- Use past tense.
- Include only results pertinent to the question, no background or discussion.

RESULTS ARE DIFFERENT FROM DATA.

- *Data* are facts, often numbers, obtained from experiments. Data can be raw, summarized, or transformed.
 - “In 20 control subjects, the mean resting blood pressure was 85 ± 5 (SD) mmHg. In comparison, in the 30 tennis players, the mean resting blood pressure was 94 ± 3 mmHg.”
 - The above example gives *data*, but no *results*.
 - Present *data* after stating the *result* they support.
- *Results* are general statements that interpret data.
 - “The mean resting blood pressure was higher in the 30 tennis players than in the 20 control subjects [94 ± 3 (SD) vs. 85 ± 5 mmHg, $p < 0.02$].”

A NOTE ABOUT WORD CHOICE

- Ability:
 - “We could not demonstrate high-affinity, low-capacity DHE binding sites in heart particulates prepared from three adult sheep”.
 - “Could not demonstrate” implies that binding sites may have been there, but the technique was not sensitive enough to detect them.
- Actuality:
 - “There were no high-affinity, low-capacity DHE binding sites in heart particulates prepared from three adult sheep”.

Likewise, be careful when choosing between “did not” and “failed to”.
“Failed” implies that there was an expectation that the value “should have” X.
In general, use the neutral “did not”.

FIGURES & TABLES

- Figures and tables should be simple, **expand information** rather than repeat it, be consistent with reported data, and summarize the data.
- Figures and tables should be comprehensible **on their own**, without referring to the rest of the manuscript.

FIGURE EXAMPLE

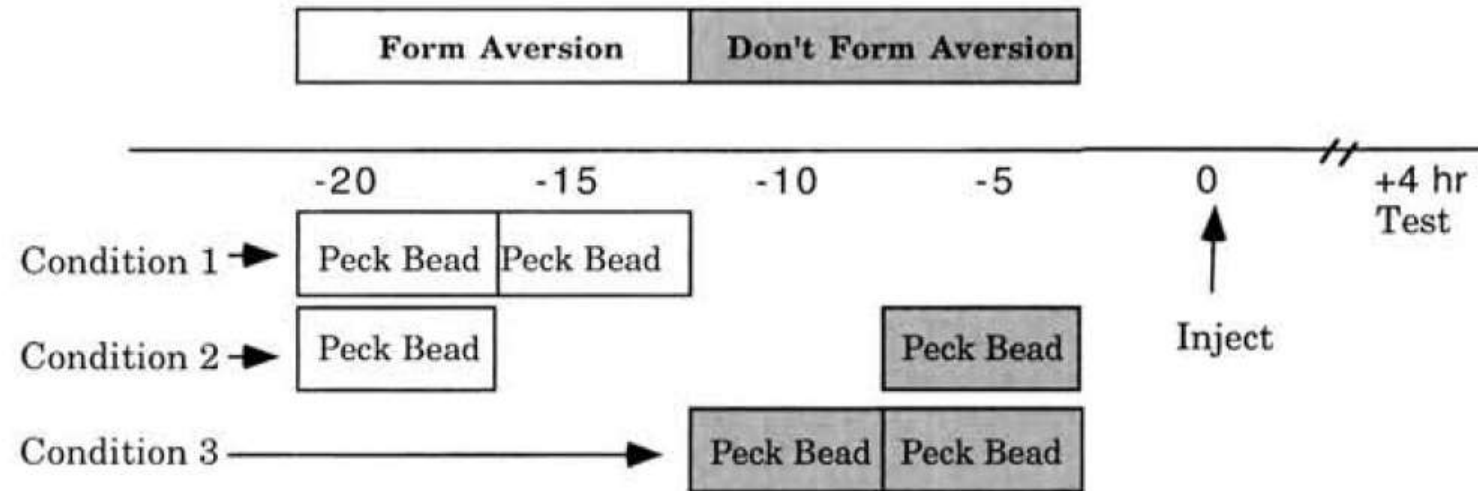


Figure 1. The design and predictions of Experiment 1. Chicks pecked either a red or white bead and then a bead of the other color at different times before injection of saline or lithium chloride. They were tested 4 hr after pecking the last bead.

