

# Autoimmune and Inflammatory Disorders (AIID)

*Expertise & Experience*  
*January 2020*



## About Cello Health BioConsulting

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Cello Health BioConsulting, previously Defined Health, is a knowledge-based consultancy deeply rooted in science and the unique and ever-evolving challenges and opportunities facing the biopharma industry.

Cello Health BioConsulting provides strategic advice for corporate growth strategy, disease area selection, indication prioritization, early market access strategy and early value profile development.

Cello Health BioConsulting is known for “unconventional insight” – forward thinking, independent, objective and actionable strategic advice to realize value across all therapeutic areas and stages of development.

*Let's work together.*



# Autoimmune and Inflammatory Disorders

## Experience & Expertise



### Scientific Understanding

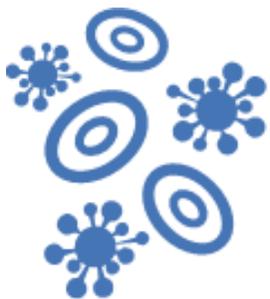
- Our team of PhD and MS trained consultants and analysts dig deep into the biology of our clients' technologies and the diseases they aim to address, allowing us to provide actionable recommendations regarding the therapeutic potential of our client's programs and the best indications to direct resources

### Experience and Insight

- Extensive experience performing opportunity assessments, search projects to identify licensing and acquisition opportunities, and indication prioritization projects for products with broad mechanisms applicable across multiple AIID indications, including most common and many rare AIID indications

### Leverageable Resources

- To aid in indication selection, evaluation, and prioritization for programs with broad application across multiple diseases, our team has assembled a curated catalog of >150 different AIID indications and designed a robust and efficient indication prioritization process which allows us to quickly compare and contrast different potential development paths



### AIID Team



### Practice Leads:

David J. Lomb, PhD, Associate Principal

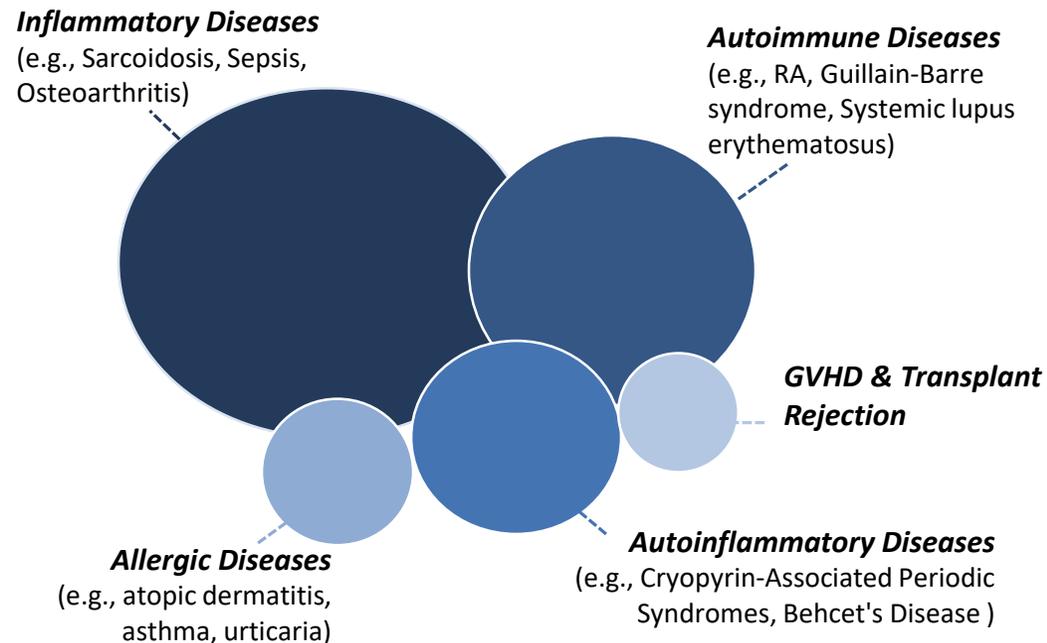
Danielle M. Marra, MS, MBA, Associate Principal

