

20.109 Communication Workshop 1: Designing Effective Figures

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Introduction

- Why care about science communication?
- What is your experience with the quality of the science communication that you've encountered?

We often blame ourselves for struggling to understand talks or papers,

but **poor communication is often the barrier** – not your scientific understanding.

You're already a good *reader* of science,
and that means you can give good feedback.

"I got stuck here. I feel like there was a huge logical leap I couldn't follow."

"There's way too much going on in this plot.
What am I supposed to be looking at?"

What makes you feel that communication was successful?

As the reader...

“I got it!”

Message, “so what?”	Context justifies importance, scientific question is clear & compelling, significance & novelty explained
Visuals	Appealing, uncluttered, all relevant information present & easily located
Overall style	Logical flow, concise, minimal jargon

What makes you feel that communication
was successful?

As the writer...

“I got what I wanted!”

useful feedback, a good grade,
a grant, an investor, a citation

In these workshops, we'll work on turning your instincts as a reader of science into a toolset for...

- identifying when scientific communication is confusing
- identifying WHY it's confusing
- fixing the problem

...and start applying these tools to your 20.109 communication tasks.

Structure of the workshops

1. Discuss an example from the field
2. Derive principles and strategies
3. Practice strategies
4. Go home with a checklist/rubric

Figures and Captions: why start here?

Figures must convince your peers of your data's novelty and credibility.

- Hold your “naked” data up to be judged.
- Tell your story compellingly AND honestly.

What are the basic components of a figure?

Herbas MS et al., , Shichiri M, Ishida N, Kume A, Hagihara Y, et al. (2015) Probucol-Induced α -Tocopherol Deficiency Protects Mice against Malaria Infection. **PLoS ONE** 10(8): e0136014.

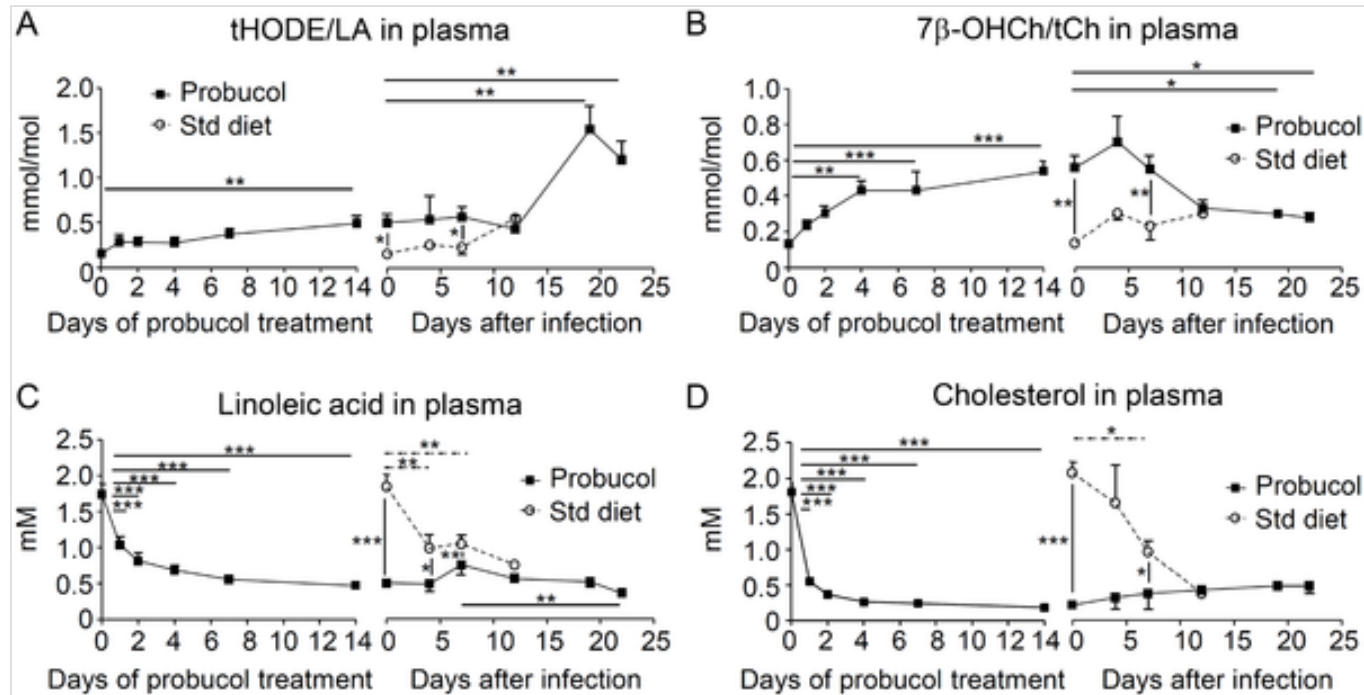


Fig 4. The ratios of lipid peroxidation products to parent lipids in plasma increased after probucol pre-treatment.

