A New Path to Medicine

Stifel 2019 Healthcare Conference

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Forward-Looking Statements

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aTyr Pharma

Company Overview

aTyr: A New Path to Medicine

- Focus: translating novel biological pathways into first-in-class therapeutics
- Lead drug candidate ATYR1923 enrolling Phase 1b/2a trial in pulmonary sarcoidosis
  - Potential for rapid expansion into other interstitial lung diseases with a total estimated $2-3b global opportunity(1)
  - Interim safety data December 2019
  - Final results mid-2020(2)
- Pipeline of Neuropilin-2 (NRP2) antibodies and tRNA synthetase candidates
- Broad IP estate covering pipeline of tRNA synthetase protein compositions and certain associated pathways
- Cash, cash equivalents and investments at $38.1m as of 9/30/19

(1) aTyr estimates for inflammatory ILD: Pulmonary Sarcoidosis, CHP, CTD-ILD; excludes IPF
(2) Dependent on patient enrollment

aTyr Development Pipeline

PROGRAM	DISEASES	DISCOVERY	PRECLINCAL	PHASE 1	PHASE 2	PHASE 3
ATYR1923	Pulmonary Sarcoidosis					
	Chronic Hypersensitivity Pneumonitis (CHP)					
	Connective Tissue Disease ILD (CTD-ILD)					
tRNA Synthetase Candidates	Undisclosed		CSL Behring			
NRP2 Candidates	Undisclosed					

