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**A Beginner's Guide to Writing a Life  
Science Paper**

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## How to Write a Good Life Science Paper

Sitting down for the first time to write your own life science paper can be a daunting prospect. Writing a PhD thesis is hard - but publishing a scientific paper adds another level of difficulty as it exposes us and our research to a greater level of scrutiny and critic.

So we thought we would start this article with two pieces of good news to get you started:

1. You are going to publish a life science paper! That is great news and many congratulations are due for all of your hard work to get to this position.
2. You are reading this article: when each of the scientists at ichorbio set out to write their first papers they had a blank screen: hopefully you can learn from our mistakes through the article below.

We are mainly focusing our examples for publishing life science articles in the *in vivo* space as that is the background and strength of ichorbio, but as much as possible we have made sure that our beginner's guide can be used by all life science fields.

A couple of final points:

- This has been a group effort, written by all of the R&D staff in ichorbio and we have paid for been reviewed by external consultants with extensive publication experience. So this article is from a “we” perspective, and so we hope it is more balanced and detailed because of this.

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- At the time of the first release our guide to writing a life science paper is just under 40 pages long, but please do not be overwhelmed: the document is double-line spaced to make it easier to read and we have also split it into ~1 page sections to make it more digestible. We have also tried to answer specific and practical questions about how to write a good science paper (for example “how long should a research article be?” and “how do we write a results section?”) - so feel free to skip to the specific part you need help on via the contents section below. We have also provided a pdf version of this document so that you can easily print out the specific pages you want to read in more detail (please be mindful before printing the whole article).

## Before Writing your Life Science Paper: Best Practices

This may seem like an unusual place to start this document but we wanted to spend a little bit of time discussing the sorts of things you should be doing on a day-to-day basis to get yourself into a position to publish your life science paper in a high impact journal.

### Do a thorough literature review

To ensure that your research is impactful you need to familiarize yourself with the body of research already published. Often there is a large amount of literature available, especially for hot areas of research and sometimes the results from different studies are conflicting.

One way to address this could be to hire a group to do a systematic reviews on your behalf: an example is [SYRCLE](#) in animal research. Systematic reviews identify and critically evaluate the findings of all the relevant high quality studies that examine a particular research question. Systematic reviews establish to what extent existing research has progressed towards clarifying a particular issue. This can help provide implications for best practice and also shape the direction of future research.

### Choose the question / hypothesis you want to address

At the start it may feel like you are fishing for research information or research topics to create a life science paper on and that is fine: everybody goes through that when they are trying to prepare for new grants and things.

But this kind exploratory work is best suited for a small pilot trial and generally is not for paper format. Maybe it can be used for a presentation and a poster or a short paper at a meeting?

It is important to keep evaluating the question you have chosen when you are performing your research: is it still the core question or hypothesis that is driving your main study or does it need to be adjusted? How does it fit into the current research in your field and how can you go about answering it / proving it to be true or false as the case may be?

## **Make sure your experimental design is reasonable and appropriate for the study**

It is important that you make decisions about how to design your experiments from the outset so that you do not waste resources. This is of course critically important for animal research - but budget and time constraints affect us all so designing your experiments from the outset will help a lot. Some considerations before starting your experiments:

### **1. Do you have a clearly defined question?**

As discussed above :-)

## 2. What is the reference population?

In the very first sentence in the methods section of a 2017 [paper](#) in a high impact journal the authors mention that they used male New Zealand white rabbits. When we look at this our first question is why have they only used males for this: are males actually representative of both males and females? And if not, why were just males used? Likewise the authors have chosen to use New Zealand white rabbits: are these the best model for this particular coronavirus versus others? Are they representative of all rabbits? Are they a good model for humans?

And these are the sorts of questions that you should be thinking about when starting to design your experiments. Related questions will be how the groups are created, what are the endpoints of the experiment, what are the group sizes and more.

## 3. Is bias avoided at every stage?

Bias distorts the end itself. And it is generally not intentional. People do not start out doing research and plan to have biased results, but it can occur and it can be reduced by blinding:

Level	Single Blind		Double Blind		Triple Blind
Subject / Caregiver	X		X	X	X
Observer		X	X		X
Data Analyst			X	X	X

In this experiment the individual, if it is a human based study, does not know which treatment group they are in. And the observer who is watching those subjects or dealing with them on a

regular basis does not know which group they are in. In addition to this, the person analyzing the data does not know which group they are in and we can blind at a single, double or triple level. Obviously the triple blind scenario is the most robust when you think about quality of papers and publications.

