Three Trends Shaping Assay Development and HTS coming out of SLAS2026

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While the life sciences community continues to process what we learned at the record-breaking SLAS2026 conference in Boston, it's clear that assay development and high-throughput screening (HTS) are at an inflection point. Novel technologies, emerging biological questions, and new expectations for speed and decision-making are reshaping how we think about screening for small molecule drug discovery. Interestingly, while speed continues to dominate discussions, discovery strategy is also a core driver.

Throughout the conference and exhibition, three themes consistently emerged in conversations with scientists, engineers, platform leaders, and drug hunters.

1. AI/ML Is Only as Good as the Biology Beneath It

Artificial intelligence and machine learning (AI/ML) dominated many discussions at SLAS2026. AI is transforming how we design experiments, screen, analyze screening data, prioritize hits, and identify patterns across modalities. As enthusiasm for AI accelerates, it's also becoming increasingly recognized that AI cannot compensate for weak biology.

AI has not reduced the importance of assay development, rather, it has raised the bar. Predictive models rely on high-quality, reproducible, and biologically meaningful datasets. Therefore, there must be an emphasis on assay design, data quality, and data presentation (e.g., how well can the data be reused, reanalyzed, and integrated across other programs?). As a result, teams are thinking earlier about assay robustness, controls, and data structure as strategic assets.

2. Novel Targets Demand Creative Assay Thinking

The second major trend is the growing focus on novel and biologically complex targets. Discovery teams are increasingly pursuing protein–protein interactions (creating them and disrupting them), transient complexes, intrinsically disordered proteins (IDPs), and pathway-level phenotypes.

These targets and systems often resist traditional assay formats and therefore off-the-shelf solutions rarely apply. Instead, progress depends on creativity at the interface of biology, chemistry, and technology. Many novel targets may require innovative assay design, including those accessible through outsourcing models. High-throughput screening in this context is less about brute force and more about carefully engineered experiments that ask and answer the right biological question at scale.

3. Multi-Dimensional Readouts Are Becoming the Norm

The third trend is an emphasis on designing data-rich assays. Cell-based assays shift further towards high-content screening, high-dimensional screening, and multi-parameter phenotypic screens. Multiplexing biochemical assays is more challenging, although continued innovation in the label-free space, particularly with mass spectrometry, offers a solution for screening two or more targets simultaneously. Finally, binding assays using DNA encoded library (DELs) and affinity selection mass spectrometry (ASMS) platforms can screen multiple targets in parallel and many compounds simultaneously.

This evolution reflects a broader industry recognition that richer data enables deeper mechanistic insight, better triage of false positives, and earlier differentiation between compounds that merely modulate a signal and those that meaningfully impact biology. One challenge is that complex readouts magnify variability, sensitivity to experimental conditions, and consequences of poor assay design, and therefore intensifies the need for reproducibility and straightforward interpretability. Finding the balance between data-rich and overly complex is critical.

Bringing It All Together:

What ties these trends together is the nexus of technology and biology. AI, novel targets and biology, and high-content and/or high-throughput screening all depend on well-designed assays that faithfully represent, mirror, or mimic biological reality in the best way possible while remaining scalable and reproducible.

As we continue our discussions from SLAS 2026, the conversation should not be framed as "old versus new" approaches. Instead, it's about recognizing that the future of screening is built on a deeper integration of innovative technology, biological insight, assay craftsmanship, and scalable execution.