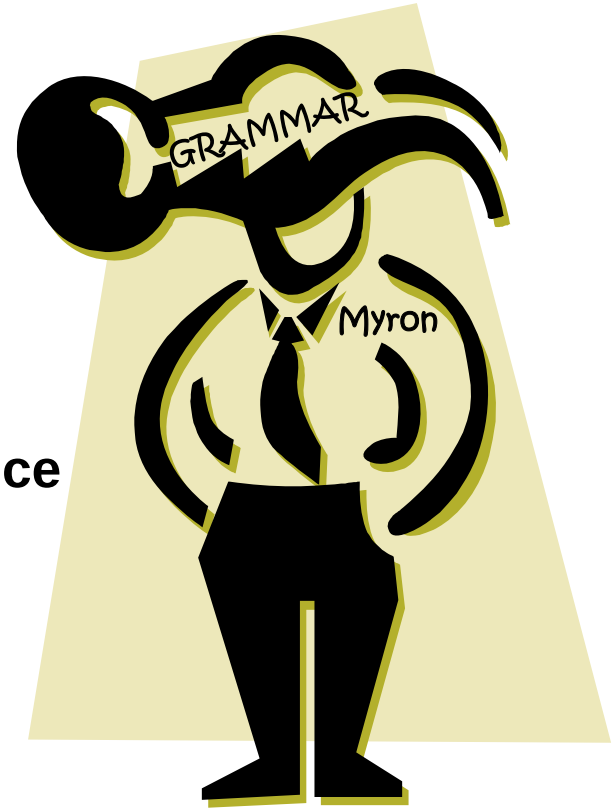
The "Grammar Hammer": Common Mistakes in Scientific Writing



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for online access by
ASPET Graduate Students and Postdocs

For ASPET visitors: about this slide set

- None of this slide set matches the order from my presentation at Experimental Biology 2017
- I change this material -- content, organization, layouts -- from time to time
- I hope to have a more user-friendly online version later this year; but I hope this is useful for now
- Feel free to use this material for your own benefit, but please check with me before passing it on to others (I am a wee bit proprietary about my collection of information)
- Please feel free to contact me with questions or suggestions for additional content, at mtoews@unmc.edu

Grammar Matters!

- There are rules!
- Apply to EVERY SECTION of a manuscript
  - and all other scientific writing
- Good writing can make a bad paper seem better than it is.
- Bad grammar DOES get in the way of an otherwise good paper.
- Most people, including very bright scientists and scholars, make many common mistakes.

Grammar Matters!

I like
cooking my family
and my pets.

Use commas.
Don't be a psycho.

An English professor wrote the words :

"A woman without her man is nothing"

on the chalkboard and asked his students to punctuate it correctly.

All of the males in the class wrote:

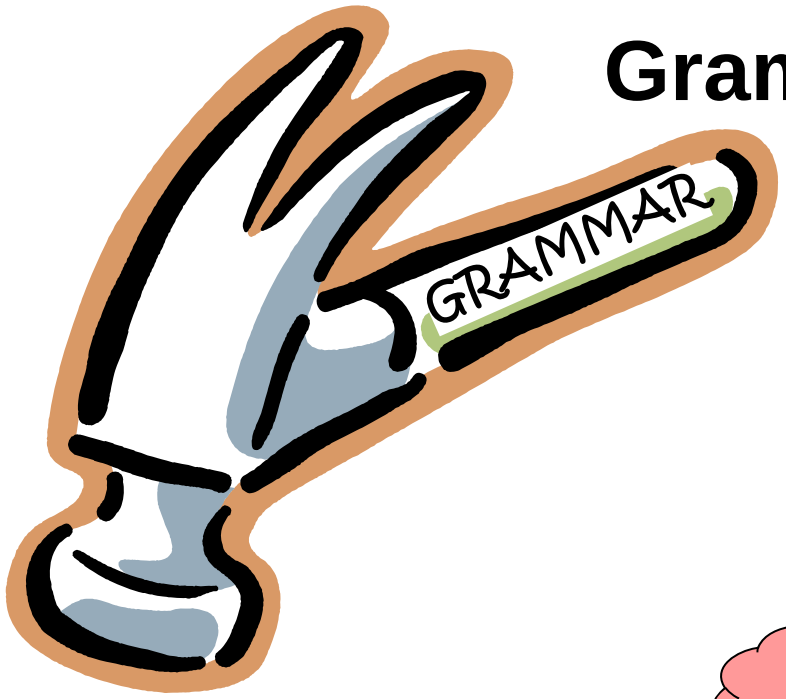
"A woman, without her man, is nothing."

All the females in the class wrote:

"A woman: without her, man is nothing."

Punctuation is powerful

Pounded by the Grammar Hammer



Locked up in the Grammar Slammer

Quick Review: Parts of Speech

- Noun: person, place, or thing
  - professor, laboratory, drug, experiment, results
- Verb: action word or state of being
  - test, determine, explore, run; be, been, am, are, is, was, were
- Adjective: modifies/describes a NOUN
  - brilliant professor, toxic drug
- Adverb: modifies/describes a verb or an adjective
  - definitively test, precisely determine, very toxic drug
- Preposition: in, to, of, on, for, by, at, over, under, into, beside
- Conjunction: and, or, but

Quick Review: Parts of Sentences

- Subject: who/what does the action
- Predicate: what the action is
- Object: what receives the subject's action (object of the verb)
  - The drug cured the patient.
  - The drug caused toxicity.

- Prepositional phrases
  - The drug cured the patient **of** his desire **to** keep smoking.
  - The drug caused toxicity **by** its actions **on** D2 dopamine receptors.

  - We use these a lot in scientific writing!
  - Prepositions have their own "objects" (object of the preposition)
    - **of** – his desire
    - **to** – keep smoking
    - **by** – its actions
    - **on** – D2 dopamine receptors

#1. Don't "space out" with numbers and units.

- **Rule: A number and its units cannot be written as one word**
- Simple and obvious
  - you would not write "10students" as one word!
  - don't write 10ml or 6hr as one word either!!

- **Rule: Use a space if the number and its units are a simple adjective and noun combination**
- Example: The reaction was started by adding 10 µL of substrate.

- **Rule: Use a hyphen if the number and its units are used as an adjective to modify another noun.**
- Example: Cells were grown on a 60-mm dish.

- Double example: A 12-well plate has 12 wells on each plate.

#1. Don't "space out" with numbers and units.

- **Rule: The same rule applies for numbers written as numerals or as words.**
  - a 6-well plate
  - a three-step procedure
  - a two-site competition binding curve

- Note that this includes ….
  - "number plus adjective" (six-sided); and
  - "number plus noun" (four-step)

- **Rule: There are not spaces either before or after the hyphen**
  - it is written as if it was one word
  - but word processors will know to break a line at the hyphen

#1. Don't "space out" with numbers and units.

