CLAIMS

1. A method for producing an enriched population of haploid human ES cells comprising:

    a) identifying haploid metaphase cells in a sample from a population of ES cells, wherein the ES cells are derived from an artificially activated human oocyte; and
    b) sorting the population of ES cells based on cell ploidy to produce an enriched population of haploid human ES cells.

2. The method of claim 1, further comprising maintaining the enriched population of ES cells in culture for at least three passages and optionally sorting the ES cells in culture every three to four passages, wherein the sorting is based on cell ploidy.

3. The method of claim 1, wherein the haploid metaphase cells in the sample are identified by metaphase spread analysis, sub-2c cell sorting, flow cytometry, centromere protein immunofluorescence staining, or DNA fluorescence in situ hybridization.

4. The method of claim 1, wherein the sorting step comprises at least one cycle of fluorescence-activated cell sorting (FACS), optionally wherein said sorting step comprises 2-5 cycles of FACS and said enriched population of haploid human ES cells is a substantially pure population of haploid human ES cells.

5. An enriched population of haploid human embryonic stem (ES) cells *in vitro*.

6. The enriched population of claim 5, or the method of claim 1, wherein the enriched population comprises at least 5% haploid human ES cells, optionally wherein the enriched population comprises at least 95% haploid human ES cells.

7. A population of haploid multipotent human cells *in vitro*.

8. A method for producing the population of haploid multipotent human cells of claim 7, comprising:

    a) culturing haploid human embryonic stem cells under conditions for directed differentiation;
    b)
        i. culturing haploid human ES cells under conditions to induce embryoid body formation; and
        ii. dissociating the embryoid body into cells; or
    c)
        i. injecting haploid human ES cells into a non-human mammal under conditions to induce teratoma formation; and

ii. dissociating the embryoid body into cells;

thereby producing a population of haploid multipotent human cells.

9. The method of claim 8, further comprising:

d) sorting the dissociated cells based on cell surface markers, optionally wherein the sorting comprises FACS.

10. The population of claim 7, or the method of any one of claims 8 or 9, wherein the population of haploid multipotent human cells:

a. is a substantially pure population;
b. comprises endodermal progenitor cells;
c. comprises mesodermal progenitor cells;
d. comprises ectodermal progenitor cells; or
e. comprises neural progenitor cells.

11. A population of haploid differentiated human somatic cells in culture.

12. A method for producing the population of haploid differentiated human somatic cells of claim 11, comprising culturing haploid human ES cells or haploid multipotent human cells under conditions for directed differentiation, thereby producing a population of haploid differentiated human somatic cells.

13. The population of claim 11, or the method of claim 12, wherein the haploid differentiated human somatic cells are selected from the group consisting of neurons, cardiomyocytes, pancreatic cells, skin cells, muscle cells, kidney cells, liver cells, lung cells, and intestinal cells.

14. A method of genetic screening comprising:

a) exposing the enriched population of human haploid ES cells of any one of claims 5 or 6 to a mutagen to induce at least one mutation in the cells;
b) selecting human haploid ES cells in the enriched population that contain the mutation; and
c) identifying a genotypic and/or phenotypic effect of the mutation in the human haploid ES cells.

15. The method of claim 14, wherein the genetic screening is a forward genetic screen, or wherein the mutagen is selected from the group consisting of a physical mutagen, a chemical mutagen, and a biological agent.