ACCELERATING BRAIN RESEARCH & DRUG DEVELOPMENT

NeuroAnalytic Services

Grace Medical provides analytic services for brain research and drug development using comprehensive data sets and independent interpretation.

We help you concentrate your program strengths, protect or release resources, and insure decisions prior to making large investments.

Our multi-dimensional approach utilizes brain-specific data sets at the genetic, anatomical, developmental, circuit and/or species level, which are then vetted against relevant literature and integrated into a summary tailored to address researcher and project specific goals.

For discovery, we provide or validate preliminary results that will help elevate or eliminate experimental choices, leading to more complete study aims/ designs that will differentiate your research strategy.

For drug development, we assess for translational (human) relevance, rank drug or tissue specific targets for efficacy, reveal alternative targets for well characterized compounds, and mitigate side effect concerns; all of which serve to select and de-risk drug targets.

GRACE MEDICAL INSTITUTE

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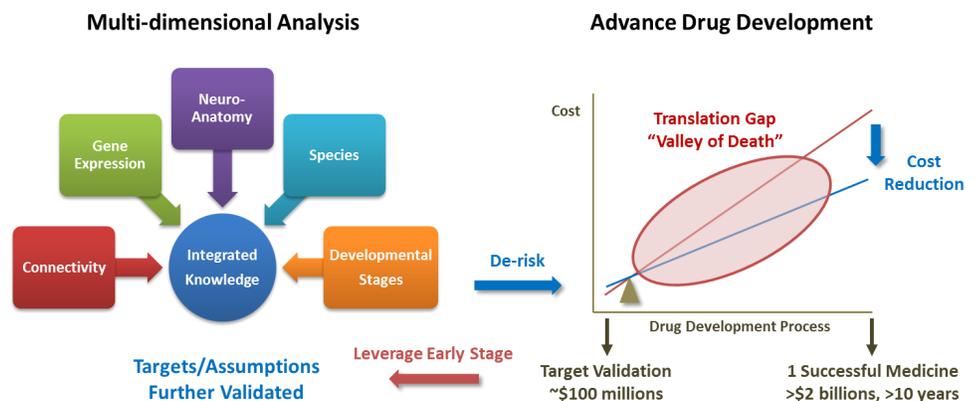## How do our services benefit the drug development process?

- We **find and test assumptions**. One clear reason CNS drugs have mixed success arises from the difficulty in controlling for genetic and anatomic variability across species. Untested assumptions carry considerable translational risks, which dilute the research endeavor and require additional time and money to resolve (e.g. waiting for clinical trials to reveal variability). We apply efficient cross-disciplinary expertise earlier in the drug development process, which promotes **better study design**.

Why use multi-dimensional analysis/integrative approach?

- CNS is complicated. The brain contains 100s of regions ("organs") and cell types, each exhibiting unique combination and level of 16,000+ genes/proteins and 1000s of connections that may **vary by species and age**.
- We may now exploit this complexity with the advent of "Big Data." We can readily examine these data sets, guided by current neurobiological understanding, to **reinforce and expand your project specific findings and conclusions**.
- Fewer surprises. Increased confidence that your drug target and related pathways are similar across multiple dimensions **insures your progress**. Conversely, based on differences, **side effects** may be predicted and ameliorated.
- Get ahead. From a competitive perspective, the ability to leverage this advanced knowledge means fewer model assumptions and faster response times to changing program pressures. Likewise, expectations from reviewers and regulatory agencies are increasing. **Differentiate** your proposal with more **depth and breadth**.

Why would I need a service to improve my research goals?

- Having a **trusted expert** to help you estimate the risks, manage the progress, and deliver the results of specific project goals**, frees you and your team** to concentrate on your most productive efforts.
- Establishing groundwork quickly **promotes your project** and **informs key decisions:** evaluate your CNS drug targets, enhance your basic research position, or just examine your ideas from a neuroscience perspective.
- Our familiarity with the data creation process and structure, allows for **efficient** crosschecking, analysis, and interpretation for hypothesis testing. Fundamental subject knowledge and experience **add value** to previous and future experiments.

