



# R&D Update Call: Unique treatment effect of varoglutamstat on kidney function in diabetes patients

July 18, 2024

|Vivoryon Therapeutics N.V.

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# Entering a new era of R&D focused on kidney disorder therapies

## Significant kidney function improvement (total VIVIAD population)

- ✓ **Statistically significant and clinically meaningful change in eGFR<sup>1</sup>** in overall VIVIAD Phase 2 study population (prespecified analysis)
  - Between-group treatment effect of 3.4mL/min/1.73m<sup>2</sup>/year (p<0.001; slope analysis)
- ✓ **Robust and consistent effect observed across various methodologies and analyses**
  - eGFR was calculated as a slope analysis across 2 years taking all available data into account
  - Effect was equally demonstrated with eGFR calculated based on creatinine and based on cystatin C
  - Results were consistent - creatinine measurements were repeated multiple times with different samples and laboratory equipment
- ✓ **Excellent tolerability & safety profile**



# Enhanced kidney function in diabetes patients

## Compelling outcomes in diabetes subgroup of VIVIAD study

### Compelling outcomes in diabetes

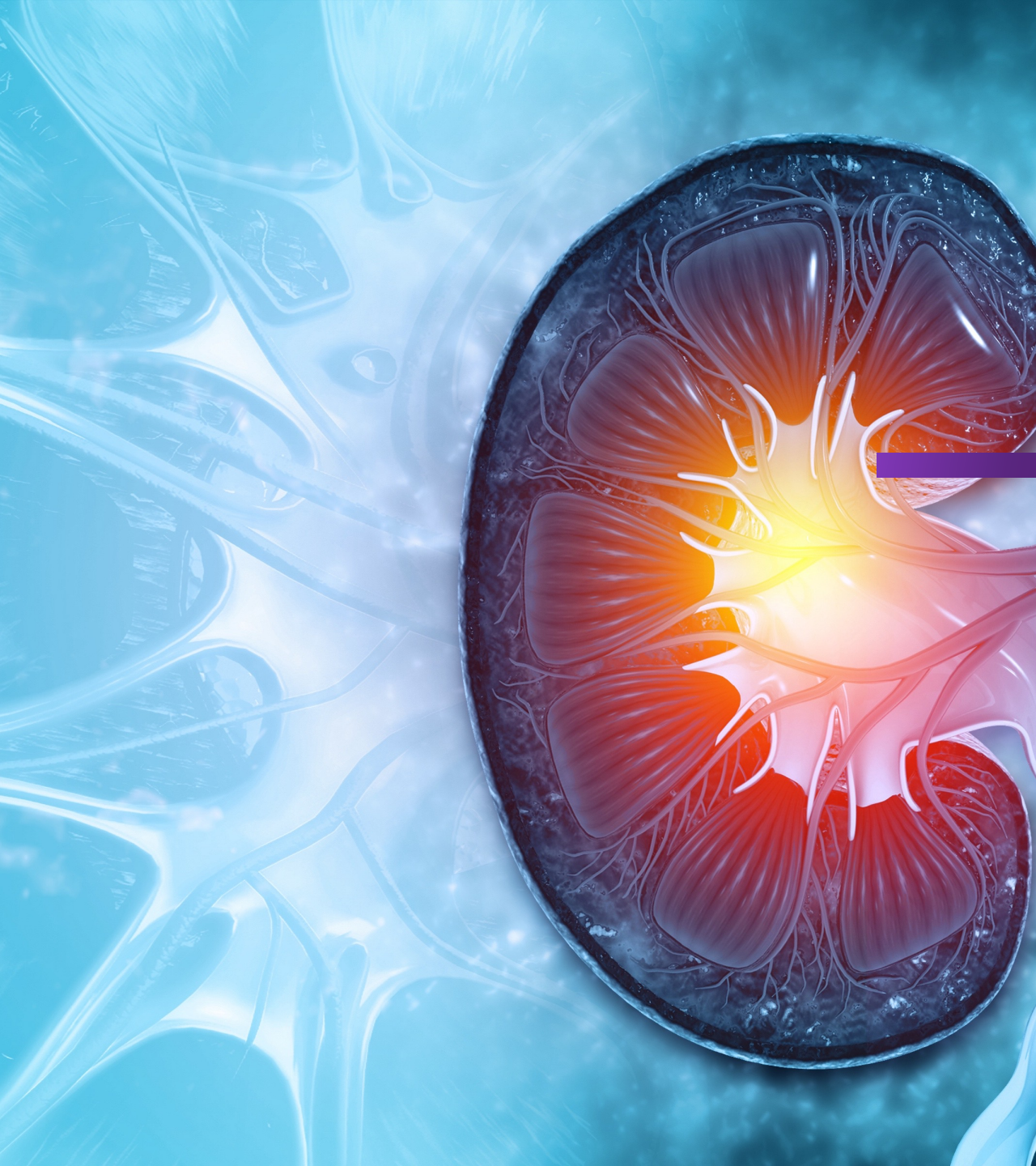
- ✓ **Treatment effect in diabetes subgroup<sup>1</sup> was substantially higher than in the overall patient population**
  - Outstanding improvement of eGFR (slope):  
> 8 mL/min/1.73m<sup>2</sup>/yr (p=0.02)
- ✓ **Additional potential health benefits observed<sup>2</sup>**
  - Trend for improving transaminases: - 6 units average at week 48
  - Mild weight loss: - 4 kg at week 48
  - Lowering diastolic blood pressure: - 6 mmHg at week 48
- ✓ **Comparable adverse event (AE) rates vs. total population**

### Clear pathway to advance in DKD

- ◆ Complement available data with a **Phase 2 study in advanced stage 3b/4 diabetic kidney disease (DKD)<sup>3</sup>** on top of standard of care (SoC)
- ◆ **Conduct non-clinical and mechanistic studies** in parallel to prioritize additional disorders for clinical development







# VIVIAD STUDY - KIDNEY DATA

All patient analysis and  
diabetes subgroup analysis

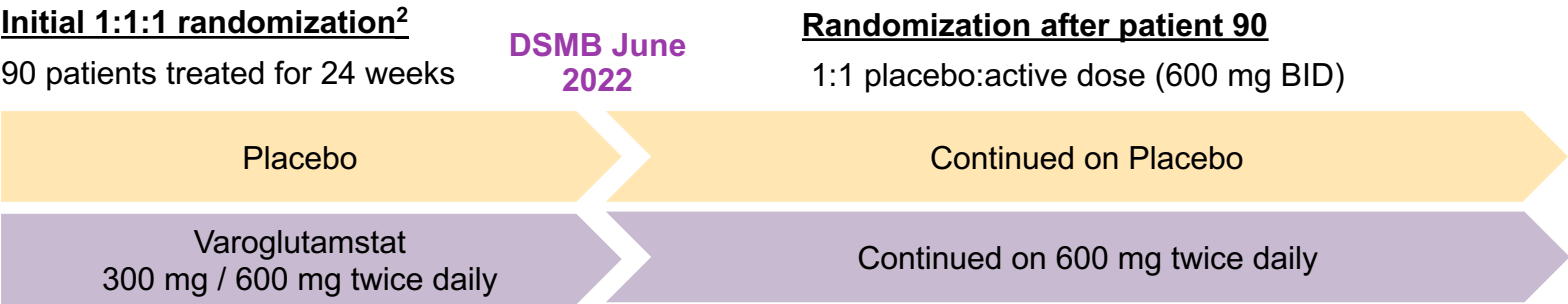
# Kidney function was investigated as part of VIVIAD Phase 2b

Study included prospectively specified endpoint to evaluate kidney function in elderly AD patients

**Patients<sup>1</sup>:** Mild cognitive impairment or mild dementia (early Alzheimer’s disease, AD); 50 – 80 years of age

**Primary/secondary objectives:**  
Effect of varoglutamstat on working memory and attention and safety<sup>1</sup>

**Exploratory kidney endpoint:**  
Estimated glomerular filtration rate (eGFR) measured by serum creatinine level using MDRD<sup>3</sup> formula



	Baseline / Randomization	Week (Wk) 24	Wk 48	Wk 60	Wk 72	Wk 84	Wk 96	Follow up (FU) 4 weeks post treatment end
<b>Number of participants</b>								
<b>Total population (n=259)</b>								
Varoglutamstat N (%)	142		129 (90.8)	121 (85.2)	109 (76.8)	82 (57.7)	60 (42.3)	
Placebo N (%)	117		108 (92.3)	99 (84.6)	75 (64.1)	57 (48.7)	33 (28.2)	
<b>Diabetes subgroup (n=32)<sup>5</sup></b>								
Varoglutamstat N (%)	20		15 (75.0)	14 (70.0)	12 (60.0)	9 (45.0)	6 (30.0)	
Placebo N (%)	12		11 (91.7)	9 (75.0)	7 (58.3)	7 (58.3)	2 (16.7)	



<sup>1</sup> More information at clinicaltrials.gov ID NCT04498650. <sup>2</sup> Randomization after patient 90 to 1:1 placebo:active dose. BID: twice daily, <sup>3</sup> MDRD Modification of Diet in Renal Disease method. <sup>4</sup> Protocol defined study duration was between 48 to 96 weeks and study ended for all participants when the last patient randomized patient completed week 48 visit. <sup>5</sup> Diabetes subgroup: patients having at baseline either medical history of diabetes (type 1 or 2) and/or comedication with drugs used in diabetes and/or untreated with a HbA1c > 6.5%; HbA1C=Hemoglobin A1C/Hemoglobin (mmol/mol)

