effector function of $CD8^+$ T cells. In addition, IL-1 activates intrinsic IL-1 receptor (IL-1R) signaling in pre-committed T helper (TH) cell lineages, and acts as a signal for increased T effector cytokine production. IL-1 usage has been suggested as an adjuvant in weak or inefficient vaccines, to increase vaccination protection activity. Accordingly, inflammation-activators such as oxidized phospholipids have been examined as inducers of hyperactive dendritic cells *in vivo* capable of enhancing hyperactivation of dendritic cells and inducing an improved antigen specific immune response when the oxidized lipids are administered to a patient with an immunogen.

SUMMARY

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

The present disclosure provides methods and compositions for inducing the *in vitro* or *ex vivo* maturation of immature dendritic cells (DC) to produce hyperactive mature dendritic cells, with a combination of agents that simultaneously provide broad immune stimulation (*i.e.,* a dendritic cell maturation agent with or without Interferon γ in combination with an inflammation-activating lipid), and for priming those cells for an enhanced immune response, including an enhance T cell response, an enhanced Th1 response, and/or antigen-specific cytotoxic T cell response.

In one aspect, an *in vitro* or *ex vivo* method is provided for producing a cell population enriched for hyperactive mature dendritic cells that produce an enhanced immune response to a predetermined antigen, the method comprising: providing a cell population comprising $CD14^-$ immature dendritic cells; and contacting the immature dendritic cells with an effective amount of a dendritic cell maturation agent, with or without Interferon gamma (IFNγ), and an inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells for a time period sufficient to form mature dendritic cells; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC; and wherein the mature dendritic cell population produces an enhanced Th1 response to the antigen when contacted with naïve T cells.

In another aspect, an *in vitro* or *ex vivo* method is provided for producing an enhanced immune response to an antigen, the method comprising: providing a cell population comprising $CD14^-$ immature dendritic cells; contacting the immature dendritic cells with an effective amount of a

dendritic cell maturation agent, with or without Interferon gamma (IFNγ), and a predetermined antigen under culture conditions suitable for maturation of the immature dendritic cells to form the mature dendritic cell population; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist; wherein the maturing dendritic cells take up and process antigen during maturation; formulating the mature dendritic cells for administration to an individual; wherein the mature dendritic cell formulation is to be administered together with an effective amount of an inflammation-activating lipid to produce an enhanced Th1 immune response to the predetermined antigen as compared with the formulated dendritic cell composition administered without the inflammation-activating lipid; wherein the inflammation-activating lipid comprises oxPAPC or PGPC.

In another aspect, an *in vitro* or *ex vivo* method is provided for producing a hyperactivated mature dendritic cell population, comprising: providing a cell population enriched for $CD14^-$ immature dendritic cells; and contacting the immature dendritic cells with an effective amount of a dendritic cell maturation agent; with or without Interferon gamma (IFNγ); and an inflammation activating lipid under culture conditions suitable for maturation of the immature dendritic cells to a time period sufficient to form a hyperactivated mature dendritic cell population; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC. In another aspect, an *in vitro* method is provided for producing activated antigen specific T cells, comprising: providing a cell population comprising $CD14^-$ immature dendritic cells; contacting the $CD14^-$ immature dendritic cells with a predetermined antigen; contacting the immature dendritic cells with an effective concentration of a dendritic cell maturation agent; with or without IFNγ; and an inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells for a time period sufficient to form a hyperactive mature dendritic cell population; wherein the dendritic cell maturation agent comprises a TLR agonist

comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC; and contacting the hyperactive mature dendritic cells with naïve T cells to form activated antigen specific T cells producing an increased amount of IFNγ as compared with T cells activated with a dendritic cell maturation agent with or without IFNγ, and without the inflammation-activating lipid; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC.

In another aspect, a use of hyperactivated T cells in the manufacture of a medicament for producing an enhanced immune response in an animal is provided, wherein the use comprises: providing a cell population comprising $CD14^-$ immature dendritic cells; contacting the immature dendritic cells with effective amounts of a dendritic cell maturation agent; with or without IFNγ; and an inflammation-activating lipid, and a predetermined antigen under culture conditions sufficient for maturation of the immature dendritic cells to form mature dendritic cells; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC; contacting the mature dendritic cells with naïve T cells to form activated T cells producing an increased amount of IFNγ and/or IL-1β as compared with T cells activated with a dendritic cell maturation agent and IFNγ without the inflammation-activating lipid; and wherein the enhanced immune response is a Th1 response.

