

SUPPLEMENTARY METHODS

Inclusion/exclusion criteria

Inclusion criteria

- (1) Male and female patients with type 2 diabetes mellitus aged 19 years or older.
- (2) Participants who underwent dual therapy (fixed-dose combination product allowed) for one of the following, along with diet and exercise therapy:
 - 1) Those taking metformin $\geq 1,000$ mg/day and dapagliflozin 10 mg/day at the same dose for at least 8 weeks before the screening visit (Visit 1).
 - 2) Those taking metformin $\geq 1,000$ mg/day and sodium-glucose cotransporter 2 (SGLT2) inhibitor except for dapagliflozin at the same dose for at least 8 weeks before the screening visit (Visit 1).
- (3) Participants with $7.0\% \leq$ glycosylated hemoglobin (HbA1c) level $\leq 10.5\%$ at the screening visit (Visit 1, Visit 1-1).
- (4) Participants with fasting plasma glucose level ≤ 270 mg/dL at the screening visit (Visit 1).
- (5) Participants with $18.5 \text{ kg/m}^2 \leq$ body mass index $\leq 40 \text{ kg/m}^2$ at the screening visit (Visit 1).
- (6) Those who voluntarily decided to participate in the study and signed a written informed consent form after listening to and fully understanding the detailed explanation of this clinical trial.

Exclusion criteria

- (1) Participants with type 1 diabetes mellitus, secondary diabetes, gestational diabetes, diabetic ketoacidosis, diabetic coma, diabetic pre-coma, lactic acidosis, and acute or chronic metabolic acidosis.
- (2) Participants with hypopituitarism or adrenal insufficiency, pulmonary infarction, severe pulmonary dysfunction, and other conditions prone to accompany hypoxemia.
- (3) Participants with severe infectious disease or severe traumatic systemic disorder.
- (4) Those with end-stage renal disease or undergoing dialysis.
- (5) Participants with genetic diseases of galactose intolerance, Lapp lactase deficiency, and glucose-galactose malabsorption.
- (6) Participants with liver cirrhosis, chronic active hepatitis B or C, cholecystitis, acromegaly, asthma, or major skin allergies.
- (7) Participants with thyroid dysfunction requiring drug therapy with thyroid stimulating hormone levels outside the normal range at the screening visit (Visit 1). However, those treated with stable thyroid hormone replacement therapy for at least eight weeks before the screening visit (Visit 1) were allowed to enroll.
- (8) Participants with gastrointestinal disorders such as dehydration, diarrhea, and vomiting at the screening visit (Visit 1).
- (9) Participants with a history of resection of more than half of the stomach or small intestine, heart failure of New York Heart Association (NYHA) class III or greater, acute and unstable heart failure, and congestive heart failure.
- (10) Participants with a history of hypersensitivity to the components of clinical investigational products, dipeptidyl peptidase 4 (DPP4) inhibitors, SGLT2 inhibitors, metformin, or glimepiride.
- (11) Participants with a history of bariatric-metabolic surgery within 1 year prior to the screening visit (Visit 1).
- (12) Participants with a history of uncontrolled arrhythmia, unstable angina, myocardial infarction, stroke, transient ischemic attack, coronary artery bypass grafting, coronary intervention, or cerebrovascular disease within 3 months prior to the screening visit (Visit 1).
- (13) Participants with a weight change of more than 10% within 3 months prior to the screening visit (Visit 1).
- (14) Participants who underwent surgery (minor surgery with no restriction on food and fluid intake) within 4 weeks prior to the screening visit (Visit 1) or scheduled to undergo surgery (minor surgery with no restriction on food and fluid intake) during the clinical trial period.
- (15) Participants with one or more of the following findings in the clinical laboratory tests conducted at the time of the screening visit (Visit 1):
 - 1) Positive for anti-human immunodeficiency virus (HIV) antigen test.