Novel Functions of tRNA Synthetases

INTRACELLULAR

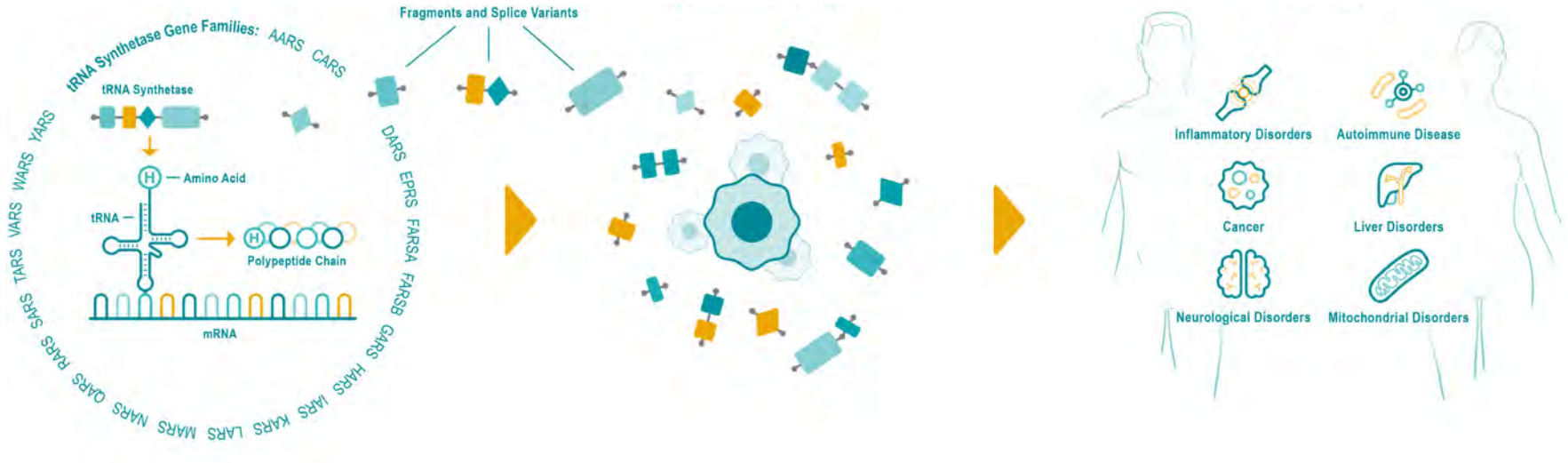
Catalyze Protein Synthesis

EXTRACELLULAR*

Secreted in Circulation and Tissue to Regulate Diverse Pathways

PHYSIOLOGICAL

Pathway Disruption Associated with Disease



* Extracellular tRNA synthetases = exARS

aTyr

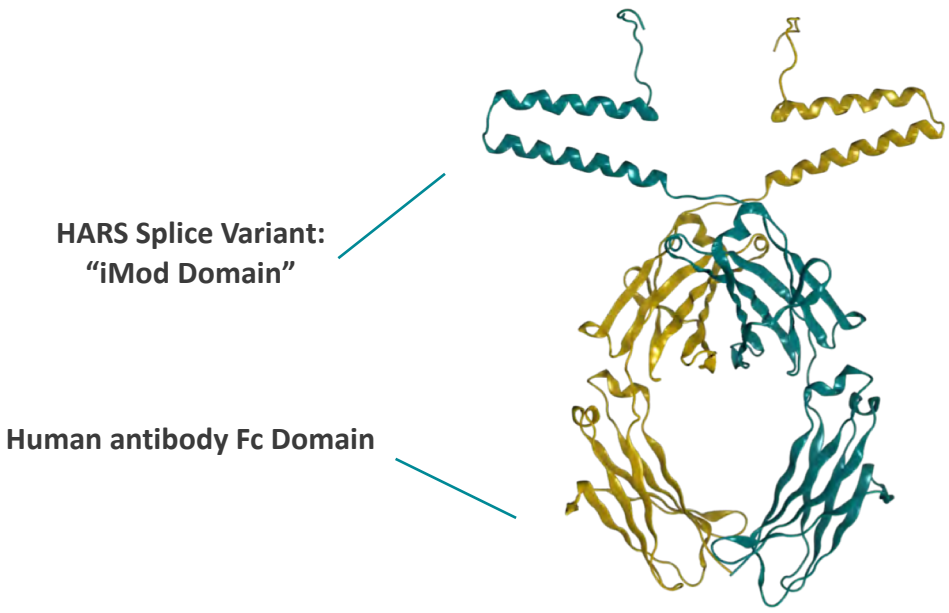
CSL Behring Collaboration

Goal	• Identify new IND candidates from up to four tRNA synthetases from aTyr's proprietary pipeline of novel proteins (non-HARS derived)
Terms	• CSL Behring to fund all R&D costs • aTyr eligible for up to $17m in option fees if CSL Behring advances all four programs ($4.25m per synthetase program) • aTyr grants CSL Behring an option to negotiate licenses for worldwide rights to each IND candidate that emerges from the collaboration
About CSL	• CSL Behring is a global biotherapeutics leader specializing in immunology, hematology and other rare and serious medical conditions • CSL Behring employs >22,000 people globally, and delivers its therapies to more than 60 countries
Status	• aTyr received first phase of funding totaling $630k, and of that recognized $278k of collaboration revenue through Q3 2019

ATYR1923

For the Treatment of Pulmonary Sarcoidosis

ATYR1923: Novel Engineered Protein Therapeutic



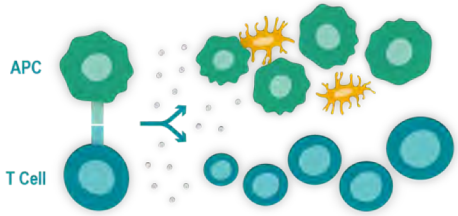
- iMod Domain of HARS enriched in the human lung
- Inhibits human T cell activation/cytokine release
- Binds selectively to Neuropilin-2 (NRP2)
- Regulates a number of immune cell-types, including: T cells, Neutrophils, Macrophages, Dendritic cells
- NRP2 expression in granulomas identified in sarcoidosis patients
- iMod Domain fused to Fc Domain to extend half-life
- Once-monthly IV dosing regimen

ATYR1923 Mechanism of Action in ILD

Disease Trigger

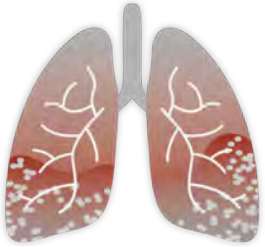
Organic; inorganic; infectious; autoimmune

Aberrant Immune Response



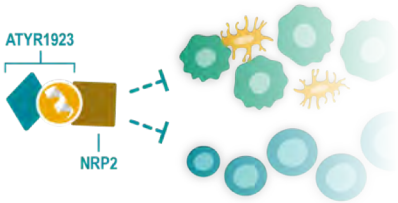
T-cell activation; pro-inflammatory cytokines/chemokines triggering fibrotic pathways; NRP2 upregulation on immune cells

