Tackling AD at the roots: early intervention to address multiple hallmarks of AD

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VIVORYON THERAPEUTICS

Investment Highlights

- **Enzyme inhibition for targeted intervention:** Modulating the activity of proteins altered in disease settings
- **Lead product candidate varoglutamstat in AD: Phase 2a evidence of disease-modifying activity and FDA Fast Track designation:**
  - Statistically significant ($p = 0.05$, $d = 0.23$[1]) change from baseline in working memory after 3-months treatment
  - Upstream intervention with dual MoA: Targeting Abeta and CCL2 modulation
  - Addresses all three major hallmarks of AD: Abeta aggregation, neuroinflammation and tau pathology, as well as synaptic function; no signs of ARIA side effects in clinical setting
  - Preclinical evidence provides strong therapeutic rationale for combining varoglutamstat with monoclonal Abeta antibodies to treat AD[2]; future opportunity to explore varoglutamstat in combinations with own and external assets
- **Ongoing Phase 2b program** in AD designed towards clear path to potential regulatory approval[3]; interim data show varoglutamstat is well-tolerated; studies ongoing in Europe and the U.S.
- **Oral small molecule:** Good blood-brain-barrier penetration, intracellular activity, attractive COGS
- **Large pharma partnership deals:** Simcere (QPCT/L in AD; Greater China regional partnership potentially worth up to US$ 565 M), OSI/Astellas (DPP4), AstraZeneca (CDK9)
- Follow-up programs in **oncology, inflammatory diseases/NASH** and **AKI/fibrosis**
- **Strong IP** including composition of matter coverage beyond 2035

AD: Alzheimer's disease; CCL2: chemokine (C-C motif) ligand 2; CDK9: Cyclin-dependent kinase 9; COGs: cost of goods; d: Cohen's d (standardized mean difference); DPP4: dipeptidyl peptidase-4; p: p-value; QPCT/L: glutaminyl cyclase and glutaminyl cyclase-like protein; [1]ITT: intention to treat population; [2]Hoffmann et al., 2021; [3]Cummings, Feldman and Scheltens, 2019

EXPERIENCED LEADERSHIP

Seasoned Biopharma Experts Covering All Relevant Aspects of Drug Development

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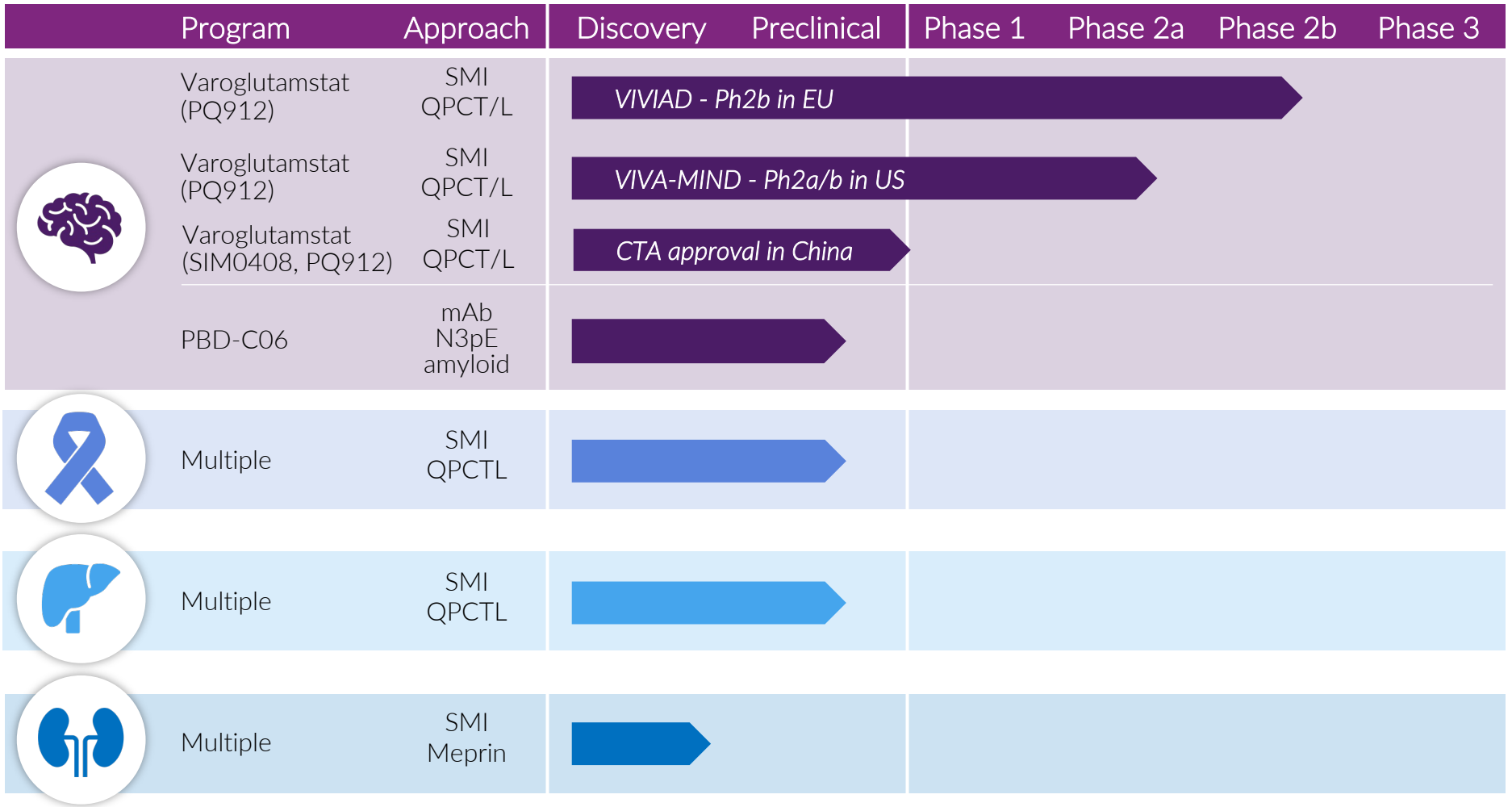
DIVERSE PIPELINE ADDRESSING SEVERE INDICATIONS