# VIVIAD Phase 2b baseline characteristics

## Total population and diabetes subgroup

### Key figures

- ◆ Average age > 68 years
- ◆ Diabetes subgroup ≈ 12% of VIVIAD patients
- ◆ Mean baseline eGFR ≈ 80 mL/min/1.73m<sup>2</sup>

Item	VIVIAD total population (total N = 259)		Diabetes subgroup <sup>1</sup> (total N = 32)	
	Varoglutamstat N (%)	Placebo N (%)	Varoglutamstat N (%)	Placebo N (%)
<b>Number of participants</b>	142	117	20	12
<b>Sex – n (%)</b>				
Female	69 (48.6)	62 (53.0)	11 (55.0)	7 (58.3)
Male	73 (51.4)	55 (47.0)	9 (45.0)	5 (41.7)
<b>Age (in years) – Mean (SD)</b>	68.6 (7.08)	68.3 (7.78)	68.9 (6.97)	72.5 (4.91)
<b>eGFR (ml/min/1.73 m2) categorization at baseline – n (%)</b>				
≥ 90	39 (27.5)	25 (21.4)	5 (25.0)	5 (41.7)
60-89	97 (68.3)	82 (70.1)	13 (65.0)	5 (41.7)
45-59	6 (4.2)	9 (7.7)	2 (10.0)	2 (16.7)
30-44	0	1 (0.9)	0 (0.0)	0 (0.0)
< 30	0	0	0 (0.0)	0 (0.0)
<b>eGFR (ml/min/1.73 m2) at baseline – mean (SD)</b>	83.0 (16.90)	79.9 (16.08)	81.4 (21.99)	85.7 (21.13)
<b>Average treatment duration (weeks)</b>	77.7	73.7	69.6	70.4
<b>HbA1C<sup>2</sup> at baseline – mean (SD)</b>	39.27 (6.797)	38.85 (5.191)	49.8 (9.43)	48.4 (2.42)
<b>Mean blood pressure at baseline (mmHg) – mean (SD)</b>				
systolic	138.6 (15.42)	135.0 (15.85)	137.1 (14.79)	128.1 (13.55)
diastolic	81.1 (10.41)	80.4 (9.35)	79.2 (12.18)	78.8 (6.22)

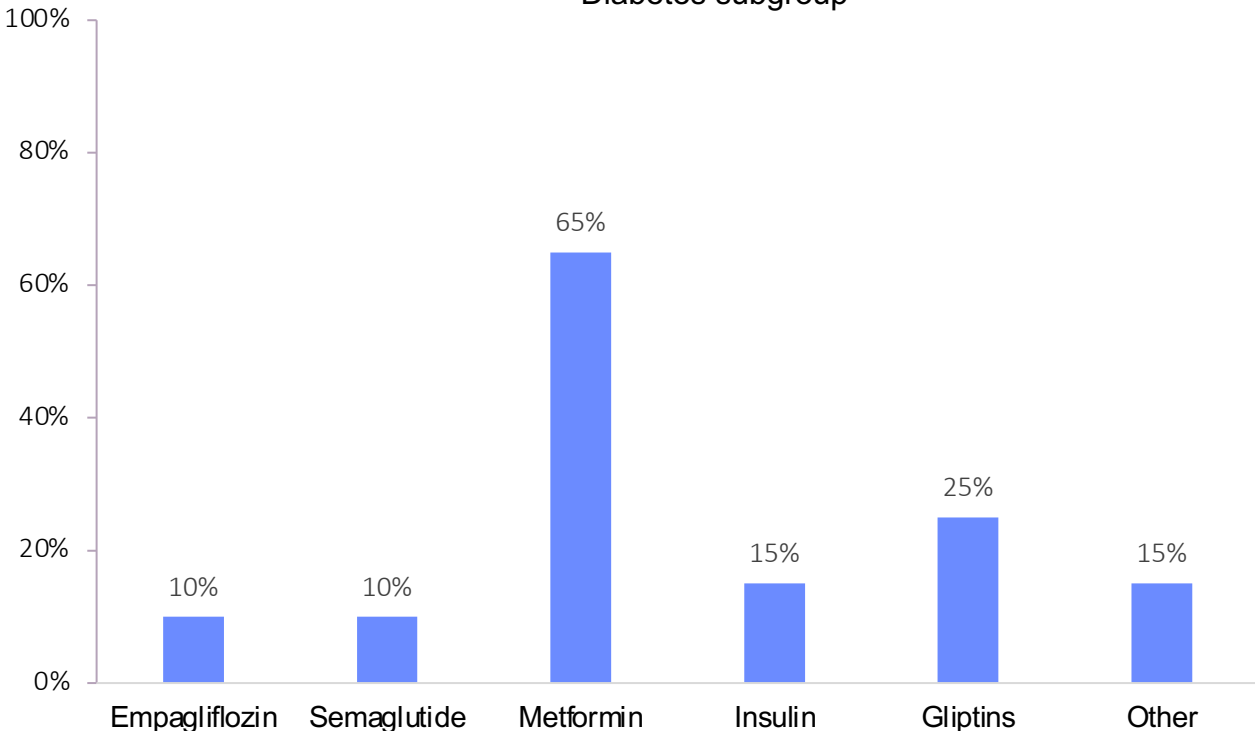
<sup>1</sup> Diabetes subgroup defined as defined as patients having at baseline either medical history of diabetes (type 1 or 2) and/or comedication with drugs used in diabetes and/or untreated with a HbA1c > 6.5%; <sup>2</sup> HbA1C = Hemoglobin A1C/Hemoglobin (mmol/mol)



# Baseline medication in varoglutamstat arm of VIVIAD Phase 2b

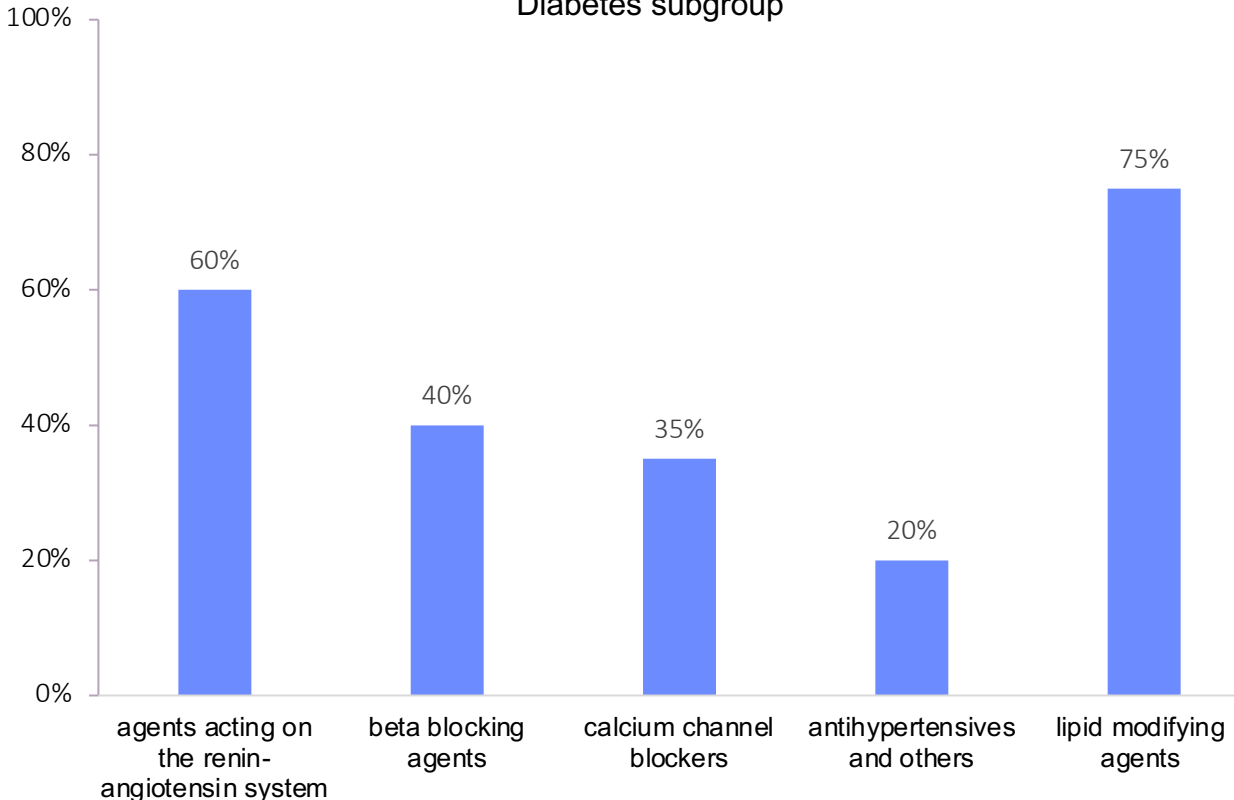
Diabetes patients received multiple SoC therapies for diabetes and hypertension

Diabetes-specific medication  
Diabetes subgroup



Proportion of patients with comedication (%)  
■ Varoglutamstat (n =20)

