the activating and/or inhibiting of one or more signaling pathways within a precursor cell. Also disclosed are methods for using the disclosed gastric cells, gastric tissues, and or gastric organoids derived from precursor cells.

[0006a] In one embodiment, there is provided a method of inducing formation of a gastric tissue, comprising the steps of:

a) activating one or more signaling pathways within a precursor cell, wherein said one or more signaling pathways are selected from a WNT signaling pathway, a WNT/FGF signaling pathway, a FGF signaling pathway, or a combination thereof;

b) inhibiting a BMP signaling pathway within said precursor cell; and

c) administering retinoic acid to said precursor cell.

[0006b] In one embodiment, there is provided a composition comprising gastric tissue produced in vitro from one or more precursor cells.

[0006c] In one embodiment, there is provided a method of generating a gastric organoid comprising fundus tissue comprising the steps of

a) generating a definitive endoderm (DE) from a pluripotent stem cell;

b) contacting said definitive endoderm with an agent that activates the FGF pathway, an agent that activates the WNT pathway, an agent that inhibits the BMP pathway, and retinoic acid to generate a posterior foregut; and

c) contacting said posterior foregut with EGF, retinoic acid, an agent that activates the WNT pathway, and an agent that inhibits the BMP pathway to generate a fundus tissue.

[0006d] In one embodiment, there is provided a method of generating a gastric organoid comprising antrum tissue comprising the steps of

a) generating a definitive endoderm (DE) from a pluripotent stem cell;

b) contacting said definitive endoderm with an agent that activates the FGF pathway, an agent that activates the WNT pathway, an agent that inhibits the BMP pathway, and retinoic acid to generate a posterior foregut; and

c) contacting said posterior foregut with EGF, retinoic acid, and an agent that inhibits the BMP pathway to generate an antrum tissue.

[0006e] In one embodiment, there is provided a kit comprising a gastric tissue produced in vitro from one or more precursor cells.

[0006f] In one embodiment, there is provided a method for identifying the absorption effect of gastric cells or tissues, comprising the steps of:

a) contacting gastric cells or tissues with a compound, wherein said gastric cells or tissues are produced *in vitro* from one or more precursor cells; and

b) detecting a level of absorption of said compound by said gastric cells or tissues.

Brief Description of the Drawings

[0007] Those of skill in the art will understand that the drawings, described below, are for illustrative purposes only. The drawings are not intended to limit the scope of the present teachings in any way.

[0008] The patent or application file contains at least one drawing executed in color. Copies of this patent or patent application

[0009] publication with color drawing(s) will be provided by the Office upon request and payment of the necessary fee.

[0010] **FIG 1** depicts expression of Sox2/Cdx2/B-catenin in gastric spheroids and the effect of RA.

[0011] **FIG 2A-2E** depicts schematic representation of the *in vitro* culture system used to direct the differentiation of hPSCs into three-dimensional gastric organoids (FIG 2A), the defining markers of developing posterior foregut organs by wholemount immunofluorescent staining of mouse E10.5 embryos with Sox2, Pdx1 and Cdx2 (FIG 2B), PDX1 expression in the presence and absence of RA (FIG 2C), stereomicrographs showing morphological changes during growth of posterior foregut spheroids into hGOs (FIG 2D), and a comparison of developing mouse antrum at E14.5 and E18.5 and comparable stages of hGO development (FIG 2E).

[0012] **FIG 3A-3D** depictsMuc5AC, TFF2, GSII UEAI, and CHGA expression in P12 Antrum, E18.5 Antrum and d34 Organoid (FIG