Lung Inflammation & Fibrosis



Persistent, unresolved inflammation in the lung can lead to fibrosis; patients experience chronic cough, dyspnea, mortality

ATYR1923 Dampens Immune Responses



ATYR1923 binds to NRP2 and downregulates cytokine and chemokine production and T-cell activation

Stabilized Lung

Reduced inflammation and fibrotic deposition; symptom relief, stabilized lung function*

* aTyr hypothesis

ILDs Share Persistent Immune Engagement

Pulmonary Sarcoidosis
- Non-caseating granulomas (CD4+ T cell driven)
- SOC: steroids - cytotoxic agents - TNF inhibitors

Chronic Hypersensitivity Pneumonitis (CHP)
- Exaggerated immune response to environmental antigen
- No effective SOC

Connective Tissue Disease – ILD (CTD-ILD)
- >50% of Scleroderma patients and 10% RAs
- SOC: Mycophenolate mofetil or cyclophosphamide (2019 nintedanib approval) for Ssc-ILD

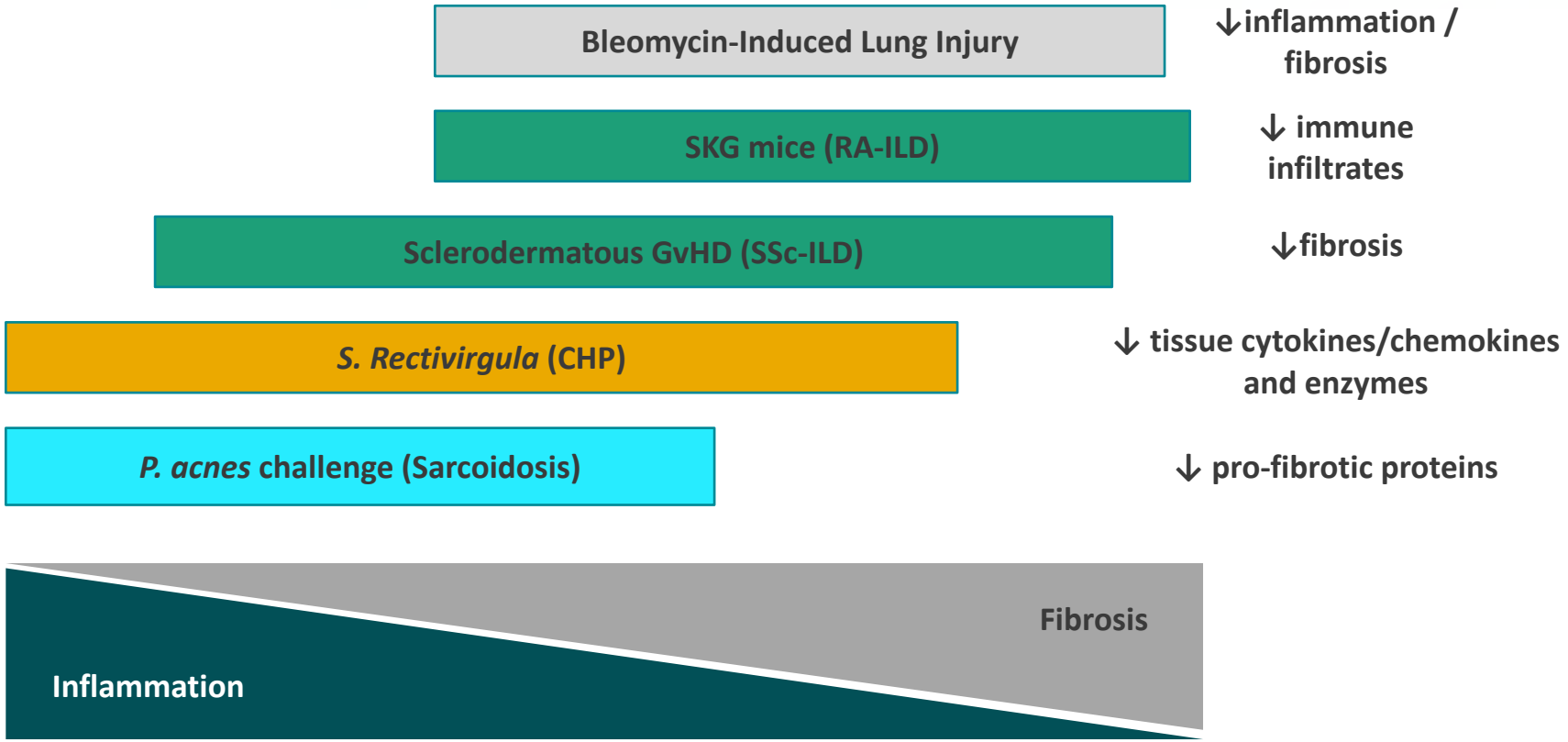
Idiopathic Pulmonary Fibrosis (IPF)
- Irreversible fibrotic disease
- SOC: Nintedanib or pirfenidone (>$2.2b combined 2018 net revenue)