Other medication  
Diabetes subgroup



Proportion of patients with comedication (%)  
■ Varoglutamstat (n =20)





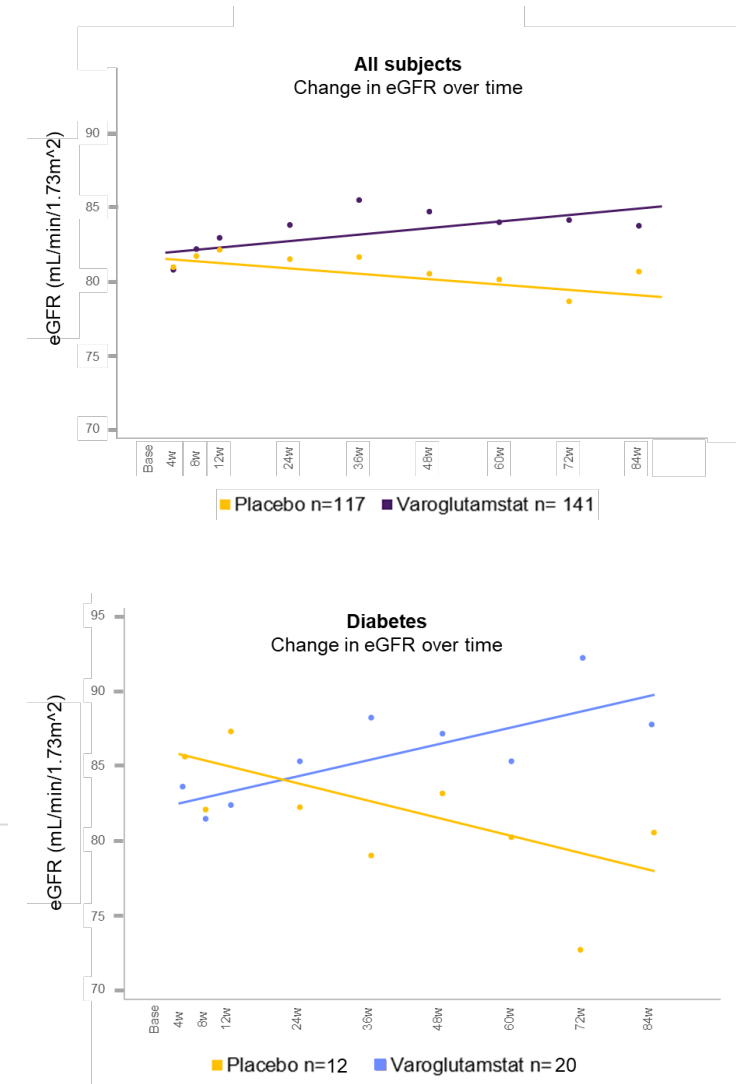
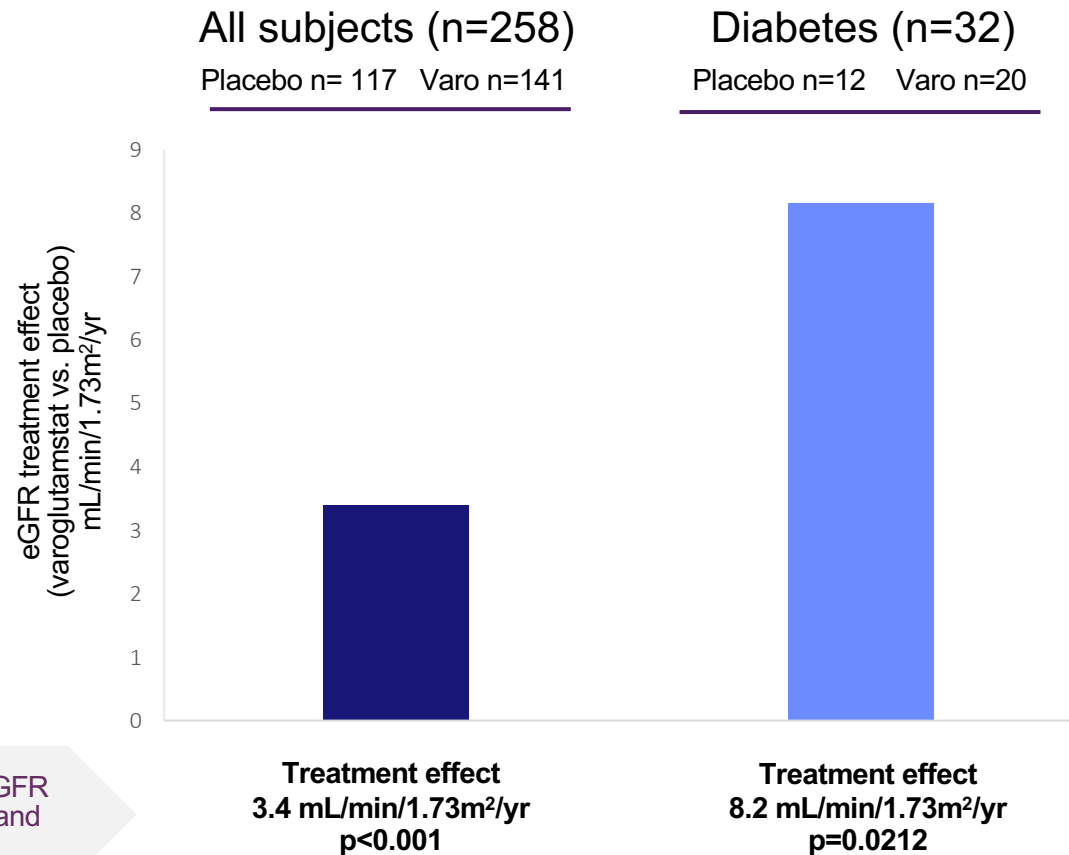
# Treatment effect even more evident in diabetes subgroup

## eGFR measured using creatinine and MDRD

Statistically significant improvement in annualized change in eGFR (mL/min/1.73m<sup>2</sup>/year) as measured by slope analysis (MDRD)

Other subgroups (e.g. patients with hypertension and cardiac disorders) had similar effect sizes as the overall population

**Treatment effect:** difference between the eGFR slope of the varoglutamstat treated patients and the eGFR slope of the placebo patients



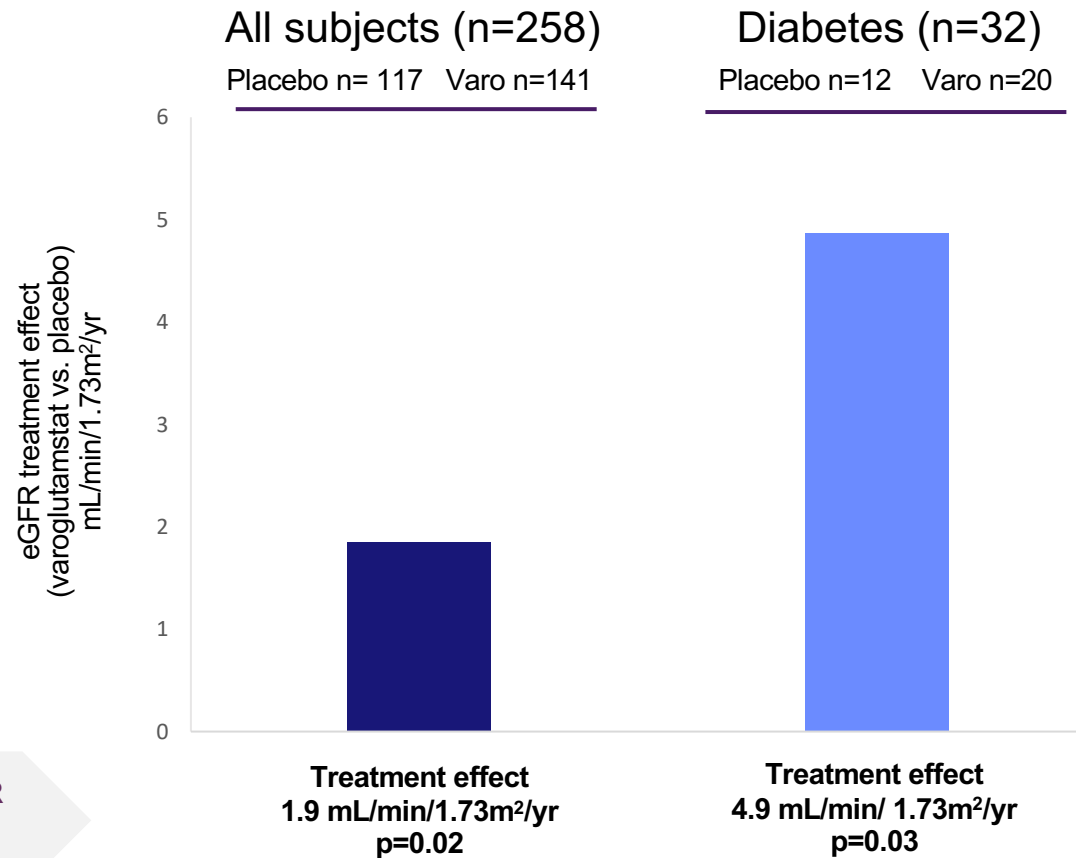
# Treatment effect seen across methodologies