- **Temperatures need spaces, between number and units again**
  - between value and degree sign: 37 ˚C, not 37˚ C or 37˚C

- **Other "places for spaces"**
  - around equals sign: n = 3, not n=3
  - around plus/minus: 29 ± 7, not 29±7
  - also around >, <, ~, and most other symbols

#1. Don't "space out" with numbers and units.

- **Two exceptions!**

  - **Percentages are not hyphenated and there is NOT a space**
    - they are a ratio and are unit-less
    - 5% serum, 0.01% bromphenol blue

  - **Concentrations are not hyphenated but there IS a space**
    - perhaps because they are also ratios, not simple units?
    - 50 mM is really 50 mmoles/liter

    - a 50 mM buffer
    - Epinephrine (10 µM) was added 10 min prior to the assay.
    - 10 mM or 50 µg/ml, never 10mM or 50µg/ml

#2. Spaces with other number cases

- **Rule: Most other "quantity-related" words are also hyphenated when used as a compound adjective**
- Examples
  - semi-transparent plastic tubes
  - bi-directional reaction
  - multi-component signaling complex
  - a mono-phasic true solution
  - "Her half-finished manuscript lay beside her pillow".

- Some can be written as one word – personal or journal style decisions
  - bidirectional, monophasic
  - more often hyphenate if comparing: mono-phasic *vs.* bi-phasic
  - not if just using one: “catalyzes a bidirectional reaction”
- **One rule does apply: BE CONSISTENT!**
  - don't say unidirectional *vs.* bi-directional regulation, for example
  - don't hyphenate semi-log plot sometimes, not others

#2. Spaces with other number cases

- **Rule: Compound numbers must be hyphenated when written as words.**
- Examples
  - Fifty-four patients were enrolled in the study.
  - One-hundred percent of the knock-out animals survived the injury.
  - Average cost per run was over three-thousand dollars.

- **Better idea: Avoid writing them as words!**
- Examples
  - Of the 54 patients enrolled in the study, …….
  - Remarkably, 100% of the knock-out animals survived the injury.
  - Average cost per run was over $3000.

#3. Hyphens in compound words

- **Rule: A noun-verb combination used as an adjective is always hyphenated!!**

- "The drug induced side effects"
  - Is this a sentence by itself?
    - "The drug induced side effects. These included headache, nausea, gas, …"
  - Or is this only the subject of a sentence?
    - "The drug-induced side effects ….of aspirin include GI distress."

- It is the hyphen that lets me know ,without having to read the whole sentence first!

- **This includes most forms of the verb: ed, ing, ent**
- **But only when used as an adjective**

- Common examples
  - receptor-mediated
    - Beta receptor-mediated responses are blocked by propranolol.
    - The beta receptor mediated the response, because the response was blocked by propranolol.
  - concentration-dependent effects; ligand-independent transactivation
  - drug-metabolizing enzyme; rate-limiting step
  - ligand-binding domain
    - but "receptors were measured by ligand binding"
  - RNA-dependent DNA synthesis, exercise-induced asthma
  - site-directed mutagenesis, FDA-approved drug

- What terms do you use in your work? Hyphenate them correctly!!

❑ "Adjective-verb" combinations used as adjectives are hyphenated

- ➢ “blue-labeled tubes”
  - if the labels on the tubes are blue

- ➢ but "blue labeled tubes"
  - if the tubes are blue and also labeled
  - but perhaps labeled in red?
  - **the red-labeled blue tubes** = the blue tubes with red labels

- **"Preposition-verb" combinations used as adjectives are often hyphenated, but also often written as one word**
  - over-utilized phrases, under-developed sexual organs
  - overlooked, upturned, inbred
- **No strong "rule"**
  - overexpression *vs.* over-expression of the receptor
- **Except BE CONSISTENT!**
- **Same for prepositions often come after the verb form**
  - "clearly spelled-out expectations"
    - an adjective
  - but "expectations were spelled out clearly from the start"
    - part of the verb/predicate

❑ "Adverb-verb" combinations used as adjectives are NOT hyphenated

- ❑ Words ending in "y" or "-ly" are usually adverbs and not hyphenated
- ❑ Adverbs always modify verbs or adjectives, so they don't need special treatment when used that way
  - ➢ a newly identified enzyme
  - ➢ a highly regarded expert in the field
  - ➢ a very limited interaction
- ❑ These words are always adverbs, so no hyphen is needed to indicate "I'm using a non-adverb word as an adverb here“
- ❑ Some I DO “like” to hyphenate
  - ➢ well-established as one example

❑ Hyphenate BOTH terms if they modify the same word

- the Ca^{2+}- and phospholipid-dependent enzyme PKC
- The epinephrine- and isoproterenol-induced responses were both blocked by propranolol with similar potency.

- The drug-sensitive and -insensitive cells were compared for…
  - two words <u>after</u> the hyphens instead of before

Hyphenation summary

- **Always hyphenate**
  - All noun-verb combinations if used as adjective
  - All number-verb, number-noun, number-adverb combinations used as adjectives
- **Sometimes hyphenate**
  - A few adjective-noun combinations if used as adjectives
- **Don't hyphenate**
  - Adverbs, including –ly words and others
  - Two adjectives that modify the same noun

#4. Proper plurals

Learn rules or memorize….

…. which is singular and which is plural….

…and then use the correctly matched verb form!!

Singular	Plural
cell	cells
hypothesis	hypotheses

The hypothesis (singular) that PKC is (singular) involved was only one of several equally likely hypotheses (plural) that were (plural) tested.

Separate hypotheses are proposed for each specific aim.

A separate hypothesis is proposed for each specific aim.

Proper plurals

Singular	Plural
drug	drugs
datum	data

"Data" is always plural -- THE MOST FREQUENT MISTAKE!!

- with plural article (these data, never this data)
- and plural verb forms: data are, data show, data have been confirmed
  never data is, data shows

Correct:

"Data presented are the averages of at least three experiments".

Incorrect:

"The data is clinically important because it shows a difference between the two groups of patients."

Correct:

"The datum at 5 min, but only that specific data point, is statistically significant."

Proper plurals

Singular	Plural
drug	drugs
medium	media

Two different media (plural) were used in our studies: Dulbecco's modified Eagle's medium (singular) for mammalian cells and Weymouth's medium (singular) for insect cells.

"Growth media were obtained from Gibco" only if more than one kind of medium was used!

(Even though growth medium has multiple components, it is a single growth medium)

Singular	Plural
criterion	criteria
phenomenon	phenomena
mitochondrion	mitochondria
equilibrium	equilibria
medium	media
bacterium	bacteria
optimum	optima
minimum, maximum	minima, maxima
symposium	symposia
datum	data
hypothesis	hypotheses
thesis	theses
axis	axes
stimulus	**stimuli**
fungus	fungi
nucleus	nuclei
focus. locus	foci, loci
alumnus	alumni

Singular forms all end in consonants

Plural forms (almost) all end in vowels

"Most graphs have two axes—one x-axis and one y-axis."