# Autoimmune and Inflammatory Disorders

## Strategic Insights



- ◆ Autoimmune and inflammatory diseases (AIDs) encompass >150 diseases, each resulting from a host immune response against self or non-self antigens, and affect up to 50 million individuals in the U.S. alone
- ◆ AIDs can be broadly characterized into 5 sub-categories (bottom left) based on type of immune response (e.g., adaptive vs. innate) and origin of the antigen (e.g., self vs. non-self) the host immune system is reacting to.
- ◆ Collectively, AID represents the largest pharmaceutical market by revenue globally, accounting for ~20% of all sales in 2019 (~\$145 billion).



Forecasted AID Global Sales (\$M)



# Autoimmune and Inflammatory Disorders

## Strategic Insights



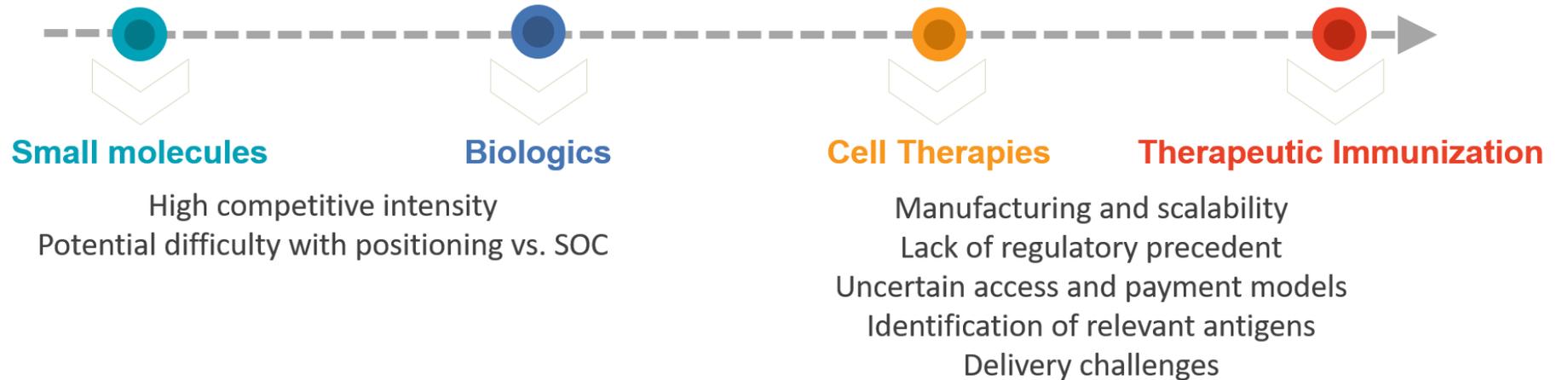
- ◆ Continued growth is expected in the AIID space, but new entrants face meaningful clinical and commercial challenges associated with both the indication and the treatment modality.

### Mature or Maturing Indications

- ▼ Significant payer/access challenges
- ▼ Biosimilar entry
- ▼ High competitive intensity
- ▼ Limited addressable patient populations

### Under-served or Rare Indications

- ▼ Difficult to study patient populations
- ▼ Little or no regulatory precedent
- ▼ Hard to demonstrate preclinical PoC



# Autoimmune and Inflammatory Disorders

## Strategic Insights



- ◆ Despite the challenges in this space, promising new treatments are being investigated which could potentially disrupt existing and nascent AIID markets alike (e.g., NLRP3/inflammasome inhibitors, T regulatory adoptive cell therapy, antigen-specific immune tolerizing approaches, etc.).
- ◆ To successfully develop and commercialize novel approaches for AIIDs companies will need to address several important considerations:



***Given my company's size and resources, what is the best possible development path within the AIID space for my program?***



***What clinical profile would my program need to demonstrate to support uptake by physicians and favorable reimbursement from payers?***



***What data would be required to inflect the expected and justifiable value for my program, and to establish a path to secure future investment or partnering?***



