Analyze That episode transcript

Beyond the Ratios: How NanoDrop™ Ultra Supports Biopharma Workflows

This transcript has been lightly edited for clarity, readability, and length. The content reflects the original discussion and technical intent of the speakers.

Intro: Welcome to Analyze That, a series where we talk about the impact of analytical solutions across industries, from metals to power generation to pharmaceuticals and everything in between. You'll hear from experts who are passionate about sharing their insights on emerging technologies, real-world applications, and the innovations shaping the future of safety, quality, and reliability across industries. Thanks for joining us. Let's dive in.

Justin Shaffer: Hello, everyone. I'm Justin Schaefer. I'm the product specialist for the Nanodrop product line here at Thermo Fisher Scientific. And I'm joined by my colleague, Brian Matlock. He's one of our senior application scientists who's worked for many years closely with Nanodrop instrumentation. And this year marks the 25th anniversary of Nanodrop. And so today we'll be talking about how Nanodrop has evolved over that time. How it's used in biopharma workflow specifically. And then we'll take a look at the Nanodrop Ultra, our latest model, and kind of what value has been added now that we've incorporated the fluorescence and the Acclaro Pro features, and really what those features bring to the newer model. So, Brian, thanks for joining me. Why don't we just start from the beginning, from your point of view. How did Nanodrop originate? You know, were there any kind of limitations, key limitations in the traditional UV-Viz workflows that Nanodrop was really designed to overcome?

Brian Matlock: I've been working with the Nanodrop products for close to 20 years now. And I think back to grad school and early in my career, we were quantitating DNA and RNA almost daily using cuvettes and traditional UV-Vis approaches. So that workflow had a lot of pain points, a lot of friction. You know, you had to do dilutions. You were cleaning, you

know, those quartz cuvettes between samples. And all the calculations were manual to determine concentration. You know, it was time-consuming and, you know, there was variability. Nanodrop really changed that by enabling microvolume measurements without dilution. Giving you direct concentration readouts and using a variable path length that could handle wide concentration ranges within your sample. So, it simplified what was very routine, but a critical step in molecular biology labs. I mean, at the core of all of this, we were still using UV-Vis spectroscopy. So, it's probably worth stepping back and talking a bit about what that measurement actually is and why it's so widely used.

Justin Shaffer: Yeah, that's a really good point. And I certainly don't miss cleaning cuvettes, that's for sure. But yeah, why don't you walk us through what a UV-Vis measurement is and why it remains such a core technique in those life sciences labs particularly.

Brain Matlock: Yeah, absolutely. So, at a basic level, UV-Vis is just measuring how much light a sample absorbs at specific wavelengths. And for things like DNA, RNA, and proteins, that absorbance is directly related to concentration. But one of the useful aspects, especially with Nanodrop, is that you're not... getting a single number, you're collecting full spectral data. So, in addition to concentration, you're also getting a sense of what else is in the sample, whether that's protein contamination, organic compounds, or other impurities that could impact downstream work. It's also a label-free technique, so you're not adding anything to the sample. It's very fast. You can go from sample to answer just within a few seconds. So even though it's established technique, it's still widely used because it gives you both concentration and a quick read on sample quality right before your workflow.

Justin Shaffer: Yeah, that makes sense. And so, you touched on UV-Vis and how that technique is so widely used. But how did Nanodrop really become so dominant? I mean, I feel like almost, you know, everyone knows or at least hears of Nanodrop. So, yeah, in your opinion, how did Nanodrop really become so dominant? And, you know, where does it fit in kind of to the biopharma workflows in particular?

Brian Matlock: Yeah, I think a big part of Nanodrop's adoption really lines up with the genomics boom in the early 2000s. So as labs started generating a lot more DNA and RNA samples, there was a real need for fast, simple way to quantify those samples before moving into downstream applications. Nanodrop fit that need well. It made it very easy to

get accurate concentration data, required very little sample. A lot of times we only had 20 microliters. of sample to work with and you were still getting full spectral information so it wasn't just about quantitation it was also about understanding sample quality and it worked really well across DNA, RNA, and even protein workflows so that made it pretty broadly applicable So as the technology evolved, we started to go beyond just reporting those classical purity ratios like the 260-280 or the 260-230. So, we introduced the NanoDrop One platform in the Acclaro suite, which had more advanced algorithms. And what those algorithms allowed us to do… was to use that full spectral data more effectively to help identify potential contaminants in the sample. So today, Nanodrop really sits as a central QC step upstream of a lot of critical workflows. You know, like QPCR, sequencing, cloning, and even protein expression. It's that quick checkpoint were confirming both concentration and quality before committing to more time and cost-intensive downstream processes. And that role becomes even more important when you start looking at how these measurements fit into broader biopharma or bioprocessing workflows.

