DM1 (T-DM1) and pertuzumab have individually demonstrated activity in MBC patients, and a combination of pertuzumab and trastuzumab has been shown to be active in HER-positive MBC patients (Baselga J, et al. "A Phase II trial of trastuzumab and pertuzumab in patients with HER2-positive metastatic breast cancer that had progressed during trastuzumab therapy: full response data", European Society of Medical Oncology, Stockholm, Sweden, September 12−16, 2008).

[0013] SUMMARY OF THE INVENTION

[0013a] In a first aspect, the present invention refers to the use of a therapeutic combination in the manufacture of a medicament for the treatment of a cancer expressing ErbB2, wherein the therapeutic combination is to be administered as a combined formulation or by alternation to a mammal, wherein the therapeutic combination comprises a therapeutically effective amount of trastuzumab-MCC-DM1, and a therapeutically effective amount of pertuzumab; wherein administration of the therapeutic combination results in a synergistic effect.

[0013b] In a second aspect, the present invention refers to the use of a therapeutic combination in the manufacture of a medicament for the treatment of breast cancer, wherein the therapeutic combination is to be administered to a mammal as a combined formulation or by alternation, and wherein the therapeutic combination comprises a therapeutically effective amount of trastuzumab-MCC-DM1, and a therapeutically effective amount of pertuzumab, wherein administration of the therapeutic combination results in a synergistic effect.

[0014] The ~~invention~~disclosure relates generally to the anti-HER2 antibody-drug conjugate, trastuzumab-MCC-DM1, administered in combination with one or more chemotherapeutic agents to inhibit the growth of cancer cells. Certain combinations of trastuzumab-MCC-DM1 and a chemotherapeutic agent show synergistic effects in inhibiting the growth of cancer cells in vitro and in vivo. The combinations and methods of the ~~invention~~disclosure may be useful in the treatment of hyperproliferative disorders such as cancer. The combinations may inhibit tumor growth in mammals and may be useful for treating human cancer patients.

[0015] In one ~~aspect~~example, the ~~invention~~disclosure includes a method for the treatment of a hyperproliferative disorder comprising administering a therapeutic combination as a combined formulation or by alternation to a mammal, wherein the therapeutic combination comprises a therapeutically effective amount of trastuzumab-MCC-DM1, and a therapeutically effective amount of a chemotherapeutic agent selected from a HER2 dimerization inhibitor antibody, an anti-VEGF antibody, 5-FU, carboplatin, lapatinib, ABT-869, docetaxel, GDC-0941, and GNE-390.

[0016] The therapeutically effective amount of trastuzumab-MCC-DM1 and the therapeutically effective amount of the chemotherapeutic agent may be administered as a combined formulation or by alternation.

[0017] The ~~invention~~disclosure also relates to methods of using the compositions for *in vitro*, *in situ*, and *in vivo* diagnosis or treatment of mammalian cells, organisms, or associated pathological conditions.

[0018] The ~~invention~~disclosure also relates to methods wherein administration of the therapeutic combination results in a synergistic effect.

[0019] Another ~~aspect~~example of the ~~invention~~disclosure are pharmaceutical compositions comprising trastuzumab-MCC-DM1, a chemotherapeutic agent selected from a HER2 dimerization inhibitor antibody, an anti-VEGF antibody, 5-FU, carboplatin, lapatinib, ABT-869, docetaxel, GDC-0941, and GNE-390; and one or more pharmaceutically acceptable carrier, glidant,

diluent, or excipient.

[0020] Another ~~aspect~~example of the ~~invention~~disclosure provides methods of treating a hyperproliferative disease or disorder, comprising administering to a mammal in need of such treatment effective amounts of trastuzumab-MCC-DM1 and a chemotherapeutic agent. Trastuzumab-MCC-DM1 and the chemotherapeutic agent may be co-formulated for administration in a combination as a pharmaceutical formulation or they may be administered separately in alternation (alternating, sequential dosages) as a therapeutic combination. In one ~~embodiment~~example, T-DM1 is delivered by infusion and the chemotherapeutic agent is delivered orally.

[0021] Another ~~aspect~~example of the ~~invention~~disclosure provides methods to predict effective drug combinations for in vivo efficacy where the combinations include trastuzumab-MCC-DM1 and an anti cancer, standard-of-care, chemotherapeutic agent. Efficacy data from in vitro cell proliferation and in vivo tumor xenograft experiments are analyzed qualitatively and quantitatively. Quantitative analysis methods may be based on the Chou & Talalay median effect and isobolograms generating a combination index (CI) value to denote synergy, antagonism, or additivity, or on the Bliss Independence ribbon graph deflection.

[0022] Another ~~aspect~~example of the ~~invention~~disclosure is a method of using a therapeutic combination of the ~~invention~~disclosure to treat a disease or condition such as cancer, including one modulated by HER2 or KDR9 (VEGF receptor 1) in a mammal.