In another aspect, an *in vitro* method is provided for producing an anti-tumor immune response comprising: providing a cell population comprising $CD14^-$ immature dendritic cells; contacting the immature dendritic cells with an effective amount of a dendritic cell maturation agent; with or without IFNγ; under culture conditions suitable for inducing maturation of the immature dendritic cells, wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist; and isolating the maturing dendritic cells

prior to full maturation; formulating the maturing dendritic cells for intratumoral or systemic administration; wherein the maturing dendritic cells are to be administered intratumorally; and wherein an inflammation-activating lipid is to be administered either intratumorally or systemically, wherein the inflammation-activating lipid comprises oxPAPC or PGPC.

In another aspect, an *in vitro* method is provided for producing a mature dendritic cell population that produces an enhanced Th1 response to an antigen, the method comprising: providing a cell population comprising $CD14^-$ immature dendritic cells; and contacting the immature dendritic cells with an effective amount of a dendritic cell maturation agent; with or without Interferon gamma (IFNγ); and an inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells for a sufficient time to form the mature dendritic cell population; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC; wherein the mature dendritic cell population produces an enhanced Th1 response to the antigen when contacted with naïve T cells.

In another aspect, a use of mature dendritic cells in the manufacture of a medicament for producing an anti-tumor immune response in an individual is provided, the use comprising: providing a cell population comprising $CD14^-$ immature dendritic cells; contacting the immature dendritic cells with a predetermined antigen, an effective amount of a dendritic cell maturation agent; with or without IFNγ; and an inflammation-activating lipid, under culture conditions suitable for inducing maturation of the immature dendritic cells and for a time period sufficient for the dendritic cells to uptake and process the predetermined antigen and to mature the dendritic cells; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating

lipid comprises oxPAPC or PGPC; isolating the mature dendritic cells; and formulating the isolated mature dendritic cells for administration to the individual.

In another aspect, a use of maturing dendritic cells in the manufacture of a medicament for producing an enhanced anti-tumor immune response in an individual is provided, the use comprising: providing a cell population comprising $CD14^-$ immature dendritic cells; contacting the immature dendritic cells with an effective amount of a dendritic cell maturation agent; with or without IFNγ under culture conditions suitable for inducing maturation of the immature dendritic cells, wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist; isolating the maturing dendritic cells prior to full maturation; formulating the isolated maturing dendritic cells for administration to the individual; and wherein the maturing dendritic cells are to be co-administered to the individual with an inflammation-activating lipid comprising oxPAPC or PGPC.

In another aspect, a use of the hyperactivated dendritic cells produced by the methods as disclosed herein in the manufacture of a medicament for treating cancer is provided.

In another aspect, a composition for activating antigen specific T cells is provided, comprising: a cell population enriched for dendritic cells matured with an effective concentration of a dendritic cell maturation agent, with or without IFNγ, and an inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells and for a time period sufficient to form hyperactive mature dendritic cells; and a predetermined antigen; wherein the cell population enriched for hyperactive mature dendritic cells produces an enhanced T cell response as compared with mature dendritic cells matured with the effective concentration of a dendritic cell maturation agent; with or without IFNγ; and without the inflammation-activating lipid, preferably wherein the enhanced T cell response is a Th1 response.

In another aspect, a composition comprising an isolated, hyperactive mature dendritic cell population, comprising: isolated hyperactive mature dendritic cells, produced

by contacting a cell population comprising $CD14^-$ immature dendritic cells with an effective concentration of a dendritic cell maturation agent; with or without IFNγ; and an inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells for a time period sufficient to form the hyperactive mature dendritic cells; wherein the hyperactive mature dendritic cells produce an enhanced T cell response, preferably wherein the enhanced T cell response is an increase in effector and memory T cell generation when contacted with naïve T cells; an increase in terminal differentiation and/or activation of CD4+ and/or CD8+ T cells; and an increase in the secretion of IL1β.

