

INSIGHTS
WHERE AI MEETS
BIOLOGY

NEW PATHS FROM DISCOVERY TO DEPLOYMENT

Industry leaders converged on a shared view that AI capability itself is no longer the primary constraint in biological discovery. Instead, progress is now gated by data quality, experimental context, validation discipline, and the ability to integrate models into real scientific and clinical workflows.

Speakers consistently positioned AI as an augmentative layer — accelerating insight generation and revealing patterns invisible to humans — while accountability and decision-making remain firmly with scientists and clinicians.

The prevailing tone in the room was pragmatic rather than visionary: AI is already reshaping biology, but only where it is embedded into trusted processes and grounded in experimental reality.



FREDDIE METHERELL
PORTFOLIO DIRECTOR

LATENT BIOMARKERS AND MACHINE-NATIVE BIOLOGY

AI is enabling a shift in biomarker discovery by operating directly on raw biological data rather than pre-processed, human-curated features.

One AI-native biology company described training foundation models directly on raw mass-spectrometry output, allowing models to learn from millions of spectral signals typically discarded during preprocessing.

Rather than collapsing complex datasets into a few hundred annotated peaks, these approaches preserve high-dimensional structure, enabling downstream models to capture substantially richer biochemical signal. “We realised we were throwing away most of the biology before the model ever saw it” shared one senior executive at an AI-first biology company

Speakers reported order-of-magnitude improvements in predictive accuracy when downstream models were trained on these latent representations, with improved selectivity and robustness across biological contexts.

A clear message emerged that preprocessing is no longer a neutral step: how data is condensed increasingly determines what biology models can — and cannot — discover.



Philip Tagari, Chief Scientific Officer, insitro

PRECISION MEDICINE AND AI-NATIVE BIOMARKERS

In oncology-focused sessions, large biopharma organisations described how AI is enabling entirely new classes of biomarkers that cannot be derived through human interpretation alone. One senior leader outlined AI-driven quantitative pathology approaches that measure sub-cellular protein distributions and spatial ratios invisible to the human eye.

These biomarkers are already advancing through regulatory pathways, supported by rigorous validation and strong links to patient outcomes.

“No pathologist could score this by eye — but the clinical signal is undeniable.”
— Industry leader, global oncology biopharma

Multi-modal foundation models integrating imaging, genomics, transcriptomics, and clinical data were repeatedly cited as essential for patient stratification, particularly in cases where single modalities provide conflicting signals.

The discussion on biomarkers reframed AI less as a decision engine and more as measurement infrastructure — expanding what biology can be quantitatively observed in patients.



TRUST, HALLUCINATION, AND THE HUMAN IN THE LOOP

Trust surfaced as a central concern throughout the biology track. Multiple speakers acknowledged that hallucination and variability are inherent properties of generative models, reinforcing the need for human oversight in high-stakes domains such as healthcare.

Best practices discussed included disciplined benchmarking, strict data governance, uncertainty quantification, and explicit mechanisms for models to signal when they are operating outside their domain of confidence.

“If a model can’t tell you when it’s likely wrong, it’s not ready for biology.”

— *Head of AI, large pharmaceutical organisation*

Rather than full interpretability, speakers emphasised the importance of predictable behaviour, reproducibility, and defensible validation frameworks — particularly in regulatory contexts.

Overselling AI capability was repeatedly cited as a risk, with several participants warning that credibility lost through premature deployment would be difficult to recover in the short term.

FROM CORRELATION TO CAUSATION IN MULTI-OMICS

Sessions on multi-omics integration highlighted the scale and complexity of modern biological data, spanning billions of measurements across heterogeneous modalities. Leaders stressed that flattening such data into simplified representations often destroys the very signal AI is meant to exploit.

AI was described as most effective when multiple omic layers converge on shared biological mechanisms, particularly when anchored in human genetics and clinically validated pathways.

Knowledge graphs and neurosymbolic approaches were repeatedly referenced as enabling infrastructure, allowing AI systems to reason over structured biological relationships while remaining grounded in curated domain knowledge.

The consensus was that AI accelerates hypothesis generation, but experimental validation remains the arbiter of biological truth.



AI IN ANTIBODY DISCOVERY AND OPTIMIZATION

Panels on antibody discovery drew a clear distinction between where AI is already delivering value and where challenges remain. Hit identification, lead optimisation, and property balancing were described as relatively mature applications, dramatically compressing development timelines.

However, de novo engineering for novel targets and complex modalities such as bispecifics remains constrained by data availability rather than model capability.

“The models aren’t the limiter — the assays are.” shared one scientific founder at an antibody-focused AI company

From a translational perspective, regulatory pressure to reduce animal testing was framed as both an opportunity and a near-term challenge, with speakers expressing uncertainty around regulatory readiness and acceptance of AI-derived evidence.

Several participants noted that AI's greatest impact may lie in enabling exploration of design spaces previously considered impractical, rather than replacing established discovery paradigms.

CONTEXTUAL INTELLIGENCE AS A COMPETITIVE ADVANTAGE

Across biology, animal health, and agriculture, speakers repeatedly returned to the importance of context. Data lacking experimental, organism-specific, or environmental context was described as operationally unusable, regardless of scale.

Participants emphasised that retaining rich metadata enables downstream filtering and reinterpretation, whereas missing context cannot be recovered after the fact.

“You can always filter context out later. You can never add it back.”

— Senior data leader, life sciences organization



Contextual intelligence emerged as a stronger differentiator than model architecture, particularly for organisations seeking to deploy AI at scale.

WHAT THIS SIGNALS FOR BIOLOGY IN 2026

Looking ahead, the biology track suggested that AI's impact will be defined less by headline model performance and more by execution discipline. Leaders expect progress to hinge on tighter integration between computational and experimental teams, stronger validation standards, and workflows that enable rapid iteration between prediction and experiment.

By 2026, competitive advantage is likely to depend on the ability to:

- generate high-fidelity, context-rich biological data;
- deploy AI systems that are auditable, interpretable, and trusted;
- and keep humans firmly in the loop for scientific and clinical decisions.

The mood at AIDDD 2025 was one of cautious confidence: AI is already changing biology in drug discovery, but its long-term value will be determined by how responsibly it is applied.

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