

Claims

1. A kit for diagnosing thyroid disease, comprising a cell expressing a thyroid stimulating hormone receptor (TSHR), a cAMP dependent calcium channel and a calcium sensitive protein, wherein the calcium sensitive protein is a protein that emits luminescence in response to calcium.
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2. The kit according to claim 1, further comprising an anti-TSH antibody.
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3. The kit according to claim 1 or 2, further comprising ViviRen (R) as a luminescent substrate for the calcium sensitive protein.
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4. The kit according to any one of claims 1-3, further comprising TSH or a stimulating TSAb monoclonal antibody.
- 20 5. The kit according to claim 4, further comprising forskolin.
6. The kit according to any one of claims 1-5, wherein the TSHR is TSHR having the amino acid sequence represented by SEQ ID NO:1, the cAMP dependent calcium channel is a modified CNG calcium channel having the amino acid sequence represented by SEQ ID NO:2 and the calcium sensitive protein is modified apoaeguorin having the amino acid sequence represented by SEQ ID NO:3.
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7. The kit according to any one of claims 1-6, wherein the cell is selected from the group consisting of a CHO cell, a HEK293 cell and a 3T3 cell.
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8. A kit according to any one of claims 1-7 for use in diagnosing thyroid disease.

5 9. The kit of claim 8, wherein the amount of a thyroid stimulating antibody and/or the amount of a thyroid stimulation blocking antibody in a biological sample, is determined.

10 10. The kit according to claim 8 or 9, for diagnosing Graves' disease and/or Hashimoto's disease.

11. A method for diagnosing thyroid disease, for determining a human having a high risk of developing
15 thyroid disease, or for determining the effectiveness of treatment of thyroid disease, comprising the following steps (1), (2), and (3) or (1'), (2), and (3):

(1) preparing a mixture containing the cell comprised in the kit according to any one of claims 1-7, a
20 luminescent substrate for the calcium sensitive protein, a Ca^{2+} -free medium or a $\text{Ca}^{2+}/\text{Mg}^{2+}$ -free medium, TSH and a sample derived from the blood of a test subject; or

(1') preparing a mixture containing the cell comprised
25 in the kit according to any one of claims 1-7, a luminescent substrate for the calcium sensitive protein, a Ca^{2+} -free medium or a $\text{Ca}^{2+}/\text{Mg}^{2+}$ -free medium and a sample derived from the blood of a test subject;

(2) adding a Ca^{2+} -containing solution to the mixture
30 prepared in (1) or (1'); and

(3) measuring the luminescence of the calcium sensitive protein emitted from the cell.

12. The method according to claim 11, wherein the mixture prepared in (1') further contains an anti-TSH antibody.

5 13. A method for diagnosing hypothyroidism, comprising the following steps (1) to (3):

- (1) preparing a mixture containing the cell comprised in the kit according to any one of claims 1-7, a luminescent substrate for the calcium sensitive
10 protein, a Ca^{2+} -containing medium, TSH or a stimulating TSAb monoclonal antibody and a sample derived from the blood of a test subject;
- (2) adding forskolin to the mixture prepared in (1); and
- 15 (3) quantifying the luminescence of the calcium sensitive protein emitted from the cell.

14. The method according to any one of claims 11-13, wherein the cell is not cultured in a sterile environment.
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15. The method according to any one of claims 11-14, wherein the TSHR is TSHR having the amino acid sequence represented by SEQ ID NO:1, the cAMP dependent calcium channel is a modified CNG calcium channel having the amino
25 acid sequence represented by SEQ ID NO:2, the calcium sensitive protein is modified apoaequorin having the amino acid sequence represented by SEQ ID NO:3 and the luminescent substrate for the calcium sensitive protein is ViviRen (R).