## Measurement of eGFR using all cystatin C measurements and 2021 CKD-EPI

Statistically significant improvement in annualized change in eGFR (mL/min/1.73m<sup>2</sup>/year) as measured by slope analysis of Cystatin C CKD-EPI 2021

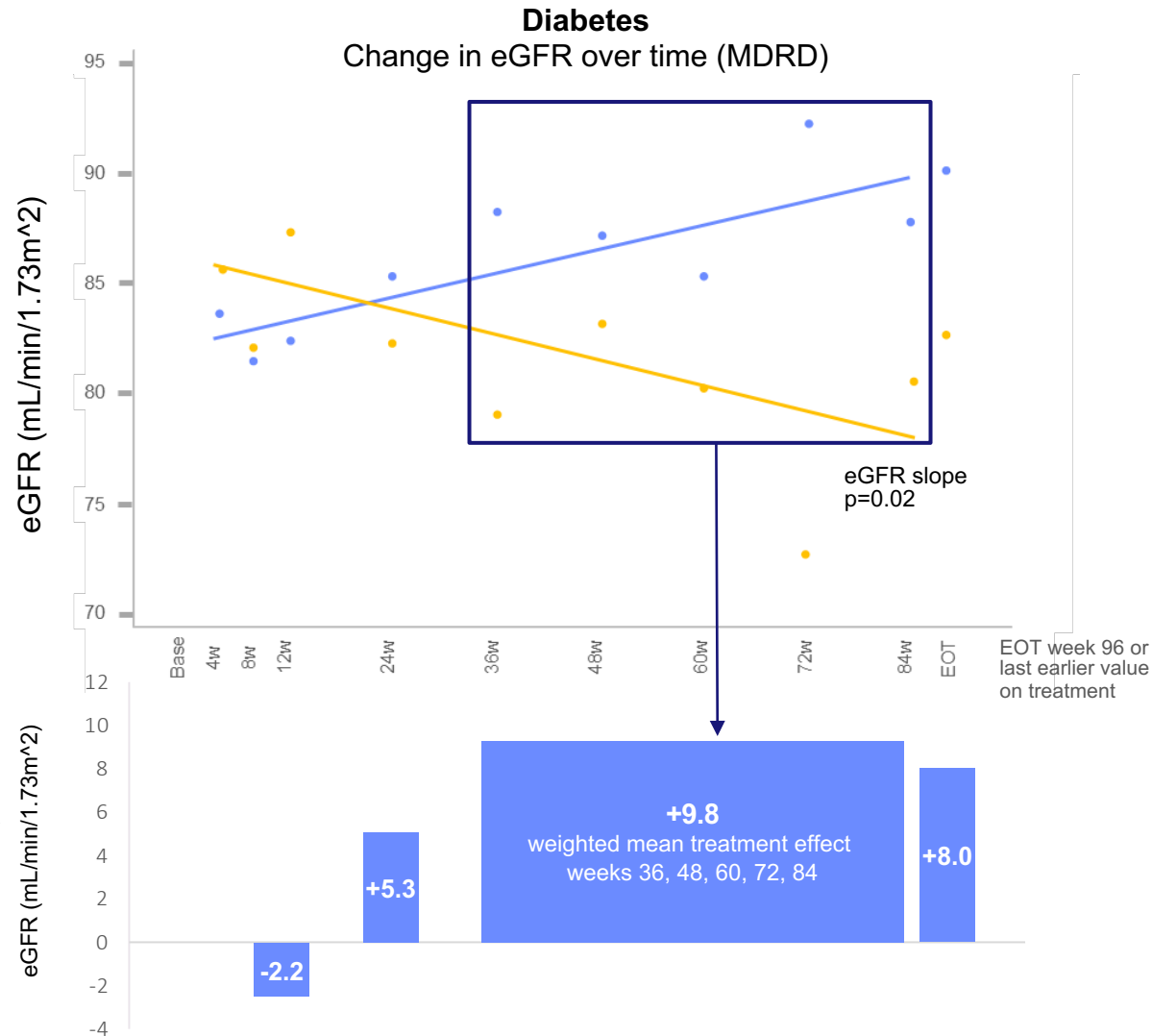
Other subgroups (e.g. patients with hypertension and cardiac disorders) had similar effect sizes as the overall population

**Treatment effect:** difference between the eGFR slope of the varoglutamstat treated patients and the eGFR slope of the placebo patients



# Time analysis shows durable treatment effect over two years

Up to nine-month escalation period before reaching full treatment effect



**Treatment effect analysis:**  
MMRM analysis of baseline to visit differences between varoglutamstat and placebo confirm slope analysis

## Onset of action:

- ◆ First treatment effect seen at week 24, approx. 50% of maximum effect observed

## Sustained effect size:

- ◆ Sustained effect seen during weeks 36 - 84

## Durability of effect:

- ◆ Last visit on treatment shows similar effect size as weighted mean of weeks 36 - 84, confirming a durable long-term effect



# Excellent safety profile consistent across 2 years study duration

Varoglutamstat was well-tolerated at the dose of 600mg BID

Item	VIVIAD total population (total N = 259)		Diabetes subgroup <sup>3</sup> (total N = 32)	
	Varoglutamstat N (%) <sup>1</sup>	Placebo N (%) <sup>1</sup>	Varoglutamstat N (%) <sup>1</sup>	Placebo N (%) <sup>1</sup>
<b>Patients randomized</b>	142	117	20	12
<b>Subjects who completed treatment</b>	119 (83.8)	105 (89.7)	15 (75.0)	11 (91.7)
<b>Subjects discontinued from treatment</b>	23 (16.2)	12 (10.3)	5 (25.0)	1 (8.3)
- due to adverse events	6	4	1	1
- due to protocol deviation	1	0	0	0
- due to withdrawal	15	7	4	0
- due to physician decision	0	1	0	0
- other	1	0	0	0
<b>Subjects with treatment emergent adverse events (TEAEs)</b>				
- any TEAE	120 (84.5)	95 (81.2)	17 (85.0)	9 (75.0)
- any related TEAE	31 (21.8)	26 (22.2)	5 (25.0)	2 (16.7)
- serious TEAE	18 (12.7)	10 (8.5)	2 (10.0)	1 (8.3)
- serious related TEAE	2 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)
- severe TEAE <sup>2</sup>	22 (15.5)	9 (7.7)	3 (15.0)	2 (16.7)
- severe related TEAE <sup>2</sup>	4 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)
- fatal TEAE	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
<b>Clinically diagnosed ARIA</b>	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

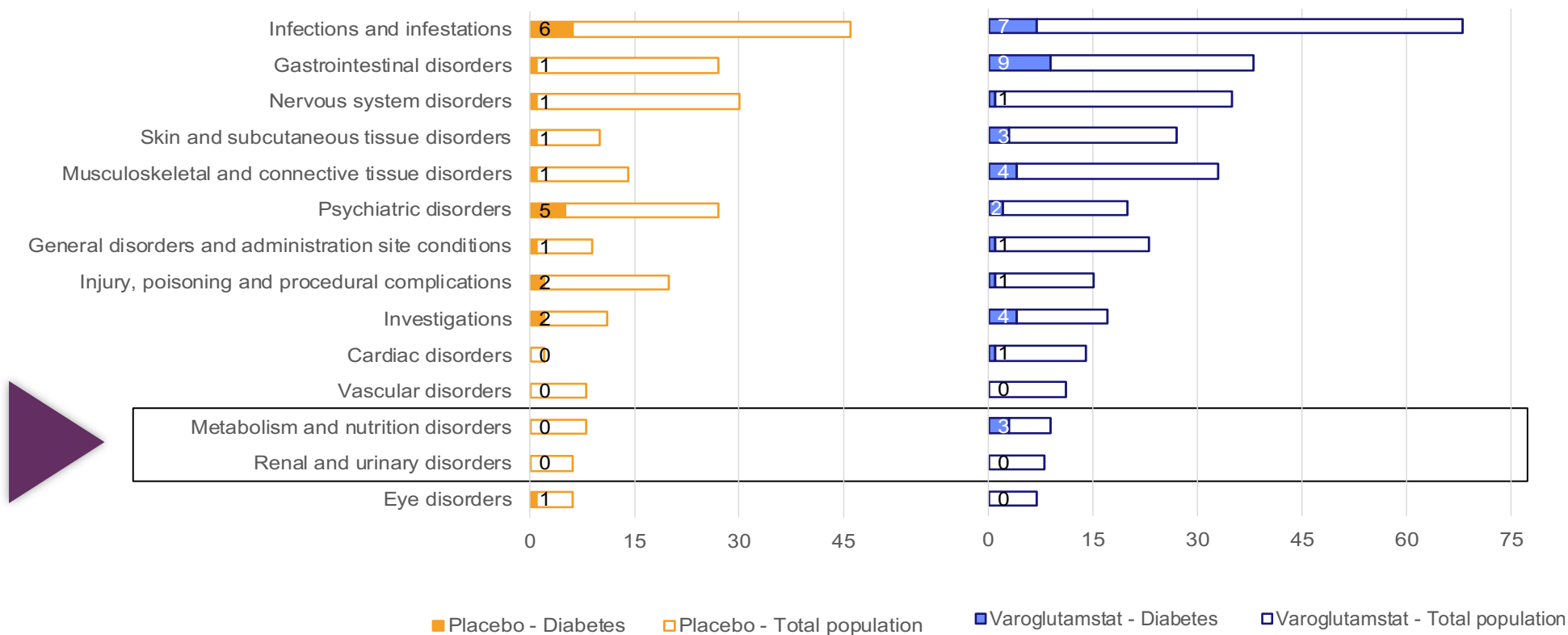




# No adverse kidney effects observed

No meaningful differences observed in renal and metabolic systems AE in total population and diabetes subgroup