mAb: monoclonal antibody; SMI: small molecule inhibitor; CTA: Clinical Trial Application

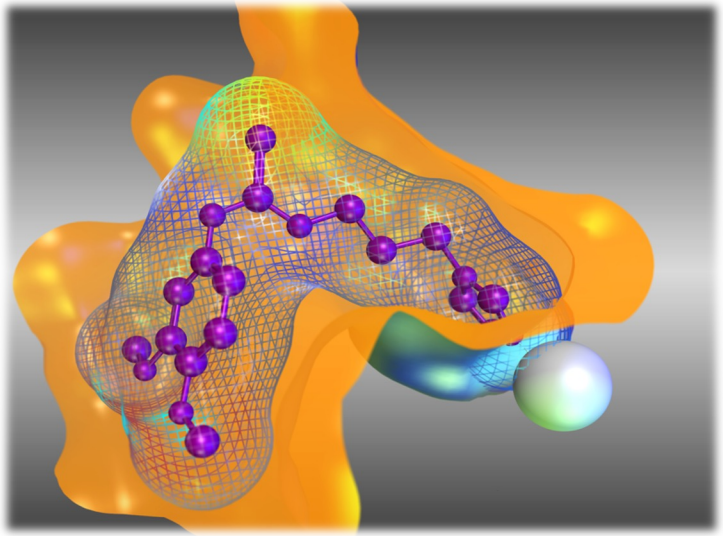
ALZHEIMER'S DISEASE

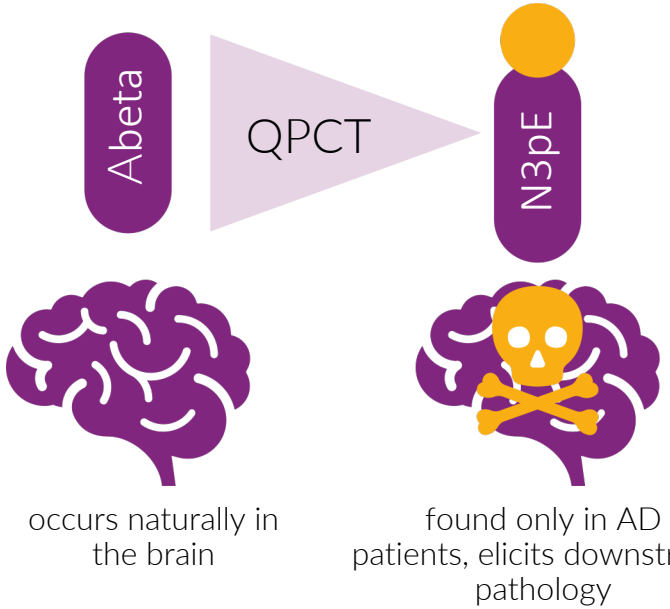
THE BURDEN

- ~30 million people suffering from AD worldwide, number expected to double by 2050, with ~12.7 million in the US alone
- Heavy burden on patients, families, caregivers and the public healthcare system
- No cure available, five established drugs on the market address symptoms only
- Aducanumab recently approved amid controversial discussion on reduced Abeta plaque load as surrogate marker for cognitive improvement

