Quantification of GIP inhibitory activity using *iLite*® GIP Assay Ready Cells

For research and professional use only. Not for use in diagnostic procedures.

This application note contains a suggested protocol and performance data.
Each individual laboratory must set up their own method and perform relevant validations.

Background

Glucose-dependent insulinotropic polypeptide (GIP) is an incretin hormone belonging to the secretin/vasoactive intestinal polypeptide family of gastrointestinal regulatory peptides (1,2). GIP and another incretin hormone, glucagon-like peptide-1 (GLP-1), are the primary physiological peptides responsible for regulating postprandial metabolism in humans, accounting for approximately 60-80% of the insulin secretion after a meal (1,3). GIP initiates metabolic events through the amplification of glucose-dependent insulin secretion following ingestion of lipids, carbohydrates, or amino acids. Postprandial nutrient disposition is primarily mediated by insulin and glucagon, including the storage of excess nutrients in adipose tissue (1-4).

GIP is a 42-amino acid polypeptide produced by enteroendocrine K cells of the proximal small intestine (1). It binds to its specific receptor, the glucose-dependent insulinotropic polypeptide receptor (GIPR), expressed in the pancreas, stomach, small intestine, adipose tissue, the heart, distinct neuronal populations, bone, specific immune cell populations, and endothelial cells (2,4). Current incretin-based therapies comprise GLP-1 receptor agonists (e.g., semaglutide) and newer dual GIP/GLP-1 receptor co-agonists (e.g., tirzepatide), which leverage complementary hormonal pathways to treat hyperglycaemia in people with type 2 diabetes and promote body weight reduction. (5,6). Dual agonists represent an evolution of GLP-1 therapies, combining GIP and GLP-1 receptor activation to achieve greater metabolic efficacy and form the basis of emerging next-generation anti-obesity pharmacotherapies (5,7).

The *iLite*® GIP Assay Ready Cells can be used for measurements of GIP inhibitor activity / GIP receptor inhibitor activity.

Principle of the assay

The *iLite*® GIP Assay Ready Cells are engineered cells, optimized to be responsive to GIP receptor agonists, resulting in a proportional expression of Firefly Luciferase (FL). Binding of GIP to its receptor results in activation of the CRE regulated Firefly luciferase reporter gene construct. *iLite*® GIP Assay Ready Cells also contain the Renilla Luciferase (RL) reporter gene, under the control of a constitutive promoter. The constitutive expression of RL allows normalization of GIP induced FL activity, and renders assay results independent of variations in cell number or serum matrix effects. The Firefly luciferase signal can be measured in a luminometer following addition and incubation of luciferase substrate. The Firefly luciferase signal is proportional to the functional activity of GIP receptor agonist in the sample. In the presence of GIP receptor inhibitor or a substance able to neutralize activity of GIP receptor agonist, the signaling through GIP receptor is reduced, resulting in a decreased stimulation of Firefly luciferase production.

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Thus, the Firefly luciferase signal is inversely proportional to the amount of inhibitory activity against either GIP receptor or GIP receptor agonist in a sample. The *iLite*® GIP Assay Ready Cells can therefore be utilized as an assay for quantification of GIP inhibitor activity / GIP receptor inhibitor activity in test samples, including human serum. In the following outline, anti-Tirzepatide antibody is used as example of GIP inhibitory activity – GIPR inhibitors can be used as well, and application note for quantification of anti-GIPR antibody can be requested from Svar Life Science.

Material and equipment needed

Material and equipment	Suggested supplier	Reference
iLite® GIP Assay Ready Cells	Svar Life Science	BM4110
Diluent (DMEM containing 9% heat inactivated FBS + 1% Penicillin-Streptomycin).	Gibco	31966-021 (DMEM) 26140-079 (FBS) 15140-122 (Penicillin-Streptomycin)
Rabbit anti-Tirzepatide polyclonal antibody	AntibodySystem	PHK13902
Tirzepatide	Eli Lilly	NA
Firefly/Renilla luciferase substrate	Promega	E2920, Dual-Glo Luciferase Assay System
Plate; White walled micro well plate suitable for luminescence	Revvity	6055680
Microplate Luminometer with appropriate reading software – no filter on luminometer	Contact Svar Life Science for list of recommended suppliers	NA
Incubator, 37 °C with 5% CO_2	NA	NA
Water bath, 37 °C	NA	NA
Single-channel and multi-channel pipettes with polypropylene disposable tips	NA	NA
Polypropylene tubes or plate for dilution	NA	NA
Single-use polypropylene reservoir	NA	NA
Plate shaker	NA	NA
Timer	NA	NA