Multi-dimensional Analysis — Gene Expression, Neuro-Anatomy, Species, Connectivity, Integrated Knowledge, Developmental Stages, De-risk, Leverage Early Stage, Targets/Assumptions Further Validated

Advance Drug Development — Cost, Translation Gap "Valley of Death", Cost Reduction, Drug Development Process, Target Validation ~$100 millions, 1 Successful Medicine >$2 billions, >10 years

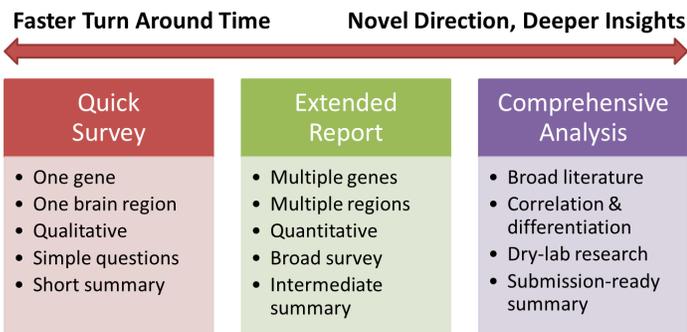ACCELERATING BRAIN RESEARCH & DRUG DEVELOPMENT

NeuroAnalytic Services

REPORTING SERVICES

Let our experience in constructing and analyzing large scale, comprehensive data sets for the brain help meet your project goals. We fashioned a modular approach to be an "on demand" complement to your team or a more complete option to extend your capabilities, **with an emphasis on timeline adherence**.

Faster Turn Around Time   **Novel Direction, Deeper Insights**

Quick Survey	Extended Report	Comprehensive Analysis
• One gene • One brain region • Qualitative • Simple questions • Short summary	• Multiple genes • Multiple regions • Quantitative • Broad survey • Intermediate summary	• Broad literature • Correlation & differentiation • Dry-lab research • Submission-ready summary

Quick Survey: Focused effort to quickly report/confirm either: gene expression patterns across brain regions (distribution), molecular characterization within a region, translational assumptions between species, developmental patterns, or connectivity.

Extended Report: Expands characterization detailing molecular identity and relationship to other regions (including positive and negative marker genes). Additional dimensions such as anatomy, gene sets, connectivity, or species variations.

Comprehensive Analysis: Transforms multi-modal data sets into insights. Our integrative approach synthesizes quantitative informatics analysis, manual proof-checking by experts, and cross referencing to published literature.

KEY POINTS

Solutions:
- Drug target selection
- Drug repurposing
- Translational relevance
- Neurotoxicology endpoints
- Efficacy/safety assessment
- CNS lab selection/oversight
- Model validation
- Independent data verification
- Preliminary data generation

Methodology:
- "Dry" lab
- Data mining vetted with biological expertise

Strengths:
- Brain mapping
- Professional network
- Access and communication
- Publication record
- Reliability, versatility

WHAT IF

- You knew where your drug will act in the human brain?
- You could predict drug safety in early human development?
- You could rank your drug candidate list with "Big Data"?
- You didn't have to train or distract your team?
- You didn't have to run another set of experiments?
- You had independent confirmation or additional data?
- You had a pinch hitter you could rely on?
- **You already had the answer?**
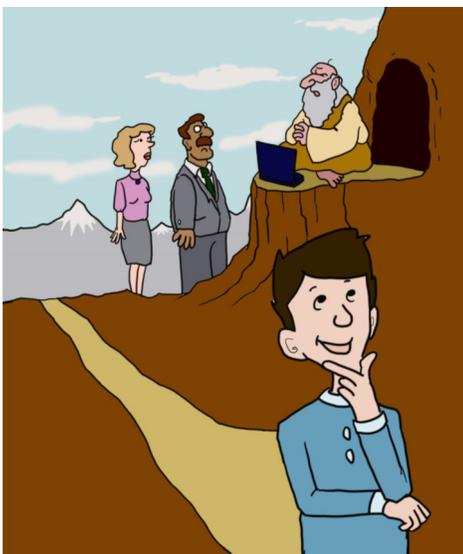
OUR MOTIVATION

Since 2006, we've dedicated ourselves to building and promoting the application of large data sets ("Big Data") in order to foster brain research. We helped pioneer the production of, and community access to, petabytes of brain mapping data, which opened a new avenue that rapidly changed the CNS research landscape. We applied an integrative approach that produced a string of broad impact discoveries and top-tier publications.

This good fortune was facilitated by crossover training in cellular and molecular biology, neuropharmacology, quantitative neuroanatomy, and our management approach that harmonized both business and scientific priorities. While we enjoyed the comradery and accolades of this effort, we recognized an opportunity to apply these and other public resources to advance disease research and drug development. Now, we strive to inspire and enable others to maximize the benefits of "Big Data."

ANALYSTS/CONSULTANTS
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