A PATH FORWARD

- VVY discovered QPCT-mediated formation of a neurotoxic Abeta variant, N3pE amyloid (pGlu-Abeta), as driver of AD pathology[1,2]
- VVY is developing small molecule inhibitors to prevent N3pE amyloid formation - rather than aiming to clear existing plaques[3]





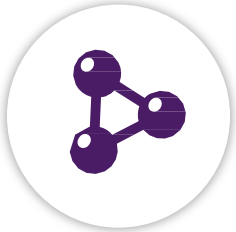
[1] *Schilling et al., Nat. Med. 2008;* [2]*Grochowska et. al. EMBO 2017;* [3]*Buchholz et. al., J. Med. Chem 2006, Nussbaum et. al. Nature 2012*

DRUG DEVELOPMENT IN ALZHEIMER'S DISEASE

THE CHALLENGE

- Low success rate and long development phase delay new treatments and discourage investment in AD drug development
- Studies across drug development programs have identified important strategies for decreasing the risk and increasing the likelihood of success in drug development programs
- These experiences provide guidance for our approach to AD drug development

THE "RIGHTS" OF AD DRUG DEVELOPMENT[1]



Right Target

Targets appropriate biologic process for AD therapeutic intervention

Right Drug

Has appropriate PK/PD profile, brain distribution, preclinical efficacy and safety in Phase 1

Right Biomarkers

Guide participant selection, monitor target engagement, disease modification and side effects

Right Participants

Are in appropriate phase of AD (preclinical, prodromal, dementia)

Right Trial

Is prudently designed and run as well-powered study with appropriate endpoints and duration

