CLAIMS

1. A method of modulating the activity of target cells, the method comprising:

a.) producing primed red blood cells by contacting red blood cells with at least one agent that modulates the level of one or more proteins associated with the red blood cells, wherein the at least one agent is a protein, a protease inhibitor, or a cell; and

b.) mixing the target cells with one or more primed red blood cell components selected from the group consisting of:

(i) the primed red blood cells;

(ii) supernatant obtained from incubating or culturing the primed red blood cells;

(iii) lysate obtained from the primed red blood cells;

(iv) membranes obtained from the primed red blood cells; and

(v) red blood cell ghosts produced from the primed red blood cells,

wherein mixing the target cells with the one or more primed red blood cell components modulates the activity of the target cells.

2. The method of claim 1, wherein the primed red blood cells modulate one or more activities of the target cells selected from the group consisting of cell signalling, immune response, cell development, cell growth, cell death, inhibition of cell growth, and cell repair.

3. The method of claim 1 or claim 2, wherein the target cells are one or more selected from the group consisting of immune cells, immortalized cells, cancer cells, stem cells, endothelial cells, fibroblasts, and synovial cells.

4. The method of any one of claim 1-3, wherein the target cells are from a subject.

5. The method of any one of claims 1-4, wherein the target cells are within a subject.

6. The method of any one of claim 1-5, wherein the target cells are to be administered to a subject.

7. The method of any one of claims 1-6, wherein the one or more proteins associated with the red blood cells are cytokines, chemokines, or growth factors.

8. The method of any one of claims 1-6, wherein the one of more proteins associated with the red blood cells is selected from the group consisting of FGF basic, Eotaxin, G-CSF, GM-CSF, IFN-γ, IL-IB, ILlra, IL-2, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12(p70), IL-13, IL-15, IL-17, IP-10, MCP-1, MIP-lα, MIP-lB, PDGF-BB, RANTES, TNF-α, and VEGF.

9. The method of any one of claims 1-6, wherein the one of more proteins associated with the red blood cells is selected from the group consisting of IL-la, IL-2Ra, IL-3, IL-12, IL-16, IL-18, CTACK, GRO-α, HGF, IFN-α2, LIF, MCP-3, M-CSF, MIF, MIG, B-NGF, SCF, SCGF-B, SDF-lα, TNF-B, and TRAIL.

10. The method of any one of claim 6-9, wherein the target cells are to be administered to the subject by one or more routes selected from the group consisting of systemically, locally, intravenously, subcutaneously, intra-articularly, intramuscularly, intrathecally, and intraperitoneally.

11. The method of any one of claim 4-10, wherein the subject has a disease or disorder.

12. A method of a priming red blood cells, comprising:

i) measuring the level of one of more proteins associated with the red blood cells;
ii) contacting the red blood cells with at least one agent, wherein the at least one agent is a protein, a protease inhibitor, or a cell;
iii) measuring the level of the one or more proteins associated with the contacted red blood cells; and
iv) comparing the level of the one or more proteins associated with the red blood cells before and after being contacted with the at least one agent, wherein a difference in the level of at least one of the one or more proteins associated with red blood cells indicates that the red blood cells have been primed.

13. The method of claim 12, wherein the level of two or more proteins, three of more proteins, four or more proteins, five or more proteins, six or more proteins, seven or more proteins, eight or more proteins, nine or more proteins, ten or more proteins, eleven or more

proteins, twelve or more proteins, thirteen or more proteins, fourteen or more proteins, or fifteen or more proteins associated with red blood cells is measured.

14. The method of claim 12 or claim 13, wherein there is a difference in the level of at least one, at least two, at least three, at least four, at least five, at least six, at least seven, at least eight, at least nine, at least ten, at least eleven, at least twelve, at least thirteen, at least fourteen, or at least fifteen of the one or more proteins associated with the red blood cells.

15. The method of any one of claims 12-14, wherein the at least one agent is a cell, and wherein the cell is selected from the group consisting of a primary cell or other healthy/normal cell from a subject, a cancer cell, an immortalized cell, a cell line derived from a subject, an immune cell, a stem cell, an endothelial cell, a fibroblast, or a synovial cell.

16. The method of any one of claims 12-15, wherein the one of more proteins associated with the red blood cells is a cytokine, a chemokine, or a growth factor.

17. The method of any one of claims 12-16, wherein the one of more proteins associated with the red blood cells is selected from the group consisting of FGF basic, Eotaxin, G-CSF, GM-CSF, IFN-γ, IL-IB, ILlra, IL-2, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12(p70), IL-13, IL-15, IL-17, IP-10, MCP-1, MIP-lα, MIP-lB, PDGF-BB, RANTES, TNF-α, and VEGF.

18. The method of any one of claims 12-16, wherein the one of more proteins associated with the red blood cells is selected from the group consisting of IL-la, IL-2Ra, IL-3, IL-12, IL-16, IL-18, CTACK, GRO-α, HGF, IFN-α2, LIF, MCP-3, M-CSF, MIF, MIG, B-NGF, SCF, SCGF-B, SDF-lα, TNF-B, and TRAIL.

19. The method of any one of claims 12-18, wherein the one of more proteins associated with the red blood cells is a cytokine.

20. Use of red blood cells and/or target cells according to any one of claims 1-19 in the manufacture of a medicament for preventing, treating, or ameliorating a disease or disorder in a subject; wherein the disease or disorder is selected from the group consisting of cancer,

infectious disease, organ failure, autoimmune disease, autoimmune disorders, inflammation, and immune deficiency.

21. The use of claim 20, wherein the red blood cells and/or target cells are to be administered to the subject by one or more routes selected from the group consisting of systemically, locally, intravenously, subcutaneously, intra-articularly, intramuscularly, intrathecally, and intraperitoneally.

22. The use of claim 20 or claim 21, wherein the subject is a human or non-human mammal.