[0023] Another ~~aspect~~example of the ~~invention~~disclosure is the use of a therapeutic combination of the ~~invention~~disclosure in the preparation of a medicament for the treatment of a disease or condition such as cancer, including one modulated by HER2 or KDR9 (VEGF receptor 1) in a mammal.

[0024] Another ~~aspect~~example of the ~~invention~~disclosure includes articles of manufacture or kits comprising trastuzumab-MCC-DM1, a chemotherapeutic agent, a container, and optionally a package insert or label indicating a treatment.

[0025] Another ~~aspect~~example of the ~~invention~~disclosure includes a method for determining compounds to be used in combination for the treatment of cancer comprising: a) administering a therapeutic combination of trastuzumab-MCC-DM1, and a chemotherapeutic agent selected from a HER2 dimerization inhibitor antibody, an anti-VEGF antibody, 5-FU, carboplatin, lapatinib, ABT-869, docetaxel, GDC-0941, and GNE-390 to an in vitro tumor cell line, and b) measuring a synergistic or non-synergistic effect.

[0026] Additional advantages and novel features of this invention shall be set forth in part in the description that follows, and in part will become apparent to those skilled in the art upon examination of the following specification or may be learned by the practice of the

Claims:

1. Use of a therapeutic combination in the manufacture of a medicament for the treatment of a cancer expressing ErbB2~~hyperproliferative disorder~~, wherein the therapeutic combination is to be administered as a combined formulation or by alternation to a mammal, wherein the therapeutic combination comprises a therapeutically effective amount of trastuzumab-MCC-DM1, and a therapeutically effective amount of pertuzumab; wherein administration of the therapeutic combination results in a synergistic effect.

2. The use of claim 1, wherein the therapeutically effective amount of trastuzumab-MCC-DM1 and the therapeutically effective amount of pertuzumab are to be administered as a combined formulation.

3. The use of claim 1, wherein the therapeutically effective amount of trastuzumab-MCC-DM1 and the therapeutically effective amount of pertuzumab are to be administered by alternation.

4. The use of claim 3 wherein the mammal is to be administered pertuzumab and then subsequently administered trastuzumab-MCC-DM1.

5. The use of claim 2, wherein the therapeutic combination is to be administered at about three week intervals to a human with the ~~hyperproliferative disorder~~ cancer expressing ErbB2.

6. The use of any one of the preceding claims, wherein trastuzumab-MCC-DM1 is to be administered at intervals from about one week to three weeks to a human with the ~~hyperproliferative disorder~~ cancer expressing ErbB2.

7. The use of claim 6, wherein the trastuzumab-MCC-DM1 is to be administered no more frequently than every 3 weeks at a dose of 2.4, 3.0 or 3.6 mg/kg intravenously.

8. The use of any one of the preceding claims, wherein the amount of trastuzumab-MCC-DM1 and the amount of pertuzumab are each from about 1 mg to about 1000 mg and the amount of trastuzumab-MCC-DM1 and the amount of pertuzumab are in a ratio of about 1:10 to about 10:1 by weight.

9. ~~The use of any one of the preceding claims, wherein the hyperproliferative disorder is cancer expressing ErbB2.~~The use of claim 7, wherein trastuzumab-MCC-DM1 is to be administered

every three weeks at a dose of 3.6 mg/kg, and pertuzumab is to be administered intravenously at a loading dose of 840 mg followed by a 420 mg intravenous maintenance dose every three weeks.

10. The use of any one of the preceding claims, wherein the mammal is a HER2 positive patient.

11. The use of any one of the preceding claims, wherein the HER2 positive patient has received trastuzumab or lapatinib therapy.

~~12. A pharmaceutical composition comprising trastuzumab-MCC-DM1, pertuzumab,; and one or more pharmaceutically acceptable carrier, glidant, diluent, or excipient, wherein administration of the pharmaceutical composition results in a synergistic effect.~~

~~13. The pharmaceutical composition of claim 12 comprising a pharmaceutically acceptable glidant selected from silicon dioxide, powdered cellulose, microcrystalline cellulose, metallic stearates, sodium aluminosilicate, sodium benzoate, calcium carbonate, calcium silicate, corn starch, magnesium carbonate, asbestos-free talc, stearowet C, starch, starch 1500, magnesium lauryl sulfate, magnesium oxide, and combinations thereof.~~

12~~14~~. Use of a therapeutic combination in the manufacture of a medicament for the treatment of breast cancer, wherein the therapeutic combination is to be administered to a mammal as a combined formulation or by alternation, and wherein the therapeutic combination comprises a therapeutically effective amount of trastuzumab-MCC-DM1, and a therapeutically effective amount of pertuzumab, wherein administration of the therapeutic combination results in a synergistic effect.

~~15. A method for determining a therapeutic combination of trastuzumab-MCC-DM1, and pertuzumab to be used for the treatment of cancer comprising:~~

~~a) treating an in-vitro tumor cell line with a therapeutic combination of trastuzumab-MCC-DM1, and pertuzumab, and~~

~~b) measuring a synergistic or non-synergistic effect;~~

~~whereby a synergistic therapeutic combination for the treatment of cancer is determined.~~