Slide adapted from Dr. Steven Nathan, Medical Director, Advanced Lung Disease and Transplant Program at Inova Fairfax Hospital, Falls Church, VA

Pre-Clinical Translational Data Supports ILD Development

Bleomycin-Induced Lung Injury (IPF) – Mouse	• ATYR1923 reduced fibrosis and inflammation • Comparator: pirfenidone • Presented at ATS, May 2017
Bleomycin-Induced Lung Injury (IPF) – Rat	• ATYR1923 returned lung function to normal and reduced fibrosis and inflammation • Comparator: nintedanib • Presented at ATS, May 2018
Sclerodermatous chronic-graft vs host disease (SSc-ILD) – Mouse	• ATYR1923 reduced lung and skin fibrosis • Comparator: nintedanib • Presented at Scleroderma Foundation Patient Conference, July 2018
SSc-cGVHD (SSc-ILD); *P. acnes* (Sarcoidosis); *S. rectivirgula* (CHP); SKG (Ra-ILD) – Mouse	• ATYR1923 demonstrated stage-dependent anti-inflammatory and anti-fibrotic effect in various experimental models of ILD • Comparator: various • Presented at ATS, May 2019

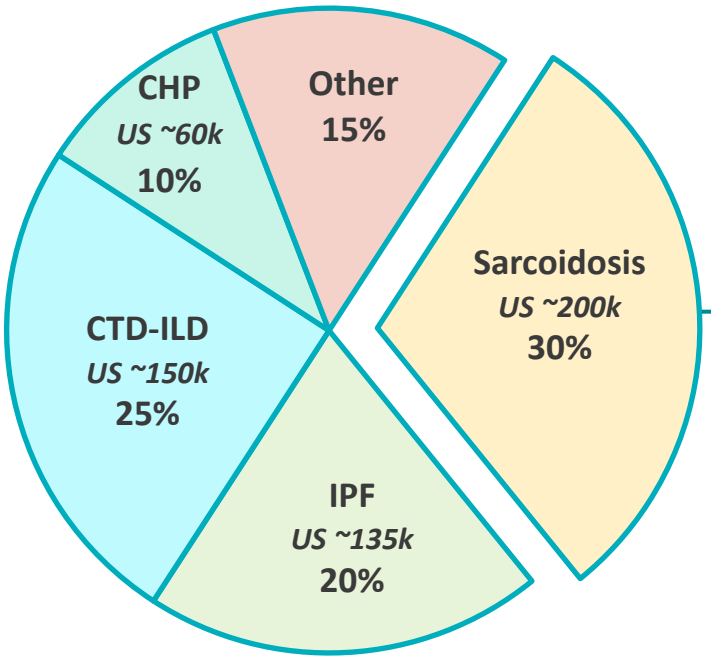
Demonstrated Effect in Multiple ILD Models