Number of patients with TEAEs by system organ class (SOC)<sup>1</sup>

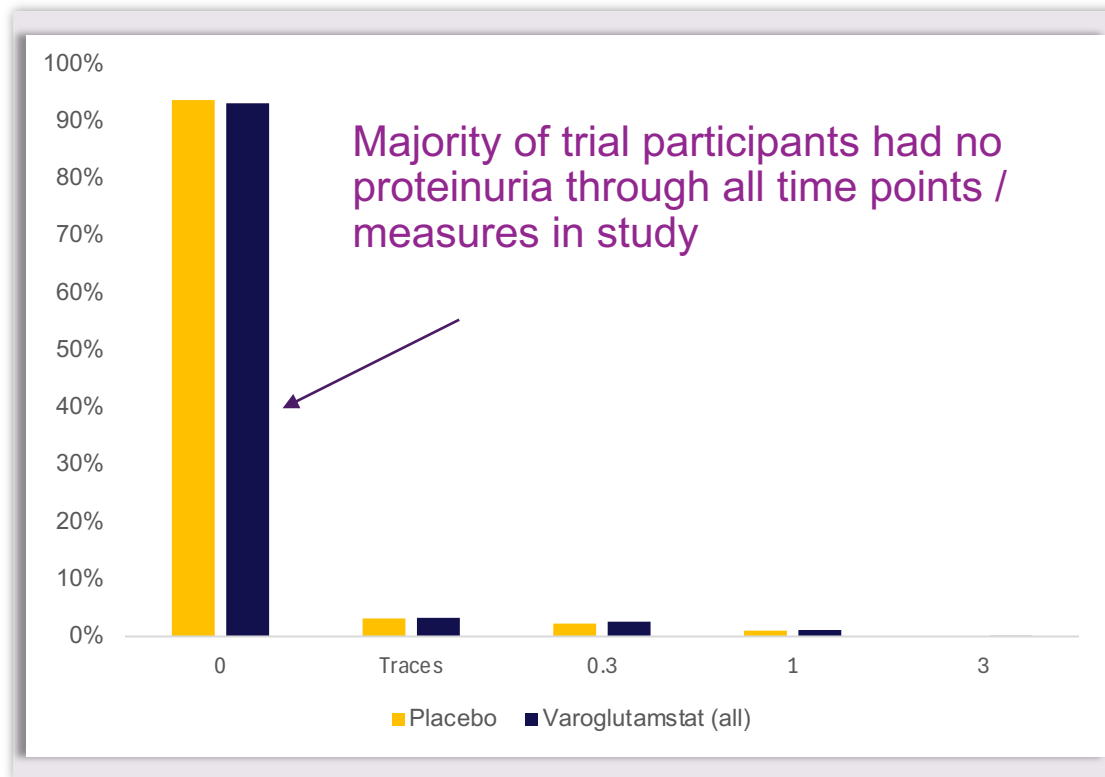


- ◆ Main difference in diabetes subgroup appears to be the gastrointestinal AE rate, however all were mild to moderate, temporary



# Urine dipstick analysis showed no evidence of increased proteinuria

VIVIAD (all) and diabetes subgroup shows varoglutamstat has no adverse effect on kidney



Clear evidence that varoglutamstat does not induce or increase proteinuria

Item	VIVIAD total population (total N = 259)		Diabetes subgroup <sup>1</sup> (total N = 32)	
	Varoglutamstat N = 142	Placebo N = 117	Varoglutamstat N = 20	Placebo N = 12
<b>Total number of patients % (n) with</b>				
Protein in Urine (Dipstick positive) at Baseline	4.9 % (7)	2.6 % (3)	5.0 % (1)	0.0 % (0)
Sustained positive results of protein in urine (i. e., at at least three post-baseline visits and more severe than the baseline result)	4.9 % (7)	6.8 % (8)	0.0 % (0)	8.3 % (1)

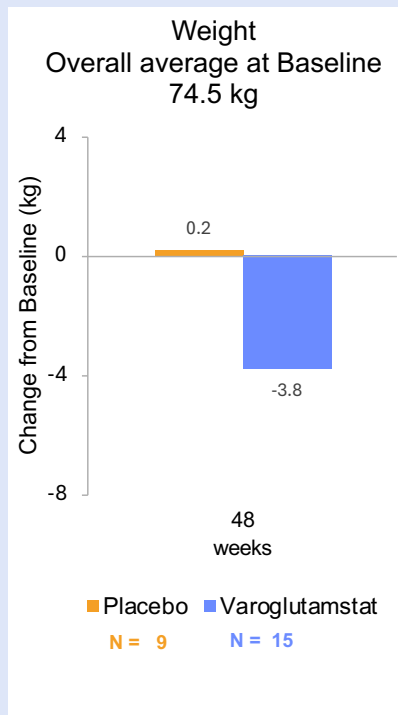


# Additional health benefits observed in diabetes subgroup

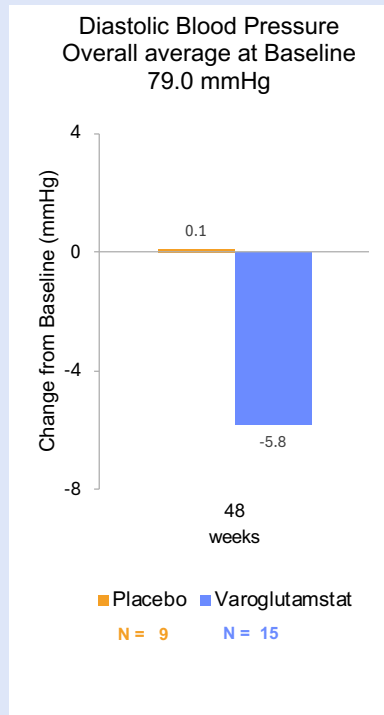
Promising effects on weight loss, blood pressure and liver enzymes

Diabetes subgroup<sup>1</sup>

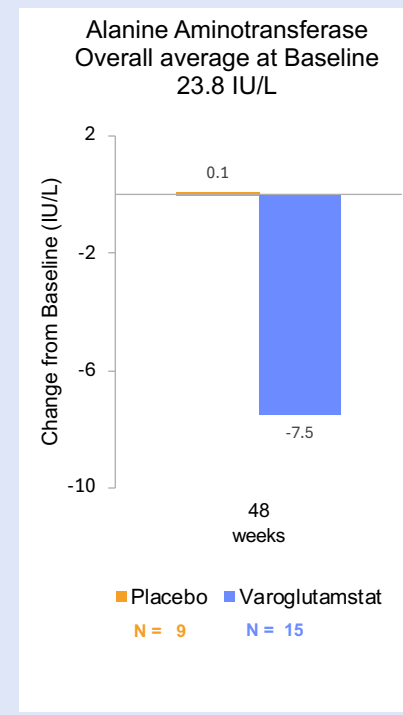
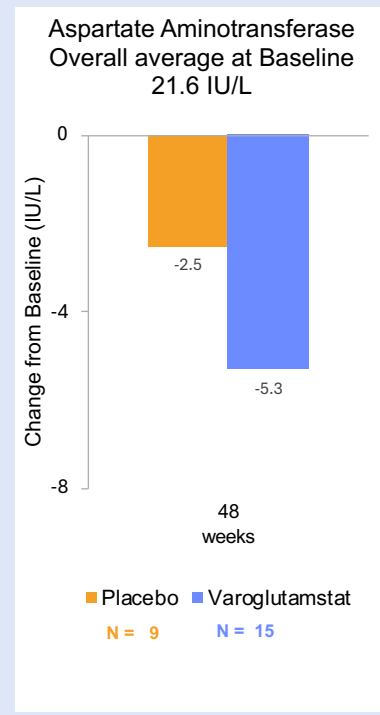
Change in **weight** from baseline (kg)



Change in **diastolic blood pressure** from baseline (mmHg)



