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AI in Drug Discovery Series: Generate Biomedicines

We hosted the Co-Founder and CTO of Generate Biomedicines to discuss AI's evolving role in drug discovery, development productivity, and how programmable proteins could pave the way to programmable biology.

Our discussion with the CTO of Generate Biomedicines, Gevorg Grigoryan, underscored that drug development remains fundamentally an information and integration problem, not a tooling problem. Despite decades of cheaper and faster experimental technologies, industry-wide productivity, measured by the ~5–8% conversion of INDs to NDAs/BLAs, has not meaningfully improved. AI's promise, in this framing, is less about incremental efficiency gains and more about restructuring how biological knowledge is generated, integrated, and acted upon end-to-end. The key unlock is scale: AI enables the scientific method itself (hypothesis, experiment, update, repeat) to run faster and in parallel, but only when paired with deep biological context.

Generate's platform exemplifies what AI can enable when paired with "intentionality at scale," the ability to define desired therapeutic properties upfront and systematically design molecules to meet them. The GB-0895 asthma program illustrates this approach, where integrated ML, biology, and experimental cycles (as short as eight days) enabled rapid optimization across affinity, half-life, and binding profile, compressing timelines from bench to clinic to under a year. Importantly, the headline is not a single asset, but the implication that molecule design can move from stochastic discovery toward goal-directed engineering. In proteins, the bounded chemical alphabet and evolutionary priors make this particularly tractable compared to small molecules.

A central theme was fragmentation: drug development spans so many disciplines that no single individual, or siloed organization, can reason across the full system. AI's most durable contribution may be its ability to integrate target biology, molecule design, translational insight, and development strategy into a shared computational context, reducing handoff losses and late-stage failure. This has implications for probability of success, particularly upstream in target selection and molecule – target fit, where AI may ultimately blur the historical separation between target identification and drug design. While big pharma is increasingly adopting ML tools, most are layering them onto existing workflows rather than rethinking the model itself.

Looking forward, competitive advantage in AI-enabled biotech is shifting away from standalone models toward integration capability and data relevance. Structural ensembles, functional assays tied to clinically meaningful biology, and, ultimately, clinical and organoid-derived data are likely to be the most defensible

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long-term differentiators. If AI meaningfully improves probability of success, the CTO expects the industry to reinvest gains into more programs rather than harvest savings, accelerating output rather than preserving excess returns. Net-net, AI's impact in biotech is likely to be nonlinear and multi-year: near-term efficiency gains are real, but the larger opportunity is transforming drug development from a craft into a more engineerable, systematic discipline.