"When given a stimulus, cells responded. Responses were different for different stimuli.

"There are three loci for drug intervention: the most common locus is the cell surface receptor, a second important locus is the intracellular signaling pathway, and the newest locus is targeting the nucleus with gene therapy."

Proper ADJECTIVE forms

❑ The ADJECTIVE forms end in "al"

Singular noun	Plural noun	ADJECTIVE
maximum	maxima	maximal
minimum	minima	minimal
focus	foci	focal
locus	loci	local

To determine EC_{50}, you first find the maximum and minimum on the curve.

- these are nouns

The maximal value is called the E_{max} and the minimal value is E_{min}.

- these are ADJECTIVES modifying the noun "value"

5. Too many significant figures

- All of your "significant figures" should be "believable"
- Looking at your error bars is a good way to decide
- Instruments and spreadsheets give you lots of numbers that are meaningless; don't use them unless you believe them!!

forskolin and theophylline. $[cAMP]_i$ was 93.6±14.1 fmol/well in control BTSMCs,
94 ± 14

and was elevated to 3,061±307 and 702.8±131 fmol/well by forskolin (30μM) and
3060 ± 310 700 ± 130

theophylline (10μM), respectively (n=6 for each condition). Membrane-permeated

dibutyryl cAMP was also detected as 'cAMP' by the antibody in the kit and showed

4,468±502 fmol/well after the treatment with dibutyryl cAMP (300μM, n=6).
4470 ± 500

5. Too many significant figures

- What else is wrong in this paragraph?

forskolin and theophylline. $[cAMP]_i$ was 93.6±14.1 fmol/well in control BTSMCs, and was elevated to 3,061±307 and 702.8±131 fmol/well by forskolin (30μM) and theophylline (10μM), respectively (n=6 for each condition). Membrane-permeated dibutyryl cAMP was also detected as 'cAMP' by the antibody in the kit and showed 4,468±502 fmol/well after the treatment with dibutyryl cAMP (300μM, n=6).

#6. Correct commas:
6a. in parenthetical statements

- "Parenthetical" loosely means that it could also be put in parentheses, or that it is an "aside" or an "addition"; the sentence would be complete without it.

- **Commas always come in pairs when in the middle of a sentence!**
  - The inhibitor genistein, known to be selective for tyrosine kinases, unexpectedly inhibited this serine kinase-mediated response also.
    - Many times this second comma is missing; it is mandatory
    - Just like open and close parentheses (…) always in pairs

- **One comma is OK only if the parenthetical statement ends the sentence.**
  - The reaction was inhibited by C3 toxin, a selective blocker of Rho.

❑ One-word parenthetical statements, and some simple multi-word parentheticals, do not NEED commas

- ❑ I personally strongly prefer that they NOT be used.
  - ➢ The protein kinase inhibitor genistein did not alter the response.
    - preferred
  - ➢ The protein kinase inhibitor, genistein, did not alter the response.
    - less appropriate

❑ "and" and "but" go <u>outside</u> the commas

- **WRONG** (but COMMON!): The control cells showed modest internalization**,** but contrary to our hypothesis**,** drug-treated cells showed even less internalization.
  - *This is the way you might SAY it in a seminar, but it is NOT correct GRAMMAR for writing!*

- **CORRECT**: The control cells showed modest internalization but**,** contrary to our hypothesis**,** drug-treated cells showed even <u>less</u> internalization.
  - ***The sentence must read correctly WITHOUT the parenthetical statement!***

#6. Correct commas:
6b. in compound sentences

- **No "… , and …" unless the clauses on both sides of the ", and" are independent**
  - meaning both a subject (noun) and predicate (verb) on both sides

- **"and" without a comma does not require a second subject**
  - but a second subject can be used, if the sentence is not too long

  - **Incorrect:** The cells were pretreated with pertussis toxin for 24 hr**,** and lysed by scraping in a hypotonic buffer.
    - there is no subject in the part after the comma
    - here probably best to just leave out the comma
  - **Incorrect:** Taxol is a drug that prevents cancer cells from undergoing cell division, and is often used to treat patients with rapidly proliferating tumors.
    - here probably best to say "… division, and it is often used…"
    - better yet to split this into two sentences

- Commas should NOT be used (abused) simply to "break up long sentences".

  - "For long sentences, the better alternative is to make them two separate sentences, with either a period or a semi-colon separating them, rather than using lots of commas, which I find annoying, and others will also, so avoid doing this."

  - "For long sentences, the better alternative is to make them two separate sentences. Use either a period or a semi-colon separating them, rather than using lots of commas. I find excess commas annoying, and others will also. Annoying your readers should always be avoided!"

#7. Which *vs.* That

- A tough distinction, but with simple rules of thumb!

- **"That"** is used to **"restrict"** the meaning or to **"identify"** a specific entity
- **"Which"** does not restrict but rather **"elaborates"** or **"describes"**

- Rule of thumb #1:
  - If the phrase **can be taken out** without losing the meaning of the overall sentence, use **"which"**
  - If the phrase **is vital** to the point of the sentence, use **"that"**

- Rule of thumb #2:
  - **"Which"** statements are almost always set off with commas
  - **"That"** statements should NOT be set off with commas

  - If commas seem needed or natural, use **"which"**
  - If commas are NOT needed or seem awkward, use **"that"**

- Non-science examples for simplicity
  - The car that I drive is a red Toyota Prius.
  - My car, which is a Toyota Prius, gets 50 miles per gallon.
  - The car that I drive, which is a red Toyota Prius, gets 50 miles per gallon.

- Drug examples
  - Tamoxifen**, which** is a so-called anti-estrogen**,** is the most appropriate drug for this patient.
    - "which is a so-called anti-estrogen" can be left out and the sentence is still complete and true and meaningful
    - and this would not read well without the commas
  - The drug **that** is most appropriate for this patient is tamoxifen.
    - taking out "that is most appropriate for this patient" leaves a complete sentence but it has lost its meaning
      - The drug is tamoxifen.
    - and it would seem awkward to use commas here

- Most common kind of wrong use
  - The drug **which** we used to block redox signaling was tempol.
  - The drug **that** we used to block redox signaling was tempol.

- More examples that might help you
- More examples, which you might find helpful

  - Rats **that** are treated with STZ develop diabetes symptoms.
  - STZ-treated rats**, which** are totally defective in insulin secretion**,** are a common model of Type 1 diabetes.

  - The receptor **that** is the subject of my NIH grant is the AT_2 angiotensin receptor.
  - The AT_2 angiotensin receptor**, which** is the subject of my NIH grant**,** is a G_q-coupled receptor.