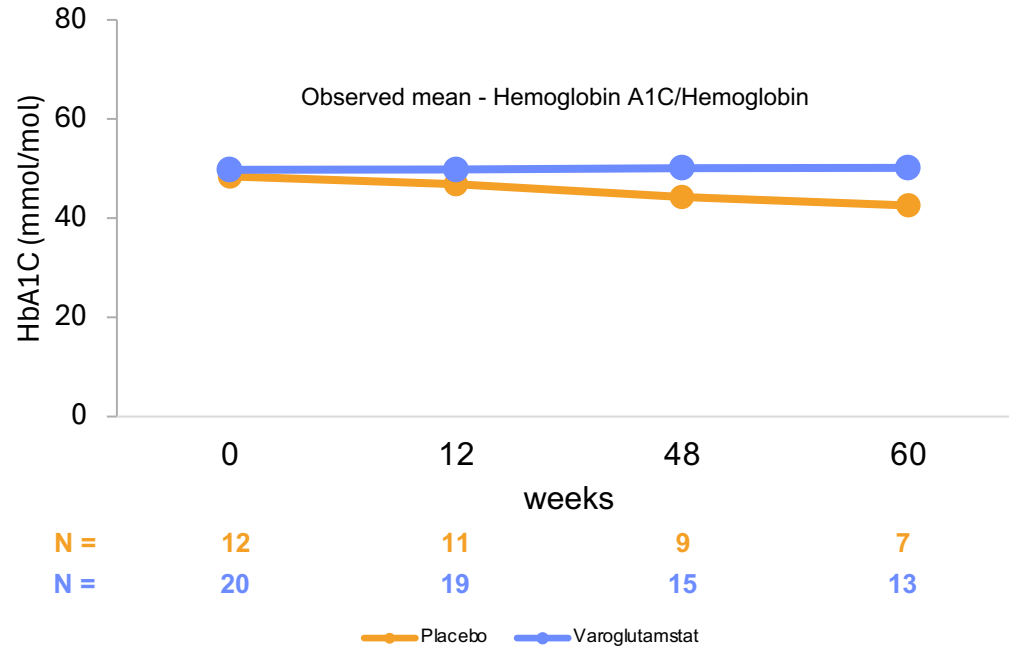
Change in liver **transaminases** from baseline (IU/L)



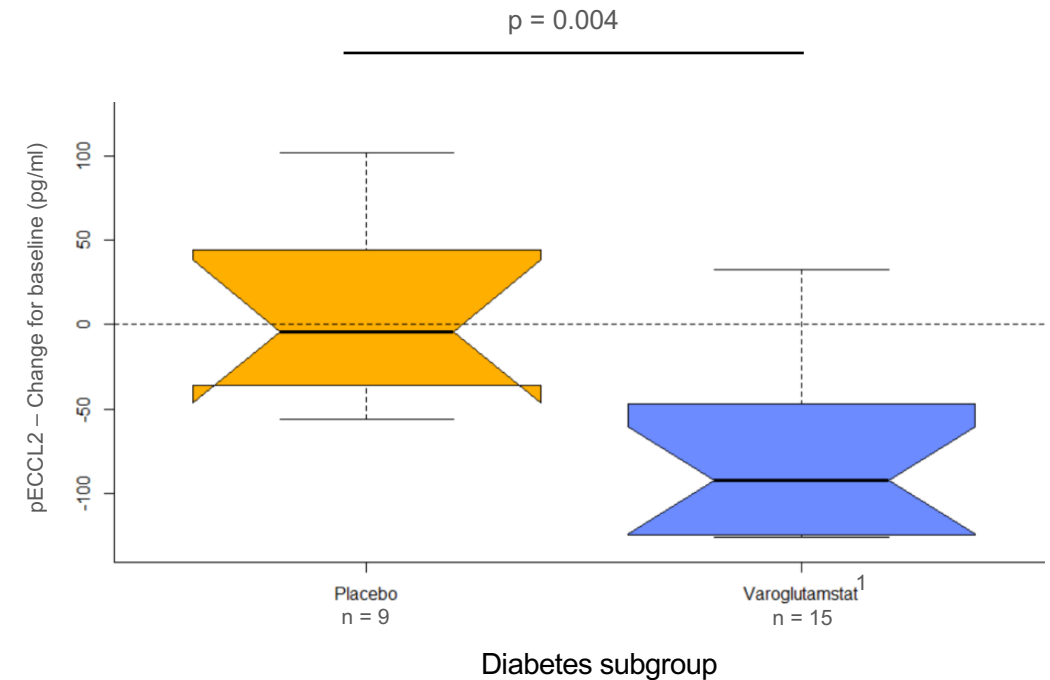
# Reduction of inflammation likely contributing to treatment effect

No change in glycemic control; change in pE-CCL2 provides insight into mechanism of action

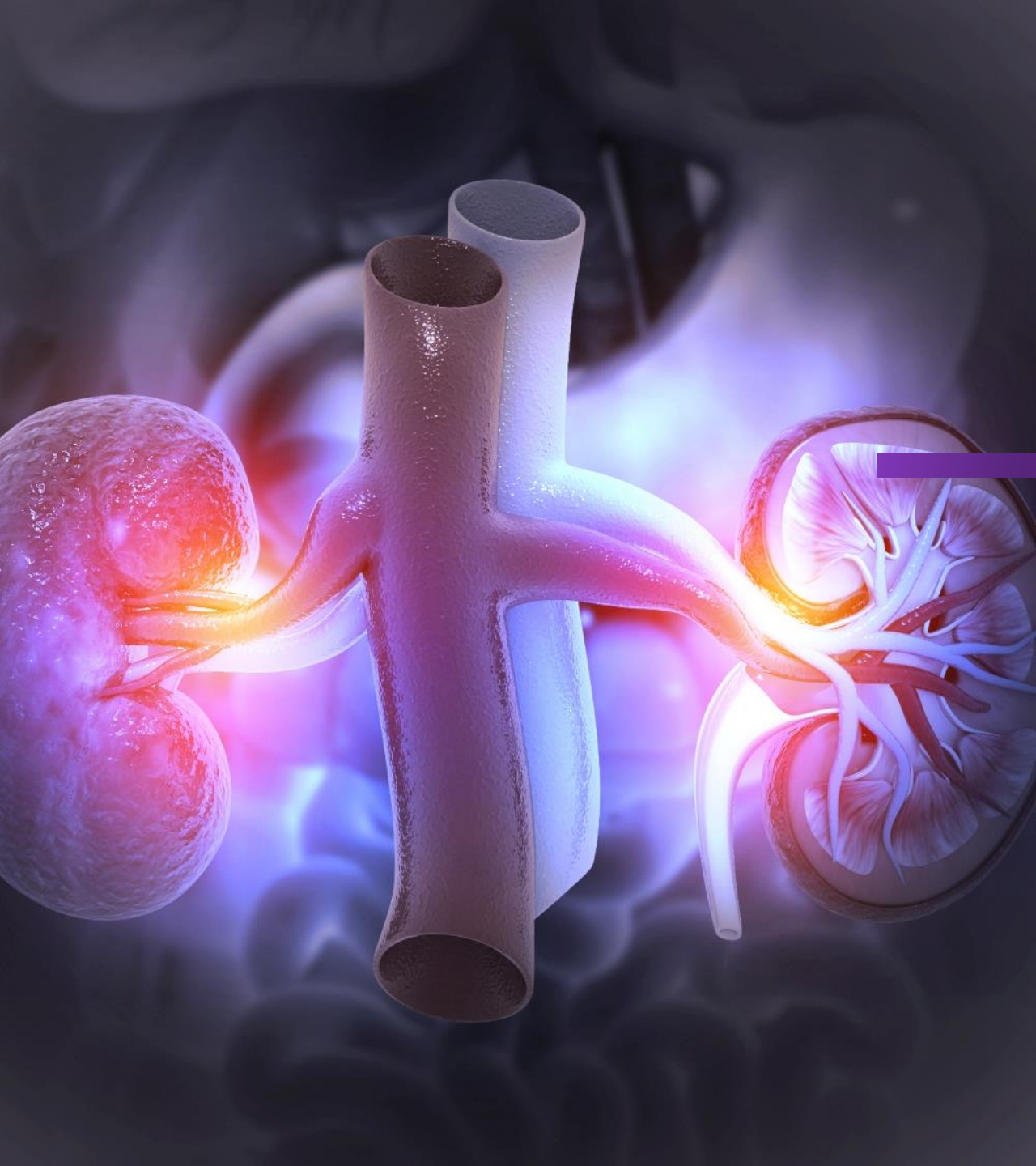
**Positive effect on kidney function appears independent of any change in glycemic control**