[1] *adapted from Cummings, Feldman and Scheltens, 2019*

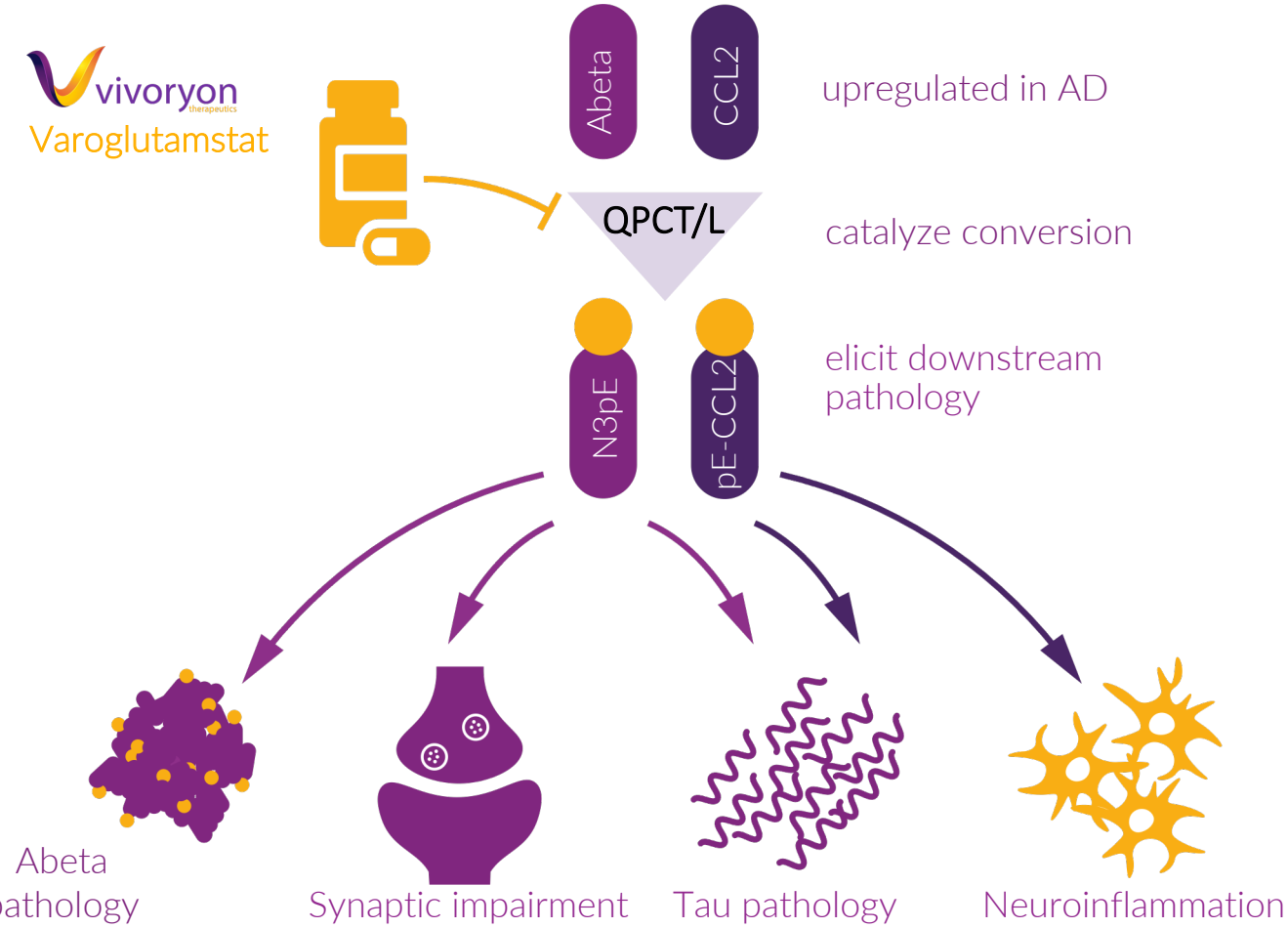
TARGETING QPCT/L IN AD

Validated Target for Intervention Upstream of Pathological Processes

ROLE OF QPCT/L IN AD PATHOLOGY

- Increased activity of glutaminyl cyclase (QPCT) is associated with AD pathology in humans[1]
- QPCT catalyzes formation of neurotoxic N3pE amyloid by cyclization of N-terminal glutamate on Abeta[2]
- N3pE amyloid correlates with QPCT expression and MMSE status in AD patients and is not found in healthy individuals[3]
- Varoglutamstat targets all aggregation states of Abeta as N3pE is equally present in soluble and insoluble forms of Abeta[4]
- Targeting QPCTL (isoform of QPCT):
  - Inhibits neuroinflammation by modulating CCL2 activity
  - Increased levels of QPCTL and high pE-CCL2 levels correlate strongly with low MMSE scores[5]

NEUROTOXIC N3PE DRIVES AD PATHOLOGY



[1]Gunn et al., J.Neurochem 2021; [2] Schilling et al., Nat. Med. 2008; [3]Morawski et. al., JAD 2014; Nussbaum et al., Nature 2012; [4]Upadhaya et.al., Brain 2014, [5]Hartlage-Rübsamen et al., Acta Neuropathol, 2015

TARGETING MULTIPLE PATHOGENETIC HALLMARKS OF AD

Varoglutamstat Inhibits Formation of Toxic Abeta Species Upstream of Other Approaches

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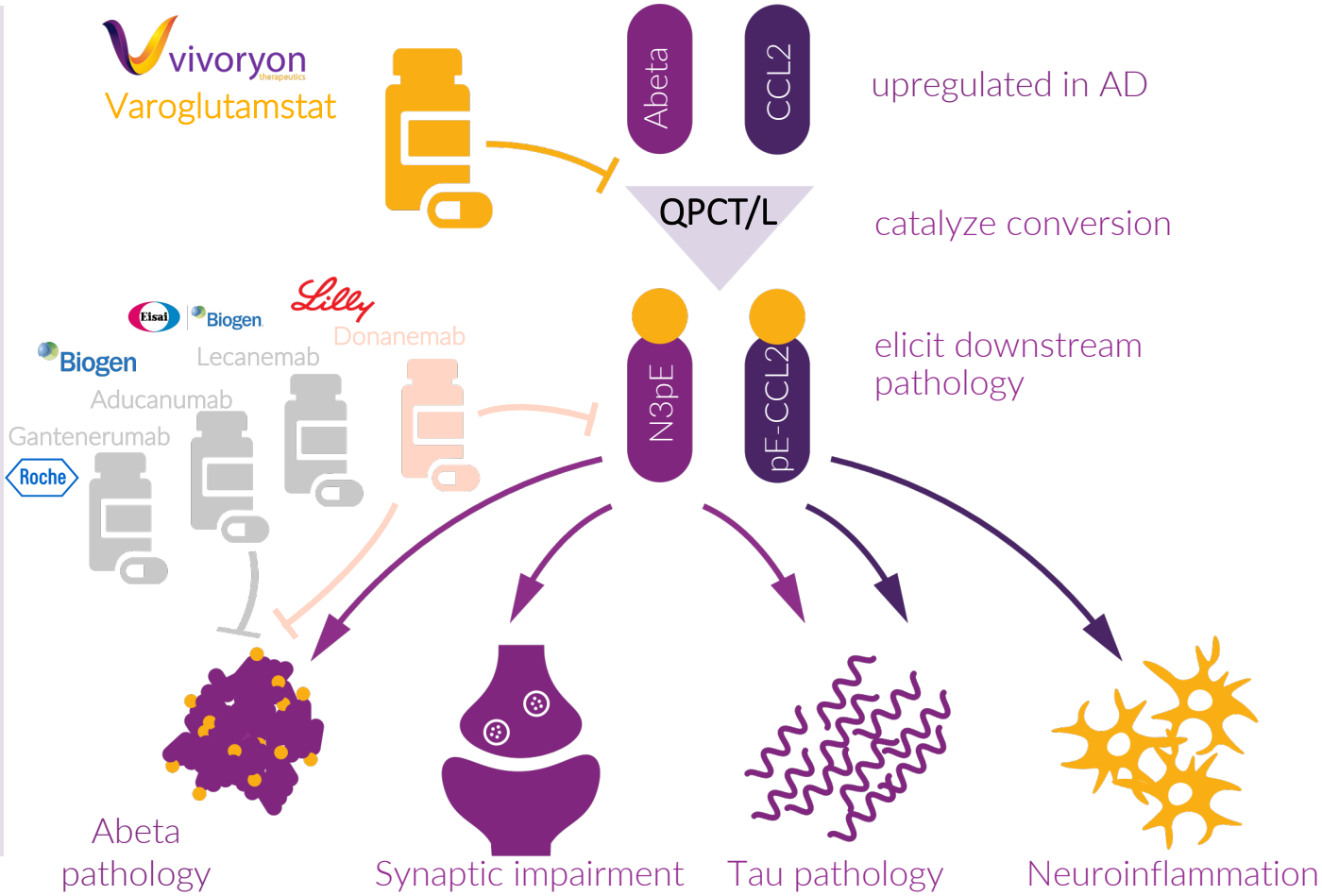
VAROGLUTAMSTAT TARGETS UPSTREAM PATHOGENESIS