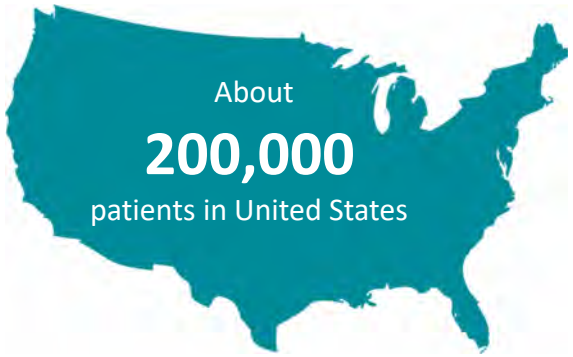
aTyr

Sarcoidosis: A Major Form of ILD

ILD Patient Distribution



$2-3b Global Opportunity(1)



50% require systemic therapy

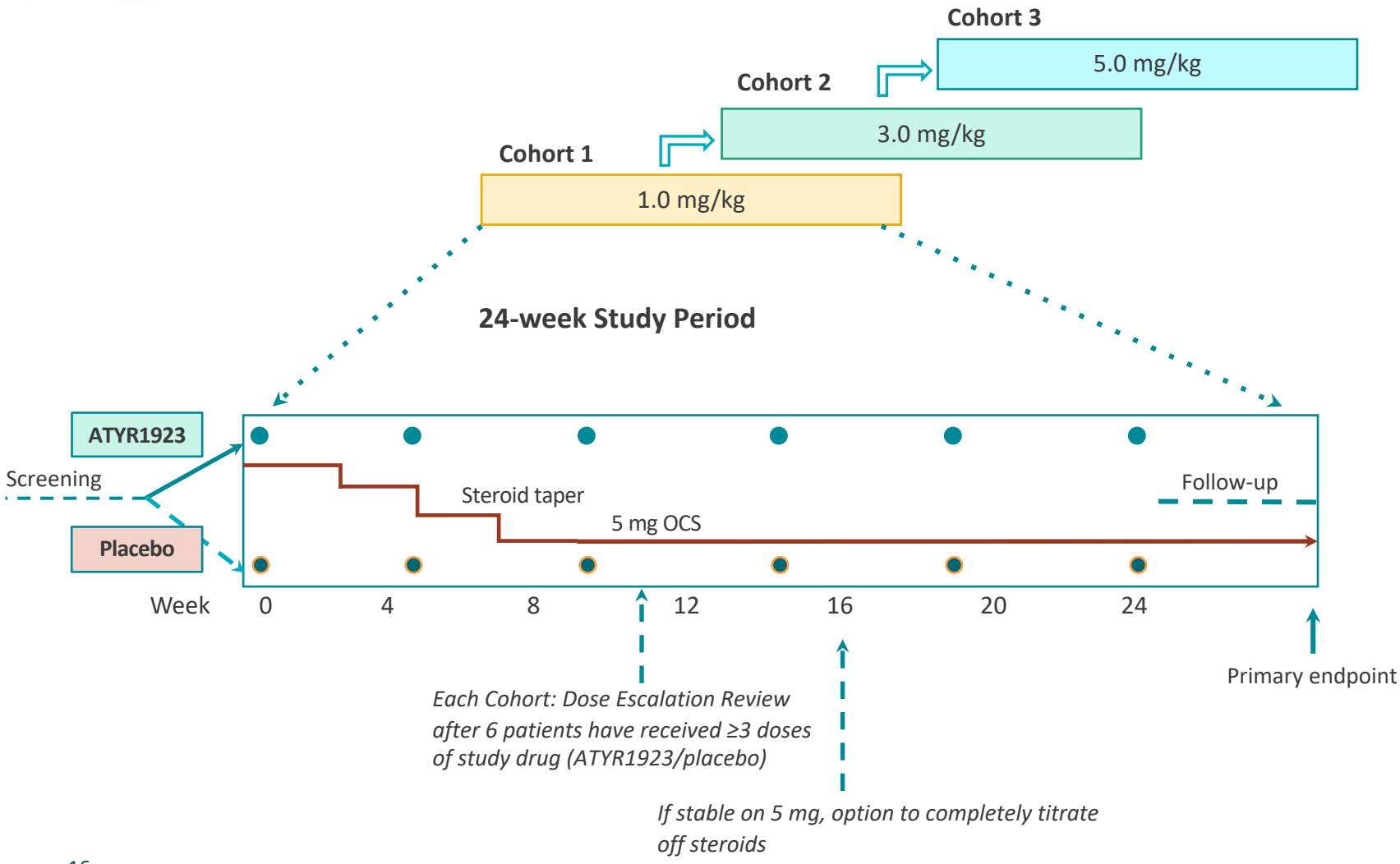
30% with chronic progressive disease despite currently available treatment