We just want to make a little tangential remark about randomization for studies. We need to think about this a lot, not only when you are conducting this study, but you also need to convey this when writing impactful papers: randomization reduces the possibility that unidentified determinants of the outcome will bias us the results of the study.

That is why the method used to randomize the study should be described exhaustively in the methods section. Randomization is not the same as haphazard selection. So deciding that you are going to start with, for example, cage number three first and then move on to cage 8 is not randomization.

Randomization could be flipping a coin every time a decision has to be made, or it could be done by using a random number list from a statistics textbook or my preferred way is just using a computer generated list from a website like [www.random.org](http://www.random.org).

#### **4. Statistical analysis and interpretation**

We want to bring up this [paper](#) that was published in 2010 that was based on a survey of over 270 published papers. They all looked at experimental designs, statistical analysis and reporting of research using animals. In this particular study, they found that only 12% of these publications reported randomization and 14% reported blinding to reduce bias in animal selections and outcome measurements.

They also found that only 70% of the publications fully described the statistical methods and presented the results with a measure of variability that allows readers to determine the significance of the findings.

And then finally, less than 60% of the papers stated the hypothesis, the number and the characteristics of animals used. This suggests that there are a lot of areas for improvements and experimental design analysis and reporting.

## **Are the right partners involved in the work that is going to be published?**

This is another important question that needs to be continuously asked as your project progresses: do you have all the right contributors for your project or are there skill sets that are perhaps missing?

As an example, say we are reading a paper about a new mouse phenotype for a particular disease condition and it involves a lot of pathology analysis. If the authors of the paper are all molecular biologists and there is no comparative pathologists involved there could be credibility issues about the final conclusions of the phenotype.

If you ensure that the right collaborators are involved it ensures the highest accuracy of interpretation, lends weight to your findings and can help when submitting your paper to high impact journals.

## Before writing your Life Science Paper: Assessing the Work you have Produced

### High impact or low impact?

Your first step in preparing to write a scientific paper is to think about the following:

- Have we done something new and interesting?
- Is there anything challenging in our work?
- Is our work related directly to a current hot topic?
- Have we provided solutions to some a difficult problem?
- Could our work help others to progress their research?

If your answers are all "yes," then you should find success in submitting your paper to higher impact journals. If any of the responses are "no", then it is more likely that you will need to submit your paper to a local journal or one with lower Impact Factor.

When responding to these questions, you should keep in mind that reviewers are using questionnaires in which they must respond to criteria such as:

- Does the paper contain sufficient new material?
- Is the topic within the scope of the journal?
- Is it presented concisely and well organized?

- Are the methods and experiments presented in a way that they can be replicated?
- Are the results presented adequately?
- Is the discussion relevant, concise and well documented?
- Are the conclusions supported by the data presented?
- Is the language acceptable?
- Are figures and tables adequate and well designed?
- Are all references cited in the text included in the references list?

## Decide what type of the manuscript to write.

There are at least three options on the type of manuscript:

1. **Full articles, or original articles**, are the most important and impactful types of papers. Often they are substantial completed pieces of research that are of significance as original research.
2. **Letters/rapid communications/short communications** are usually published for the quick and early communication of significant and original advances. They are much shorter than full articles (usually strictly limited in size, depending on each journal).
3. **Review papers or perspectives** summarize recent developments on a specific hot topic, highlighting important points that have previously been reported and introduce no new information. Normally submissions for these are by invitation from the editor of the journal.

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You must self-evaluate your work: Is it sufficient for a full article, or are your results so good that they should be shared as soon as possible?

It is worth asking your supervisor or a colleague for advice on the type of manuscript to be submitted. Remember also that sometimes outsiders – i.e. colleagues not involved in your research – can see things more clearly than you.

Whatever type of article you write, plan to submit only one manuscript, not a series of manuscripts. (Normally editors hate this practice, since they have limited space and series of manuscripts consume too many pages for a single topic or an author/group of authors).

## Writing a Scientific Research Article

### Write the paper in a concise and clear way

Is there a clear story? Can people follow the flow of the paper?