Precautions

- This application note is intended for professional laboratory research use only. The data and results originating from following the Application Note should not be used either in diagnostic procedures or in human therapeutic applications.
- Use and handle the material and instruments referenced according to the supplier's/manufacturer's instructions or product specifications accompanying the individual material and instruments.
- Dispose of all sample specimens, infected or potentially infected material in accordance with good microbiological practice. All such materials should be handled and disposed as though potentially infectious.
- Residues of chemicals and preparations are generally considered as biohazardous waste and should be inactivated prior to disposal by autoclaving or using bleach. All such materials should be disposed of in accordance with established safety procedures.

Propriety Information

In accepting delivery of *iLite*® Assay Ready Cells the recipient agrees not to sub-culture these cells, attempt to sub-culture them or to give them to a third-party recipient, and only to use them directly in assays. *iLite*® cell-based products are covered by patents which are the property of Svar Life Science AB and any attempt to reproduce the delivered *iLite*® Assay Ready Cells is an infringement of these patents

Protocol

Preparation of GIP inhibitor

Rabbit anti-Tirzepatide polyclonal antibodies from AntibodySystem have been used to neutralize Tirzepatide and inhibit the GIPR induced Firefly luciferase expression in *iLite*® GIP Assay Ready Cells (refer to the table and graph below).

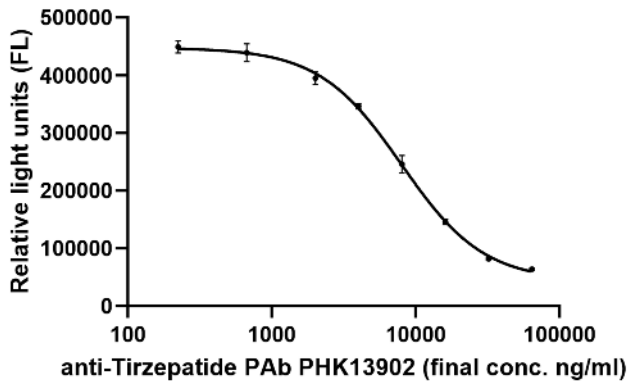

Figure 1. Example of anti-Tirzepatide PAb dose-response-curve

Final 20 pM Tirzepatide	Anti-Tirzepatide PAb Suggested calibrator solution concentrations, µg/mL
A	258
B	129
C	64
D	32
E	16
F	8.0
G	2.7
H	0.90

Table 1. Suggested calibrator solution concentrations for anti-Tirzepatide PAb cat# PHK13902

Assay preparation and incubation

1. Design a plate layout. It is recommended to perform the test at minimum in duplicates.
2. Perform a serial dilution of the reference GIP inhibitor. Ensure matrix consistency between reference antibody solutions, control solutions, and sample solutions.
3. Add 20 µL of the reference GIP inhibitor dilutions, controls and samples to assigned wells (final concentration will be a quarter of the solution concentration).
4. Add 20 µL of GIP (here Tirzepatide) to all wells (with solution concentration at 80 pM, final concentration will be 20 pM Tirzepatide).
5. Place the lid on the plate, mix and incubate the plate for 30 minutes at 37 °C with 5% CO_2
6. Thaw the vial of *iLite*® GIP Assay Ready Cells in a 37°C water bath with gentle agitation. The cell suspension is mixed very carefully ten times with pipette to ensure a homogeneous distribution of cells.
7. Dilute 250 µL cell suspension with 5.75 mL Diluent.
8. Add 40 µL diluted cells to each well.
9. Place the lid on the plate, mix and incubate for 5 hours at 37 °C with 5% CO_2.