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VAROGLUTAMSTAT: POTENTIAL TO ALTER THE COURSE OF AD

Translating *in vivo* Evidence for Relevance of QPCT Inhibition into Human AD

Abeta Pathology	QPCT is essential for N3pE amyloid formation *in vivo*[1] 5XFAD mice, QPCT ko and tg	QPCT/ N3pE	Dose-dependent reduction of QPCT activity in CSF & serum (Ph1 + Ph2a)
Neuroinflammation Tau Pathology	CCL2 activity promotes neuroinflammation and accelerates tau pathology[2] rTg45105 mice, CCL2 AAV	CCL2/ Tau	Dose-dependent decrease of pE-CCL2 in serum (Ph1)
Cognition	QPCT inhibition improves cognitive parameters in AD mouse models[3] hAPPSLxhQPCT mice, MWM	Cognition/ Memory	Statistically significant changes from baseline in working memory as measured by CogState (Ph2a)

[1]*Jawhar et al., 2011;* [2]*Joly-Amado et al. 2020; Hartlage-Rübsamen et al., 2015;* [3]*Hoffmann et al., 2017*

CLINICAL DEVELOPMENT STRATEGY

Clear Path To Potential Regulatory Approval
Extensive Phase 1 and Phase 2 trials

Preclinical research
In vitro and in vivo studies

COMPLETED

- QPCT inhibition improves cognitive parameters in AD mouse models
- QPCT is essential for N3pE amyloid and pE-CCL2 formation *in vivo*

Phase 1
Assessment of safety and tolerability in 205 healthy volunteers

COMPLETED

- Varoglutamstat is well-tolerated – no DLT at 800 mg twice daily or up to 3.6g once daily

Phase 1
Assessment of safety and tolerability in 60 healthy Chinese volunteers

IN PREPARATION

Phase 2a SAPHIR
Assessment of safety and tolerability in 120 patients with early AD

COMPLETED

- Statistically significant changes from baseline in working memory after only 3 months of treatment (as measured by CogState)
- High target occupancy detected at doses of 150 mg BID and above

Phase 2b VIVIAD
Assessment of safety, tolerability and efficacy in 250 patients with MCI or mild AD

Fully recruited
Final readout Q1/2024

- Endpoints: safety, attention/working memory, NTB, biomarkers
- Parallel group, dose-finding part completed, study continues with DSMB recommended maximum dose of 600 mg BID or placebo
- Fully enrolled (259 pts); planned to allow for mean treatment duration of ~82 weeks

Phase 2a/b VIVA-MIND
Assessment of efficacy and safety in 180 patients with early AD

Expanded treatment duration in Phase 2a portion (72 weeks)
Study status update in Q1/2023

- Endpoints: safety, attention/working memory, CDR-SB, biomarkers

Pivotal study or accelerated approval

- FDA Fast Track designation granted in 2021
- Two possible scenarios for late-stage development
  - Application for accelerated approval (based on consistent / positive data of Phase 2b studies)
  - Phase 3 clinical development

BID: twice daily; CDR-SB: clinical dementia rating scale-sum of boxes; DLT: dose-limiting toxicity; NTB: neuropsychological test battery