One thing that we have always discussed with graduate students over the years is that you will rarely receive full credit for all the work that is done to pull a paper together: perhaps it took you nine months to learn how to embed tissues, prepare tissue sections and prepare a new immunohistochemistry assay for your lab. You will not get credit for that in the paper. Maybe you will get that in the appendix of your thesis, but it should not go into the paper.

A common problem is that papers that are submitted are way too long. So you should work very hard at condensing your material and removing any filler words or filler paragraphs to ensure that people can really follow the storyline and connect the dots between the points that you want to make.

Try to follow the point, proof, comment format for your paragraphs:

1. Tell them what you found in your paper
2. Provide the proof or support for your theory with other papers that have been published in that area
3. Wrap it up in a nice comment that summarizes what the conclusions are for that particular paragraph

Experts find it really hard to be simple and straightforward when they are writing about things that they are experts in, but as much as possible try to use plain language and avoid jargon when you are writing. This can increase the accessibility of your paper and the audience can be much broader than you imagined.

And one thing that is really annoying for reviewers and readers are spelling and grammar mistakes. It is simple to make these types of mistakes, but they are also very easy to fix: from a simple spell check to free apps like Grammarly that can recommend changes in sentence structure and more.

If you are unsure whether parts of your article are clear enough, get somebody else to read it for you to make sure these little errors disappear.

## **How many words should a life science paper be?**

There is no simple answer to this question and it is very important to look at the Guide for Authors in the life science journal you are looking to publish in. However, it is safe to say that an ideal length for a manuscript is 25 to 40 pages, double spaced, including essential data only.

Here are some general guidelines:

- Title: Short and informative
- Abstract: 1 paragraph (<250 words)

- Introduction: 1.5-2 pages
- Methods: 2-3 pages
- Results: 6-8 pages
- Discussion: 4-6 pages
- Conclusion: 1 paragraph
- Figures: 6-8 (one per page)
- Tables: 1-3 (one per page)
- References: 20-50 papers (2-4 pages)

## What is the format for a life science paper?

The organization and structure of a scientific manuscript is always the same no matter what journal you want to target. It starts with a Title followed by an Abstract and well-chosen Keywords.

For the content of the abstract, do not forget that this is what the reviewers get sent by the editors and what they use when they are trying to make a decision as to whether or not to review the paper. Reviewers will make a determination on the quality of your paper based first on the quality of your abstract.

For the sections after, you should follow the [IMRAD format](#), which is an acronym for the format below:

- Introduction: What did you do compared to what was done before? Why did you undertake this research project?

- **Methods:** How did you do it and what did you use?
- **Results:** What answers did you find?
- **And**
- **Discussion:** What is the meaning and the perspectives of all this?

This section of main text is then followed by the Conclusion, Acknowledgements, References and Supporting Materials.

While this is the structure of what your finalized life science paper will look like, it is actually easier and more logical to write it in a different order:

## 1. Figures and tables of a life science paper

"A picture is worth a thousand words" - and it is especially true in life science. Figures represent what you have worked so hard for and what is going to actually answer your chosen question for your paper. Therefore your data is the first thing to organize for your article. A key question is "what is the best format for figures and tables in your life science paper?" We will try and answer this question below:

There are two main ways to present your data: as tables or figures.

Tables can be very useful to organize and display the raw results of an experiment, whilst figures are visual representations of data and can be used effectively to compare different variables / groups with calculated or theoretical values (Figure 1).

Weight distribution among 18-year-old young male sex (n = 2.194). Pelotas, Brazil, 2010

Weight at 18 years of age (in kg)	Absolute frequency(n)	Relative frequency (%)
40.5 to 59.9	554	25.25
60.0 to 65.8	543	24.75
65.9 to 74.6	551	25.11
74.7 to 147.8	546	24.89
<b>Total</b>	<b>2.194</b>	<b>100.00</b>

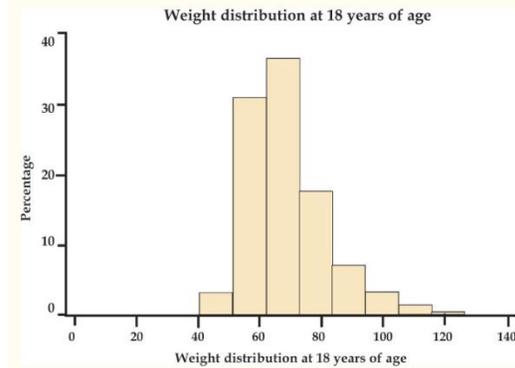


Figure 1: An example of the same data presented as table or as figure. Depending on your main goals, you can show your data either as table (to show actual numbers) or as figure (to compare gradients). Note: Never include vertical lines in a table.

