**CLAIMS**

1. An *in vitro* mammalian oocyte maturation medium when used for increasing maturation of a mammalian oocyte, the medium comprising species-specific granulocyte macrophage-colony stimulating factor (GM-CSF), wherein the level of maturation is greater than that of a mammalian oocyte of the same species when cultured in a medium which does not comprise GM-CSF, and wherein an embryo derived from the oocyte cultured in the oocyte maturation medium has improved development.

2. The medium of claim 1, wherein the GM-CSF increases developmental competence of the oocyte, and wherein the level of developmental competence is greater than that of a mammalian oocyte of the same species when cultured in a medium which does not comprise GM-CSF.

3. The medium of claim 1 or claim 2, wherein an embryo derived from the oocyte cultured in the medium has one or more of an increased on time blastocyst development, an increased blastocyst inner cell mass number, increased blastocyst rate, increased trophectoderm cell number, increased blastocyst total cell number, and increased viability.

4. The medium of any one of claims 1 to 3, wherein a blastocyst derived from the oocyte cultured in the medium has decreased DNA damage.

5. The medium of any one of claims 1 to 4, wherein one or more of implantation, pregnancy rate, and development to term, in a recipient following transfer of an embryo derived from the oocyte cultured in the medium to the recipient, is increased.

6. The medium of any one of claims 1 to 5, wherein the mammalian oocyte is selected from the group consisting of a human oocyte, a bovine oocyte, a porcine oocyte, an equine oocyte, a canine oocyte, a feline oocyte, a murine oocyte, an ovine oocyte, and a non-human primate oocyte.

7. The medium of any one of claims 1 to 6, wherein the mammalian oocyte is from an aged and/or obese subject.

8. The medium any one of claims 1 to 7, wherein the amount of GM-CSF present in the medium is about 0.1 ng/ml to about 100 ng/ml.

9. A method of *in vitro* maturation of a mammalian oocyte, the method comprising culturing the oocyte *in vitro* in a medium of any one of claims 1 to 8.

10. A method of increasing maturation of a mammalian oocyte *in vitro*, the method comprising culturing the oocyte *in vitro* in a mammalian oocyte maturation medium comprising species-specific granulocyte macrophage-colony stimulating factor (GM-CSF), wherein the level of maturation is greater than that of a mammalian oocyte of the same species when cultured in a medium which does not comprise GM-CSF, and wherein an embryo derived from the oocyte cultured in the oocyte maturation medium has improved development.

11. The method of claim 10, wherein the GM-CSF increases developmental competence of the oocyte, and wherein the level of developmental competence is greater than that of a mammalian oocyte of the same species when cultured in a medium which does not comprise GM-CSF.

12. The method of claim 10 or claim 11, wherein an embryo derived from the oocyte cultured in the medium has one or more of an increased on time blastocyst development, an increased blastocyst inner cell mass number, increased blastocyst rate, increased trophectoderm cell number, increased blastocyst total cell number, and increased viability.

13. The method of any one of claims 10 to 12, wherein a blastocyst derived from the oocyte cultured in the medium has decreased DNA damage.

14. The method of any one of claims 10 to 13, wherein one or more of implantation, pregnancy rate, and development to term, in a recipient following transfer of an embryo derived from the oocyte cultured in the medium to the recipient, is increased.

~~15. The method of any one of claims 10 to 14, wherein the method is used as part of an assisted reproductive technology.~~

~~16~~15. The method of any one of claims 10 to ~~15~~14, wherein the mammalian oocyte is selected from the group consisting of a human oocyte, a bovine oocyte, a porcine

oocyte, an equine oocyte, a canine oocyte, a feline oocyte, a murine oocyte, an ovine oocyte, and a non-human primate oocyte.

~~17~~16. The method of any one of claims 10 to ~~16~~15, wherein the mammalian oocyte is from an aged and/or obese subject.

~~18~~17. The method of any one of claims 10 to ~~17~~16, wherein the amount of GM-CSF present in the medium is about 0.1 ng/ml to about 100 ng/ml.

~~19~~18. A method of increasing developmental competence of a mammalian oocyte *in vitro*, the method comprising culturing the oocyte *in vitro* in a mammalian oocyte maturation medium comprising species-specific granulocyte macrophage-colony stimulating factor (GM-CSF), wherein the level of developmental competence is greater than that of a mammalian oocyte of the same species when cultured in a medium which does not comprise GM-CSF, and wherein an embryo derived from the oocyte cultured in the oocyte maturation medium has improved development.

~~20~~19. The method of claim ~~19~~18, wherein an embryo derived from the oocyte cultured in the medium has one or more of an increased on time blastocyst development, an increased blastocyst inner cell mass number, increased blastocyst rate, increased trophectoderm cell number, increased blastocyst total cell number, and increased viability.

~~21~~20. The method of claim ~~19~~ 18 or claim ~~20~~19, wherein a blastocyst derived from the oocyte cultured in the medium has decreased DNA damage.