  - The receptor **that** is the subject of my NIH grant**, which** is the AT_2 angiotensin receptor**,** is a G_q-coupled receptor.
    - an example of that and which used properly in the same sentence

#8. The Oxford Comma

- In scientific writing, it is for sure accepted, and preferred by many, to use commas between all items in a list, including the last item before "and"
  - This is called the "Oxford comma"
    - "The inhibitors tested were LY290082 for PI3K, calphostin C for PKC**, and** Y27632 for Rho kinase."
- Whose rules?
  - This "Oxford comma" IS expected by MLA (Modern Language Assn) and in English courses.
  - The AP (Assoc Press) rules for journalism DO NOT allow it.
  - Science ALLOWS it and most science writers PREFER it
  - It is very strongly preferred by me!!
    - seems rational and consistent – like all science writing should be!

The Oxford Comma

WithOUT the Oxford Comma --
-- totally wrong meaning!!

- People at my birthday party included two strippers, Michelle Obama and Hillary Clinton.

- Among those interviewed were Merle Haggard's two ex-wives, Kris Kristofferson and Robert Duvall.

- This dissertation is dedicated to my parents, Ayn Rand and God.

#9. Inappropriate use of "time words"

- Ideally, don't use "while", "since" or "as" EXCEPT to indicate the relationship of events in time.

- "While" means two things happening at the same time
  - if not, use "although" or "whereas", not "while"
- "As" also means two things happening at the same time
  - if not, use "because", not "as"
- "Since" means one thing happening after another has happened
  - if not, use "because", not "since"

Inappropriate use of "time words"

- **"While" should generally be replaced with "although" or "whereas"**

  - Incorrect: While staurosporine is a PKC inhibitor, it can also inhibit other kinases.
    - (The intent is not to indicate that these two events are taking place at the same point in time.)

  - Better: Although staurosporine is….
    Whereas staurosporine is…..

  - Correct use of "while": "While the cells were being incubated in serum-free medium to induce cell cycle arrest, they were also being exposed to pertussis toxin to inactivate G_i.
    - Here the point is that the starvation and pertussis toxin treatments were going on simultaneously.

Inappropriate use of "time words"

- **"As" should generally be replaced with "because"**
  - Incorrect: As C3 toxin is a highly selective Rho inhibitor, our data implicate Rho as a mediator of synergism.
    - (The intent is NOT to indicate that these two events are taking place at the same point in time.)
  - Better: Because C3 toxin is….
  - Correct use of "as": "As the cells reached confluence, their shape changed from flattened to cuboidal.
    - (Here the point is that the shape change coincided in time with the attainment of confluence.)

Inappropriate use of "time words"

- **"Since" should generally be replaced with "because"**

  - Incorrect: Since C3 toxin is a highly selective Rho inhibitor, our data indicate Rho as a mediator of synergism.
    - (The intent is not to indicate that one event is taking place at a later time point than the other.)

  - Better: Because C3 toxin is….

  - Correct use of "since": "Since changing the HEPA filter in our hood, we have no further problems with cell contamination.
    - (Here the word "since" is properly used to indicate that one thing has happened following another thing in time.)

#10. Avoiding First Person

- **There is a strong preference in writing scientific manuscripts to avoid (minimize) the use of first person**

- **Person**
  - First person nominative - I, we
    - "We treated the cells with …. "
  - First person possessive - my, our …
    - "Our data show that ……"
  - Third person - it, they, them, their (or "things", other nouns, e.g. cells)
    - "The cells were treated with …… "
    - "The data presented here show that …."
  - Switching from first person to third person is easy
    - and makes writing more professional
    - and leaves it in the "active voice", which many prefer also

❑ Pros And Cons of First Person

- First person can sound like bragging about all that you did
  - Emphasis on you rather than on what was accomplished

- But using NO first person can make your writing seem "impersonal"
  - Is that good or bad for science writing?
  - Scientific writing should be about the science, not who did it
  - You can still tell a good "story" without first person!

- You will find that many if not most papers use first person extensively
  - So it is not "forbidden", but I strongly dislike it

❑ If first person is used, almost always use "we/our" rather than "I/my"

  - Science is almost always a group effort!

- **Some good examples of converting first person to third person**
  - **(to eliminate I/we)**

  - We tested the hypothesis that….
  - The hypothesis guiding these studies was that….
  - These studies tested the hypothesis that….

  - We instilled saline or drug into mouse lungs …
  - Saline or drug was instilled into mouse lungs…

  - We further speculate that ROS alter the BBB by…
  - These data suggest that…
  - Another possibility is that…

- **Some bad examples of avoiding first person:**

"We hypothesize that …."

- "It is the hypothesis of this study that …… "
- "The authors of this manuscript hypothesize that ……. "
  - Very cumbersome ways to avoid first person

"It is suggested by the authors of this manuscript that ….. "

  - Even cumbersomer!!
- "The hypothesis of this study is that …… "
  - Not first person but still active, clear, not cumbersome

❑ Acceptable places to use first person in <u>manuscripts</u>

- to make Dr. Toews happy!

- Introduction, only once!
  - "We hypothesized that …. "
- Discussion, only one situation!
  - "We speculate that ….." or "We propose that these drugs,,,,,, "
- Your hypothesis and speculation are quite "personal", not "facts"

- LIMITED USE of first person **<u>possessive</u>** is not as "bad"
  - "Our previous studies showed that ….. "
  - "Our data differ from those previously reported …."

- Another example where first person active may be <u>necessary</u>
  - "<u>We</u> were unable to reproduce the effects reported by Schultz *et al.*"

❑ Good ways to avoid first person

➢ even when it is "OK" to use it!

- ➢ OK but not great
  - "Our data suggest that …… "
- ➢ Better but a bit cumbersome and not very specific
  - "The data presented here suggest that ….. "
- ➢ Perhaps best
  - "The ability of X to prevent Y suggest that ….. "
  - This approach tells the reader exactly WHICH data suggest …

- Places Dr. Toews **STRONGLY DISLIKES** first person
  - Methods
    - "We obtained inhibitors from …. "
    - "We grew cells in DMEM ……. "
  - Results
    - "We found that AngII decreased renal blood flow …. "
    - "We next tested whether ……. "
  - Traditional writing "purists" agree with me on this
  - Drs. Schultz and Zucker don't mind first person as much as Dr. Toews
    - They like it to be more like telling a story about your work
    - Dr. Toews thinks it sounds like a grade school report
      - My Summer Vacation -- We went to the beach. I saw a whale. Our cottage was nice. My pictures are on facebook.

- One more important comment on first person

  - Papers in *Science* and *Nature* are rational exceptions
    - these journals publish their "manuscripts" as "reports" or "letters"
    - from individual scientists to members of the society
    - which makes first person -- "we did this", "we found that" much more acceptable to me

- One more example **CLASS**

  - As we lowered the pH, we obtained progressively more of the desired reaction product.

  - As the pH was lowered, progressively more of the desired reaction product was obtained.