In another aspect, a composition comprising isolated or enriched hyperactive mature dendritic cells and a pharmaceutically acceptable carrier is provided, wherein the hyperactive mature dendritic cells produce more IL-1β, produce an increase in effector and memory T cells; and produce an increase in terminal differentiation and/or activation of CD4+ and/or CD8+ T cells than mature dendritic cells prepared by maturation of immature dendritic cells with a composition comprising effective concentrations of the dendritic cell maturation agent; with or without IFNγ; without the inflammation-activating lipid under conditions suitable for the maturation of the dendritic cells.

In one example, a method is provided for producing a mature hyperactive dendritic cell population, including providing immature dendritic cells; and contacting the immature dendritic cells *in vitro* or *ex vivo* with an effective concentration of dendritic cell maturation agent with or without Interferon γ and an inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells to form a hyperactive mature dendritic cell population. The mature hyperactive dendritic cell population produces an increased level of IL-1, in particular, IL-1β, an increase in effector and memory T cell generation, and an increase in terminal differentiation and activation of $CD4^+$ and $CD8^+$ T cells than induced by a mature dendritic cell population contacted *in vitro* or *ex vivo* with only the dendritic cell maturation agent with or without Interferon γ and without the inflammation-activating lipid. Similarly, the hyperactivated DCs produce greater amounts of Th-1 stimulating cytokines and smaller amounts of Th-2 stimulating cytokines than induced by a mature

CLAIMS

1. An *in vitro* or *ex vivo* method for producing a cell population enriched for hyperactive mature dendritic cells that produce an enhanced immune response to a predetermined antigen, the method comprising:

providing a cell population comprising $CD14^-$ immature dendritic cells; and

contacting the immature dendritic cells with an effective amount of a dendritic cell maturation agent, with or without Interferon gamma (IFNγ), and an inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells for a time period sufficient to form mature dendritic cells; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC; and

wherein the mature dendritic cell population produces an enhanced Th1 response to the antigen when contacted with naïve T cells.

2. An *in vitro* or *ex vivo* method for producing an enhanced immune response to an antigen, the method comprising:

providing a cell population comprising $CD14^-$ immature dendritic cells;

contacting the immature dendritic cells with an effective amount of a dendritic cell maturation agent, with or without Interferon gamma (IFNγ), and a predetermined antigen under culture conditions suitable for maturation of the immature dendritic cells to form the mature dendritic cell population; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist;

wherein the maturing dendritic cells take up and process antigen during maturation;

formulating the mature dendritic cells for administration to an individual; and

wherein the mature dendritic cell formulation is formulated for administration together with an effective amount of an inflammation-activating lipid to produce an enhanced Th1 immune response to the predetermined antigen as compared with the formulated dendritic cell composition administered without the inflammation-activating lipid; wherein the inflammation-activating lipid comprises oxPAPC or PGPC.

3. An *in vitro* or *ex vivo* method for producing a hyperactivated mature dendritic cell population, comprising:

providing a cell population enriched for $CD14^-$ immature dendritic cells; and

contacting the immature dendritic cells with an effective amount of a dendritic cell maturation agent; with or without Interferon gamma (IFNγ); and an inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells to a time period sufficient to form a hyperactivated mature dendritic cell population; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC.

4. An *in vitro* method for producing activated antigen specific T cells, comprising:

providing a cell population comprising $CD14^-$ immature dendritic cells;

contacting the $CD14^-$ immature dendritic cells with a predetermined antigen;

contacting the immature dendritic cells with an effective concentration of a dendritic cell maturation agent; with or without IFNγ; and an inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells for a time period sufficient to form a hyperactive mature dendritic cell population;

wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC; and

contacting the hyperactive mature dendritic cells with naïve T cells to form activated antigen specific T cells producing an increased amount of IFNγ as compared with T cells activated with a dendritic cell maturation agent with or without IFNγ, and without the inflammation-activating lipid; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC.

5. Use of hyperactivated T cells in the manufacture of a medicament for producing an enhanced immune response in an animal, wherein the use comprises:

providing a cell population comprising $CD14^-$ immature dendritic cells;

contacting the immature dendritic cells with effective amounts of a dendritic cell maturation agent; with or without IFNγ; and an inflammation-activating lipid, and a predetermined antigen under culture conditions sufficient for maturation of the immature dendritic cells to form mature dendritic cells; wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC;

contacting the mature dendritic cells with naïve T cells to form activated T cells producing an increased amount of IFNγ and/or IL-1β as compared with T cells activated with a dendritic cell maturation agent and IFNγ without the inflammation-activating lipid; and

wherein the enhanced immune response is a Th1 response.