***If partnering is a goal, how can I maximize deal value and select the partner and deal structure best able to deliver its corporate objectives?***



***What are the key obstacles to successful commercialization of my AIID program and what needs to be done to overcome these obstacles?***

# Autoimmune and Inflammatory Disorders

## CHBC's Proprietary AIID Catalogue



### What is CHBC's AIID Catalogue and how can it help you?

- ◆ Common questions among our clients include what diseases fall under the broad category of AIID and how best to evaluate and prioritize across indications to identify areas that would be best-suited for their platform, technology, or strategy.
- ◆ To aid in these important strategic questions, CHBC has developed and maintains a carefully curated catalogue of >150 AIID diseases.
  - This resource is a unique offering as there are no publicly available databases that capture and catalogue the “universe” of AIID indications.
  - Information captured includes description, organs affected, subsegments (e.g., autoimmune vs. autoinflammatory, T-cell mediated vs. B-cell mediated), epidemiology, disease severity, and level of unmet need.
- ◆ The AIID catalogue is often used as a starting point for indication selection and evaluation, and is paired with our rigorous indication prioritization process which allows us to compare and contrast different potential development paths and identify prioritized areas for investment.

Disease Name	Disease description	Primary Organ(s) Affected	AIID Category	Type of Immune Response	Prevalence		Incidence		US Incidence (1/100,000)	EU Incidence (1/100,000)	Age of Onset	Disease Severity	Disease Comment	Natural History	Unmet Need	Unmet Need Comment
					W (1/100,000)	U (1/100,000)	W (1/100,000)	U (1/100,000)								
Achalasia	Achalasia results from	Esophagus	Autoimmune disease	T-cell mediated	10	10.02	163	100	5.333	5.05	Adult	1	Symptoms similar to	Chronic episodic	1	No disease severity no
Acute disseminated	Acute disseminated	Brain, Spinal Cord	Autoimmune disease	Adaptive and innate	Unknown	Unknown	0.20	0.07	854	359	Juvenile	5	Acute non-relapsing	Acute	4	APLE combinations of
Addison's disease	Autoimmune Addison													Chronic persistent	2	Requires hormone

Detailed, robustly-supported catalogue

		High (5)	Medium (3)	Low (1)	
		Scientific	<b>Scientific Rationale (option 1)</b> High quality product will have desired clinical impact based on current understanding of the disease pathogenesis/pathophysiology	<b>Scientific Rationale (option 2)</b> Clinical data in humans exists demonstrating beneficial effect of addressing the target/mechanism	Scientific Rationale (option 1) Scientific Rationale (option 2)
Commercial	Level of Unmet Need	Significant impact on morbidity and/or mortality	Meaningful impact on morbidity, limited impact on mortality	Limited impact on morbidity and no impact on mortality and/or highly effective with limited issues (i.e. limited unmet need)	
	Competitive Intensity – Marketed Products	No approved competitive products on the market	Limited number of approved competitive products on the market (<5)	Multiple approved competitive products on the market (>5)	
	Competitive Products – Pipeline	Few competitive products in the pipeline (<5), future competitive threat low	Moderate number of competitive products in the pipeline (10-20), future competitive threat moderate	Significant number of pipeline products in the pipeline (>40), future competitive threat moderate/high	
	In-Kind Competition	No in-kind competitive products in preclinical or clinical development	Limited (3-5) in-kind competitive products in preclinical or clinical development	Multiple (28) in-kind competitive products in preclinical or clinical development	
Estimated Market Opportunity		Distinction of N/MI will be made at conclusion of ratings once the size of all addressable patient populations across indications are determined			