To make a good decision, it is critical to think hard about the main point you are trying to make; however an illustration (table or figure) cannot be used to display an information that has been described elsewhere in the manuscript. And remember: illustrations must be self-explanatory

Also: keep it simple and looking good, appearances count in life science!

Below are some other considerations:

- Plots should not be crowded with data sets, lines and symbols (Figure 2), use no more than three or four data sets per figure and use appropriate axis scales, labels and label size

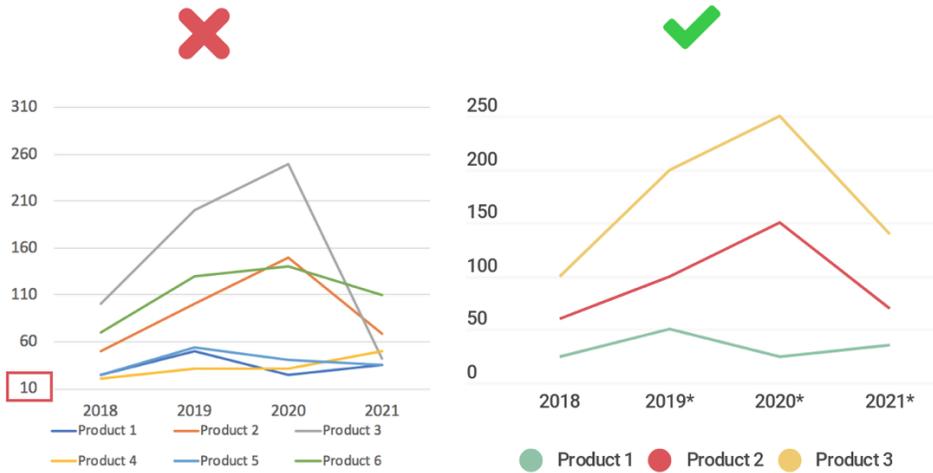


Figure 2: Do not clutter your graphs with too much data, keep it simple but impactful.

- Use decimals, lines, etc. in an appropriate manner in tables and plots (Figure 4)

*Form should follow function*

Depth	Gravel	Sand	Mud
5 m	3,42%	81.41%	15,17%
50 m	2,5%	58.42%	39.08%
100 m	0,0%	32.5%	67.5%

Water depth (m)	Gravel (%)	Sand (%)	Mud (%)
5	3.4	81.4	15.2
50	2.5	58.4	39.1
100	0.0	32.5	67.5

Figure 4: Inadequate use of lines, number of decimals, decimal separators (use always dots, not commas) and position of units (above) and its adequate use (below) for a clearer table.

- Do not use long unnecessary tables (e.g., lists of antibodies, chemical compositions, or lists of species and abundances). If needed, include them as supplementary material.

- Include a scale marker / bar and use the highest resolution possible for photographs and videos.

What about the use of colour? It costs money so use it only when necessary. Try different lines, symbols and shades of grey to make sure that the data points / groups are easily distinguishable and clear (Figure 5). The fee for illustrations in colour depends on the journal but it can be quite expensive especially when you want to submit multiple colour figures. This does not apply to online journals and for some journals it is possible to submit figures in duplicate: for example one in color for the online version of the journal, and another in black and white for the hardcopy journal.

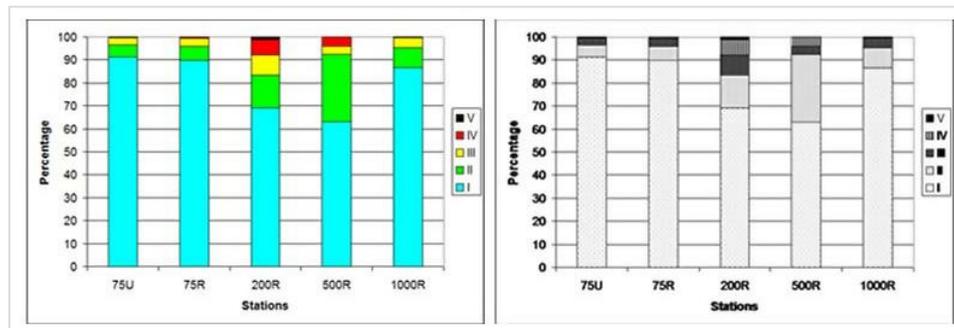


Figure 5: Using black and white for print can save money but always make sure that the data is well represented.

