Identify the quality of your protein and start getting consistent results with Tycho

NANOTEMPER

If you're following your trusted protocol and getting inconsistent results...

Are there impurities causing questionable results?

Is the batch you're testing similar to the last one?

Did you use the right amount of material in your assay?

Is your protein even present in your sample prep?

Are your samples properly stored?

Did your protein lose its functional activity?

Could it be the salt, pH or buffer that's affecting your protein?

If you answered yes, then first check the quality of your protein

WITH TYCHO

Tycho measures protein quality

Tycho tells you so much about the quality of your protein — presence, purity, concentration, functionality and similarity — in a single experiment. These can all be measured simply by determining whether your protein is structurally intact or properly folded.

Using only 10 µL of sample, find out the quality of any protein in 3 minutes and make your assay development and purification workflows more efficient.

The earlier you know more complete information about the quality of your protein, the easier it will be for you to decide whether or not to move forward with your experiments.

Verify the quality of your starting material or similarity between batches

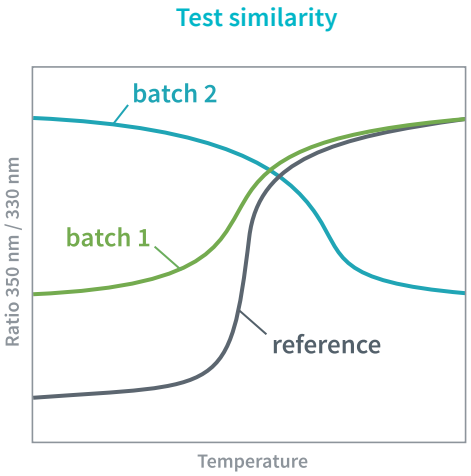
You work with so many types of samples—some you prepared yourself, some you bought commercially, and others you inherited from someone else.

You probably assume that the quality of your sample is good. Likely you don't even know if the sample you purchased or prepared yourself is similar to the previous batch you tested. You also don't have an easy way to verify if the sample you inherited is of the right quality.

It's not until you get to the end of a long drawn out experiment that you discovered something went wrong.

Then comes the need to troubleshoot the problem (which is not fun). Maybe you ended up with a smear on your SDS-PAGE, or you didn't see a band on your Western. You're so frustrated that you didn't detect a signal from your ELISA, or that there was no interaction in your binding assay.

With Tycho, compare the structural integrity or unfolding profile of that new sample prep to your reference sample of the right quality to verify they are similar. If they differ, you may have a sample of lower quality that contains contaminants—this indicates the need to further purify it or optimize your purification workflow. Having confidence that you are working with the highest quality samples all the time, will result in more consistent results.



Quickly identify discrepancies between protein batches by comparing to a reference sample

Check for sample presence, amount and purity

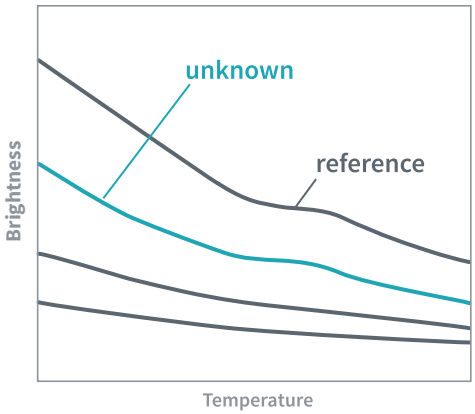
Your protein sample is precious material—especially to you. After all that time and labor spent isolating it, are you sure your purification worked? How much did you recover? Really, what's in that tube?

Part of determining the quality of that sample in your tube is confirming your protein is present and how much is isolated or purified. You'll need this info to properly plan your next experiments.

Typically, you would use a spectrophotometer to check purity and concentration followed by confirmation of its identity by SDS-PAGE or Western blot. But, you don't actually need to keep doing it that way.

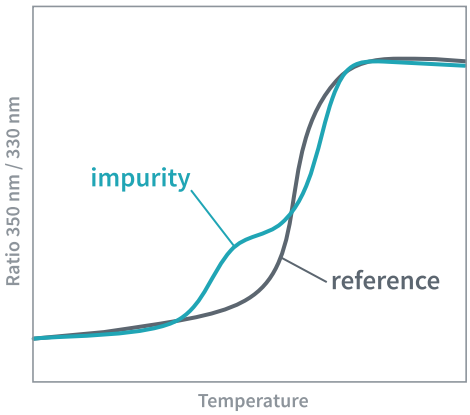
Once you've run Tycho to confirm results from traditional methods, you'll realize that the results from Tycho not only show you the presence of your protein but also if impurities are present. And, it even lets you determine the concentration of it. So in the future, shelve those traditional methods that take time and use up a lot of your precious material.