Rigorous evaluation process

	Scientific			Clinical & Regulatory			Technical			Commercial			Score		
	A	B	C	D	E	F	G	H	I	J	K	L		M	N
Acute graft-versus-host disease	3	2	3	3	2	3	2	3	2	3	2	3	3	1	35
Renal transplant rejection	3	3	2	3	1	1	3	3	3	2	3	3	3	2	35
Non-alcoholic steatohepatitis	3	2	2	3	1	1	3	3	3	2	2	3	3	3	34
Systemic sclerosis	2	1	3	2	3	2	2	3	2	3	2	2	3	3	33
Intestinal fibrosis	3	3	1	2	1	1	2	2	3	2	2	2	3	3	32
Idiopathic pulmonary fibrosis	2	1	2	3	1	2	3	2	3	3	2	1	3	3	31
Transthyretin-related amyloidosis	3	2	1	3	3	1	2	3	3	2	2	2	3	1	31
Ankylosing spondylitis	3	1	2	3	1	2	3	2	3	2	1	1	3	3	30
Chronic graft-versus-host disease	3	1	2	2	1	1	2	3	2	3	2	3	3	2	30

Actionable output (e.g., indication prioritization)

# Autoimmune and Inflammatory Disorders

## Recent Case Study #1



### AIID Cell Therapy Indication Prioritization

#### The Client

- Early stage biotechnology company using cell biology and genetic engineering to develop a new generation of engineered cell therapies
- Core therapeutic areas include neurology, cardiology, and immunology

#### Business Challenge

- Identify, evaluate and prioritize autoimmune and inflammatory disease indications (>150) in which the Company's cell therapy programs are expected to have the greatest therapeutic and commercial potential
- Provide feedback on optimal design of cell therapy product for prioritized indications

#### Our Approach

- Initial triage of indications based on scientific rationale, unmet need and pharmacoeconomic support
- Evaluation and scoring of in-scope indications based on scientific, clinical/regulatory and commercial criteria
- Deep dives on prioritized indications and cognate cell therapy products and final indication rankings

#### Valued Outcome

- Ranked list of AIID indications of greatest potential value for the Company's cell therapy programs
- Recommendations regarding the indications expected to have the greatest therapeutic and commercial potential
- Identification of key challenges for each path and recommendations on how to mitigate development risk



# Autoimmune and Inflammatory Disorders

## Recent Case Study #2



### Search & Evaluation

#### The Client

- Large Japanese Pharmaceutical company heavily dependent on three marketed products for immunology, genitourinary, and oncology indications
- Additional therapeutic areas of interest include cardiology, diabetes, gastrointestinal disease, infectious disease and neurology

#### Business Challenge

- Company's immunology franchise largely dependent on a single product which recently lost patent protection and internal pipeline lacks compelling replacements
- Identify, evaluate and rank high-value development stage in-licensing and acquisition candidates to support strategic initiative of bolstering AIID pipeline

#### Our Approach

- Conducted initial "triage" screen of ~2,300 AIID assets in Phase I to Phase III development to generate starting list of all assets of potential interest
- Conducted secondary (~800 assets) and tertiary (~400 assets) screens to identify top 10 biologic and small molecule AIID programs

#### Valued Outcome

- Curated catalog of the entire universe of assets currently in development for, or that have potential for, any AIID indication
- Actionable list of nine potential partnering candidates with the greatest clinical and commercial potential based on extensive secondary research-based analyses

# Autoimmune and Inflammatory Disorders

## Recent Case Study #3



### Indication Prioritization and Opportunity Assessment

#### The Client

- Clinical stage, public European biotechnology company with a drug discovery platform for creating antibodies against a specific target
- Primary therapeutic focus and clinical stage asset in oncology, however the platform potentially applicable for autoimmune, inflammatory, and allergic diseases

#### Business Challenge

- With attention centered on advancing the lead asset in oncology, resources were constrained and AIID expertise was limited to evaluate and select indication(s) to pursue
- Internal teams lacked a process for selecting indications and were unclear of all diseases within the “AIID universe” that could be considered for prioritization

#### Our Approach

- Utilized CHBC’s curated AIID database to triage and evaluate >150 indications
- Identified a limited set of indications that rated highly according to a customized rating matrix evaluating scientific, commercial, clinical, and regulatory factors
- Conducted KOL interviews to refine prioritization