One last issue you need to consider when preparing a figure is how to choose the best graph for your data. Line graphs are generally used to show progress overtime and for continuous data sets (e.g., in a transect from coast to offshore in Figure 6). However, it is not well suited to compare different groups / values. Histograms or bar graphs are best to show numbers that are independent of each other (Figure 6).

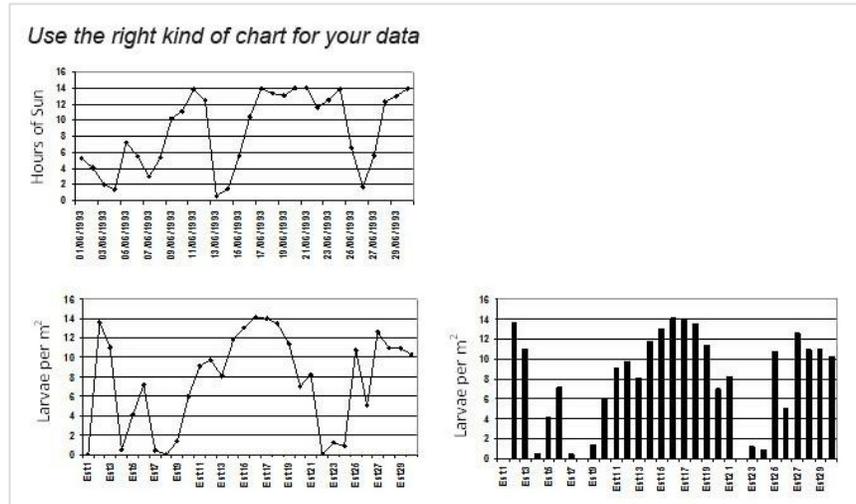


Figure 6: Choose the right type of graphs to better represent your data

## 2. The Methods Section of a Life Science Paper: 2-3 pages

Here is where you explain how your experiments were conducted. This section is easy to write if you are methodical and kept an up to date and detailed lab note book. Description of your methods must be complete, correct and written in a logical order. This is particularly important since reviewers will pay close attention to its quality and may reject the paper if they are not satisfied. Also, your results need to be reproducible by others.

This section should describe the research protocol, the materials used (equipment, compounds, antibodies, etc.), how they were prepared / used, how measurements and calculations were performed and very importantly what statistical tests were used to analyze the data. All the compounds used in the study must be identified so you cannot use proprietary or unidentifiable compounds.

The methods section is not the place to make any comments, describe your results and / or to discuss them.

Remember to keep it simple and brief: for established methods, you do not need to include all the details and it is a very common practice to indicate the previously published procedures. You will need to include them in the References but this can save you time and space in your paper.

There are some guidelines you can follow to help you be precise and thorough during this process, for example:

- For compounds, you can check the recommendations of the [International Union of Pure and Applied Chemistry](#) and the [IUPAC–IUB Combined Commission on Biochemical Nomenclature](#).
- For animal use, use accepted taxonomical nomenclature (International Code of Zoological Nomenclature).
- For units of measurement, follow the [International System of Units \(SI\)](#).

#### **4. The Results Section of a Life Science Paper: 6-8 pages**

The results section is where you present all the answers you found to your research question. Tell a compelling story. To that end, think carefully about how you are going to organize this section and describe the data. This will also help tremendously for the discussion later.

Present representative results only; we will talk about adding supporting materials later. You must organize this section logically. Use sub-headings and keep results that show the same conclusion together. It is more logical and will make it easier to review and read. The publisher's guide for author contains very helpful tips for this.

The results section is not the place to include references, you are talking about your results and your results only. Keep that for the discussion.

Depending on whether or not you choose a print journal, print only journal or an open journal, you are going to be limited in how much and what you can present. Do not repeat identical material, tables, figures and texts. This just lengthens the paper unnecessarily.

Illustrations should come with legends that allow the reader to fully understand the information that is in that particular figure or table. They need to be standalone and you need to have a really good legend; never assume that the reader will be able to identify objects in your images. So you want to put a little arrow, a letter or a number in there that points the readers to what it is that you want them to see and to get out of that particular image.