Source: Chromiak, W., Barber, T.A., & Kyler, K.J. (2000). *Selective associations in day-old chicks: when do CS traces become available for sickness conditioned learning?* Behavioral Neuroscience, 114(1), 117-124.

COMMON MISTAKES

Interpretive
comments in
Results section

Discrepancies
between Results
and Abstract

Repeating data
that are listed in
Tables and
Figures

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DISCUSSION

Purpose, approach, common mistakes



PURPOSE

This Discussion is where you interpret your results in light of **what was already known** about the subject of the investigation, and to explain our new understanding of the problem after taking your results into consideration.



APPROACH

Write the Discussion section to answer the question:

“What does this mean?”

WHAT TO INCLUDE HERE:

- This section should be structured as if it were a **natural flow of ideas**.
- Start with a simple statement of the key findings and whether they are consistent with the study objectives listed in the Introduction section.
- Strengths, weaknesses, and limitations should be addressed.

ORGANIZATION

Beginning:

State the answer to the question and support the answer with results.

Middle:

Organize topics according to the science or from most to least importance to the question.

End:

Restate the answer or indicate the importance of the work.

STATE & SUPPORT THE ANSWER

Answer each question exactly as you asked it:

- Use the same key terms, point of view, and (when appropriate), the same verb.

Support the answer by:

- Using your own results and others' results when relevant
- Citing figures and tables when they would be helpful
- Citing appropriate references for others' results



KEY QUESTIONS

- Do your results provide answers to your testable hypotheses? If so, how do you interpret your findings?
- Do your findings agree with what others have shown? If not, do they suggest an alternative explanation or perhaps a unforeseen design flaw in your experiment (or theirs?)
- Given your conclusions, what is our new understanding of the problem you investigated and outlined in the Introduction?
- If warranted, what would be the next step in your study, e.g., what experiments would you do next?