#### Valued Outcome

- Provided in-depth market assessments of the top 5 rated indications along with final recommendations of which diseases to prioritize
- Findings informed client’s strategic development plan for the platform outside of oncology



# Autoimmune and Inflammatory Disorders

## Recent Case Study #4



### IO Target Prioritization for AIID

#### The Client

- Clinical stage biotechnology company with a drug discovery platform for creating modified proteins
- Core therapeutic focus on immuno-oncology (IO) with rich pipeline

#### Business Challenge

- Investigate potential to reverse the principles of IO to target AIID and generate additional value
- Prioritize selected IO targets for evaluation as potential AIID targets
- Identify AIID indications where manipulating these targets might have a therapeutic benefit

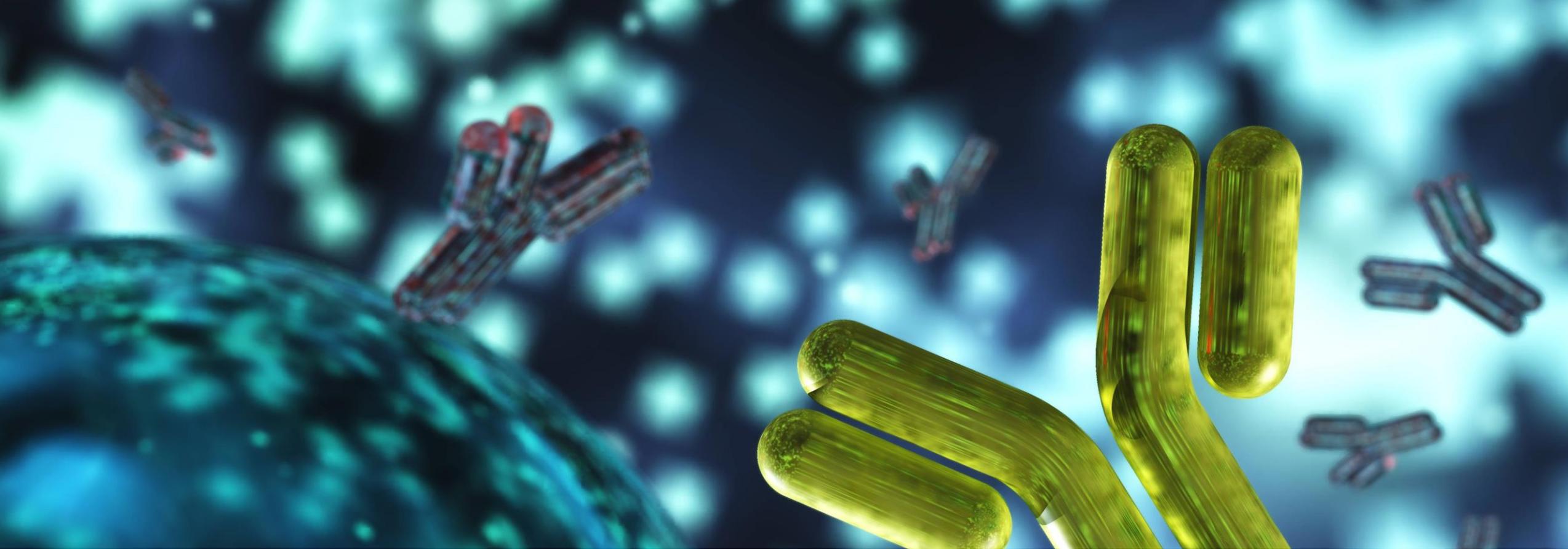
#### Our Approach

- Exhaustive literature review of each target to understand level of support of the role in AIID
- Collegial interviews with key thought-leaders on each target and potential to impact AIID with IO approaches
- Indication assessments to evaluate market size, unmet needs, development challenges, & competitive intensity

#### Valued Outcome

- Prioritization of the selected targets
- Recommendations for preclinical development for the 2 lead targets and identification of most attractive indications to pursue
- Rich understanding of potential challenges of clinical development in this nascent area





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***Let's work together!***

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