Six-week-old C57BL/6J mice were treated with 1% w/w probucol in the diet for 2 weeks and then infected with 0.2 mL of 1×10^5 erythrocytes /mL infected with *Plasmodium yoelii* XL-17. Plasma samples were obtained at day 0, 1, 2, 4, 7, and 14 after starting the probucol diet (n = 5 per group) and at day 0, 4, 7, 12, 19, and 22 post-infection (n = 2 to 7). The ratio of total hydroxyoctadecadienoic acid (HODE), a peroxidation product of linoleic acid (LA), to linoleic acid (tHODE/LA) in plasma (A) and the ratio of 7 β -hydroxycholesterol (7 β -OHCh), a peroxidation product of cholesterol, to total cholesterol (7 β -OHCh/tCh) in plasma (B) were measured. The concentration of LA (C) and tCh (D) were measured by using gas chromatography-mass spectrometry (GC-MS). All data are expressed as mean \pm SE. Statistical analysis was carried out by analysis of variance (ANOVA). * p < 0.05, ** p < 0.025, and *** p < 0.001. The solid bars indicate the significant changes in probucol-treated groups and the dotted bars indicate the significant changes in standard (Std) diet-fed mice.

Basic figure components

Title

Choice of data

**Presentation
choices**

Caption

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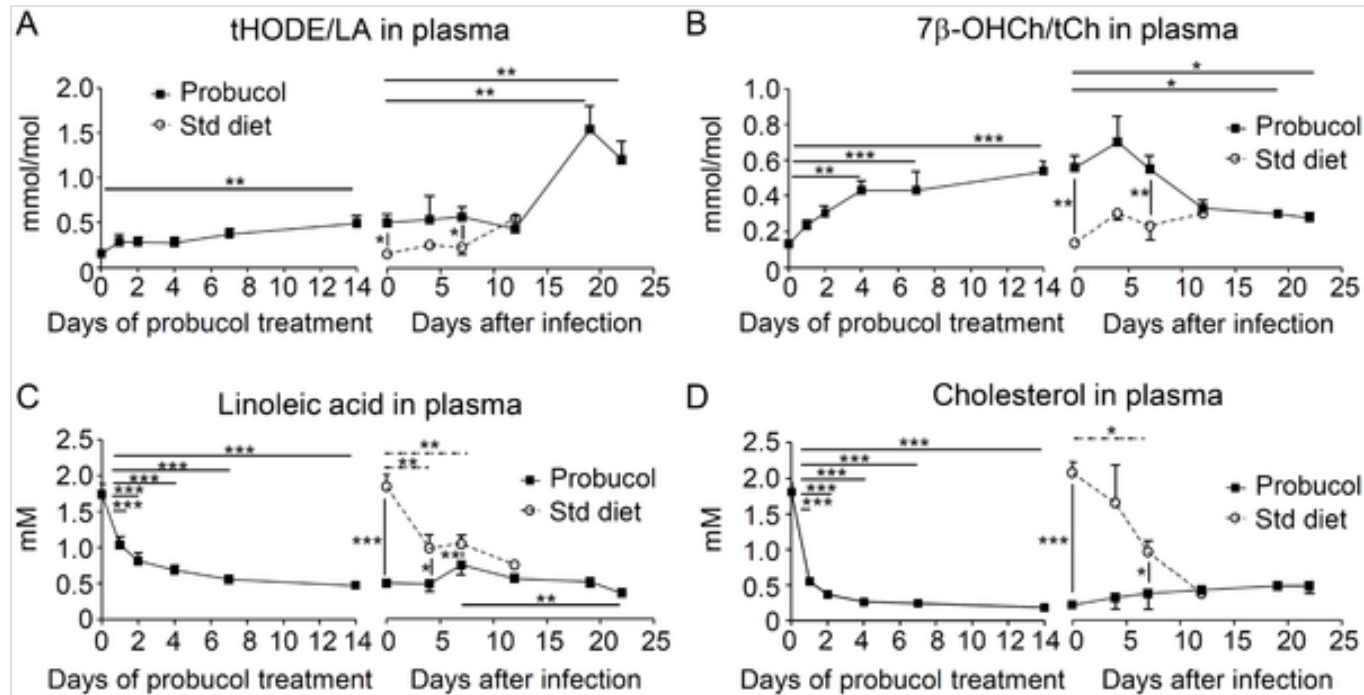