COMMON MISTAKES

Starting with a
second
Introduction

Starting with a
summary of the
results

Beginning the
discussion with
secondary
information

Writing a
Discussion that is
simply too long

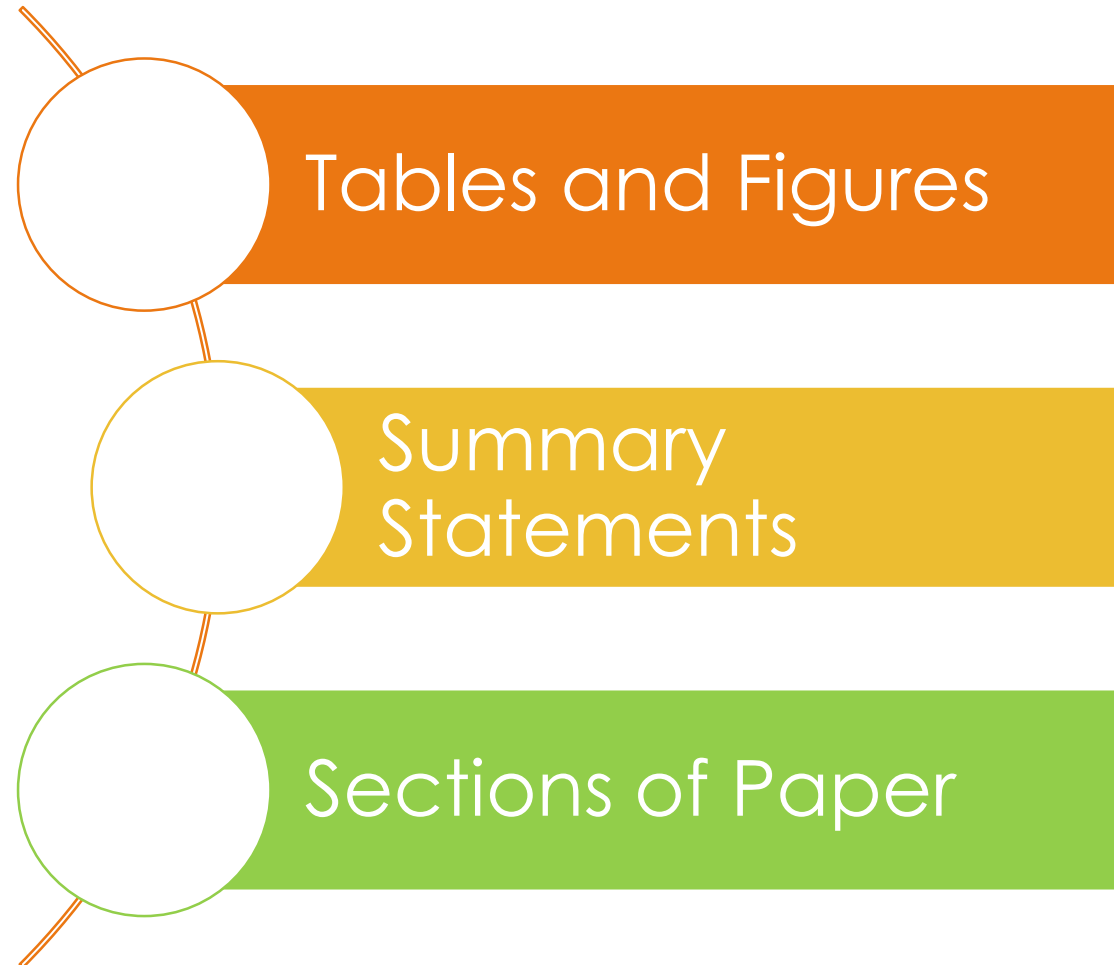
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THE FIRST DRAFT

Approach, sequence of writing

FIRST STEPS

- Some find it helpful to create tables and figures first.
- These can then be used to help write summary statements.
- These summary statements are then “fleshed out” to create the sections of the paper.
- Don’t worry about grammar, structure, and spelling at this stage.



SUGGESTED ORDER

Method

- Provide all details necessary to replicate the study.

Results

- Organized presentation of findings
- Use past tense.

Discussion

- Explain the meaning of the results.

Introduction

- Introduce the topic to readers in a straightforward, non-wordy manner.



A NOTE ABOUT THE ABSTRACT

Write
the abstract
last.



RESOURCES

Publications, identifying target journals, editing on campus

HELPFUL PUBLICATIONS

- Glasman-Deal, H. (2010). Science research writing: a guide for non-native speakers of English. Imperial College Press: London.
- Papasian, C. J. & Morrison, D. C. (2018). Writing for biomedical publication.
<http://www.grantcentral.com/workbooks/biomedical-publication/>
- Zeiger, M. (2000). Essentials of writing biomedical research papers. McGraw-Hill: New York.

RESOURCES

To identify target journals:

MedBioWorld <http://medbioworld.com>

- A comprehensive list of 13,000 biomedical journals, with JCR rankings for 5,000
- Can select by topic and sort alphabetically or by impact factor

Journal/Author Name Estimator (JANE)

- <http://jane.biosemantics.org>
- Suggests possible target journals based on the title of your manuscript
- Can also search by keywords

OUHSC STAFF EDITOR

Ms. Kathy Kyler is the VPR staff editor. Her editorial assistance will be available on request without charge through the Vice President for Research office.

In general, turnaround time is 7 business days for manuscripts and 5 business days for grant proposals of 12 pages or less for the research plan.

Submit your proposal or manuscript project in an MS Word format to Kathy at Kathy-Kyler@ouhsc.edu.

REFERENCES

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