

Writing a Scientific Paper

Theory and Practice

How to write a Scientific Paper

And get it published

Successful Scientific Publication

50% High quality science

50% High quality communication

British Journal of Pharmacology

2001-2006, Senior Editor

Reading the referee reports and editor decisions on about 250 MSS annually

2006- present, Press Editor

I read about 300-350 MSS per year checking

Layout and format

Scientific terms

Language --- style, syntax, grammar

**Two concepts are crucial
in scientific writing**

Logic

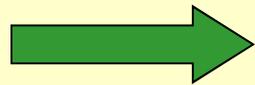
Communication

Logic

Hypothesis / Proposition



**Predictions
Questions**



**Testing by Experiment
(results)**



Conclusions / Answers

Logical layout of ideas / events

At least 3 reasons

Logic is fundamental for all science

Easier to see how Conclusions are derived from the Results and support (**or not**) the Hypothesis

Easier to communicate YOUR ideas to OTHERS

Communication

Experimental results are only half the project

The other half is to communicate those results to others

Maximise efficiency of communication

1. Make the work clear and reliable
2. Get the work published

Practical comments on Good Scientific Writing

Two main types of comments

Logic

Scientific design, content, treatment

Communication

Format; layout, Journal style

Format

Read

the

Instructions to Authors

Components of a Paper

- Title
- Abstract / Summary
- Introduction
- Methods
- Results (inc Figures and Tables)
- Discussion
- References

Title

Logic MAJOR finding or conclusion

Effect A in system B is due to mediator C

“Hypertension in rats fed BigMacs is due to inhibition of nitric oxide synthesis in blood vessels”

“Inhibitory transmission in nucleus accumbens is potentiated by CR-12345” an antagonist of substance P

Title

Communication

Its function is to encourage others to read your paper, so it should be ***INTERESTING and EXPLICIT***

Imagine searching for your paper on Pubmed—include in your title the words that you would use in your search

Title

Format

How many words /spaces / characters?

Usually 150 characters and spaces

Avoid:-

complex chemical names

(better to say .. ABC5476, a CB₁ receptor antagonist)

unfamiliar abbreviations

(ATP is OK, but not T2DM)

technical details

(model of anxiety rather than open maze test)

Examples of good titles



Investigation of the immunosuppressive activity of artemether on T-cell activation and proliferation

Ketamine impairs excitability in superficial dorsal horn neurons by blocking sodium and voltage-gated potassium currents

Inhibition of RhoA/Rho kinase pathway is involved in the beneficial effect of sildenafil on pulmonary hypertension

Examples of poor titles



Antileukoproteinase protects against hepatic inflammation but not apoptosis in the response of D-galactosamine-sensitized mice to lipopolysaccharide

Selectivity of d[Cha⁴]AVP and SSR149415 at human vasopressin and oxytocin receptors: evidence that SSR149415 is a mixed vasopressin V_{1b}/oxytocin receptor antagonist

Title

**Minor effects of antioxidants on angiotensin II-induced
aortic rupture and renal damage in aged
apolipoprotein(E) -deficient mice**

Old age vitiates benefit of antioxidants.....

Antioxidants are less effective in aged than in young ApoE...mice??

Reduced protection by antioxidantsin aged

**Failure of antioxidants to prevent angiotensin II-induced
aortic rupture in aged apolipoprotein(E)-deficient mice**

Summary

Logic ----- “Think” in sub-headings

Background & Purpose- why did you do it?

Disease / clinical need / mechanism; put question / hypothesis

Experimental approach – how did you do it

Species, *in vivo/vitro*; b.p., behaviour; enzyme assay; RT-PCR

Key results – what happened?

Summarize MAIN findings

Conclusions and Implications – what does it all mean?

What was answer to question/hypothesis; what is new

Summary

Format – depends on Journal

Use the correct layout:

Are there sub-headings in the Summary?

Are there separate paragraphs?

Are these numbered?

Use the correct length:

250 / 200 words or ?

Introduction

Logic

Present the background; refer to previously published work that is **directly** relevant to the problem that you are tackling.