With open journals, we recommend increasingly that people consider using supplementary data. Here you can include the data that may be sort of background or preparatory, not directly relevant to the points that you are making. This is way better and less frustrating than reading "data not shown" when you are trying to compare work between your own lab and others.

Also think about using the supplementary data you need to have the appropriate statistical information to support the hypothesis. Do not try to “save” data for another paper. Instead use whatever you need to reinforce your conclusion.

Be very careful with your statistical analysis. Here are some rules to follow:

- Indicate the statistical tests used with all relevant parameters: e.g., mean and standard deviation (SD): 21% ( $\pm 3$ ); median and interpercentile range: 5 years (2.5 to 7.5 years).
- Use mean and standard deviation to report normally distributed data.
- Use median and interpercentile range to report skewed data.
- For numbers, use two significant digits unless more precision is necessary (3.14, not 3.1385611).
- Never use percentages for very small samples e.g., "one out of two" should not be replaced by 50%.

Just a side note about negative results as these are always challenging for us to think about and it continues to be a hotly debated topic. Sometimes these results are not as impactful but they help to address bias and they reduce unnecessary use of animals, equipment and other things. It is very common that research groups think that something was never tested before when in fact it was simply because that information cannot be found. This is changing little by little; you can now find online repositories as well as even very high quality journals that allow you to publish negative results - it's all about how you market them in the title and of course other aspects of your paper. So we would highly recommend to include negative results where you think that the result itself is important.

## 5. How to write the Discussion in a Life Science Paper: 4-6 pages

The discussion is the most important section of your life science paper. In the Results section you tell a story; the Discussion is where you have to sell it! The Discussion is where you explain what the results mean and what are the perspectives of your work. Remember that a weak discussion can lead to the rejection of your manuscript.

As far as organization, you can think of your discussion as an inverted pyramid: start with the general and move on to the specific. First, briefly remind the readers the research problem you are investigating. Then describe your major findings (without reiterating the results) and compare them to similar studies by your peers whether they support yours or not. This is where you can show your ability to think creatively about issues, to interpret your findings based on evidence and your deep understanding of the research question you are investigating.

Take into account the following tips:

1. Follow a logical stream of thought and do not state anything beyond what the results support
2. Do not introduce new terms, ideas or new results in the discussion
3. Do not rely on imagination for your analysis and interpretation:
  - Describe your major findings (pattern, principles, etc.) and compare them to your own research and the research of others
  - Describe and discuss anything that was unexpected (why do you believe it happened and its potential significance to your study)

- Identify possible limitations and weaknesses and discuss how it could affect the validity of the results. Be honest but not apologetic
- Propose recommendations for further research but not anything that could have been easily addressed in your study
- Do not exaggerate!

When it comes to revision, remember that it is not just paper work but actually represents lots of actual lab work. You will probably need to repeat and perform further experiments. This is a must when reviewers make critical recommendation that are needed to prove your hypothesis.

## 6. How to write the Conclusion in a Life Science Paper: 1 paragraph

The conclusion consists of a concise summary of the most important implications of your study. This is where you explain why your findings are important and how they contribute to advances in the field. Depending on the journal, it can be a separate section or the last paragraph of the Discussion.

The conclusion is not a reiteration of the abstract, but a summary of your understanding of the problem. You can also use this opportunity to provide a clear scientific rationale for you study and propose any recommendations for further research.

Try your best to leave the best possible impression to the reviewers and readers so they can judge your work based on its true merits.

## 7. How to write the Introduction in a Life Science Paper: 1.5 – 2 pages

One thing that is quite common is a lack of distinction between the introduction and the discussion sections of a life science paper.

So just as a brief reminder, the introduction provides a very brief background and context for this specific line of research. It sets up the hypothesis, the objectives, and the approach for the particular research problem.

The discussion, on the other hand, interprets and describes the significance of the main findings of the paper in light of previous or similar work in the field. It should outline some limitations of the work that was conducted and then point a way forward for future research. So try to avoid having background material in the discussion and interpretation pieces in the introduction.

A good introduction should answer the following questions:

- What is the research question?
- What is your hypothesis?
- How do you plan to answer and test it?
- What are your objectives?