  - Avoiding first person
  - Plus nice correct use of "as" as a time word

Places were first person IS important!

- **Use of first person is accepted, necessary, important in dissertations, seminars and grant applications**

  - Seminars, particularly students and postdocs, are all about your own ideas and your experiments and what you have done and learned
  - Same for dissertations!
  - Here it is OK and even preferred to use "I", to make it clear what you did *vs.* what your lab did
    - "Our lab had data suggesting …… My project is to extend these ideas by …… In my first experiments, I tried using siRNA ….."

  - Grants are all about your hypothesis and your preliminary data and what you will do with the grant money
    - "As a preliminary test of our hypothesis, we treated cells with drug X"
    - "Our first approach will be to ……. "

Personally, I don't care what you "think"!

- **Avoid "personal thoughts"**
  - We wondered whether Enzyme X might be involved.
  - We considered the possibility that maybe it was Enzyme Y instead.
  - We sought to establish which enzyme was involved.
  - We decided to test inhibitors of both enzymes.
  - At first we were confused by the data.

  - "And we decided to reject your paper because we considered it so poorly written that we were confused too, and we wondered why you had never learned to write properly!"

- **Just state the facts!**
  - Inhibitor X reduced the response by 84 ± 11% but Inhibitor Y had no significant effect, implicating Enzyme X as the likely mediator.

#11. Abbreviations

Rules for using abbreviations

1. Don't abbreviate unless necessary
2. Avoid abbreviating single words, with the exception of chemicals
3. Abbreviations should be used at least three times, in general
   - otherwise write out the entire word both times
4. Avoid making up your own non-standard abbreviations
5. Define each abbreviation the first time you use it
   - in the text or in a footnote, per journal style
6. Use the abbreviation every time after you define it
   - don't make reader learn your abbreviation and then use full word!
7. Double-check abbreviation usage before submitting
   - search for full word and for abbreviation from start to finish
   - every abbreviation defined? full word only used once?
8. Check your journal's style sheet and follow it
   - many abbreviations do not need defining; DNA, RNA, EKG, e.g.

Capitalization in Abbreviations

- My convention on when to capitalize in abbreviations
  - not a "rule", but my way (a good way) of being consistent

- Capitalize only the first letter of abbreviations that are shortened words
  - Iso for isoproterenol (not ISO)
  - Veh for Vehicle (not VEH)
  - Glu for glutamate, but Glc for glucose (not GLU or GLC)
- Capitalize all letters that stand for words or at least syllables (initialisms)
  - PMA for phorbol myristate acetate
  - EGF for epidermal growth factor
  - EKG for electrokardiogram
  - IL for interleukin, RNA for ribonucleic acid

- Contrasting examples
  - Ser for serine, but SER for stimulus-evoked response
  - Ala for alanine, but ALA for antigen-like activity

Acronyms (a bit of trivia, perhaps)

- Abbreviations that we pronounce as words are called "acronyms"

  - STAT is an acronym
  - ERK is an acronym
  - NFκB is NOT an acronym

  - ELISA is an acronym
  - PCR is NOT an acronym

  - CAT and PET are acronyms
  - MRI and EKG are NOT acronyms

Abbreviations - using "a" or "an"

- Decide whether to use "a" *vs.* "an" with abbreviations based on whether the sound of the spoken term begins with a consonant or a vowel, not on the first letter of the written abbreviation
  - "a UNMC faculty member"
    - not an, even though UNMC begins with a vowel
    - the sound (YouEnEmSee) begins with a consonant (Y)
    - "U" is the only vowel whose sound begins with a consonant
  - "an MCP-mediated effect on IL8 release"
    - not a, even though MCP begins with a consonant
    - the sound (EmSeePee) begins with a vowel
    - many consonant sounds begin with a vowel!!
      - "an SDS gel", "an LTP-inducing agent"
- The same "U" policy applies to whole words
  - "a ubiquitination inhibitor", not "an"
  - "a unilateral triangle", not "an"

Abbreviations: plural *vs.* singular

- Carefully define the PLURAL form of abbreviations—
  - Beta adrenergic receptor (BAR) or beta adrenergic receptors (BARs)
    - Either one allows me to say ….
    - "BARs were down-regulated …." or
    - "The BAR agonist salmeterol caused…."
  - Avoid defining plural word with singular abbreviation or singular word with plural abbreviations
    - Glutamate receptors (GR) are important in the brain.
    - Now EVERY use of GR must be plural, because defined as receptors.
    - And "GR" without an "s" does not sound "plural" to be used with "are" – "GR are membrane ion channels"

Abbreviations: "*et al., etc.*"

❑ Periods with *et al.*

- **"et"** is Latin for "and"; it is a word, not an abbreviation; so no period
- **"al"** is short for "alii", meaning "others"; an abbreviation, so a period
- No comma in front of "*et al.*" in author lists (Jones *et al.*)

❑ Rules for *etc.*

- **"et cetera"** means "and the like"; "cetera" is abbreviated, so a period; but always written as one word, *etc.*

❑ Never use "and" in front of *etc.*, since the "*et*" itself means "and"

❑ **Ideally NEVER use "*etc.*" in scientific writing**

- use "and many additional examples" or "among others" or "as examples" instead
- using "etc." makes it look like you couldn't or didn't bother to find any more examples!

#12. Setting up sentences

- Sentences should **NOT** begin with a lower-case letter or a numeral
  - This is a rule, but cumbersome
  - It is easy to avoid!

- Examples of the traditional rule (and how to avoid being cumbersome)
  - "…. treated with 10 mM NaCl. Twenty microliters of AsO_3 were added…."
  - "Next, 20 µl of AsO_3 were added…." or "AsO_3 (20 µl) was added…"

  - … treated to elevate cAMP levels. Cyclic AMP was then extracted by ……"
  - " …. cAMP levels. Extraction of cAMP was performed by ……."

Active *vs.* Passive Voice

- **Active voice: the subject of the sentence does the action**
  - Albuterol caused smooth muscle relaxation.

- **Passive voice: the subject of the sentence is acted upon**
  - Smooth muscle relaxation was induced by albuterol.

- Both are fine.
- Many recommend a mixture of the two for good writing.

Person and Voice

- Do not use **"cumbersome"** passive voice to avoid first person

  - It is the hypothesis of this study that ……
  - It is hypothesized that ……
  - The authors of this study hypothesize that …….

    ✓The hypothesis of this study was that …… " (third person)

    ✓ We hypothesized that ….. (OK use of first person)

  - It was noticed by the authors that there were fewer endosomes in the inhibitor-treated cells.

    ✓There were fewer endosomes ….

    ✓Fewer endosomes were found …..

Two bad examples from a recent PubMed search on PGE receptors:

It was decided to evaluate the effect of PGE2 on the secretion of VEGF, an inducer of angiogenesis. In summary, our findings show that PGE2 induces cAMP production….