Determine presence and concentration



Quickly ID your protein and get an indication of its concentration compared to a reference sample of known concentration

Monitor purity



Detect impurities in your sample compared to your quality reference standard

Determine the right buffer recipe for storage or assay development

You've spent a ton of time purifying your protein. Then you have to decide whether to use it right away or store it. Regardless, you have to make sure your protein is happy and is in the right buffer recipe—pH, salts or additives—or you're right back to purifying another batch of protein.

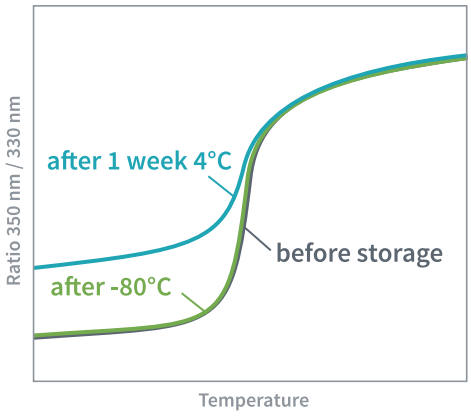
If you use it right away, first you have to ask yourself whether your sample is compatible with the conditions of your assay or next steps.

If you choose to store it, your protein may require its own unique buffer formula depending on if you deep freeze it, or if you decide to temporarily put it in the fridge or on ice.

Any mishaps can cause your protein to degrade, lose its activity, or fall out of solution which in addition also causes the concentration to change. All of these things impact the quality of your protein.

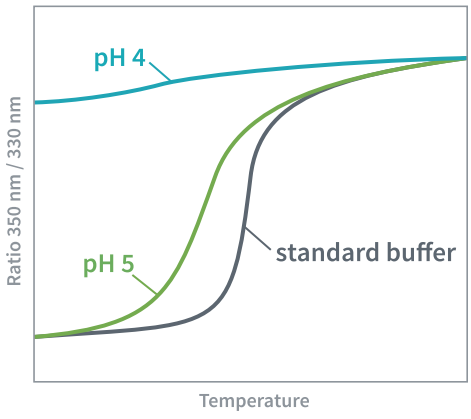
Use Tycho to identify the right buffer recipe for storage or assay development to preserve the quality of your protein. Quickly screen different buffers, additives and excipients as well as storage temperatures and time periods to determine the right conditions for your protein samples. Use this information to help optimize your assay conditions for future experiments. In the end, you'll spend less time generating unnecessary batches of protein.

Monitor storage conditions



Monitor the effects of storage conditions on your protein preparations

Optimize assay conditions



Quickly screen and determine the appropriate buffer to assay your protein

Quickly confirm functionality

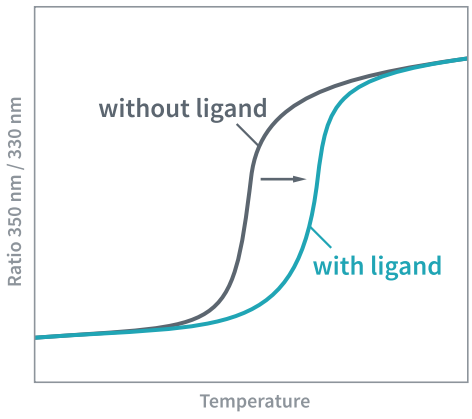
You've run that gold-standard method everyone uses in the lab, but you're getting unexpected results you can't explain. You find yourself stuck in that endless loop of troubleshooting each assay variable and repeating the experiment until you get the expected result. That trusted protocol isn't turning out to be as reliable as you thought.

The real issue could be functionality of your protein, which is a key aspect of sample quality that is often overlooked. Since traditional tests for functionality that look at interactions between two molecules take too much time or are too complicated to set up, they aren't worth the effort to run or are skipped until issues arise.

A simple test looking at functionality earlier in the process, though, could have saved you from spending a lot of time and effort troubleshooting. The reality is that any assay, even a gold-standard method, will need some tweaks or optimization.

Tycho tests functionality in 3 minutes and tells you if your protein is interacting with other molecules. Since it does this in a label-free way with very little sample, it's much easier than traditional methods, so now there's no reason why you wouldn't do it earlier.

Test functionality



Determine functionality with a quick test of interaction between two molecules

Tycho improves any workflow with a quick protein quality check

Initial purification
Test for the presence of your protein

Chromatography step(s)
Pinpoint the fraction that contains your isolated protein and check its functionality

Purified protein
Confirm batch similarity, purity, functionality and concentration

Storage conditions
Determine batch similarity, purity, functionality and concentration

Assay development
Check the concentration of your protein and test if its functional or has activity

Swiftly identify the quality of any protein using small amounts of sample

Run label-free analysis

Avoid modifying your protein and gather native and more relevant results on the quality and functionality of your protein sample.

Conserve precious sample

Checking your protein's quality early on in your experiments will help you run less tests later and Tycho only uses 10 µL of sample for an analysis.