- 2) Aspartate transaminase (AST) or alanine transferase (ALT) level >upper normal limit (UNL)×3.
- 3) Fasting triglyceride level was 500 mg/dL or more.
- 4) Estimated glomerular filtration rate (Modification of Diet in Renal Disease [MDRD] formula) was less than 45 mL/min/1.73 m².
- 5) Participants with a creatine phosphokinase of 2.5 times greater than the ULN and accompanying symptoms such as dyspnea and chest pain.
- (16) Participants who had taken insulin (allowed to be enrolled if insulin was administered temporarily [14 days or less] owing to surgery or for examination), glucagon-like peptide 1 (GLP-1) receptor agonists, thiazolidinediones, or DPP4 inhibitors within 12 weeks prior to the screening visit (Visit 1).
- (17) Participants who had taken sulfonyleureas, meglitinides, or α-glucosidase inhibitors within 8 weeks prior to the screening visit (Visit 1).
- (18) Participants who had taken drugs for weight loss within 12 weeks prior to the screening visit (Visit 1).
- (19) Participants who had been administered systemic corticosteroids chronically (>14 days) within 8 weeks prior to the screening visit (Visit 1).
- (20) Participants who had undergone the radiological test with intravenous injection of iodinated contrast medium (e.g., intravenous urography, intravenous cholangiography, angiography, and computed tomography using a contrast medium).
- (21) Participants taking oral contraceptives (allowed if taking the same dose for at least 8 weeks before the screening visit to treat menopausal symptoms), warfarin, digoxin, strong CYP3A4 inhibitors, strong CYP3A4 inducers, organic cation transporter (OCT) inhibitors, or OCT inducers at the screening visit (Visit 1).
- (22) Participants who had taken other investigational products within 4 weeks prior to the screening visit (Visit 1).
- (23) Participants with a history of malignancy within 5 years prior to the screening visit (Visit 1).
- (24) Participants with a history of drug or alcohol abuse, or other substance abuse within 6 months prior to the screening visit (Visit 1).
- (25) Pregnant or lactating women and women of childbearing age who cannot consent to contraception by methods other than oral contraceptives*
*Methods other than oral contraceptives include physical barrier methods, including condoms, contraceptive diaphragms, or cervical caps.
- (26) Participants with physical (such as severe disorders in the liver, heart, kidney, lung, hematological, endocrine, musculoskeletal, and gastrointestinal system) or mental (cognitive disorders, mental illness) conditions that may interfere with the ability to participate in the study.
- (27) Others, such as participants evaluated as ineligible at the discretion of investigators, such as those with severe complications of diabetes.

Secondary endpoints

Main study: Change from baseline after 24 weeks or ratio at 24 weeks

Extension study: Change from baseline after 52 weeks or ratio at 52 weeks

- (1) HbA1c level (%) at 52 weeks
- (2) Fasting plasma glucose level (mg/dL)
- (3) HbA1c response rate (less than 7.0%, less than 6.5%)
- (4) 7-point self-monitoring blood glucose parameters: mean daily glucose level (mg/dL), postprandial glucose level (mg/dL) at 2 hours after breakfast/lunch/dinner, glycemic excursion (mg/dL)
- (5) Fasting insulin, fasting proinsulin, glucagon, C-peptide, and adiponectin levels and proinsulin-to-insulin ratio
- (6) Homeostatic model assessment of β-cell function (HOMA-β), homeostatic model assessment of insulin resistance (HOMA-IR), and quantitative insulin sensitivity check index (QUICKI)
- (7) Rescue therapy rate

- (8) Fasting lipid parameters (total cholesterol, low-density lipoprotein, high-density lipoprotein, triglyceride, and free fatty acids)
- (9) AST, ALT, and γ -glutamyltransferase
- (10) Ketone body (total ketone, acetoacetate, and β -hydroxybutyric acid)
- (11) Urine albumin creatinine ratio (UACR) and N-acetyl- β -D-glucosaminidase (NAG)
- (12) High-sensitivity C-reactive protein
- (13) Body weight
- (14) General food craving questionnaire-trait (G-FCQ-T) score