It was demonstrated that mice missing functional EP4 had higher levels of airway inflammation. Cell-based assay systems demonstrated that PGE2 inhibited cytokine release also.

Wordy Wordings

- Avoid using unnecessarily wordy wording, especially to begin sentences--be concise wherever possible!

  - "Because of the fact that….." **(Avoid this!)**
  - "Due to the fact that…" **(Avoid this!)**
  - "Because ……." **(Has identical meaning, 4 fewer words!)**

  - "In spite of the fact that…"
  - "Although…."

  - "In order to test our hypothesis……" **(Avoid this!)**
  - "To test our hypothesis ….." **(Same meaning, shorter)**

  - To test whether it might be possible that…..
  - To establish whether……..

Wordy Wordings

- Avoid using unnecessarily wordy wording, especially to begin sentences--be concise wherever possible!

  - "…. were observed to have higher values" **(Avoid this!)**
  - " ….. had higher values"

  - " …. were found to increase after treatment" **(Avoid this!)**
  - "…. increased after treatment"

  - (This list will keep growing)

Setting up sentences

- And just state the facts!
  - Studies have shown that Type 1 diabetics require insulin therapy.
  - Based on previous work, it is known that Type 1 diabetics require ….
  - Type 1 diabetics require insulin therapy (Reference).
  - Of course previous studies have shown it, or you wouldn't be saying it!

Setting up sentences

- Avoid multiple "alternate possibility qualifiers"

  - Instead, an alterative is that it might be possible that …. (BAD)
  - An **alternative is** that ….. (GOOD)

  - Perhaps these nanoparticles could affect ….(BAD)
  - These nanoparticles **could** affect… (GOOD)
  - **Perhaps** these nanoparticles affect….. (GOOD)

Setting up sentences

- Avoid double negatives

  - These results are not unlike those from previous studies. (BAD)
  - These results are similar to those from previous studies. (GOOD)

  - The outcome was not different from what we hypothesized. (BAD)
  - The outcome was consistent with our hypothesis. (GOOD)

13. Apostrophes can be Catastrophes!

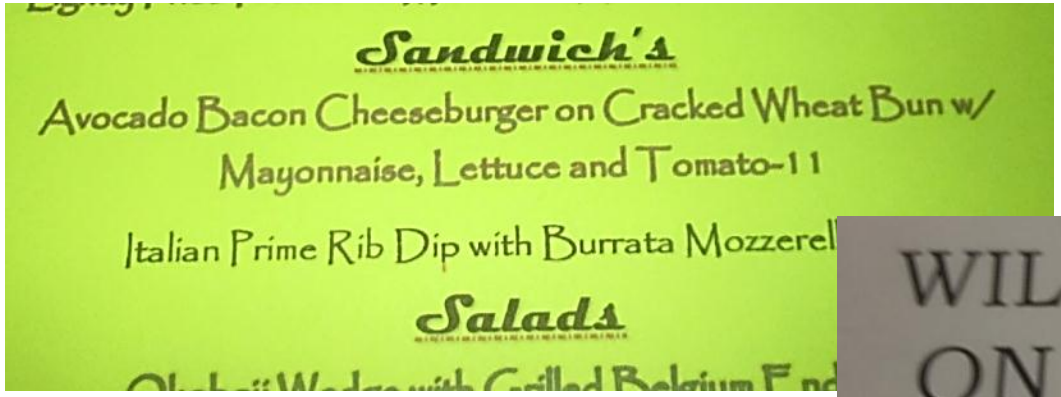
- **Do not use contractions**
  - the inhibitor didn't alter the response
  - K_D was changed but B_{max} wasn't

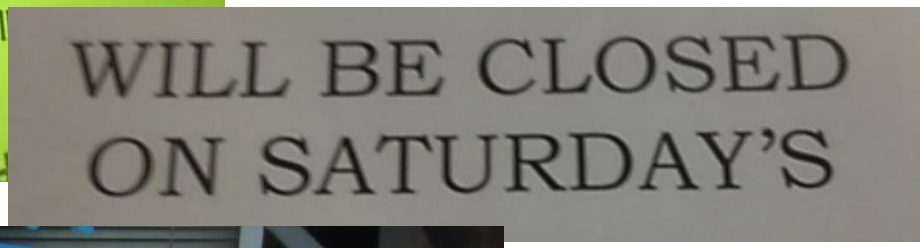
- **Possessive pronouns are acceptable**
  - Knockout animals died because their livers did not metabolize the toxin. The toxin was present in excess of its lethal concentration.

- **But do not use possessives that involve apostrophes or "s"**
  - The cell's mitochondria were abnormally shaped.
    - Mitochondrial morphology was altered.
  - The liver's enzymes' ability to metabolize aspirin can become saturated…..

  - … and we're headed for an **Apostrophe Catastrophe!**

Omaha Apostrophe Catastrophes!





Avoid ALL symbols used as text

- **Do not use symbols in place of words either**
  - Ampersand (&)
    - Aspirin & Acetaminophen both inhibit pain.
  - Plus sign (+): in text
    - Cells were grown in medium + antibiotics.
    - Probably OK to use in a defined abbreviation
    - But not minus sign, even in abbreviation
    - Too easily confused with a hyphen
  - Plus-minus sign (±): OK in numbers, not in text
    - Values are presented as means ± S.E.M.
    - Growth rate was compared for cells grown ± the test drug.

#14. Other good old grammar rules

- Using a preposition to end a sentence with (!)
  - Some now think this is too hard to deal with and is "OK"
    - "AT_2-R is only one of the receptors **that AngII binds to**."
    - "AT_2-R is only one of the receptors **to which AngII binds**."
    - I still follow this rule in writing, not so much in normal speech.
- The real rule is that the object should follow the preposition
  - "Who should I give the form to when I am done with it?"
    - Just as wrong in the middle of the sentence as at the end
  - "Who should I give the form to?"
    - Even though "to" is not the end of the sentence in the first case
  - "To whom should I give the form when I am done with it?"

❑ Split infinitives

- ➢ This is supposed to be an absolute no-no!
  - "To more definitively demonstrate whether …."
  - "To demonstrate more definitively whether …."

  - "To repeatedly use the same word is annoying."
  - "To use the same word repeatedly is annoyingl."

- ➢ This one has never bothered me, but it is clearly wrong!
- ➢ And pretty easy to train your brain to do it right!

#15. "And" a new pet peeve!

- "I want to try **and** help you."
  - means 1) you want to try, and 2) you want to help me
  - "and" means two separate things
- "I want to try TO help you"

- "We have done lots of experiments to try **and** figure this out."

- Seems to be limited to the word "try" (?)
- "Everyone" says this; but it is obviously wrong

16. A number of additional things

- **The expression "a number of" is technically meaningless**
  - because **one and zero are numbers also!!**
  - "A number of lines of evidence support our hypothesis."
    - This is true even if there is only one piece of evidence, or even if there is no evidence, for your hypothesis, because one and zero are numbers.
  - "The experiment was repeated a number of times with similar results ."
    - This can be true even if you have done the experiment only once, or even if you have never done the experiment at all!!
  - There are "a number" of better terms to use!!

