CLAIMS

1. Modified mitochondria in which a foreign protein is bound to the outer membrane of the mitochondria,

wherein the mitochondria are isolated from cells or tissues,

wherein the foreign protein comprises a mitochondria anchoring peptide and a desired protein capable of functioning inside and outside the cell,

wherein the foreign protein is bound to the outer membrane of the mitochondria by a mitochondria anchoring peptide,

wherein the foreign protein comprises an amino acid sequence recognized by a proteolytic enzyme in eukaryotic cells, or ubiquitin or a fragment thereof between the anchoring peptide and the desired protein,

wherein the mitochondria anchoring peptide is a peptide comprising an anchoring sequence of an N terminal region or a C terminal region of a protein which is located on the outer membrane of the mitochondria and is any one selected from the group consisting of TOM20, TOM70, OM45, TOM5, TOM6, TOM7, TOM22, Fis1, Bcl-2, Bcl-x and VAMP1B.

2. The modified mitochondria according to claim 1, wherein the mitochondria is derived from any one selected from the group consisting of somatic cells, germ cells, stem cells, and a combination thereof.

3. The modified mitochondria according to claim 1, wherein the mitochondria anchoring peptide is the peptide comprising the anchoring sequence of the N terminal region of a protein which is located on the outer membrane of the mitochondria and is any one selected from the group consisting of TOM20, TOM70 and OM45.

4. The modified mitochondria according to claim 1, wherein the mitochondria anchoring peptide is the peptide comprising the anchoring sequence of the C terminal region of a protein which is located on the outer membrane of the mitochondria and is any one selected from the group consisting of TOM5, TOM6, TOM7, TOM22, Fis1, Bcl-2, Bcl-x and VAMP1B.

5. The modified mitochondria according to claim 1, wherein the desired protein is any one selected from the group consisting of an active protein exhibiting an activity in a cell, a protein present in a cell, and a protein having the ability to bind to a ligand or receptor present in a cell

membrane.

6. The modified mitochondria according to claim 5, wherein the desired protein is any one selected from the group consisting of p53, Granzyme B, Bax, Bak, PDCD5, E2F, AP-1(Jun/Fos), EGR-1, Retinoblastoma(RB), phosphatase and tensin homolog(PTEN), E-cadherin, Neurofibromin-2(NF-2), poly[ADP-ribose] synthase 1(PARP-1), BRCA-1, BRCA-2, Adenomatous polyposis coli(APC), Tumor necrosis factor receptor-associated factor(TRAF), RAF kinase inhibitory protein(RKIP), p16, KLF-10, LKB1, LHX6, C-RASSF, DKK-3PD1, Oct3/4, Sox2, Klf4, and c-Myc.

7. The modified mitochondria according to claim 1, wherein the foreign protein is a desired protein bound to the peptide comprising the anchoring sequence of the N terminal region of a protein which is located on the outer membrane of the mitochondria and is TOM20, TOM70 or OM45.

8. The modified mitochondria according to claim 7, wherein the foreign protein is bound in the following order:
N terminal - the peptide comprising the anchoring sequence of the N terminal region of a protein which is located on the outer membrane of the mitochondria and is TOM20, TOM70 or OM45 - desired protein - C terminal.

9. The modified mitochondria according to claim 1, wherein the ubiquitin fragment comprises the C terminal Gly-Gly of an amino acid sequence of SEQ ID NO: 71, and comprises 3 to 75 amino acids consecutive from the C terminal.

10. The modified mitochondria according to claim 1, wherein the foreign protein further comprises a linker between a desired protein and ubiquitin or a fragment thereof.

11. The modified mitochondria according to claim 10, wherein the linker is composed of 1 to 150 amino acids.

12. The modified mitochondria according to claim 11, wherein the linker is composed of 5 to 50 amino acids consisting of glycine and serine.

13. The modified mitochondria according to claim 12, wherein the linker is (G4S)n, in which n is an integer of 1 to 10.

14. The modified mitochondria according to claim 5, wherein the protein having the ability to bind to a ligand or receptor present in a cell membrane is a ligand or receptor present on the surface of a tumor cell.

15. The modified mitochondria according to claim 14, wherein the ligand or receptor present on the surface of a tumor cell is any one selected from the group consisting of CD19, CD20, melanoma antigen E(MAGE), NY-ESO-1, carcinoembryonic antigen(CEA), mucin 1 cell surface associated(MUC-1), prostatic acid phosphatase(PAP), prostate specific antigen(PSA), survivin, tyrosine related protein 1(tyrp1), tyrosine related protein 1(tyrp2), Brachyury, Mesothelin, Epidermal growth factor receptor(EGFR), human epidermal growth factor receptor 2(HER-2), ERBB2, Wilms tumor protein(WT1), FAP, EpCAM, PD-L1, ACPP, CPT1A, IFNG, CD274, FOLR1, EPCAM, ICAM2, NCAM1, LRRC4, UNC5H2 LILRB2, CEACAM, Nectin-3, or a combination thereof.

16. The modified mitochondria according to claim 1, wherein the foreign protein is bound to the peptide comprising the anchoring sequence of the C terminal region of a protein which is located on the outer membrane of the mitochondria and is any one selected from the group consisting of TOM5, TOM6, TOM7, TOM22, Fis1, Bcl-2, Bcl-x and VAMP1B.

17. The modified mitochondria according to claim 16, wherein the foreign protein is bound in the following order:
N terminal-desired protein - the peptide comprising the anchoring sequence of the C terminal region of a protein which is located on the outer membrane of the mitochondria and is any one selected from the group consisting of TOM5, TOM6, TOM7, TOM22, Fis1, Bcl-2, Bcl-x and VAMP1B - C terminal.

18. The modified mitochondria according to claim 17, wherein the foreign protein further comprises a linker between the desired protein and the anchoring sequence of the C terminal region of a protein which is located on the outer membrane of the mitochondria and is any one selected from the group consisting of TOM5, TOM6, TOM7, TOM22, Fis1, Bcl-2, Bcl-x and VAMP1B.

19. The modified mitochondria according to claim 18, wherein the linker is composed of 1 to 150 amino acids.

20. The modified mitochondria according to claim 19, wherein the linker is composed of 5 to 50 amino acids consisting of glycine and serine.

21. The modified mitochondria according to claim 20, wherein the linker is (G4S)n, in which n is an integer of 1 to 10.

22. A pharmaceutical composition for the prevention or treatment of cancer, comprising a modified mitochondria according to any of claims 1, 3, 10, 11, 13 to 16, and 18 to 30 as an active ingredient.

23. The pharmaceutical composition according to claim 22, wherein the cancer is any one selected from the group consisting of gastric cancer, liver cancer, lung cancer, colorectal cancer, breast cancer, prostate cancer, ovarian cancer, pancreatic cancer, cervical cancer, thyroid cancer, larynx cancer, acute myeloid leukemia, brain tumor, neuroblastoma, retinoblastoma, head and neck cancer, salivary gland cancer and lymphoma.