SAPHIR– GUIDING PHASE 2B TRIAL DESIGN

SUMMARY OF KEY PHASE 2A RESULTS

COGNITION

- Statistically significant changes from baseline in a working memory parameter within 3 months (One Back Test)
- Notable changes from baseline in attention (Detection Test, Identification Test)

CSF BIOMARKERS

- Strong QPCT-inhibition (target occupancy >80% at 600 mg BID, >70% at 300 mg BID)
- Reduction of neuroinflammatory and synaptic markers (pE-CCL2, YKL40, neurogranin)

SYNAPTIC FUNCTION (EEG)

- Statistically significant reduction in theta power (marker for synaptic dysfunction)
- Notable changes from baseline in functional connectivity as measured by AEC (*post-hoc* analysis)

INFORMED TRIAL DESIGN OF EU PHASE 2B

DOSING

- DLT reached at 800 mg BID; reported AEs mostly mild to moderate, fully reversible (skin and gastrointestinal)
- Varoglutamstat is well-tolerated at doses resulting in high target occupancy (600 mg BID)
- Dose adjustments for Phase 2b to prevent AEs while maintaining high target occupancy

PLANNING

- Composite Attention/Working Memory Simulation selected as Primary Endpoint
- Robust statistical planning with 3 CogState parameters (one back test, detection, identification)
- Based on available Phase 2a data matched with large historical control data set on longitudinal rate of progression for identical cognitive composite

AEC: amplitude envelope correlation; BID: twice daily;

MULTIPLE AVENUES TO VALUE GENERATION

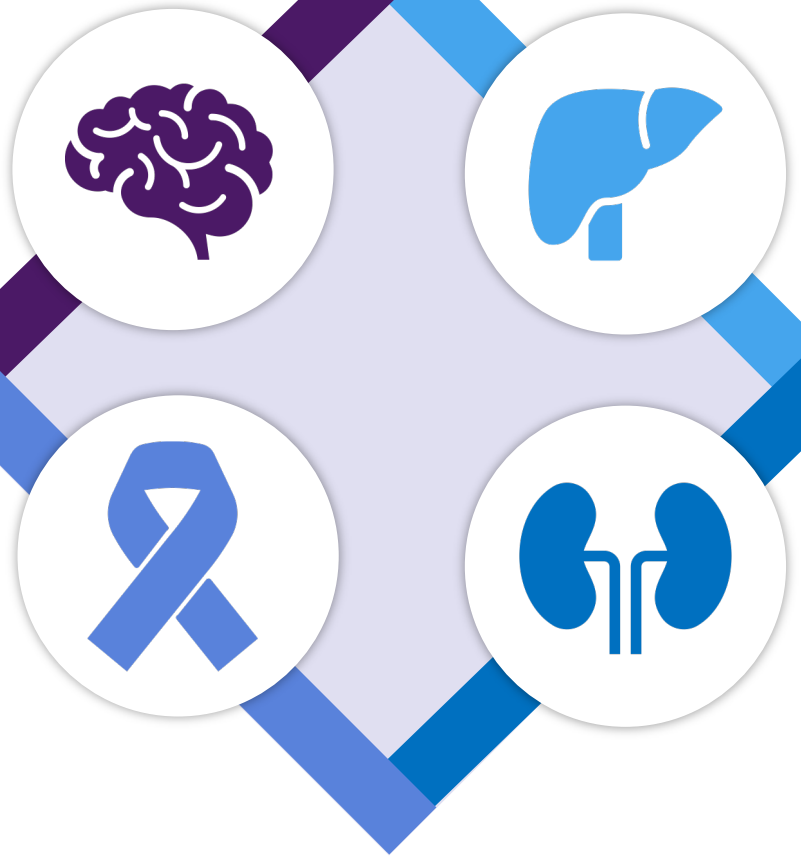
Diverse Pipeline of Oral Small Molecule Inhibitors to Address Exceptionally High Medical Need

ALZHEIMER'S DISEASE

- Small molecule oral QPCT/L inhibitors with good blood-brain barrier penetration
- Inhibits production of N3pE amyloid (pGlu-Abeta): neurotoxic, glutaminylated, soluble Abeta peptides
- Statistically significant effects on CSF biomarkers, synaptic function & working memory after 12w treatment

INFLAMMATION/NASH

- Small molecule QPCTL inhibitors to modulate the CCL2-CCR2 axis
- *In vivo* proof of concept in NAFLD mice
- Investigated as single agent and in combination with meprin inhibitors



CANCER

- Small molecule QPCTL inhibitors to modulate cancer immune checkpoint activity
- Precision intervention to modulate the activity of pro-metastatic chemokines of the CCL family
- Opportunity for combination therapies