"A number of" better words

"A number" of possibilities exist.

- a very limited number
- only a few
- very few
- a few
- some
- multiple
- several
- many
- numerous
- a large number
- an astronomically large number
- countless, endless
- an infinite number

Related non-numerical words

- diverse / different
- various / variety

Correct tense

- **Use past tense to state what you did and what you observed that you are reporting in this paper**
  - These are clearly observations of what **happened** (past tense) in your experiments and under your conditions and not necessarily what **happens** (present tense) in general.
    - C3 toxin **prevented** synergism between LPA and EGF (Fig.3).

- **Use present tense to describe what is generally accepted or is "known" from previous studies**
    - C3 toxin **is** (present tense) an inhibitor of Rho, and it **eliminated** (past tense) the response to LPA (Fig. 6).

Tense

- Mix of past and present tenses in Introduction—what is known mixed in with what was reported in previous studies
- Nearly all past tense in Methods—what was done
- Nearly all past tense in Results—what was observed
- Mix of past and present tenses again in Discussion
  - Rho mediates this response (present tense conclusion), because it was inhibited by C3 toxin (based on what did happen in a specific experiment).
- Mixed tenses in referring to past studies or current results
  - Zucker and Schultz showed (past tense) that AT1 receptors increase with agonist treatment (present tense).
  - Although fat cells express (present tense) beta receptors, beta agonists did not mimic (past tense) the effect of prostaglandin E_1.

Tense

- Future tense is ONLY used in grant applications, proposals
  - "Aminals will be injected… "
  - "Additional drugs will be tested as needed."

- Other tenses used in methods descriptions for review articles or methods articles, "giving instructions"
  - "Cells are grown in DMEM."
  - "Samples should be kept on ice ….."
  - "Samples must be kept on ice to prevent receptor degradation."
  - "Place the microscope slide in the chamber…."
    or "Next, the slide is placed in the chamber…"

Misused Words

- **Principle** means key or idea or a tenet or theme or general rule
  - or find your favorite "e" word to go with "principle"
  - "The key principle is that water likes to go where ion concentration is high."
  - "principle" is always a noun, never an adjective!

- **Principal** means main or basic
  - "The principal thing to remember is that good writing makes good science look even better; this is an important principle"
  - "We expect the principal investigator on an NIH grant to follow the principles of ethical science."
  - "principal" as used in science is almost always an adjective
  - the "principal of a school" is an example of the rare use of principal as a noun

Misused Words

- **Effect** is usually a **noun**
  - "The effect was statistically significant."
  - "Exercise training had no effect on the number of AT2 receptors."
- **Affect** is usually a **verb**
  - "Drinking a beer with lunch can affect your afternoon productivity."
  - "Using 3-day cultures rather than the usual 4-day cultures did not affect the outcome of the experiments."
- Both together
  - "Dissolving the drug in ethanol did not affect the cellular effect of the drug."

- **Effect** can be a verb, meaning "to bring about", usually with "change"
  - "Complaining about a problem is one way to effect a change in the way things are done."
  - "Aspirin can affect how you feel by effecting relief of headache pain."
- **Affect** can be a noun, in psychiatry, meaning "facial expression"
  - "Patients with depression or schizophrenia may have a flattened affect; for example, they may not smile at a friend or laugh at a joke."

Misused Words:
Making your data "quantitative"

- **Quantitative** is a word
- **Quantitate** and **quantitation** are **NOT** words!!
  - go ahead, check your dictionary; I did!

- **Quantify** is the verb form, NOT quantitate
- **Quantification** is the noun form, NOT quantitation
- **Quantitative** is the adjective form

- Maybe not a big deal
  - but if you don't do it right, good editors will change it
  - and this will annoy you

Misused Words: Who That?

- Use "who/whom" with people; "that" with things

  - She is the person **whom** you should contact.
  - **NOT:** She is the person **that** you should contact.

  - **BUT:** An antibody with strict specificity is the one **that** you should use.

Misused Words: *i.e. vs. e.g.*

- ***i.e.*** is abbreviation for *"id est*", which means "that is" or "it is" or "in other words" in English
  - used when you want to clarify or specify one thing
  - "There is no cure for IPF; *i.e.*, if you get it, it will kill you."

- ***e.g.*** is abbreviation for *"exempli gratia "*, which means "for example" in English
  - used when you want to give one or more examples
  - "There are multiple tools to identify ATII-mediated effects, *e.g.* ACE inhibitors, AT-R blockers, and newer methods such as siRNA and knockout animals."

- Both are Latin terms and should be italicized.
  - Journal style: JBC still italics, PNAS not
- Often a comma after *i.e.*
- Usually no comma after *e.g.*

Misused Words: farther, further, furthermore

- **Farther** somewhat preferred for physical distance
  - It is **farther** to Jupiter than to the moon.
- **Further** somewhat preferred for "figurative" distance
  - She is **further** along in her graduate program than I am.
- If in doubt, **further** is almost always safe and correct.
- For sure **further** if meaning is "additional"
  - …., providing **further** evidence for our hypothesis
- **Further** is also a verb
  - To **further** our goal of obtaining NIH funding, we ……
- **Further** and **furthermore** seem equally OK for extending a list
  - **Further**, the ability of aspirin to treat inflammation also requires ….
  - **Furthermore**, aspirin is contra-indicated in children because ….

Misused Words: if *vs*. whether

- We often say "if" when we mean "whether"
  - To test if PKC is truly essential, we used knock-out mice.
  - To test whether PKC is truly essential, we used knock-out mice.

- An "if" statement should always be followed by a "then" statement
  - If PKC is truly essential, then the response should not occur in PKC knock-out mice.

- A "whether" statement should always mean "whether (or not)"

Misused Words:
Be sure to "write the right word"!!

- here/hear
- there/their/they're
- your/you're/yore
- its/it's
- whose/who's
- to/too/two

- "I want you to no that I here what your saying, and I agree that its there own fault which is just to bad"—**WRONG!!**
  - These don't show up much in scientific writing but do in emails
  - This is not a failure to "edit" emails, but an indication that you never really learned this and have to "waste" time figuring out the right word
  - Which makes you look less than bright

- Ewe knead two bee shore too chews thee write ward!!