~~22~~21. The method of any one of claims ~~19~~ 18 to ~~21~~20, wherein one or more of implantation, pregnancy rate, and development to term, in a recipient following transfer of an embryo derived from the oocyte cultured in the medium to the recipient, is increased.

~~23. The method of any one of claims 19 to 22, wherein the method is used as part of an assisted reproductive technology.~~

~~24~~22. The method of any one of claims ~~19~~ 18 to ~~23~~21, wherein the mammalian oocyte is selected from the group consisting of a human oocyte, a bovine oocyte, a porcine

oocyte, an equine oocyte, a canine oocyte, a feline oocyte, a murine oocyte, an ovine oocyte, and a non-human primate oocyte.

~~25~~23. The method of any one of claims ~~19~~ 18 to ~~24~~22, wherein the mammalian oocyte is from an aged and/or obese subject.

~~26~~24. The method of any one of claims ~~19~~ 18 to ~~25~~23, wherein the amount of GM-CSF present in the medium is about 0.1 ng/ml to about 100 ng/ml.

~~27. A method of producing an embryo from a mammalian oocyte by an assisted reproductive technology, the method comprising:~~

~~(a) collecting an oocyte from an ovary of a mammalian subject;~~

~~(b) culturing the oocyte *in vitro* in a mammalian oocyte maturation medium comprising species-specific GM-CSF; and~~

~~(c) producing an embryo from the oocyte by fertilising the oocyte *in vitro,* wherein the embryo has improved development.~~

~~28. The method of claim 27, wherein one or more of implantation, pregnancy rate, and development to term, in a recipient following transfer of the embryo to the recipient, is increased.~~

~~29. The method of claim 27 or claim 28, wherein the oocyte is collected from an aged and/or obese subject.~~

~~30. The method of any one of claims 27 to 29, wherein sperm used in the assisted reproductive technology is cultured in a medium comprising GM-CSF prior to fertilisation of the oocyte.~~

~~31. The method of any one of claims 27 to 30, wherein fertilisation of the oocyte takes place in a medium comprising GM-CSF.~~

~~32. The method of any one of claims 27 to 31, further comprising the step of culturing the embryo once produced in a medium comprising GM-CSF.~~

~~33. A method of assisted reproduction involving a mammalian oocyte, the method comprising the step of culturing the oocyte *in vitro* in a mammalian oocyte maturation~~

~~medium comprising species-specific GM-CSF, wherein an embryo derived from the oocyte cultured in the oocyte maturation medium has improved development.~~

~~34. The method of claim 33, comprising the further step of fertilizing the oocyte *in vitro* with sperm that has been cultured in a medium comprising GM-CSF.~~

~~35. The method of claim 33 or claim 34, comprising the further step of culturing an embryo derived from the oocyte *in vitro* in a medium comprising GM-CSF.~~

~~36. The method of claim 35, wherein one or more of implantation, pregnancy rate, and development to term, in a recipient following transfer of the embryo to the recipient, is increased.~~

~~37. The method of any one of claims 33 to 36, wherein the oocyte is collected from an aged and/or obese subject.~~

~~38. A method of assisted reproduction involving a mammalian oocyte, the method comprising the step of *in vitro* maturation of a mammalian oocyte by culturing the oocyte *in vitro* in a mammalian oocyte maturation medium comprising species-specific GM-CSF, wherein an embryo derived from the oocyte cultured in the oocyte maturation medium has improved development.~~

~~39. The method of claim 38, comprising the further step of fertilizing the oocyte *in vitro* with sperm that has been cultured in a medium comprising GM-CSF.~~

~~40. The method of claim 38 or claim 39, comprising the further step of culturing an embryo derived from the oocyte *in vitro* in a medium comprising GM-CSF.~~

~~41. The method of claim 40, wherein one or more of implantation, pregnancy rate, and development to term, in a recipient following transfer of the embryo to the recipient, is increased.~~

~~42. The method of any one of claims 38 to 41, wherein the oocyte is collected from an aged and/or obese subject.~~

~~43~~25. Granulocyte macrophage-colony stimulating factor (GM-CSF) when used in a culture medium when used for increasing maturation of a mammalian oocyte *in vitro* or

when used for increasing developmental competence of a mammalian oocyte *in vitro*, wherein the GM-CSF is species-specific, wherein the level of maturation or developmental competence is greater than that of a mammalian oocyte of the same species when cultured in a medium which does not comprise GM-CSF, and wherein an embryo derived from the oocyte cultured in the culture medium has improved development.

~~44~~26. The GM-CSF of claim ~~43~~25, wherein an embryo derived from a mammalian oocyte cultured in the medium has one or more of an increased on time blastocyst development, an increased blastocyst inner cell mass number, increased blastocyst rate, increased trophectoderm cell number, increased blastocyst total cell number, and increased viability.

~~45~~27. The GM-CSF of claim ~~43~~ 25 or claim ~~44~~26, wherein a blastocyst derived from a mammalian oocyte cultured in the medium has decreased DNA damage.