AKI/FIBROSIS

- Novel meprin alpha/beta single and dual selective small molecule inhibitors
- *In vivo* proof of concept in AKI animal model
- Unique recognition pattern allows design of selective and specific meprin protease inhibitors

AKI: acute kidney injury; CCL2: chemokine (C-C motif) ligand 2; CCR2: C-C chemokine receptor type 2; NASH: nonalcoholic steatohepatitis; NAFLD: nonalcoholic fatty liver disease; QPCT: glutaminyl cyclase; QPCTL glutaminyl cyclase-like protein; QPCT/L glutaminyl cyclase and glutaminyl cyclase-like protein

QPCTL INHIBITION IN CANCER

Opportunity to Develop Oral Small Molecule Inhibitors in Immuno-Oncology

BACKGROUND

- Large unmet medical need remains to effectively and safely treat cancer patients
- Combination therapies as powerful tool
- Evidence for therapeutic potential of:
  - Leveraging the power of innate immunity: target the CD47-SIRPα axis
  - Interfering with metastasis: modulating potency/stability of CCL chemokines

OPPORTUNITY

- Novel orally administered small molecule approach with differentiated mode of action: no antigen sink effect, potential for improved tumor penetration
- Large patent portfolio: Composition of matter and indication coverage with expirations beyond 2035

OUR APPROACH

- Selective small molecule QPCTL inhibitor prevents:
  - Post-translational modification of CD47 to pE-CD47, thus abrogating CD47-SIRPα binding
  - Full maturation of CCL2, 7, 8, and 13 to pE-CCL2, 7, 8 and 13, leading to decreased potency and stability

PROOF OF CONCEPT

- *In vitro/in vivo* evidence of synergies with antibody-mediated immunotherapy, e.g. rituximab, daratumumab, trastuzumab, cetuximab, avelumab:
  - Combination increases phagocytosis and cytotoxicity over single agent activity
  - Significant increase of tumor doubling times in syngeneic mouse models

QPCTL INHIBITION IN INFLAMMATION/NASH

Opportunity to Develop Oral Small Molecule Inhibitors in Inflammatory Kidney and Liver Diseases

BACKGROUND

- Non-alcoholic fatty liver disease (NAFLD) is a chronic hepatic disorder characterized by steatosis in early stages, leading to non-alcoholic steatohepatitis (NASH) in more advanced stages
- NASH is expected to become the leading cause of liver transplantation in the US in the coming years
- Significant medical need to find effective therapies to manage NASH

OPPORTUNITY

- Novel orally available compounds with a differentiated mode of action targeting a subclass of therapeutically relevant chemokines
- *In vitro/in vivo* evidence of decreased inflammatory macrophages, and reduced liver fibrosis
- Large patent portfolio:
  - Composition of matter and indication coverage with expirations beyond 2035

OUR APPROACH

- Treatment of NAFLD by modulating the monocyte/macrophage-related immune response in affected livers using a QPCT/L inhibitor
- CCL2 is upregulated in liver inflammation, our QPCTL inhibitor is used to destabilize CCL2

IN VIVO PROOF OF CONCEPT

- *In vivo* NASH model (STAM™) demonstrated reduction of inflammation score, inflammatory cytokines like CCL2 and TNFalpha

MEPRIN INHIBITION IN AKI/CKD

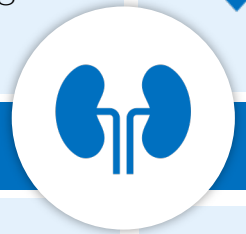
Opportunity to Develop Oral Small Molecule Inhibitors In Fibrosis and Kidney Diseases

BACKGROUND

- The estimated incidence rate of acute kidney injury (AKI) during hospitalization in the US is 2-5%, it arises in more than 50% of intensive care unit patients
- More than 1 in 7, that is 15% of US adults or 37 million people, are estimated to have chronic kidney disease (CKD)
- Significant medical need to find effective therapies to manage AKI/CKD

OPPORTUNITY

- Novel orally available picomolar small molecule inhibitors targeting metalloproteases meprin alpha and/or beta
- *In vivo* evidence of kidney protection in cisplatin induced AKI model
- Large patent portfolio:
  - Composition of matter and indication coverage with expirations beyond 2037



OUR APPROACH

- Block collagen remodeling in fibrosis by selectively inhibiting the meprin protease
- Provide kidney protection for patients treated with cytostatics by co-medication with meprin inhibitor

IN VIVO PROOF OF CONCEPT

- Evidence of kidney protection in cisplatin induced AKI model
- Effect on clinical parameters for kidney function demonstrated with with knockout animals and small molecule compound