(1) aTyr estimates for inflammatory ILD: Pulmonary Sarcoidosis, CHP, CTD-ILD; excludes IPF

ATYR1923 Phase 1b/2a Study in Pulmonary Sarcoidosis

Design	• Randomized, double-blind, placebo-controlled, multiple ascending dose
Population	• Histologically confirmed pulmonary sarcoidosis • Requiring ≥10 mg prednisone (steroid) treatment; capable of steroid taper • Symptomatic/active disease at baseline by ^{18F}-FDG-PET/CT, Pulmonary Function Tests
Dosing	• 3 sequential cohorts, 12 patients each, 2:1 randomization • ATYR1923 doses: 1.0, 3.0, and 5.0 mg/kg
Duration	• 24-week study period • Steroid taper phase down to 5.0 mg by week 8– by week 16, if stable, option to completely titrate off steroids
Endpoints	• Primary ◦ Safety and tolerability of multiple ascending IV ATYR1923 doses • Secondary ◦ Steroid-sparing effect ◦ Immunogenicity ◦ Pharmacokinetics (PK) ◦ Exploratory efficacy measures: FDG-PET/CT imaging; Lung function (FVC); Serum biomarkers; Health-related quality of life scales

Phase 1b/2a Study Schema



ATYR1923 Phase 1b/2a Study in Pulmonary Sarcoidosis

Status	• Phase 1 in 36 healthy volunteers complete • Patient enrollment ongoing in Phase 1b/2a in ~15 leading pulmonary sarcoidosis centers
Timelines	• Interim safety data: December 2019 • Study completion: mid-2020(1)
Possible Future Development	• Registrational trial in Pulmonary Sarcoidosis • Initiate P2 studies in other types of interstitial lung disease (e.g. CTD-ILD; CHP)

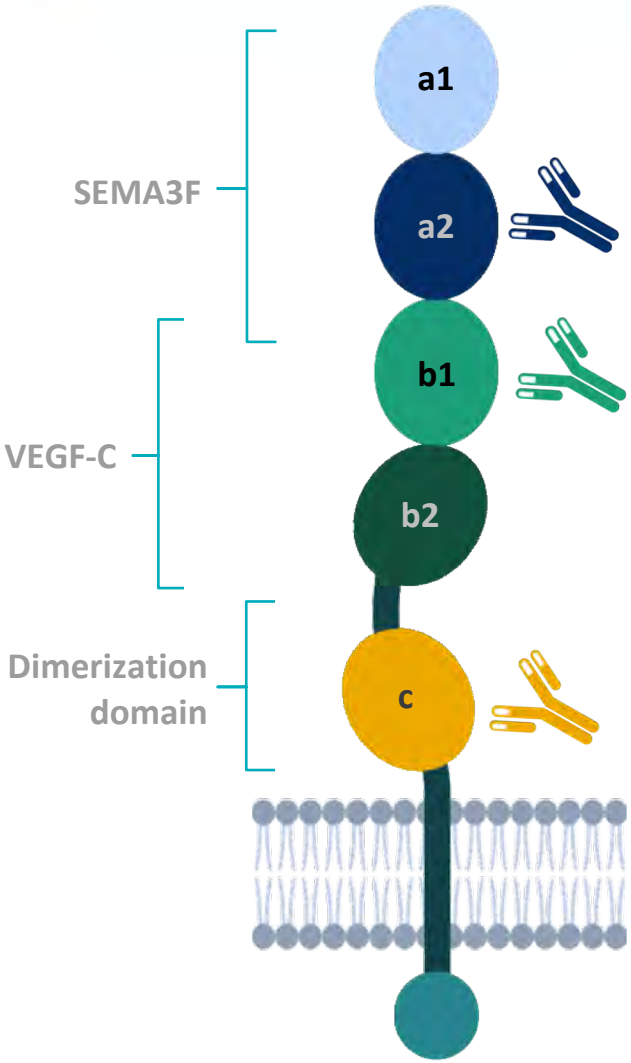
(1) Dependent on patient enrollment

NRP2 Biology

NRP2: A Novel Therapeutic Target

- NRP2 is a potentially novel target for cancer and inflammatory disorders
- Acts as a co-receptor for VEGF-C, class 3 Semaphorins and CCL21
- Expression is upregulated in tumors and immune cells during inflammation
- Expression is linked to worse outcomes in cancer
- aTyr has developed antibodies to selectively target different NRP2 epitopes for diverse therapeutic applications