Adding substrate solutions

10. Equilibrate the plate and the substrate solution to room temperature.
11. Prepare the **Firefly luciferase** substrate according to the supplier's instructions and add 80 µL per well. Mix and protect the plate from light. After 10 minutes incubation at room temperature read in a luminometer.
12. If appropriate, prepare the **Renilla luciferase** substrate according to the supplier's instructions and add 80 µL per well. Mix and protect the plate from light. After 10 minutes incubation at room temperature read in a luminometer.

QUICK GUIDE

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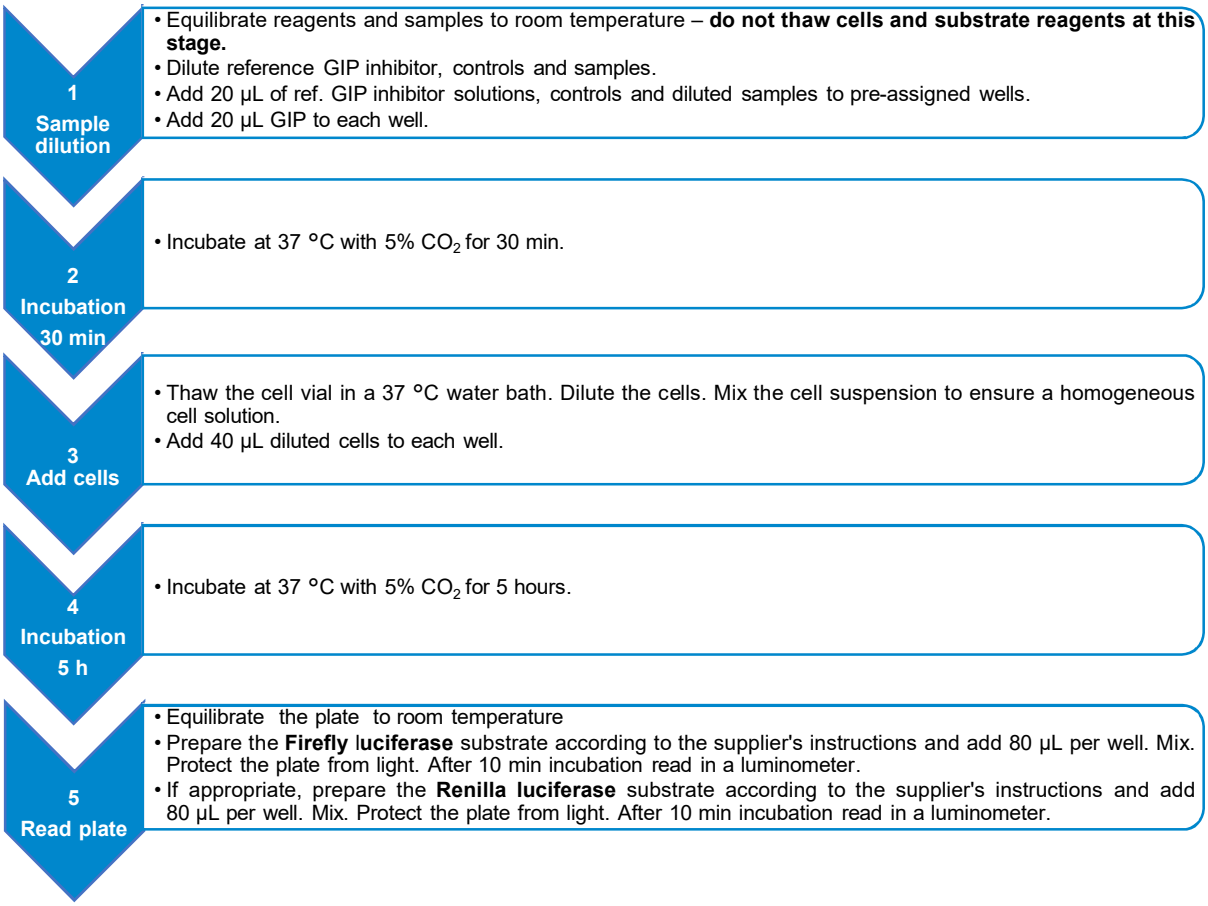

Troubleshooting and FAQ

Please consult the Svar Life Science website www.svarlifescience.com

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