VIVORYON THERAPEUTICS

Summary

PRESENT FOCUS

Differentiated upstream approach targeting all three major hallmarks of AD

Allows intervention very early in disease pathogenesis

Lead candidate varoglutamstat in clinical Phase 2b in AD

FDA granted Fast Track designation in 2021

Phase 2a data showing statistically significant changes in working memory

FUTURE OPPORTUNITIES

Regional partnership with Simcere:

Development opportunities for varoglutamstat and PBD-C06 in AD in Greater China

Investigating potential to develop varoglutamstat in combination with mAbs in AD (own and external assets)

Advancing follow-up programs into the clinic beyond AD

UPCOMING CATALYSTS

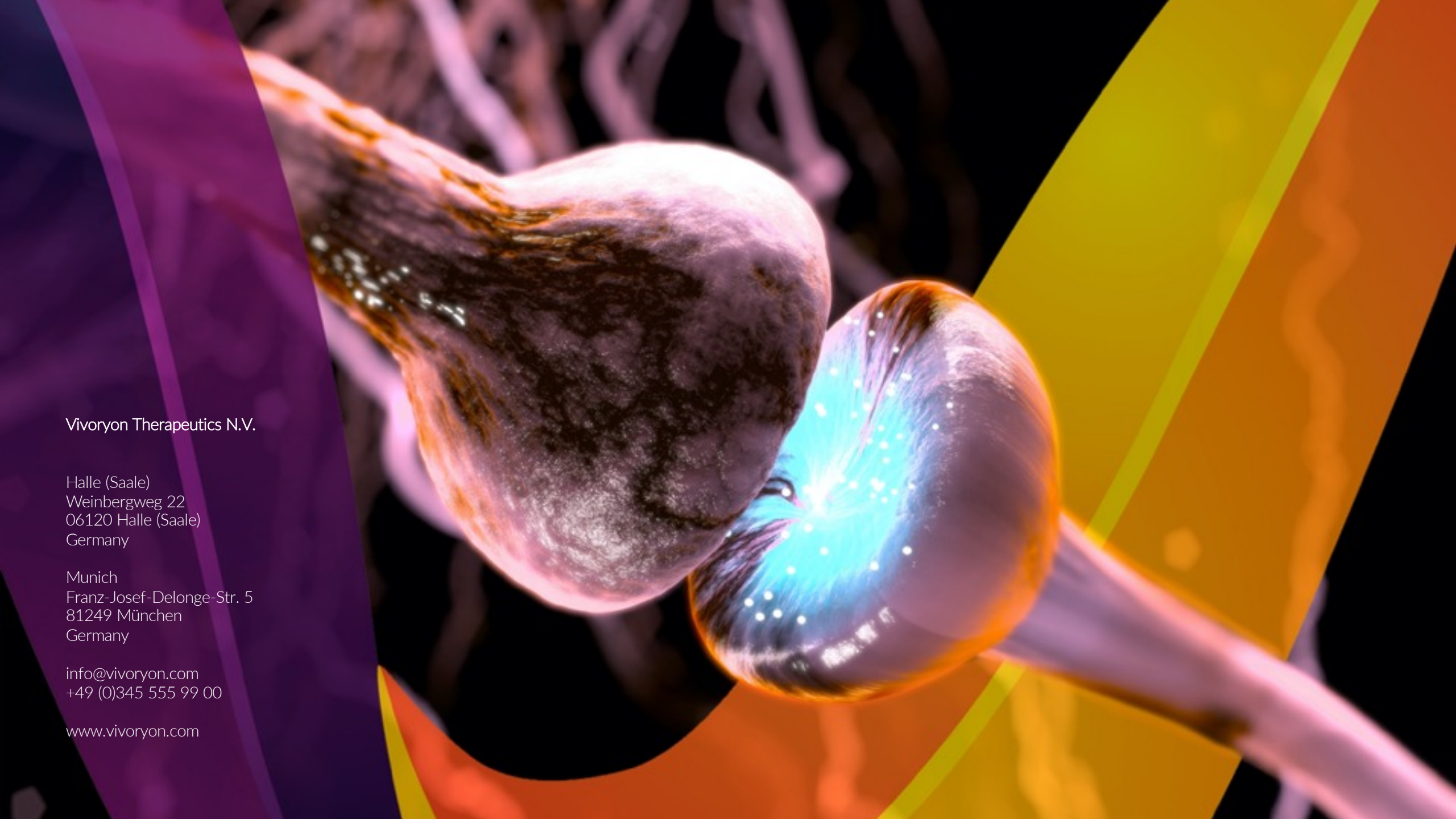
VIVIAD European Phase 2b:

Final readout Q1/2024

VIVA-MIND US Phase 2a/b:

Study status update in Q1/2023

mAb: monoclonal antibody



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