Keep it short; do not write a comprehensive review
Two pages should be enough

State clearly what question you are intending to answer and what, if any, hypothesis is being tested

Try to summarise experimental plan

Start with cells, do RT-PCR, then *in vivo* with antagonists

(??) In the last sentence, summarise the broad conclusions from your study

Methods

**Layout can vary with Journal
so READ the I to A**

Animals / tissues / cells

Experimental /assay methods

(to match order of Results)

Materials

Data analysis

Methods

Animals / tissues / cells

Need animal ethics statement

Maintenance

Killing

Anaesthetic

Total number of animals used

Human tissues / cells

Need ethics statement

(Age, sex, ethnicity, medical treatment)

Methods

Experimental methods

Don't forget the details

pH / mM for buffers

Centrifugation as “x g” NOT “rpm”

Dose ranges for drugs

Solvents, e.g. DMSO and further dilutions

Controls for drug vehicle

Methods

Materials

Sources for materials

?New compounds?

give references, structures

Plant extracts

Must be of defined chemical composition

Derived compounds are OK:-

quercetin, ginsenoside,

red wine polyphenols

Methods

Data analysis

Common and major cause of criticism

Are Statistics appropriate?

Why do we use Statistics ??

Why do we use Statistics ?

**Test the reliability of your results so others
can use them**

Statistics will tell us:

If we do this experiment again, what is the chance
that we will get the same result

So **REPRODUCIBILITY** depends on:

Full experimental description

Estimate of reliability ... which is Statistics

Statistics

Ensure adequate number of independent values (N=?)

Replicates in assay are NOT independent samples - **INTRA assay variation**

Pooled tissue from N animals is ONE sample, not N – **INTER assay variation**

Statistics

Tests of difference

- **Student's t test ONLY for two groups**
- **Any more than TWO, e.g., control and two doses OR control and two different treatments MUST be tested by ANOVA**
- **Note that all ANOVA need “post tests” which are t-tests with compensation for multiple comparisons**

Statistics

Normal vs. non-normal distribution

- human / clinical data may be better as **MEDIAN** than **MEAN**
- **Non-parametric analysis** may be better
- **Most non-parametric tests need more values (greater N) than parametric**

Results

Communication

**Show your Results in logical order –
so the reader can see how you developed
your hypothesis / idea**

**Begin each subsection with ONE SENTENCE of
why you did these experiments**

Results

Data presentation - be logical!

$$57.92 \pm 6.74\% = 58 \pm 7\%$$

$$32.55 \pm 4.67\mu\text{g} = 33 \pm 5\mu\text{g}$$

**No repetition of data in text from
Figures and/or Tables**

Results

No “non-significant” changes

If there is no statistically significant difference between two means then there is NO effect to report

No Discussion in Results

**“These data differ from those of Bloggs *et al* (2004) obtained in mice”
Not HERE –put it in Discussion**

Discussion

Length

Not too long

Five pages of A4 double spaced is enough (1500 words limit)

Not too short

Two pages is too little

Discussion 1

Logic

Don't just repeat results; **add deduction**
“**Variable A was increased by treatment B**
showing involvement of mediator C”

**Not necessary to discuss EVERY
result /set of results; only the
MAJOR points you want to discuss**

Discussion 2

Logic

Keep focused on your model

Avoid discussing rat data in dog experiment

Ensures relevance

Avoids many “conflicts with literature”

If you want to relate YOUR findings to human or other species, do that at the end of the Discussion

Discussion 3

Open with YOUR major finding summarised into two lines

“Our experiments show that renal blood flow in rats was not responsive to inhibitors of the renin angiotensin system but was altered by CB1 agonists.”

Then go on to say why you did this work

“These experiments derived from an earlier observation that.. XXX suggesting that YYY

Discussion 4

Limitations of study

Only one paragraph ?half A4 page

Discuss - different assays, sensitivity, variability

what would be useful NOW to assay

cells/ tissues vs whole animal

rats vs human

Discussion 5

Concluding paragraph(s)

not more than two

Summarise YOUR interpretation of the results, referring back to the Aims / Plan of Experiments

? Final sentence

what MIGHT be the clinical / human / wider consequences of your results

References

Usually too many

**Do you need more than 40 references
in most MSS?**

Try to get the format right

**It shows you have paid some attention
to the Instructions to Authors!**

Figures

Legibility when reduced to page size

Symbols

Lines

Lettering

Uniformity of lettering

Capitals

Font

Bold

Legends

Do they match the Figures / Tables?

Are the abbreviations in the Figure / Tables explained in the Legend?

Key to data should be in Figure (?Journal)

Significant differences explained in Legend

Marks – asterisks etc

P values; Diff from?; n =?

t-Test, ANOVA?

Acknowledgements

These are ESSENTIAL

Grants from funding bodies

CAPES / FAPESP / FAPMG etc

Any support from Companies

Compounds

Research support

Animals

Finally

**DO read through the MS for spelling, grammar
and style**

**HOWEVER if you have got ALL this right,
you are not guaranteed publication!**

Don't forget the science needs to be good also!

**BUT you will have made it easier for others
(editors and referees) to read and understand
what you have done and what you think about it**

The End