~~46. The GM-CSF of any one of claims 43 to 45, wherein the GM-CSF is used in the medium as part of an assisted reproductive technology.~~

~~47~~28. The GM-CSF of claim ~~46~~25, wherein one or more of implantation, pregnancy rate, and development to term, in a recipient following transfer of an embryo derived from a mammalian oocyte cultured in the medium to the recipient, is increased.

~~48~~29. The GM-CSF of any one of claims ~~43~~ 25 to ~~47~~28, wherein the mammalian oocyte is selected from the group consisting of a human oocyte, a bovine oocyte, a porcine oocyte, an equine oocyte, a canine oocyte, a feline oocyte, a murine oocyte, an ovine oocyte, and a non-human primate oocyte.

~~49~~30. The GM-CSF of any one of claims ~~43~~ 25 to ~~48~~29, wherein the mammalian oocyte is from an aged and/or obese subject.

~~50~~31. The GM-CSF of any one of claims ~~43~~ 25 to ~~49~~30, wherein the amount of GM-CSF present in the medium is about 0.1 ng/ml to about 100 ng/ml.

~~51~~32. A combination product when used for increasing maturation of a mammalian oocyte *in vitro* or when used for increasing developmental competence of a mammalian oocyte *in vitro*, the combination product comprising:

(i) a culture medium;

(ii) granulocyte macrophage-colony stimulating factor (GM-CSF) which is species-specific for the mammalian oocyte to be cultured in the culture medium; and optionally

(iii) instructions for culturing the mammalian oocyte in the medium together with the GM-CSF,

wherein the level of maturation or developmental competence is greater than that of a mammalian oocyte of the same species when cultured in a medium which does not comprise GM-CSF, and wherein an embryo derived from the mammalian oocyte cultured in the culture medium with the GM-CSF has improved development.

~~52~~33. The combination product of claim ~~51~~32, wherein an embryo derived from the mammalian oocyte cultured in the medium with the GM-CSF has one or more of an increased on time blastocyst development, an increased blastocyst inner cell mass number, increased blastocyst rate, increased trophectoderm cell number, increased blastocyst total cell number, and increased viability.

~~53~~34. The combination product of claim ~~51~~ 32 or claim ~~52~~33, wherein a blastocyst derived from a mammalian oocyte cultured in the medium with the GM-CSF has decreased DNA damage.

~~54. The combination product of any one of claims 51 to 53, wherein the combination product is used as part of an assisted reproductive technology.~~

~~55~~35. The combination product of claim ~~54~~32, wherein one or more of implantation, pregnancy rate, and development to term, in a recipient following transfer of an embryo derived from the mammalian oocyte cultured in the medium with the GM-CSF to the recipient, is increased.

~~56~~36. The combination product of any one of claims ~~51~~ 32 to ~~55~~35, wherein the mammalian oocyte is selected from the group consisting of a human oocyte, a bovine oocyte, a porcine oocyte, an equine oocyte, a canine oocyte, a feline oocyte, a murine oocyte, an ovine oocyte, and a non-human primate oocyte.

~~57~~37. The combination product of any one of claims ~~51~~ 32 to ~~56~~36, wherein the mammalian oocyte is from an aged and/or obese subject.

~~58~~38. A combination product when used for increasing maturation of a mammalian oocyte *in vitro* or when used for increasing developmental competence of a mammalian oocyte *in vitro*, the combination product comprising:

(i) a mammalian oocyte maturation medium comprising species-specific granulocyte macrophage-colony stimulating factor (GM-CSF); and

(ii) instructions for culturing the mammalian oocyte in the medium,

wherein the level of maturation or developmental competence is greater than that of a mammalian oocyte of the same species when cultured in a medium which does not comprise GM-CSF, and wherein an embryo derived from the mammalian oocyte cultured in the medium has improved development.

~~59~~39. The combination product of claim ~~58~~38, wherein an embryo derived from the mammalian oocyte cultured in the medium has one or more of an increased on time blastocyst development, an increased blastocyst inner cell mass number, increased blastocyst rate, increased trophectoderm cell number, increased blastocyst total cell number, and increased viability.

~~60~~40. The combination product of claim ~~58~~ 38 or claim ~~59~~39, wherein a blastocyst derived from the mammalian oocyte cultured in the medium has decreased DNA damage.

~~61. The combination product of any one of claims 58 to 60, wherein the combination product is used as part of an assisted reproductive technology.~~

~~62~~41. The combination product of claim ~~61~~38, wherein one or more of implantation, pregnancy rate, and development to term, in a recipient following transfer of an embryo derived from the mammalian oocyte cultured in the medium to the recipient, is increased.

~~63~~42. The combination product of any one of claims ~~58~~ 38 to ~~62~~41, wherein the mammalian oocyte is selected from the group consisting of a human oocyte, a bovine oocyte, a porcine oocyte, an equine oocyte, a canine oocyte, a feline oocyte, a murine oocyte, an ovine oocyte, and a non-human primate oocyte.

~~64~~43. The combination product of any one of claims ~~58~~ 38 to ~~63~~42, wherein the mammalian oocyte is from an aged and/or obese subject.