## Additional Pharmacological Effect

# IMU-856: Dose-Dependent Increase of GLP-1 in Patients

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This presentation contains "forward-looking statements" that involve substantial risks and uncertainties for purposes of the safe harbor within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. These include statements regarding management's intentions, plans, beliefs, expectations or forecasts for the future, and, therefore, you are cautioned not to place undue reliance on them. No forward-looking statement can be guaranteed, and actual results may differ materially from those projected. Immunic undertakes no obligation to publicly update any forward-looking statement, whether as a result of new information, future events or otherwise, except to the extent required by law. We use words such as "anticipates," "believes," "plans," "expects," "projects," "future," "intends," "may," "will," "should," "could," "estimates," "predicts," "potential," "continue," "guidance," and similar expressions to identify these forward-looking statements that are intended to be covered by the safe-harbor provisions of the Private Securities Litigation Reform Act of 1995.

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## IMU-856 Targets Physiological Intestinal Epithelial Regeneration and Restoration of Gut Cell Function



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 Innovative oral therapeutic approach potentially applicable to a <u>broad range</u> <u>of gastrointestinal disorders</u>



 Targets <u>physiological intestinal</u> <u>epithelial regeneration</u>, including gut hormon-producing cells

 Designed to <u>strengthen gut wall</u> <u>integrity and function without</u> <u>immunosuppression</u>



# Intestinal Production of GLP-1 Mediates Effects on Body Weight



## GLP-1: Glucagon-Like Peptide-1

- Peptide hormone generated through enzymatic breakdown of proglucagon
- Endocrine hormone, secreted by enteroendocrine
  L-cells located in the distal jejunum, ileum, and colon in response to nutrient ingestion and neuroendocrine stimulation
- Typical physiological increase in GLP-1 levels in healthy humans after a meal is 2-3 times
- GLP-1 increase leads to slow gut motility, lower food intake, increase satiety and induce insulin secretion



Left: Review Zheng, Z., Zong, Y., Ma, Y. et al. Sig Transduct Target Ther 9, 234 (2024); right: Jakubowska A, Roux CWL, Viljoen A. Endocrinol Metab (Seoul). 2024 Feb;39(1):12-22



# IMU-856: Effects on Body Weight in Preclinical Experiment and on Blood GLP-1 Levels in Celiac Disease Clinical Trial



6-Months In Vivo Study

- Regulated GLP study<sup>[1]</sup> to support clinical development
- Daily oral treatment of rats<sup>[2]</sup> for 6 months
- Dosing: 0 (vehicle), 10, 25, 75 mg/kg/day of IMU-856
- Weekly body weight measurement



### Phase 1b Clinical Trial of IMU-856

- Designed to explore effects of gluten challenge in a celiac disease patient population
- Total of 43 patients enrolled (IMU-856: N=29)
- Dosing: 80 and 160 mg QD of IMU-856, or placebo
- Double-blind treatment period of 28 days, 13 days without and 15 days with 6 g daily gluten challenge
- Patients measured post hoc for plasma GLP-1 concentrations



[1] according to ICH M3(R2) [2] Wistar Han rats / GLP-1: glucagon-like peptide-1; GLP: Good Laboratory Practice; QD: quaque die = once-daily; ICH: International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use



## In a 6-Months *In Vivo* Study, IMU-856 Dose-Dependently Reduced Weight Gain



Reduction of weight gain in % compared to vehicle control

10 mg/kg -18 % 25 mg/kg -23 % 75 mg/kg -40 %

- Dose-dependent effect on body weight gain
- Linked to reduced food consumption
- Effect in both males and females
- No effect on general health condition



Reduced body weight gain observed in 6-month toxicology study. Rats were 7-8 weeks old at study start and were expected to gain weight over the course of the study. Data show less weight gain in IMU-856 treated animals in connection with reduced food consumption.



