

## **A list of imaging data online available**

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\*note from the authors: representative underlying imaging data can be viewed at the following URL before open to the public; <https://figshare.com/s/9cbc8f644a353e918a92>

**Underlying imaging data for Figure 1F:** Fusion events observed with TIRFM in primary beta-cells and mixing 20% of THOE beta-cells , treatment of 10  $\mu$ M AMPT, or control. Glucose was added at 5 min.

**Underlying imaging data for Figure 2A:** Fsk-induced intracellular cAMP dynamics in mouse primary beta-cells, in the presence of DA (or DMSO as control) under PTX treatment. Glucose concentration was 16.7 mM. Fsk and DA (or DMSO) were added at 2 min and 5 min respectively.

**Underlying imaging data for Figure 2B:** Intracellular  $Ca^{2+}$  dynamics detected with Fluo-4, in the presence of DA in mouse primary beta-cells. Glucose concentration was 16.7 mM. 10  $\mu$ M DA (or DMSO) was added at 5 min.

**Underlying imaging data for Figure 3A:** Intracellular  $Ca^{2+}$  dynamics in the presence of DA were reversed by D1 antagonist SCH23390. Glucose concentration was 16.7 mM. 10  $\mu$ M DA was added at 1 min and 10  $\mu$ M SCH23390 (or DMSO) was added at 5 min.

**Underlying imaging data for Figure 3C:** Fusion events observed with TIRFM in mouse primary beta-cells in the presence of D1 antagonist 10  $\mu$ M SKF83566 or DMSO. Glucose was added at 5 min.

**Underlying imaging data for Figure 4C, D, E:** Intracellular Ca<sup>2+</sup> dynamics in response to glucose and DA in D1OE or D2OE beta-cells. Glucose was added at 5 min and 10 μM DA was added at 10 min.

**Underlying imaging data for Figure 4F:** Fusion events in response to glucose and DA in D1OE or D2OE beta-cells. Glucose was added at 5 min and 10 μM DA was added at 10 min.

**Underlying imaging data for Figure 5A:** Intracellular Ca<sup>2+</sup> dynamics in primary mouse islet cells in the presence of SKF83959 10μM. Glucose concentration was 16.7 mM. SKF83959 was added at 5 min.

**Underlying imaging data for Figure 5C:** Intracellular Ca<sup>2+</sup> dynamics in the presence of SKF83959 10nM in D1D2OE beta-cells. Glucose concentration was 16.7 mM. SKF83959 was added at 5 min.

**Underlying imaging data for Figure 5E:** Fusion events observed with TIRFM in mouse primary beta-cells in the presence of SKF83959 10μM or DMSO. Glucose was added at 5 min. SKF83959 (or DMSO) was added at 10 min.

**Underlying imaging data for Fig 6 H:** Intracellular Ca<sup>2+</sup> dynamics in the presence of SKF83959 in D1OE, D2OE or D1D2OE beta-cells. Glucose concentration was 16.7 mM. 100 nM SKF83959 was added at 5 min.

**Underlying imaging data for Figure S1:** Fusion events observed with TIRFM in mouse primary pancreatic beta-cells after overnight TBZ or DMSO treatment. Glucose was added at 5 min.

**Underlying imaging data for Figure S2A:** Fusion events observed with TIRFM in mouse primary beta-cells in response to DA or DMSO. Glucose was added at 5 min. 10  $\mu$ M DA (or DMSO) was added at 10 min.

**Underlying imaging data for Fig S2 C:** Fusion events observed with TIRFM in mouse primary beta-cells in the presence of DA or DMSO. 10  $\mu$ M DA (or DMSO) was added prior to observation. Glucose was added at 5 min.

**Underlying imaging data for Fig S3 B:** Fsk-induced intracellular cAMP dynamics in D1OE or D2OE beta-cells. Glucose concentration was 16.7 mM. Fsk was added at 2 min.

**Underlying imaging data for Fig S3 C:** Intracellular  $\text{Ca}^{2+}$  dynamics in response to tolbutamide in D2OE beta-cells cultured in 5.5 mM or 25 mM glucose contained DMEM. Glucose concentration was 2.5 mM. 100  $\mu$ M tolbutamide was added at 3 min.

**Underlying imaging data for Fig S4 A:** Intracellular  $\text{Ca}^{2+}$  dynamics in response to SKF83959 in the presence of 1  $\mu$ M SCH23390 or haloperidol (or DMSO) in D1D2OE beta-cells. Glucose concentration was 16.7 mM. 10  $\mu$ M SKF83959 was added at 5 min.

**Underlying imaging data for Fig S4 B:** Intracellular  $\text{Ca}^{2+}$  dynamics in response to SKF83959 in the presence of DA (or DMSO) in WT or D1D2OE beta-cells. Glucose concentration was 16.7 mM. 10 nM or 10  $\mu$ M DA (or DMSO) were added at 2 min. 10  $\mu$ M SKF83959 was added at 5 min. In D1D2OE beta-cells under PTX treatment, 10 nM or 10  $\mu$ M DA (or DMSO) were added at 5 min.

**Underlying imaging data for Fig S5 C:** Intracellular  $\text{Ca}^{2+}$  dynamics in response to SCH23390 in Drd1 WT/WT or Drd1 Tm1a/WT beta-cells. Glucose concentration was