**Reduction in pE-CCL2 – a marker of inflammation – with varoglutamstat**







# VAROGLUTAMSTAT IN DKD

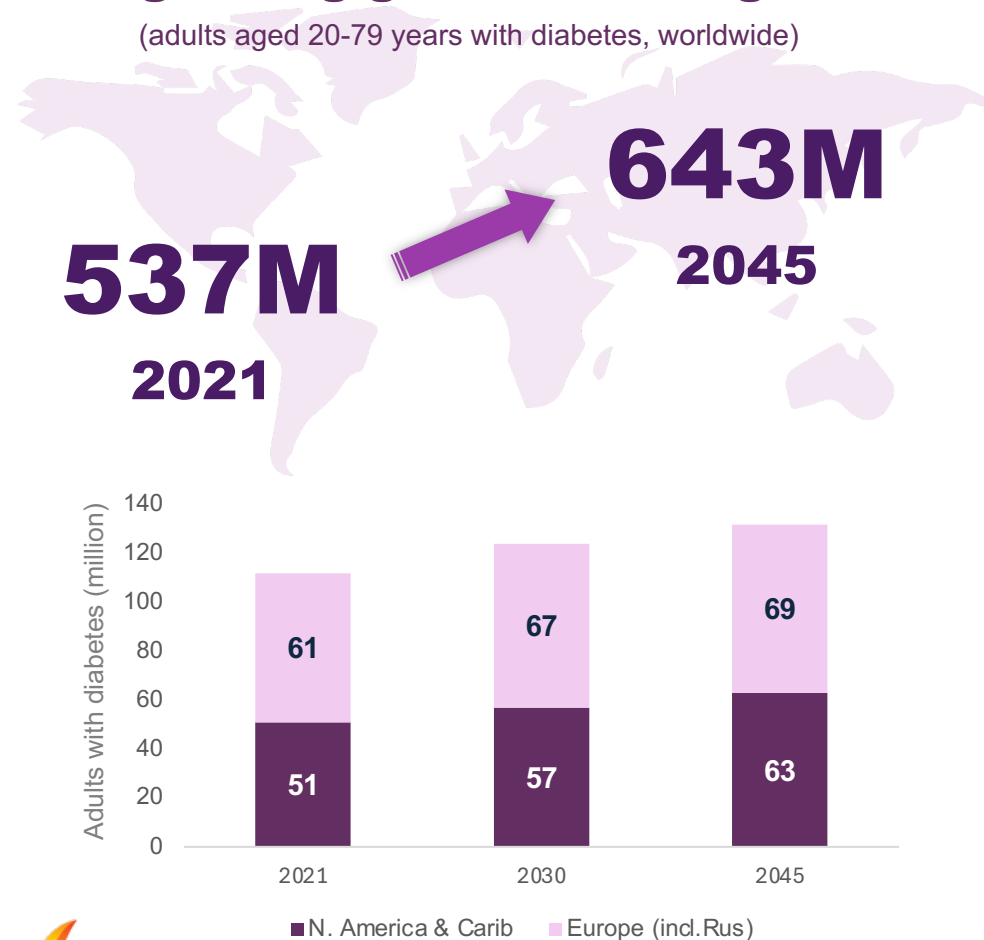
Proposed Development Plan

# Addressing unmet needs in diabetic kidney disease (DKD)

DKD is one of the leading causes of CKD and end stage renal disease (ESRD) globally

## Diabetes is a significant and growing global challenge

(adults aged 20-79 years with diabetes, worldwide)



**Diabetic kidney disease (DKD)** is defined by the presence of chronic kidney disease (CKD) in a person with diabetes<sup>1</sup>

**As with CKD, DKD is marked by a progressive decline in kidney function**

**~40%**  
of people  
with diabetes may develop  
diabetic kidney disease (DKD)

= approx.  
**45 million**  
(adults with DKD in North America (NA) & Caribbean, Greater Europe incl. Russia, based on 2021 figures)

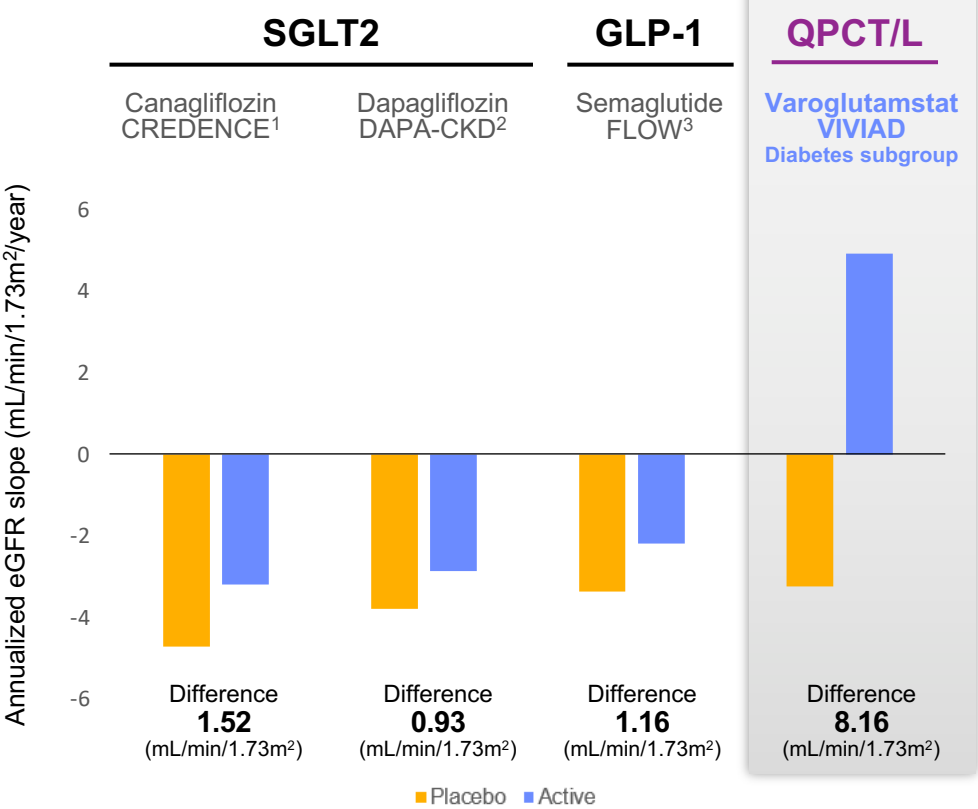
**1 in 10**  
people with diabetes  
may end up with end-stage  
kidney disease

= approx.  
**11 million**  
(diabetic adults with ESKD in USA & Caribbean, Greater Europe incl. Russia, based on 2021 figures)

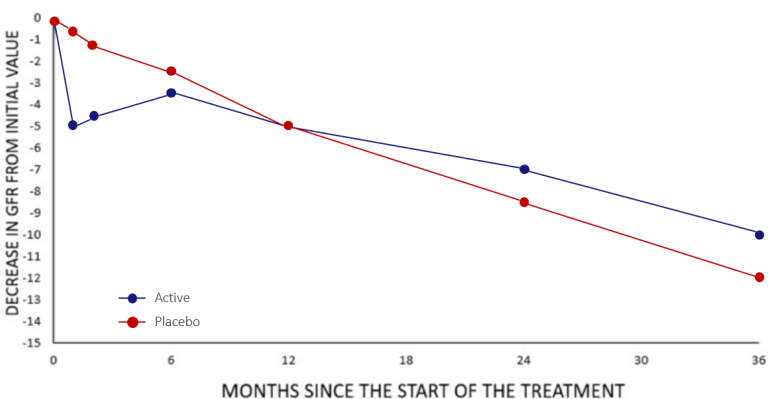


# Effect of varoglutamstat on kidney function has a unique profile

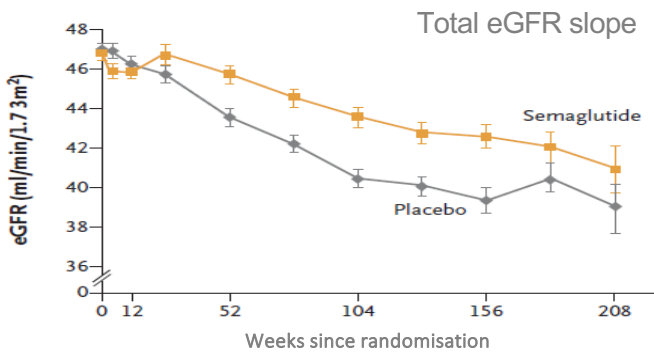
Varoglutamstat's effect on annualized eGFR slope is unique when compared to other drug classes used in DKD



SGLTi eGFR (compiled)<sup>4</sup>



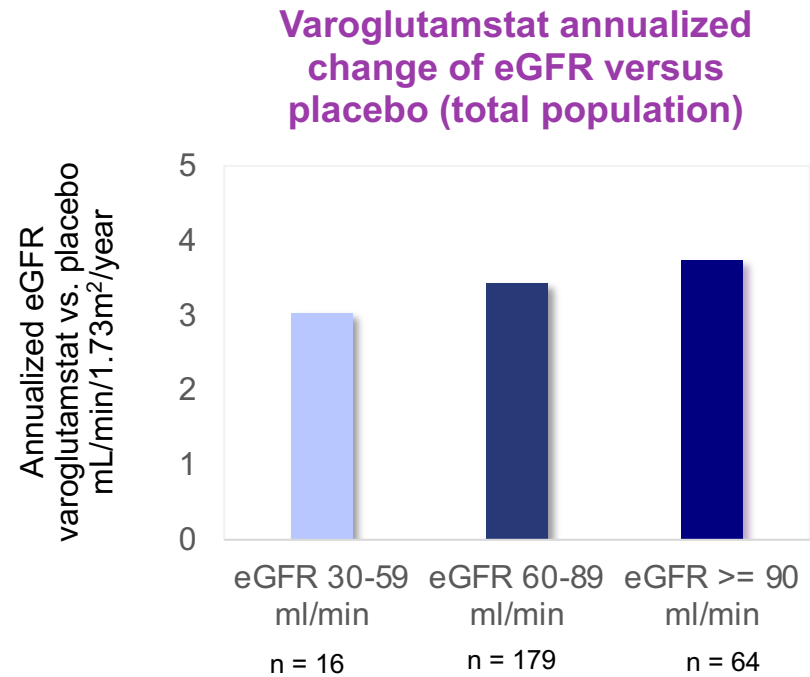
Semaglutide FLOW trial



# Outstanding data in VIVIAD diabetes subgroup informs next steps

Phase 2 study planned in more advanced patients to enable robust Phase 3 planning for DKD

VIVIAD results by baseline eGFR severity



			Persistent albuminuria categories Description and range		
			Normal to mildly increased	Moderately increased	Severely increased
			<30mg/g <3mg/mmol	30 - 300mg/g 3-30 mg/mmol	>300mg/g >30mg/mmol
			A1	A2	A3
GFR categories (ml/min/1.73m2) range and description	>90	Normal and high	Stage 1		
	60 - 89	Mild decrease related to normal age range	Stage 2		
	45 - 59	Mild - moderate reduction	Stage 3a		
	30 - 44	Moderate - severe reduction	Stage 3b		
	15 - 29	Severe reduction	Stage 4		
	< 15	Kidney failure	Stage 5		