aTyr Human NRP2 Blocking Antibodies



aTyr antibodies

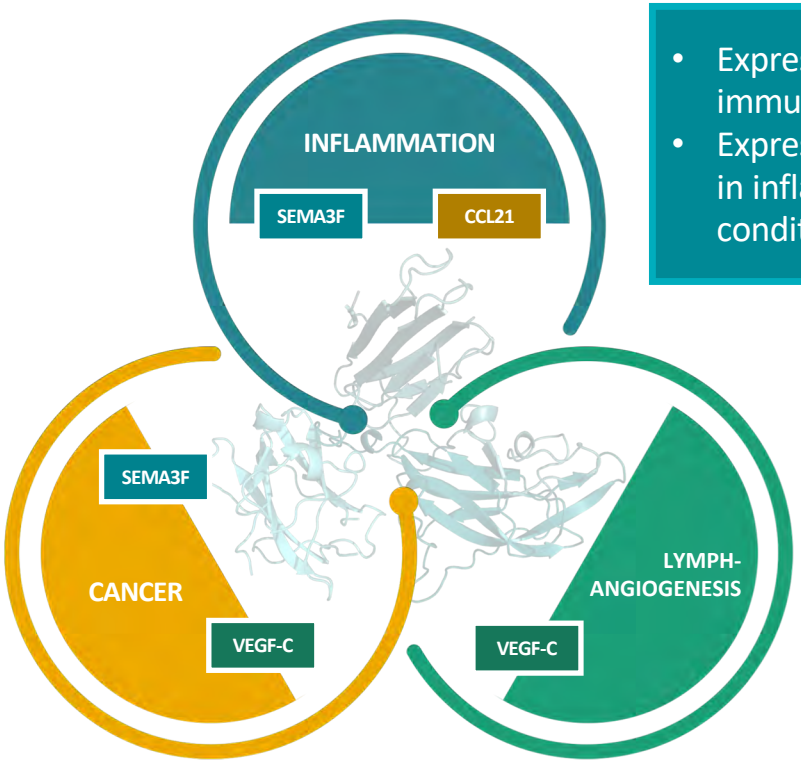
SEMA3F Blockers

VEGF-C Blockers

CCL21 Blockers

NRP2 is a Compelling Target for Cancer and Inflammation

- Overexpressed in a variety of cancers
- Tumor expression linked to worse outcomes



- Expressed on multiple immune cell types
- Expression upregulated in inflammatory conditions

- Lymphatic development and function impaired in NRP2 knockout

aTyr Pharma

Company Value Drivers

Upcoming Catalysts

ATYR1923	❑ Interim Phase 1b/2a safety data December 2019 ❑ Phase 1b/2a results mid-2020(1) ❑ Potential expansion into Phase 2 studies for CHP and CTD-ILD
CSL R&D	❑ aTyr eligible for up to $17m in option fees ❑ Option granted to CSL to negotiate licenses for worldwide rights to each IND candidate that emerges from the collaboration
NRP2 Antibody Candidates	❑ Potential new pipeline opportunities through academic and industry collaborations

(1) Dependent on patient enrollment

Building Value…for Patients and Shareholders

- ✓ Platform of new biology
  - ✓ tRNA synthetase biology
  - ✓ NRP2 antibody program
- ✓ Robust clinical program: ATYR1923
  - ✓ Understanding of MOA
  - ✓ Translational studies in multiple ILD models
  - ✓ Phase 1b/2a clinical study in pulmonary sarcoidosis
- ✓ Supported by top tier investors
- ✓ Cash, cash equivalents, and investment at $38.1m as of 9/30/2019

Thank You