Save scarce bench space

The small benchtop footprint packs a powerful punch to generate valuable info on protein sample quality.

Get answers in minutes

Generate informative data in 3 minutes fast —it makes deciding what to do next that much easier.

Easily analyze any protein sample type

Forget dialyzing or doing sample dilutions. Determine the quality of any protein in any type of buffer over a wide range of concentrations.

Experience an intuitive user interface

Starting an experimental run is a breeze using the built-in touch screen tablet. Quickly label your samples and view the results that are automatically generated for you. All experimental results are archived and available for convenient export.

Measure many sample types

- Antibodies
- Kinases
- Multimeric complexes
- Transcription factors
- Membrane proteins, solubilized in detergent or nanodiscs
- Tagged proteins
- Point mutations
- Enzymes
- Virus-like particles (VLPs)/Capsids
- Functionalized proteins (mAbs)

And many more examples...

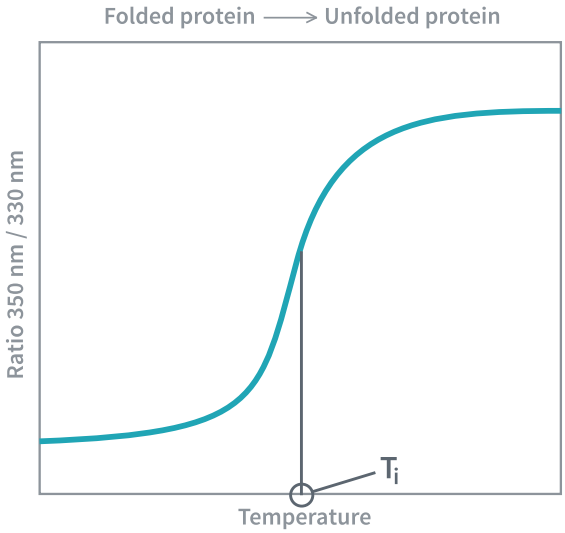
Improve purification and characterization workflows

- Test storage conditions
- Monitor sample presence during purification steps
- Examine binding interactions
- Confirm sample quality of crystals before running x-ray crystallography experiments
- Check quality of samples prior to cryo-EM
- Improve buffer recipe development
- Ensure samples are of the right quality for NMR experiments
- Determine how much material is isolated and the protein concentration
- Check protein reagent quality when doing assay development

How Tycho technology identifies protein quality

Tycho quickly reveals protein quality – presence, purity, concentration, functionality and similarity – all in one experiment. It does this all by measuring your protein's structural integrity or foldedness in a label-free way. The system measures the fluorescence of intrinsic tryptophan and tyrosine residues detected at both 350 nm and 330 nm as a 30 °C/minute temperature ramp is applied from 35-95 °C.

The profile of the folded to unfolded state can be unique to each protein. Tycho records these measured unfolding profiles so you can use them as a reference to compare and validate the quality of your sample to any future batches. Tycho also captures the total fluorescence signal (sample brightness), and the signal at the start, during and end of the thermal treatment.



Tycho utilizes a fast, defined thermal ramp to unfold a protein and identifies the inflection temperature or T_i that represent unfolding transition(s) or discrete changes in a protein's structural integrity.

> *"Tycho NT.6 was adopted by all our lab members in no time, providing crucial quality information not detected before. It will become a standard tool for everyone working on protein biochemistry."*
>
> **— Dr. Gregor Witte, Principal Investigator, K.P. Hopfner lab, Ludwig Maximilians University of Munich**

Tycho NT.6 system specifications

Samples per run	Up to 6
Experimental time per run	3 minutes
Sample volume measured	10 µL
Detected molecule concentration range (standard IgG)	0.010 to > 200 mg/mL
Dynamic molecule concentration range within one run	500-fold difference in concentration (standard IgG)
Result output	Inflection temperature (T_i) Initial ratio (350 nm/330 nm at 35 °C) Δ ratio (between 95 °C and 35 °C) Sample brightness
Repeatability of T_i* (@ 70 °C)	Standard deviation < 0.15 °C Relative standard deviation < 0.2%
ΔT_i* sufficient for significance	± 0.3 °C
Heating range	35 °C to 95 °C
Thermal ramp	30 °C/min
Precision of thermal ramp slope	± 0.05 °C/min
Fluorescence detection	330 +/- 5 nm and 350 +/- 5 nm
Source of fluorescence	Intrinsic tryptophan and/or tyrosine
Dimensions	31 cm W x 37 cm H x 18 cm D
Weight	6.6 kg
Dilution range for accurate concentration indication	0.010 to >1 mg/mL

**Depends on the unfolding profile and sample brightness. The values apply for samples showing a single unfolding transition with a Δ ratio value > 0.1 at concentrations at least 10-fold above the lower detection limit. The values apply for measurements performed at a constant ambient temperature of 23 °C.*

For more info, visit **nanotempertech.com/tycho**

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