First, you need to provide background information and context. Remember the inversed pyramid for the Discussion? It applies to the Introduction too. Start with the whole picture and move on to the specifics of your field. Base your study on the right scientific publications. Remember to include original and important studies as well recent review articles and be consistent with the nature and style of the journal you have chosen.

However, avoid improper citations of too many references that are irrelevant to the work, it is not appreciated among editors, reviewers and readers.

Here are tips you can follow:

- Once again, be concise. You are telling a story not writing a novel
- Keep it logical and remember the place and purpose of each section of your paper. Do not mix them together
- State clearly the hypothesis and objectives at the end of the introduction
- Again, do not exaggerate. Try to use expressions such as "novel", "first ever", and "paradigm-changing" only sparingly.

## **8. How to write the Abstract in a Life Science Paper: 1 paragraph**

How to write an abstract can be described in two words: Concise and Impactful. Which is easier said than done!

An abstract is like a movie trailer: it is the first detailed look readers will get of your paper and they will not read your manuscript if the abstract is not interesting.

The abstract is the last thing you will write in your paper: it includes key points of the Introduction, the Methods, the Results and the Conclusion. Despite that it is also very short so you need to be accurate, consistent and very mindful of the most important and meaningful aspects of your study.

An abstract is usually organized in the following order:

- Purpose
- Study design
- Methodology
- Major findings
- Conclusions.

Do not forget to remove any extra information and make sure you follow guidelines of your target journal as they can vary quite a bit.

## **9. Compose a concise and descriptive title**

The title of your research paper is the first thing editors, reviewers and later on readers will see. It will either draw their attention or be judged as not worth their precious time. Readers should deduce what your paper is about and its relevance to them based on the clarity and precision of your title. So this is going to require some serious thought and discussions with your co-authors.

A good research article title should reflect the content of the study in only a few words and also differentiate it from others in your field.

Keep the title informative, brief but also attractive. Avoid abbreviations and technical jargon as this will help to keep your readership as large as possible.

The title is something that the reviewers are going to examine closely. Make sure it makes sense, do not exaggerate or overstate anything.

## 10. Select keywords for indexing

Keywords are what we use every day in search engines to find the information that we need. You need to select them wisely if you want readers to find your paper. You can think of them as the label of your manuscript and choosing the right ones will have a significant impact on the number of readers finding your paper when they are searching for different topics in PubMed or other databases.

To look for keywords:

- Follow the guide for authors of your target journal. Some of them require five to eight terms, others have strict rules about the nature of the words
- Use words that you would use to search for papers in your field and related to your specific area of research
- Avoid words already included in your title, try instead to find alternate terms

- Also avoid words with a broad meaning, focus on key concepts
- Use abbreviations only well established in the field

## 11. Write the Acknowledgements

The Acknowledgements section is where you can thank people who have helped in carrying out the research but not to the extent that justifies authorship. Financial support should also be included here. You need to be mindful of who needs to be acknowledged and in what order. As always be concise and maintain the language formal.

You can mention technical help and assistance with writing and proofreading in this section. Remember to thank your funding agency or the agency giving you a grant or fellowship precisely by including the grant number or reference and the exact name of the organization.

## 12. How to write the References section in a life science paper

The references sections is probably the more common place for mistakes. First make sure to check the guide for authors and find the right format and style that correspond to your target journal policy.

Then, use the available tools such as software like [EndNote](#) or [Mendeley](#) to format and include references in your text.

As mentioned above, even though you must cite all the scientific papers your research is based on, do not use too many of them. Do not to use excessive self-citations or citations from people of the same institution as yours. Finally all cited publications must come from peer-reviewed journals.

Remember you need to present the references in the correct format: this is your responsibility. It is such a common place for mistakes that editors will really appreciate your effort to make their job easier.

Whether or not you use a software to format and include your references in the text, you must check the following:

- Spelling of author names
- Year of publications
- Usages of "*et al.*"
- Punctuation
- Whether all references are included

## Approaching Journals

### **Think carefully about which journals you select for publication**

If you have a lot of data or information you need to really carefully weigh the options; one single major high impact paper versus having two or more smaller, less impactful papers. There can be some pros and cons to each approach.

In general, we try to recommend having a single major high impact paper. You may have to lose a little bit of your data or information to be able to pull that together in a concise format, but it will have much more impact in the long run.

You want to find your target audience right at the outset. And this really helps to determine which journals are going to be suitable.