6. An *in vitro* method for producing an anti-tumor immune response comprising:

providing a cell population comprising $CD14^-$ immature dendritic cells;

contacting the immature dendritic cells with an effective amount of a dendritic cell maturation agent; with or without IFNγ; under culture conditions suitable for inducing maturation of the immature dendritic cells, wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist; and

isolating the maturing dendritic cells prior to full maturation;

formulating the maturing dendritic cells for intratumoral or systemic administration; and

wherein the maturing dendritic cells are to be administered with an inflammation-activating lipid either intratumorally or systemically, wherein the inflammation-activating lipid comprises oxPAPC or PGPC.

7. An *in vitro* method for producing a mature dendritic cell population that produces an enhanced Th1 response to an antigen, the method comprising:

providing a cell population comprising $CD14^-$ immature dendritic cells; and

contacting the immature dendritic cells with an effective amount of a dendritic cell maturation agent; with or without Interferon gamma (IFNγ); and an

inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells for a sufficient time to form the mature dendritic cell population;

wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC;

wherein the mature dendritic cell population produces an enhanced Th1 response to the antigen when contacted with naïve T cells.

8. Use of mature dendritic cells in the manufacture of a medicament for producing an anti-tumor immune response in an individual, the use comprising:

providing a cell population comprising $CD14^-$ immature dendritic cells;

contacting the immature dendritic cells with a predetermined antigen, an effective amount of a dendritic cell maturation agent; with or without IFNγ; and an inflammation-activating lipid, under culture conditions suitable for inducing maturation of the immature dendritic cells and for a time period sufficient for the dendritic cells to uptake and process the predetermined antigen and to mature the dendritic cells;

wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist and the inflammation-activating lipid comprises oxPAPC or PGPC;

isolating the mature dendritic cells; and

formulating the isolated mature dendritic cells for administration to the individual.

9. Use of maturing dendritic cells in the manufacture of a medicament for producing an enhanced anti-tumor immune response in an individual, the use comprising:

providing a cell population comprising $CD14^-$ immature dendritic cells;

contacting the immature dendritic cells with an effective amount of a dendritic cell maturation agent; with or without IFNγ under culture conditions suitable for inducing maturation of the immature dendritic cells, wherein the dendritic cell maturation agent comprises a TLR agonist comprising a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR6, a TLR7, and/or a TLR8 agonist;

isolating the maturing dendritic cells prior to full maturation;

formulating the isolated maturing dendritic cells for administration to the individual; and

wherein the maturing dendritic cells are to be co-administered to the individual with an inflammation-activating lipid comprising oxPAPC or PGPC.

10. The method of claims 1 to 4, 6 to 7, or the use of claims 5, 8, or 9, of any one of the preceding claims, wherein:

a) the dendritic cell maturation agent is the TLR4 agonist LPS, or BCG, the TLR7 and/or TLR8 agonist is an imidazoquinoline compound comprising an imidazoquinoline-4-amine compound comprising 4-amino-2-ethoxymethyl-α,α-dimethyl-1H-imidazol[4,5-c]quinolin-1-ethanol (R848) or 1-(2-methylpropyl)-lH-imidazo[4,5-c]quinolin-4-amine (R837) the TLR3 agonist is a synthetic double stranded polyribonucleotide comprising poly I:C or poly[I]:poly[C(12)U], or the TLR9 agonist is a sequence of nucleic acids containing unmethylated CpG motifs known to induce the maturation of DC, or any combination thereof;

b) wherein the inflammation-activating lipid further comprises one or more of, 1-palmitoyl-2-(5-oxovaleroyl)-*sn*-glycero-3-phosphatidylcholine (POV-PC), 1-palmitoyl-2-(5,6-epoxyisopropane E_2)-*sn*-glycero-3-phosphatidylcholine (PEIPC), 1-palmitoyl-2-(5-hydroxy-8-oxo-6-octenedioyl) *sn*-glycero-3-phosphocholine (HOdiA-PC), 1-palmitoyl-2-(5-keto-6-octene-dioyl)-*sn*-glycero-3-phosphocholine (KOdiA-PC), 1-palmitoyl-2-(5-hydroxy-8-oxooct-6-enoyl)-*sn*-glycero-3-phosphocholine (HOOA-PC), 1-palmitoyl-(5-keto-8-oxo-6-octenoyl)-*sn*-glycero-3-phosphocholine (KOOA-PC);