# Confirmation of Effects as Part of Phase 1b Clinical Trial: IMU-856 Dose-Dependently Increased GLP-1 in Celiac Disease **Patients**



28-day phase 1b clinical trial of IMU-856 in celiac disease

- Patients measured for plasma GLP-1 concentrations: N=11 (placebo), N=13 (80 mg IMU-856), N=13 (160 mg IMU-856)
- Baseline: Day 1, N=37 over all arms
- Day 14: before start of challenge, N=36
- Day 29: after last treatment on Day 28, N=32
- Morning baseline levels under fasting conditions

- Dose-dependent increase of endogenous GLP-1 levels of up to 2.5 times versus placebo control
- Typical physiological increase in GLP-1 levels in healthy humans after a meal is also 2-3 times



#### GLP-1: glucagon-like peptide-1; BL: baseline

# IMU-856 Demonstrated Functional Improvement of Gut Epithelial Cells in Phase 1b Clinical Trial in Celiac Disease Patients



Improved Uptake of Actively Transported Essential Nutrient Vitamin B12





Protected Against Gluten-Induced Decrease in Villous Height



#### SD: standard deviation



# SIRT6 Target Is <u>Highly Expressed</u> in Gut Epithelial Cells



Highest mRNA Expressions in Paneth Cells, Enterocytes, Goblet Cells and Enteroendocrine Cells such as L-Cells



Apoptotic Commensal bacteria Mucus Enteroendocrine Goblet cell cell Enterocyte Stromal cell Paneth IESC cell Macrophage

Small intestine

Left: https://www.proteinatlas.org//Right: Peterson, L, Artis, D. Nat Rev Immunol 14, 141–153 (2014) SIRT: sirtuin; mRNA: messenger ribonucleic acid; nTPM: normalized transcript per million



## Main Secretory Epithelial Cells of the Bowel Epithelium All Have Been Shown to Express SIRT6 Target



Produce and release a protective <u>mucus layer</u>, with the main component of this mucus being a protein called mucin

Secret <u>gastrointestinal hormones</u>: such as gastric inhibitory peptide (GIP), glucagon-like peptides (GLP-1 and GLP-2), cholecystokinin (CCK), ghrelin, neurotensin, serotonin (5hydroxy-tryptamine or 5-HT), and peptide YY (PYY)

Secrete <u>antimicrobial</u> peptides and proteins, most notably defensins

Meyer AR, Brown ME, McGrath PS, Dempsey PJ. Cell Mol Gastroenterol Hepatol. 2022;13(3):843-856 / SIRT: sirtuin

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# IMU-856: A Novel Mechanism Offering Potential to Go Beyond Existing GLP-1, GLP-2, GIP Mimetics



**SIRT6 Targeting Approach** IMU-856

- Functional improvement of enteroendocrine and other epithelial cells through increasing physiologic cell regeneration in gut wall
- Secretion of the physiological GLP-1 protein and possible increase of secretion of multiple incretins (currently being investigated)
- Improvement of gut barrier and functionality in general
- Oral administration, small molecule



- Providing synthetic peptides that mimic the natural hormones secreted by enteroendocrine cells
- Targets one or two target incretins only (at this point)
- Injectable, peptide



# Obesity Market Expected to Reach More Than \$170 Billion Globally by 2031<sup>[1]</sup>



## Unmet Needs Still Exist to Address This Growing Medical Challenge

- Obesity and overweight are among the fastest growing and most prevalent chronic human conditions in the world affecting ~2.5 billion adults worldwide<sup>[2]</sup>
- The economic impact of obesity and overweight in the United States is estimated to be \$706 billion, increasing to \$2.6 trillion by 2060<sup>[3]</sup>
- GLP-1 receptor agonist class has revolutionized obesity treatment but there are still unmet needs for novel mode of actions, oral administration, increased tolerability and greater efficacy
- Current drugs in development are mainly peptidomimetics with challenges in oral administration

[1] GlobalData Pharma DECODED, Feb. 11th 2025 "Obesity: Seven-Market Drug Forecast and Market Analysis – Update" [2] https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight#~:text=ln%202022%2C%202.5%20billion%20adults%20aged%2018%20years%20and%20older,1990%20to%2020%25%20in%202022
 [3] https://data.worldobesity.org/economic-impact-new/countries/US.pdf



## IMU-856's GLP-1 Effect: Summary and Outlook





Dose-dependent reduction of body weight gain of up to -40 % observed in preclinical study



Dose-dependent increase of endogenous GLP-1 levels of up to 2.5 times versus placebo observed in celiac disease phase 1b clinical trial



Typical physiological increase in GLP-1 levels in healthy humans after a meal is also 2-3 times



IMU-856 may offer potential as an oral option for weight management; potential for immediate phase 1b or phase 2 clinical testing



IMU-856 offers benefits as an easy-to-use, once-daily, oral small molecule



## IMU-856/GLP-1

Q&A Session

## Thank You!



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