What is claimed:

1. Use of a hemoglobin-based oxygen carrier in preparation of a pharmaceutical composition for treating cancerous tissues and preventing recurrence and metastasis of cancerous tumors being administered alone or in combination with at least one chemotherapeutic agent to a subject in need thereof, wherein said composition is to be administered to said subject during or after removal of cancerous tissues or tumors.

2. The use of claim 1, wherein the cancerous tissues or tumors are hepatic, nasopharyngeal, brain, colon, lung, head and neck, mammary and leukemia.

3. The use of claim 1, wherein the cancerous tissues or tumor are hypoxic.

4. The use of claim 1, wherein said hemoglobin-based oxygen carrier is cross-linked tetrameric hemoglobin having a molecular weight of 60-70kDa and is heat stable after heat treatment and addition of N-acetyl cysteine at a concentration of 0.05-0.4%.

5. The use of claim 1, wherein said composition is free of vasoconstricting impurities and protein impurities, non-pyrogenic, endotoxin-free, phospholipid-free, stroma-free and a met-hemoglobin level of less than 5% after said heat treatment and reaction with the added N-acetyl cysteine.

6. The use of claim 1, wherein said composition is to be administered by infusion in a range of approximately 0.2-1.2g/kg body weight and at a rate of less than l0ml/hour/kg body weight.

7. The use of claim 1, wherein said at least one chemotherapeutic agent is selected from 5-fluorouracil, Bortezomib, doxorubicin, cisplatin, or any combination thereof.

8. The use of claim 1, wherein said hemoglobin-based oxygen carrier is to be administered as an adjunctive therapy with said at least one chemotherapeutic agent for providing oxidative stress or shock to a mass of the cancerous tissues or tumors and for sensitizing said cancerous tissues or tumors to said chemotherapeutic agent such that apoptosis of cells in said cancerous tissues or tumors including self-renewing and tumor-initiating cells is induced.

9. The use of claim 8, wherein said self-renewing and tumor-initiating cells are cancer stem cells and/or cancerous progenitor cells.