Claims

1. A magnetic particle comprising: a ligand that specifically binds an intracellular antigen, a cell membrane penetrating cationic peptide and a cell export peptide comprising an amino acid sequence that is adapted to interact with the secretory pathway in a cell.

2. The magnetic particle according to claim 1, wherein said intracellular antigen is substantially a nuclear antigen.

3. The magnetic particle according to claim 2, wherein said nuclear antigen is selected from the group consisting of: FoxO family members, TARP, p53, Rb, E2F, hK4, BRCA1, Cdk2, SATB1, TP53INP1, Myc, Fos, or Jun.

4. The magnetic particle according to claim 1, wherein said intracellular antigen is substantially a cytoplasmic antigen.

5. The magnetic particle according to claim 4, wherein said cytoplasmic antigen is selected from the group consisting of: Jak3, GATA 1-4, Stats 1-6, CBP, NFkB, IKK, PIK3CA, BRAF, PIK3CA, EML4-ALK, VEGF, EBI3, eIF2α, Akt, PI3K, IAP, Hs, Hsp, FAK, Raf, Ras, TNF, Src, Wnt, or Abl.

6. The magnetic particle according to any one of claims 1-5, wherein said cationic cell membrane penetrating peptide is a natural cell penetrating peptide.

7. The magnetic particle according to any of claims 1-5, wherein said cationic cell membrane penetrating peptide is a synthetic sequence.

8. The magnetic particle according to claim 6 or 7 wherein said cationic cell membrane penetrating peptide is adapted to penetrate a mammalian cell.

9. The magnetic particle according to any one of claims 6 to 8 wherein said cationic cell membrane penetrating peptide is selected from the group consisting of:

YARKKRRQRRR, YARKARRQARR, YARAAARQARA, YARAARRAARR, YARAARRAARA, YARRRRRRRRR, YAAARRRRRRR, PLSSIFSRIGDP, RQIKIWFQNRRMKWKK, WEIEDEDER, GRKKRRQRRRPQ or, RRRRRRRRRRR.

~~10. The magnetic particle according to claim 9 wherein said cell membrane penetrating peptide consists essentially of the amino acid sequence: GRKKRRQRRRPQ.~~

~~11. The magnetic particle according to claim 10, wherein said cell membrane penetrating peptide consists of the amino acid sequence: GRKKRRQRRRPQ.~~

~~12 The magnetic particle according to claim 9, wherein said cell membrane penetrating peptide consists essentially of the amino acid sequence: RRRRRRRRRRR.~~

~~13 The magnetic particle according to claim 12, wherein said cell membrane penetrating peptide consists of the amino acid sequence: RRRRRRRRRRR.~~

~~14~~10. The magnetic particle according to any one of claims 1 to 13, wherein said cell export peptide ~~adapted to interact with the mammalian secretory pathway~~ is selected from the group consisting of: MCPARSLLLVATLVLLDHLSLA, MDAMKRGLCCVLLLCGAVFVSPS, MATGSRTSLLLAFGLLCLPWLQEGSA, MYRMQLLSCIALSLALVTNS or MGVKVLFALICIAVAE.

~~15. The magnetic particle according to claim 14 wherein said peptide is consists essentially of the amino acid sequence MGVKVLFALICIAVAE.~~

~~16. The magnetic particle according to claim 15 wherein said peptide is consists of the amino acid sequence: MGVKVLFALICIAVAE.~~

~~17. The magnetic particle according to claim 14 wherein said peptide is consists essentially of the amino acid sequence: MYRMQLLSCIALSLALVTNS.~~

~~18. The magnetic particle according to claim 17, wherein said peptide is consists of the amino acid sequence: MYRMQLLSCIALSLALVTNS.~~

~~19.~~11. The magnetic particle according to any one of claims 1 to ~~18~~ 10 wherein said ligand that binds said intracellular antigen is an antibody fragment or an aptamer.

~~20. The magnetic particle according to claim 19 wherein said antibody fragment is an ScFv.~~

~~21. The magnetic particle according to any of claims 1 to 18 wherein said ligand that binds said intracellular antigen is a peptide or a peptide aptamer~~

~~22. The magnetic particle according to any one of claims 1 to 21 wherein said cell is a mammalian cell.~~

~~23. The magnetic particle according to claim 22 wherein said mammalian cell is a stem cell.~~

~~24.~~12. The magnetic particle according to any one of claims ~~1-23~~ 1-11 wherein said magnetic particle further comprises a nuclear export peptide.

~~25.~~13. The magnetic particle according to claim ~~24~~ 12 wherein said nuclear export peptide comprises or consists essentially of the amino acid sequence: NELALKLAGLDINKTEGEEDAQ.

~~26.~~14. A method for the selection and isolation of a mammalian cell from a heterogeneous population of cells comprising:

i) forming a first preparation comprising a heterogeneous population of mammalian cells;

ii) contacting said population with a second preparation comprising a magnetic particle according to any one of claims ~~1-25~~ 1-13 to provide a combined preparation and providing conditions that allow penetration and binding of said magnetic particle to an intracellular antigen;

iii) incubating said combined preparation to remove unbound magnetic particles by the secretory pathway of said mammalian cell, optionally by application of a magnetic field; and

iv) applying a magnetic field to said combined preparation to select and isolate mammalian cells comprising magnetic particles bound to an intracellular antigen.

~~27. The method according to claim 24 wherein said mammalian cell is a stem cell.~~

~~28. The method according to claim 25 wherein said stem cell is a cancer stem cell.~~

~~29.~~15. A kit for customized modification of magnetic particles containing a selection of cell membrane penetrating cationic peptides selected from the group of YARKKRRQRRR, YARKARRQARR, YARAAARQARA, YARAARRAARR, YARAARRAARA, YARRRRRRRRR, YAAARRRRRRR, PLSSIFSRIGDP, RQIKIWFQNRRMKWKK, WEIEDEDER, GRKKRRQRRRPQ, RRRRRRRRRRRR, a selection of ~~secretory proteins~~ cell export peptides selected from the group MCPARSLLLVATLVLLDHLSLA, MDAMKRGLCCVLLLCGAVFVSPS, MATGSRTSLLLAFGLLCLPWLQEGSA, MYRMQLLSCIALSLALVTNS or MGVKVLFALICIAVAE, ~~and~~ activation, wash and blocking/storage buffer and optionally a nuclear export peptide and a magnet.

~~30. The kit according to claim 29 wherein said kit further comprises a nuclear export peptide.~~

~~31. The kit according to claim 30 wherein said kit further comprises or consists essentially of the amino acid sequence: NELALKLAGLDINKTEGEEDAQ.~~

~~32. The kit according to any one of claims 29-31 wherein said kit further comprises a magnet for the use of said magnetic particles.~~