Professional wording

- Use "technical" or "professional" wording rather than "common" or "conversational" wording in manuscripts

  - "To see if" PKC was involved….. **(Avoid this!)**
  - "To test whether" ……." **(Same meaning, more "professional")**

  - "We wondered if it might be" (pathway X) instead. **(Avoid this!)**
  - "To test the alternate hypothesis" **(Professional")**

  - "To make sure that we had put the same amount of protein in each well on the gel…" **(Conversational)**
  - "To confirm equal loading" **(standard professional wording)**

- More "conversational" may work well in seminars
  - not good in manuscripts

"Professional" wording - more examples

- Generally preferred to use "technical" or "professional" wording rather than "common" or "conversational" wording

  - "Samples were put in the freezer…" **(BAD)**
  - "Samples were stored at -80C…" ……." **(Professional)**

  - "Next we took the cells and put them in the incubator and let them sit for 5 min **(BAD)**
  - "Cells were incubated for 5 min" ……." **(Professional)**

  - "Next **we wondered** if thing A might cause thing B."
  - "We next **tested** whether….."
  - "To test whether …."
  - "**We sought** to determine if….."
  - "To determine…"

"Professional" wording - more examples

- Avoid using lab "jargon"

  - "Samples were run on gels……" **(Jargony)**
  - "Samples were electrophoresed……" **(A little better)**
  - "Samples were subjected to SDS PAGE ….." **("Technical")**

  - "The samples were counted in a scintillation counter."
  - "Radioactivity in each sample was quantified by scintillation spectrometry."

  - "We tissue-mizered the cells and then spun them down to pull out the membranes."
  - "Tissue was homogenized and membranes were isolated by centrifugation." ***(more experimental detail needed, but the focus here is on the wording)***

A collection of collective thoughts

- Collective nouns--singular terms for groups of things
  - singular or plural verb form??

- The class is taking an exam. (The class is doing this [as a group].)
- The class are taking an exam. (The class [members] are doing this.)

- Our course faculty (is/are) working on a textbook on Scientific Writing.

- The staff at the bookstore (is/are) reading a book on salesmanship.

- Guideline: Choose the singular verb form UNLESS "the group members" (plural) is clearly what is meant.
  - Our faculty [list] IS very large.
  - Our faculty [members] ARE good at both research and teaching.

A collection of collective issues

- Walgreens phone message:
  - Our staff is busy helping other customers.
  - All of our staff are busy helping other customers.

- NPR almost daily:
  - Visit our website to see what our staff is reading.
    - Are they all reading the same thing? (is)
    - Each reading their own thing? (are)

Of is Of-ten confusing!

- "Of" prepositional phrases further confuse the decision for many
  - singular or plural verb form??

- A list of relevant proteins is/are shown in Table 1.
- A stream of electrons pass/passes through the detection chamber.
- A box of cookies is/are on my desk.
- The Table of Contents is/are usually at the beginning of a book.

- The subject of the sentence, NOT the object of the preposition, determines the verb form.
  - even though the object of the preposition is immediately before the verb
- Pay attention for these, think carefully, make rational decisions
- The singular verb form is always grammatically correct.
  - But the plural form may not be "wrong" in specific cases.

From a recent journal club paper

- Each of the PAR1 WT and ECL2 mutant G-protein signaling assays ~~were~~ (was) performed in the same cell type and with similar levels of cell surface receptor expression.

- These findings show that glycosylation regulates coupling to G12 *vs.* Gq proteins, which modulate(s) the downstream cellular responses.

- A greater response to thrombin was observed in ECL2 mutant cells than in wild-type cells, whereas the cells responded ~~equivocally~~ equivalently to serum.

- Do NOT expect the journal to fix your writing for you
  - write it right yourself, or it will stay wrong!

Editorializing on Editing and Drafts

- Always print your drafts **double-spaced**, perhaps also with **wide margins**--(if your "editor" will edit your paper copy)
  - to allow your "editor" (mentor, colleague) space to write in suggestions, problems, alternate wording, comments!!

- Learn to recognize and use key proof-reading symbols (if you or a colleague edit printed copies)

- Use **"Track Changes"** functions of your word processing program--(if your "editor" will edit your text electronically)

Editing Aids in Word

- If anyone wants, I can show you more useful Word features
  - Compare documents
  - Customizing your button bar
  - Defining macros for complex typing used repeatedly
  - Turn off "select entire word" and other auto-corrects
  - Turn on grammar and spelling checkers

Surviving the Drafts

- Wait with putting in figures until near-final drafts
  - They make files very large and tend to jump around as you write
- Save often! (Check your auto-save options in Word)
  - to avoid losing important new writing or editing
- Save many versions, with date and time or draft number
  - YR/MO/DY/HR/MIN format will save all drafts in order!
  - "EgfPaper-090814-pm0415" format will save all drafts in order
  - "Draft 01" (always use at least 2 digits!)
- Save deleted blocks of text somewhere!
  - I often want to go back to retrieve some earlier wording or deleted reference
  - Or decide I liked my first version better!
- Delete all or most of these drafts only when done and manuscrpt accepted!
  - Reviewers may ask you to include something you had deleted

Editing: Proof-readers' marks
(from paper copies and before Track Changes)

℘	delete the marked characters
⌢	close up unneeded space
text	insert here
tr	transpose text
STET	leave text as is
ll	align
Sp	spell out abbrev.
lc	Lowercase
Cap	capitalize
clc	INITIAL caps (capitals and lowercase)
rom	roman (normal)
ital	italic
bf	bold
sc	small caps
bf ital	bold italic
wf	wrong font
¶	start new paragraph. For the
⌐	start new line here
runin	run in (combine two lines)

[	move left
]	move right
][	center
#	space
□	em space
⊙	period
❜	comma
❜;	semicolon
:	colon
❝❞	quotation mark
❜	apostrophe
?	question mark
!	exclamation mark
=	equal sign
=	hyphen
N	en dash
M	em dash
/	slash
( )	parenthesis
[ ]	square bracket

http://www.swdocs.com/proof2.htm

Frequent Proof-Reading Mark-Ups

Writing a good abstract can very hard (2 inserts)

Writing an good abstract is hard; but it can be done. (2 deletes)

Writing a good abstract can be ver y hard. (bring together)

Writing a good abstract can be veryhard. (separate)

Writing good helps make your results clear. (transpose)

….. blocked by losartan. Thus angiotensin receptors play a critical role. The next set of experiments examined the role of adrenergic receptors. Cells were …… (new paragraph)

Editing: Proof-readers' markings

Proofreaders' marks

Proofreaders' marks provide a well understood shorthand for marking corrections and changes to text. When marking a document for corrections or changes it is important to use proofreaders' marks correctly so the person implementing the changes will correctly interpret them. There are 2 general "rules to follow when using proofreaders' marks.

- make a mark reference in the margin for every mark you make in the body of the text. When the person implementing the corrections is scanning the page it is much easier to see a mark in the margin than one in the text. In most cases the marginal marks are necessary to provide additional information.
- Seperate marks in the margin with slashes. When more than one change is marked on a line, the marks in the margin must be separated by slash characters to distinguish the various marks.

Very much like Track Changes--mark in text, explained in margin!

http://www.swdocs.com/proof2.htm