Justin Shaffer: All right. Yeah, thanks, Brian. Thanks for providing that insight. Why don't we, you know, dig into that a little bit? And, you know, are you able to give us maybe some more examples on how the NanoDrop is used within those biopharma workflows? You know, maybe let's start with nucleic acids and from there go on to maybe protein or antibody development.

Brian Matlock: Yeah, a good place to start is with nucleic acid workflows. Things like vector construction, plasma prep. or oligonucleotide manufacturing for diagnostic kits. So, once you've prepared your DNA or RNA, you need a quick way to verify both concentration and quality before moving into those steps like ligation, PCR, and sequencing. That's where Nanodrop fits in. With just one or two microliters, you get a concentration measurement along with full spectral data. So, you're confirming not only how much material you have, but also whether there are contaminants present that could interfere with downstream processes. And that's important because even small amounts of contamination can impact enzyme efficiency and lead to inconsistent results. In higher throughput environments like algo production, consistency becomes even more critical. Tools like a Acclaro Pro help improve quantitation accuracy of these highly concentrated samples and using spectral data to better identify potential contaminants across batches. So on the protein side, especially in antibody development and bioprocessing, the role is very similar. Nanodrop is used to quickly quantify protein concentration, typically using A280, during steps like purification or before downstream assays. Again, it's about getting a fast, reliable

measurement while also checking for anything that might interfere with those next steps. And then more complex or highly concentrated samples, so Acclaro Pro can help improve accuracy and consistency, which is important when scaling or making batch decisions. So across both workflows, Nanodrop really acts as a quick QC checkpoint, making sure samples are ready before moving. into more complex and costly downstream processes.

Justin Shaffer: Great. Yeah. So, I think you touched on how Nanodrop really serves as that upstream QC checkpoint, making sure that the sample quality is there and that you understand how concentrated your sample really is. But how does the latest Nanodrop Ultra instrument line really build on that? You know, was the addition of fluorescence in the Acclaro Pro for those biopharma and bioprocessing workflows, you know, what value was added there? Can you dig into that a little bit?

Brian Matlock: Yeah, the NanoDrop Altar really builds on the core UV-Vis capability by adding microvolume fluorescence, which brings an additional layer of sensitivity and specificity to the platform. You know, so with absorbance, you know, you're getting that full spectral data and using it to identify what else is in the sample. But it can also be misleading sometimes when those contaminants contribute to that concentration measurement. And that's where fluorescent really shines. It's a very specific assay and is very sensitive. So, in the fluorescent assays, we have a, you know, very specific dye that binds only to the molecule of interest. So, either DNA, RNA, or protein. So, you get a very specific answer about the concentration. And because fluorescence in nature is much more sensitive measurement than absorbance. So, like a quick screen, sometimes you would just use absorbance or if you need more sensitivity, you can now use the fluorescence measurement. But I really like to encourage people to think about how to use both together on samples because using both absorbance and fluorescence to measure complex samples. really gives you a full picture of what is in that sample and how it's going to perform downstream steps. So, in the bioprocessing workflow and in the biopharma, oftentimes in those workflows, you're working with really highly concentrated samples. And that's where the Acclaro Pro software really shines. So, we have algorithms that allow us to take a very accurate measurement even on these highly concentrated samples. So previously, people would rely on either doing a bunch of dilutions to take these measurements or a consumable-based approach to take those measurements. With the Acclaro Pro software, we're taking a direct measurement, so you don't have any potential errors from the dilution standpoint, and it does not require consumable, so much more cost-effective approach. A lot of times when in these workflows you want to take replicates

and Acclaro Pro really offers a fast and easy way to take replicate measurements of these high concentration samples. So we're really finding that the Nanodrop Ultra helps extend into the biopharma and bioprocessing workflows by allowing those customers to really get out of a microvolume approach for QC.

Justin Shaffer: Thanks, Brian. You know, I really appreciate the insight. You know, I think what stands out is how Nanodrop has really kind of evolved from solving a simple workflow challenge, which was generally to make UV-Vis, you know, faster and easier to becoming a much more integral part of the biopharma workflows that you see today. So, from that early shift away from cuvette to now kind of combining absorbance you know with fluorescence in one instrument and providing advanced tools like you know the Acclaro pro software uh really the goal is to give scientists more confidence in their data and then also simplify the process at the same time um you know so with that you know i just want to thank you know Brian, thank you for running through that for walking us through the history and the applications and really where the platform is headed You know, if anyone is interested in learning more about Nanodrop, you know, all of our resources are available on our website at thermafisher.com slash nanodrop. We have a lot of information on our fluorescent assays, the Acclaro Pro software, and all our Nanodrop models that we have to offer. So, with that being said, I just want to thank everyone for listening in, and we appreciate your time.