Make sure that you have read the scope for the Journal. This can avoid embarrassing early rejections of papers and then aim high. Of course we all want to publish in high impact places, but realistically appraise your paper and the results to determine whether the quality is really good enough for your first choice. Choose wisely and do not gamble by scattering your manuscript to many journals at the same time. Only submit once and wait for the response of the editor and the reviewers.

You also want to take into consideration all the submissions and publication fees, whether or not it is open access or if there is an embargo period (six to 12 months). Think about those things when you are thinking about different journals and, which one will best meet your budget and timeframe.

When your paper is successfully reviewed and accepted for publication, you will want to get it out to the research community as quickly as possible. Some journals will have an early version that people can access after it is accepted. It might be worth it to look at some previous issues of those journals to get a sense of their reputation and to see whether it is worthwhile publishing with them.

The most common way of selecting the right journal is to look at the articles you have consulted to prepare your manuscript. Probably most of them are concentrated in one or two journals. Read very recent publications in each candidate journal (even in press), and find out the hot topics and the types of articles accepted.

Finally, consider the high rejection rates of the journals (e.g., *Nature*, *Science*, *The Lancet* and *Cell* are >90 percent), and if your research is not very challenging, focus in more humble journals with lower Impact Factors. You can find a journal's Impact Factor on its webpage or via [Science Gateway](#).

You can start writing now! Format and structure your paper keeping in mind the guidelines of the journal you want to target.

## Follow the journal submission requirements

After selecting the journal for submission, go to the web page and download the Guide for Authors, print out it and read the guidelines again and again!

They generally include detailed editorial guidelines, submission procedures, fees for publishing open access, and copyright and ethical guidelines. You must apply the Guide for Authors to your manuscript, even the first draft, using the proper text layout, references citation, nomenclature, figures and tables, etc. Following this simple tip will save your time – and the editor's time.

You must appreciate that all editors hate wasting time on poorly prepared manuscripts. They may well think that the author shows no respect.

For the actual submission, you need to follow the requirements. This may seem like a really obvious point but it is something that happens quite often so use the journal checklist to ensure you have not forgotten anything.

When you forget things this can lead to unnecessary delays in your submission (sometimes up to a month or two) and then all you get in return is a note back from the editorial office stating what is missing. At this point, the editor did not even look at it yet so you will have to go through the submission process from scratch.

Make sure all your forms are signed and submitted. A common place for errors are in references and reference lists. Make sure you go over the in text citations and the actual listings with a fine tooth comb.

Make sure the figures and tables are in the correct format and they are sized appropriately for the journal.

It is particularly important to run a plagiarism check prior to submission when you have multiple authors on your paper. All journals run these plagiarism checks and this can help to avoid embarrassment later on.

Something that we have found to be important in getting accepted into high impact journals is to write a very brief submission letter to the journal editor or sub-editor: you want to identify two or three bullet points that are really interesting and novel from your paper. And doing a nice little letter like this helps to get the editor interested and gets the paper moving quickly along in the process.

Another tip is to submit at least two preferred reviewers for your paper. Sometimes the scope of a paper might be quite broad and people may not be aware of specialists or experts in your particular area so you want to make sure that the editors are sending it to the right place.

Also, do not be afraid to identify anybody who you do not want to be a reviewer: in every field, there are people who may not agree with our particular research approaches or who are a direct competitor. It is fine to identify them. Again, you have to list a bullet point or two just to indicate why they should not be able to review your research.

## **Be persistent in getting your life science paper published.**

“Ever tried. Ever failed. No matter. Try again. Fail again. Fail Better” Samuel Beckett.

Publishing can be a very humbling experience for everyone. It can take two to three attempts in different journals to get acceptance of a paper or even two to three sets of reviews with any given journal.

If reviewers are highly critical of your paper, really take time to think deeply and reflect on their comments before starting your responses and use each set of reviewer comments to improve your paper. While you may not agree with every comment, try to address all the reviewer comments in some way. These people have donated their time and they have really thought about the items that you have put forward in your paper. It is only respectful to try to address their comments.

One last point on this topic. If you have not heard back from the journal for some time after you have submitted don't be scared to follow up with the editorial office. We all know that editors and the editorial offices are really busy, but it does happen once in a while that a paper is lost in the process. So again give them a sufficient amount of time but do follow up.

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FIN !