Protocols

A Guide for Creating Recipe-Style Protocols

The ASAP Open Science Team
Dana Lewis, PhD
Matthew Lewis, PhD
Devin Snyder, PhD
Robert Thibault, PhD

Writing Recipe-Style Protocols

This document provides guidance on how to write recipe-style protocols.

The ASAP Open Science Policy requires all research outputs, including protocols, be deposited in a publicly accessible repository no later than the time of publication and cited in the publication with a persistent identifier. **ASAP recommends using protocols.io to deposit protocols.**

If you have additional questions, email the Open Science Team at **openscience@parkinsonsroadmap.org** with the subject title: "Writing Recipe-Style Protocols Question:...".

Table of Contents

What is a protocol?

A **protocol** is a detailed, step-by-step procedure that outlines exactly what a researcher did for an experiment, or part of an experiment. Protocols are distinct from writing the Methods section of a paper, which provides a general overview of what was done for each experiment in the most concise language possible. The canonical methods format format does not usually provide enough detail for another researcher to repeat the experiment (for example, see the Cancer Reproducibility Project).

The ASAP Open Science Policy requires that a recipe-style protocol be made publicly available for each Methods subheading within a published manuscript.

A recipe-style protocol should include:
- The step-by-step set of tasks involved in an experiment
- The order of those tasks
- A description of how measurements were made
- Required materials, quantities, and source
- Any technical specifications necessary to complete the experiment

When writing a protocol, authors should provide enough detail that another researcher in the same field could repeat the experiment. Protocols may be shared on protocols.io or via a Methods paper (see how *Nature* defines a Methods paper).

> **TIP:** It may be helpful to consider what you would want to know if you wanted to repeat your own study in the future or to have someone else in your lab test your protocol.

Protocol Best Practices

- Write the protocol steps in chronological order.
- Share pictures or videos of various steps
- Share as much information as possible about the lab materials and reagents used in the experiment, including RRIDs. ASAP recommends sharing this information in a Key Resource Table that is linked to your protocol.
- Be specific about decisions made during the experiment that someone reproducing your work would need to know (e.g., exclusion criteria, replicates needed, special knowledge to get something to work, etc.).
- Convey the tacit or 'hidden' knowledge in a protocol when it is known.
    - *For example, instead of saying 'Mice were anesthetized and brains extracted. Coronal midbrain slices were prepared.' you might also include*

'For best results, time from anesthesia to slicing should be under 2 minutes.'

TIP: To identify 'hidden' knowledge, have someone in your lab try to repeat your protocol based only on what you've written. It may also be helpful to think about teaching the protocol to a new student in your lab for the first time!

- Share population or mechanism-based details in addition to time-based details.
  - *For example, instead of saying 'wait 24 hours' you might say 'wait for one cycle of cell division to complete, typically about 24 hours.'*
  - If population or mechanism-based parameters have not been tested, you should state this in the protocol.
- If creating a protocol for a methodology or technique on protocols.io, create a template for the method and then fork the protocol for each variation on that experiment.
- If citing a Methods paper, evaluate the manuscript for how well it communicates the protocol. You can use discipline-specific checklists, such as ARRIVE, CONSORT, PRISMA, and MDAR, to determine if the paper is a good protocol.

How do I use protocols.io?

ASAP recommends sharing your recipe-style protocols at protocols.io for two reasons:
1. Sharing on protocols.io allows you to share detailed steps that often can't be shared at the journal due to space constraints.
2. Sharing on protocols.io ensures the discoverability and persistence of the method.

View these guides to posting on protocols.io or this video on using the platform.

Why does ASAP require a recipe-style protocol?

Sharing recipe-style protocols has many benefits, including:
- Ensuring all information needed to perform an experiment is provided, thereby increasing the ability of other researchers to repeat your experiment and in turn build on your research findings.
- Seemingly minor changes to a protocol can make a big difference experimentally. Writing a recipe-style protocol documents these changes.

Example of a recipe-style protocol

Generated with ChatGPT, edited by Robert Thibault

Below is an everyday example of making spaghetti bolognese to highlight how ambiguous traditional Methods sections can be compared to a recipe-style protocol.

Typical manuscript methods section

Preparation of Spaghetti Bolognese

In the preliminary phase, olive oil was utilized to process the beef until its color alteration was observed, at which point certain aromatic vegetables had already been introduced. A mixture of tomatoes in varied consistencies was added under conditions conducive to flavor amalgamation, as outlined in earlier works (Doe et al, 2013). Seasoning was adjusted per subjective culinary standards, employing common condiments and aligned with broader gastronomic practices (Smith et al, 2015).

Parallel to the sauce's reduction, a separate aqueous solution was brought to a phase transition at 100℃, where substrates of durum wheat semolina were immersed until reaching an edibility threshold indicative of 'al dente' as per traditional interpretations that have been described previously (Rossi, 2017). The solid components were then separated from the liquid medium through a filtration method. Boiling time was based on packaging instructions.

The integration of pasta and sauce was executed following principles outlined in a basic culinary guide (Jones, 2010). Final garnishes included a dairy-based topping and herbaceous elements.

Recommended recipe-style protocol

Objective: Prepare four servings of Spaghetti Bolognese

Materials needed:
- 400 grams spaghetti
- 500 grams ground beef
- 1 large onion, finely chopped
- 2 cloves garlic, mined
- 800 grams canned diced tomatoes
- 3 tbsp tomato paste
- 1 cup beef broth

Aligning Science Across Parkinson's

- 1 tsp salt
- ½ tsp black pepper
- 2 tbsp olive oil
- 50 grams Parmesan cheese, grated
- Fresh basil leaves for garnish

Procedure:

1. **Preparation of Ingredients:**
   a. Finely chop the onion and mince the garlic.
   b. Measure all other ingredients as listed.
2. **Cooking the meat:**
   a. Heat the olive oil in a large skillet over medium heat.
   b. Add the chopped onions and cook until soft and translucent, about 3 minutes.
   c. Add the minced garlic and cook for another minute, until fragrant.
   d. Increase the heat to medium-high, add the ground beef and cook until fully browned, breaking up the meat with a spoon, about 7-10 minutes.
3. **Adding tomatoes and seasoning:**
   a. Stir in the diced tomatoes, tomato paste, and beef broth.
   b. Season with salt and pepper.
   c. Reduce heat to low and let the sauce simmer for 20 minutes, stirring occasionally.
4. **Cooking the spaghetti:**
   a. While the sauce simmers, bring a large pot of water to a rolling boil.
   b. Add spaghetti and cook as per package instructions, usually about 8-10 minutes, until the pasta is firm to the bite but not hard.
   c. Drain the spaghetti.
5. **Combining and serving:**
   a. Mix the cooked spaghetti with the sauce.
   b. Serve the spaghetti hot, topped with grated Parmesan cheese and fresh basil leaves.