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Evaluating figure choices

- Which data are irrelevant?
- Are there any data/labels missing?
- What could be done to better highlight the most important data?
- Is there a better way to present the data?
- Do the statistics actually add anything here?

All figures you make need all of these components!

Schematics & diagrams count as figures, too.

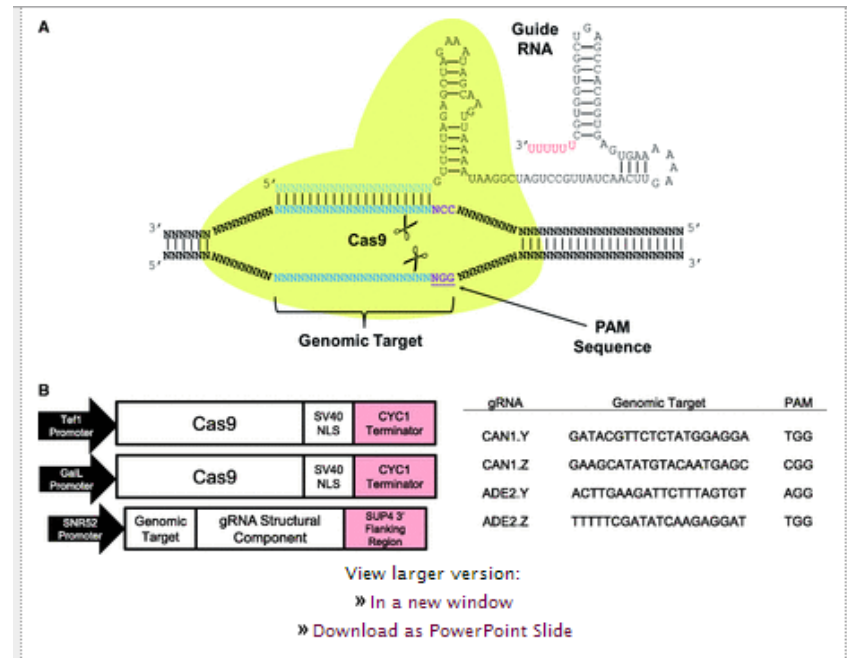
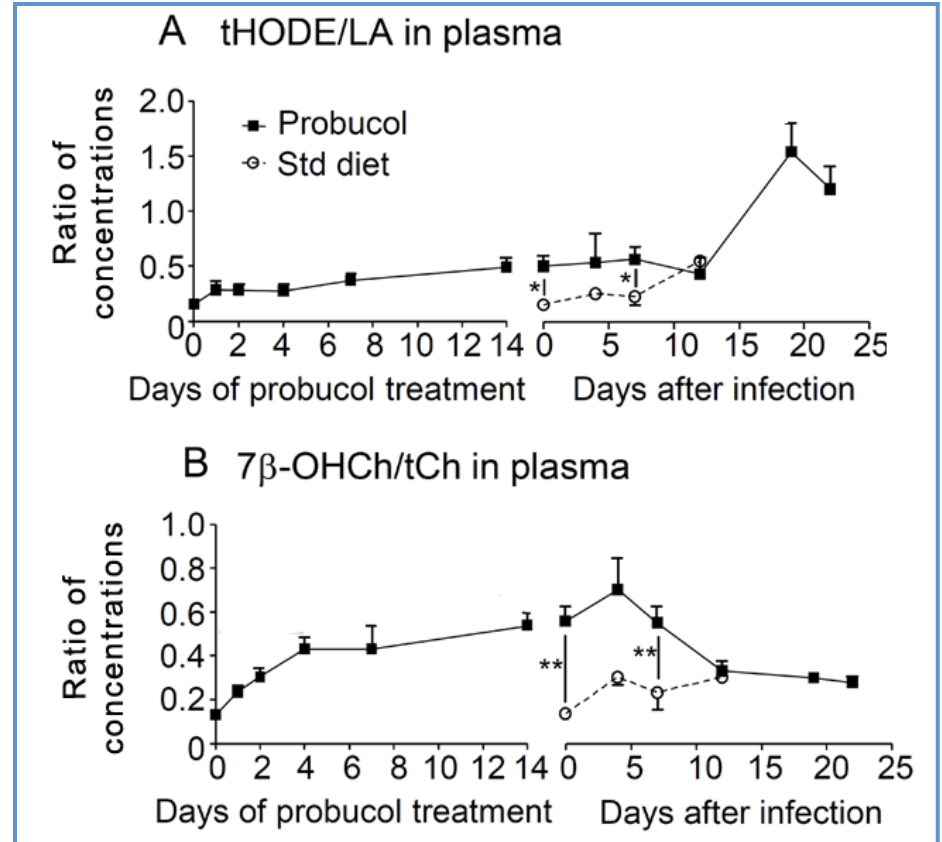
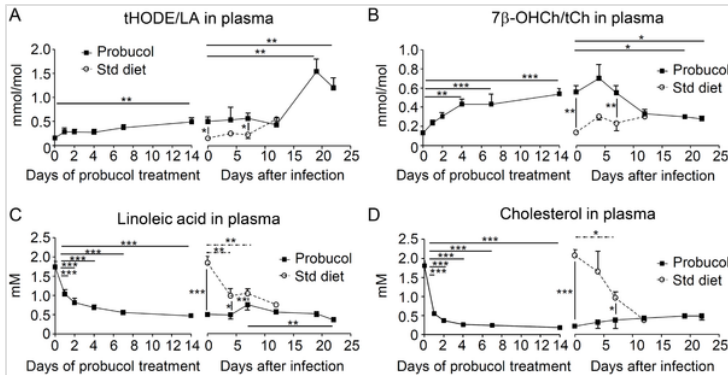