New Phase 2 trial focused on higher risk group





# Next steps for varoglutamstat development: Phase 2

Proposed Phase 2 study<sup>1</sup> in people with DKD as initial target in kidney disease

## Draft design

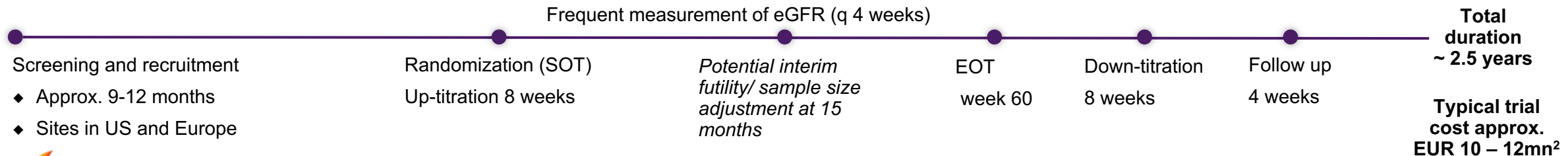
- ◆ Stage 3b/4 DKD patients with > 100mg/g albuminuria / proteinuria
- ◆ All patients on standard of care medicines (SoC)
- ◆ Randomized 1:1 varoglutamstat BID (dose 600mg BID) vs. placebo
- ◆ Treatment duration per patient 15 months

Up to 120 patients treated for 15 months to detect a difference of 5ml eGFR slope  
With 80% power  
(sensitivity for smallest treatment difference is 3.5ml)

### Key endpoints

- ◆ eGFR slope
- ◆ UA(p)CR (albuminuria)
- ◆ Biomarkers inflammation/fibrosis metabolism incl. NAFLD / NASH
- ◆ Safety

## Potential timelines



# Potential future opportunities include orphan diseases

Varoglutamstat potential in orphan diseases with major risk for end stage renal disease – e.g. Alport Syndrome / Fabry Disease

Need	<ul style="list-style-type: none"><li>◆ No specific treatment for progression to kidney failure available; current therapies slow down progression but risk of ESRD remains high</li></ul>
Opportunity	<ul style="list-style-type: none"><li>◆ Varoglutamstat has the potential to stabilize kidney function and reduce risk of and delay time to ESRD</li><li>◆ Alport ~ 150,000 patients in US and EU with moderate to high risk of kidney failure<sup>1</sup></li><li>◆ Fabry ~ incidence of 1 in 50K – 117K males (classic disease)<sup>2,3</sup>; high risk of significant renal complications</li></ul>
Potential path*	<ul style="list-style-type: none"><li>◆ Faster time to market than larger indications</li><li>◆ Phase 2 basket study with up to 60 patients followed by Phase 3 study of 180 pts to investigate eGFR and proteinuria</li></ul>



# Evidence supports QPCT/L inhibitors improving inflammation/fibrosis

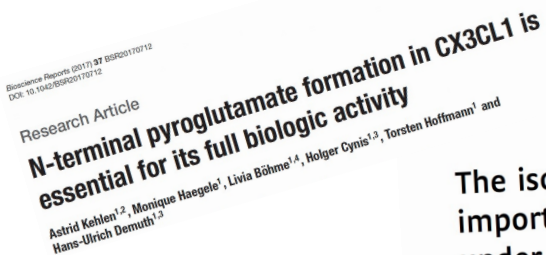
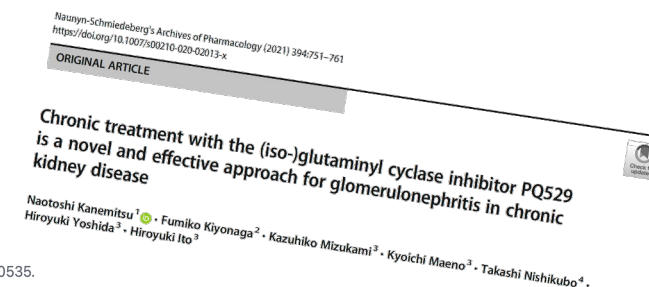
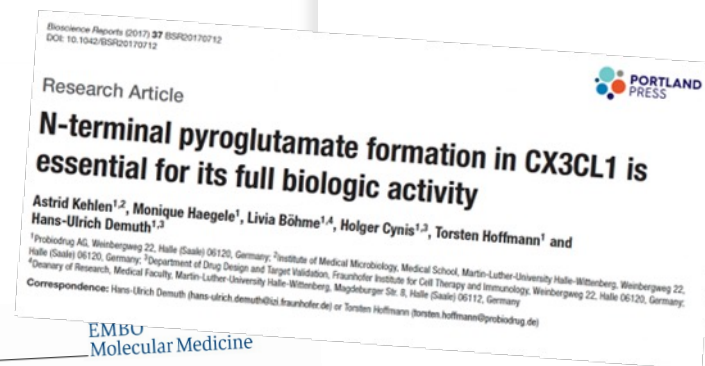
Over a decade of research showing clear effects in glomerulonephritis (kidney) and NAFLD (liver)

## Persistent low-grade inflammation is now considered a hallmark feature of chronic kidney disease (CKD)<sup>1</sup>

- ◆ Many inflammatory and fibrotic pathways require formation of N-terminal pyro-glutamates (pE) for full activity
- ◆ pE versions of chemokines like CCL-2 and CX3CL1 (fractalkine) are increased in CKD and may contribute to renal diseases<sup>2,3,4,5</sup>

## Novel research activities initiated:

- ◆ Diabetic kidney disease
- ◆ Orphan kidney disorders
- ◆ Further analysis of MoA and pathways



The isoenzyme of glutaminyl cyclase is an important regulator of monocyte infiltration under inflammatory conditions

> Biochem J. 2012 Mar 1;442(2):403-12. doi: 10.1042/BJ20110535.

Inhibition of glutaminyl cyclase attenuates cell migration modulated by monocyte chemoattractant proteins

Yi-Ling Chen<sup>1</sup>, Kai-Fa Huang, Wen-Chih Kuo, Yan-Chung Lo, Yu-May Lee, Andrew H-J Wang

<sup>1</sup> Yilmaz MI et.al., Clin Nephrology 2007; <sup>2</sup> Tesch GH, Am J Renal Physiol 2008; <sup>3</sup> Kehlen et.al, Biosci Rep, 2017; <sup>4</sup> Cynis et.al., EMBO 2011; <sup>5</sup> Cynis et.al, Intl Jour. of Exp. Pathology 2013.



# Experts support all aspects of kidney disease strategy

Collaborating with medical advisors and industry leaders to further shape our strategic shift towards inflammatory/fibrotic diseases including kidney disease



**Tobias B. Huber, MD**

Chair of the Center of Internal Medicine and Director of the III. Department of Medicine - University Medical Center Hamburg-Eppendorf (UKE), Germany

- ◆ Key areas of interest include: podocytopathies, the identification of complex principles of kidney diseases, immune-tissue interactions and inter-organ signaling
- ◆ Acting as Medical Advisor for Clinical Study Design
- ◆ Research collaboration with Vivoryon focusing on pre-clinical and mechanistic activities relating to varoglutamstat and the role of QPCT/L on kidney function



**Florian Jehle**

CEO of Vifor-FMC Renal Pharma

- ◆ Former Managing Director at FMC Ventures, CEO at Unicyte and Senior Vice President at Fresenius Medical Care; former Partner at Catenion, a strategy consulting firm working with global clients in the pharmaceutical, diagnostics and medical products industries
- ◆ Acting as Industry Expert Advisor to Vivoryon in the kidney field including strategic business and commercial advice
- ◆ Pharma industry network



**Kevin Carroll, PhD**

KJC Statistics, CEO

- ◆ Extensive experience in the design, conduct, analysis and reporting of clinical trials including a track record supporting FDA interactions and US approvals. He is an expert in kidney function trial data analysis<sup>1,2</sup>
- ◆ Acting as statistical analysis expert, providing and calculating statistical read-outs and advising on clinical trial statistical aspects





# Varoglutamstat has the potential to be the first oral treatment specifically aimed at improving kidney function on top of SoC

## **Compelling efficacy and safety data in people at risk of kidney disease**

- ✓ Statistically significant effect on kidney function in total VIVIAD population and diabetes subgroup, with robust safety data

## **Developed outline clinical plan targeting large unmet need in DKD**

- ✓ Plan for placebo-controlled Phase 2 study in stage 3b/4 DKD patients on top of SoC

## **Clear strategy for building evidence including additional kidney disorders**

- ✓ Established collaborations with industry experts and kidney specialists; further kidney function data from VIVA-MIND study in early AD<sup>2</sup> in H2 2024

## **Company activities aimed at securing all aspects to support future growth**

- ✓ Current composition of matter patent to 2031<sup>3</sup>; new patent filings have potential to extend protection to 2044+
- ✓ Actively pursuing funding and business development opportunities to fully execute Phase 2 DKD study





Q&A



## **VIVORYON THERAPEUTICS N.V.**

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