

CLAIMS:

1. An expression vector, comprising:

a first reporter nucleic acid sequence operably linked to a first expression control sequence comprising at least one Oct4 a-promoter for one or more pluripotency markers; and

a second reporter nucleic acid sequence operably linked to a second expression control sequence comprising a response element, wherein the response element comprises at least four repeats of GATA-4 protein-binding sequence that is responsive to binding of one or more response element specific proteins GATA-4.

~~2. The expression vector of claim 1, wherein the promoter is selected from Oct4, FoxD3, Sox2, or Nanog.~~

~~3. The expression vector of claim 1, wherein the promoter is Oct4.~~

~~4. The expression vector of claim 1, wherein the response element specific protein is GATA4.~~

52. The expression vector of claim 1, wherein the second expression control sequence further comprises a minimal promoter operably linked to the response element.

63. The expression vector of claim 1, further comprising a third reporter nucleic acid sequence operably linked to a third expression control sequence.

74. The expression vector of claim 63, wherein the third expression control sequence comprises a constitutive promoter.

85. The expression vector of claim 63, wherein at least one of the first, second, or third reporter nucleic acid sequence encodes a polypeptide that is imageable by optical imaging, magnetic resonance imaging, positron emission tomography, single photon emission computed tomography, or a combination thereof.

96. The expression vector of claim 1, wherein at least one of the first or second reporter nucleic acid sequence encodes a polypeptide that is imageable by positron emission tomography.

107. The expression vector of claim 1, wherein the first or second or both reporter nucleic acid sequences encode a polypeptide that itself produces fluorescence.

118. A cultured cell comprising the expression vector of claim 1.

129. An *in vitro* method for monitoring a stem cell, comprising:

delivering a first expression vector comprising a first reporter nucleic acid sequence and a second reporter nucleic acid sequence to the stem cell; and
monitoring the stem cell by imaging at least one of the first or second reporter nucleic acid sequence expression,

wherein the first reporter nucleic acid sequence is operably linked to a first expression control sequence comprising at least one Oct4 promoter for one or more pluripotency markers, and the second reporter nucleic acid sequence is operably linked to a second expression control sequence comprising a response element, wherein the response element comprises at least four repeats of GATA-4 protein-binding sequence that is responsive to binding of one or more response element specific proteins GATA-4.

13. The method of claim 12, wherein the promoter is selected from Oct4, FoxD3, Sox2, or Nanog.

14. The method of claim 12, wherein the promoter is Oct4.

15. The method of claim 12, wherein the response element specific protein is GATA4.

1610. The method of claim 129, wherein the expression vector further comprises a third reporter nucleic acid sequence operably linked to a third expression control sequence.

1711. The method of claim 1610, wherein the stem cell is selected from a unipotent stem cell, a pluripotent stem cell, a multipotent stem cell, a totipotent stem cell, an induced pluripotent stem cell, or a combination thereof.

1812. The method of claim 129, further comprising:

delivering a second expression vector to the stem cell, prior to the monitoring step, wherein the second expression vector comprises a third reporter nucleic acid sequence operably linked to a third expression control sequence comprising a constitutive promoter.

1913. A kit for monitoring stem cells, comprising:

an expression vector, wherein the expression vector comprises:

a first reporter nucleic acid sequence operably linked to a first expression control sequence; and

a second reporter nucleic acid sequence operably linked to a second expression control sequence,

wherein the first expression control sequence comprises an Oct4 promoter, and the second expression control sequence comprises a response element, wherein the response element comprises at least four repeats of GATA-4 protein-binding sequence that is responsive to the binding of a GATA4 protein.

2014. A kit of claim 1913, further comprising an additional expression vector, wherein the additional expression vector comprises a third reporter nucleic acid sequence operably linked to a third expression control sequence comprising a constitutive promoter.