Figure 1.

Diagram of Cas9 complex and schematic of genetic constructs. (A) Illustration of Cas9 protein interacting with CRISPR gRNA to direct endonuclease activity proximal to the PAM sequence. (B) Design of the Cas9 and gRNA constructs. Cas9 gene contained a SV40 nuclear localization signal and was expressed under the Gal-L inducible promoter in CAN1 experiments and the TEF1 constitutive promoter in ADE2 experiments. The gRNA was

Only include the minimum information necessary to draw a conclusion.



Exercise: Turn your gel photo into a figure.

Title	Take-home message of the figure. What conclusion should reader evaluate when looking at the figure?
Choice of data	Only data that are critical to the conclusion.
Presentation choices	Type of graph or display, legends & labeling, design choices. Uncluttered; allow quick evaluation of conclusions, without referring to legend or caption.
Caption	Descriptive only, not explanatory/interpretive. Only enough methodological detail to make it clear how results were obtained. “...include only the most relevant aspects of the methods, such as the names of the diagnostic enzymes, a clear description of any normalization or statistics done on the flow cytometry data, etc.” (<i>Mod. 1 Wiki</i>)

Closing

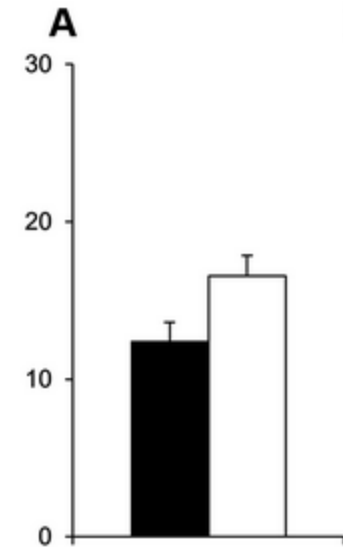
- Figure rubric + presentation → Stellar
- How can these workshops serve you better?
Let me know! dchien@mit.edu
- Two weeks: Abstracts and Titles

Additional slides

What kind of plot is the best way to display your data?

Case study: bar charts

What assumptions are you making when displaying your data as a bar chart?



Weissgerber TL, Milic NM, Winham SJ, Garovic VD (2015) Beyond Bar and Line Graphs: Time for a New Data Presentation Paradigm. PLoS Biol 13(4): e1002128. doi:10.1371/journal.pbio.1002128

A bar chart assumes a Gaussian distribution.
Scatter plots allow you & your reader to
evaluate the true distribution.