c) wherein the immature dendritic cells are contacted with the dendritic cell maturation agent for at least about 3 hours prior to the addition of the inflammation-activating lipid, and the dendritic cells are cultured for an additional about 1 to 24 hours, or more;

d) wherein the method comprises contacting the maturing dendritic cells with a predetermined antigen prior to, simultaneously with, or subsequent contacting the immature dendritic cells with the dendritic cell maturation agent, with or without IFNγ, and the oxidized inflammation-activating lipid; preferably

wherein the predetermined antigen is a tumor specific antigen, a tumor associated antigen, a tumor cell, a tumor cell lysate, a tumor cell membrane preparation, a

recombinantly produced tumor associated or tumor specific antigen, a peptide antigen, or an isolated antigen; preferably

wherein the recombinantly produced antigen, peptide antigen or isolated antigen is a tumor associated, or a tumor specific antigen, a tumor specific or tumor associated peptide antigen, or a tumor specific or tumor associated isolated antigen;

e) the method further comprises:

obtaining a cell population enriched for monocytic dendritic cell precursors; and

culturing the precursors in the presence of a dendritic cell differentiating agent to form the immature dendritic cells; preferably

wherein the dendritic cell differentiating agent is GM-CSF, or a combination of GM-CSF and Interleukin 4 (IL-4), Interleukin 7 (IL-7), Interleukin 13 (IL-13), or Interleukin 15 (IL-15);

or wherein the monocytic dendritic cell precursors are isolated from a human subject; and/or

f) wherein the enhanced immune response is a Th1 response.

11. The method of any one of claims 2 or 10, wherein the formulated mature or maturing dendritic cells and the inflammation-activating lipid are to be administered simultaneously or sequentially in any order.

12. The method of claim 3 or 10, further comprising contacting the immature dendritic cells with a predetermined antigen prior to or simultaneously with contacting with the dendritic cell maturation agent; with or without Interferon gamma (IFNγ); or the inflammation-activating lipid; and/or

wherein the activity of the mature dendritic cells is measured by an increase in a Th1 response, preferably wherein the increase in Th1 is measured by an increase in effector and memory T cell generation induced by the mature dendritic cells; an increase in terminal differentiation and/or activation of $CD4^+$ and/or $CD8^+$ T cells induced by the mature dendritic cells; and an increase in the secretion of IL1β, IL-2, and/or TNFα, by the mature dendritic cells.

13. The method of any one of claims 4 or 10, wherein the immature dendritic cells and T cells are autologous to each other.

14. Use of the hyperactivated dendritic cells produced by any of the methods of the preceding claims, in the manufacture of a medicament for treating cancer.

15. A composition for activating antigen specific T cells, comprising:

a cell population enriched for dendritic cells matured with an effective concentration of a dendritic cell maturation agent, with or without IFNγ, and an inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells and for a time period sufficient to form hyperactive mature dendritic cells; and

a predetermined antigen;

wherein the cell population enriched for hyperactive mature dendritic cells produces an enhanced T cell response as compared with mature dendritic cells matured with the effective concentration of a dendritic cell maturation agent; with or without IFNγ; and without the inflammation-activating lipid, preferably wherein the enhanced T cell response is a Th1 response.

16. A composition comprising an isolated, hyperactive mature dendritic cell population, comprising:

isolated hyperactive mature dendritic cells, produced by contacting a cell population comprising $CD14^-$ immature dendritic cells with an effective concentration of a dendritic cell maturation agent; with or without IFNγ; and an inflammation-activating lipid under culture conditions suitable for maturation of the immature dendritic cells for a time period sufficient to form the hyperactive mature dendritic cells;

wherein the hyperactive mature dendritic cells produce an enhanced T cell response, preferably wherein the enhanced T cell response is an increase in effector and memory T cell generation when contacted with naïve T cells; an increase in terminal differentiation and/or activation of $CD4^+$ and/or $CD8^+$ T cells; and an increase in the secretion of IL1β.

17. A composition comprising isolated or enriched hyperactive mature dendritic cells and a pharmaceutically acceptable carrier, wherein the hyperactive mature dendritic cells produce more IL-1β, produce an increase in effector and memory T cells; and produce

an increase in terminal differentiation and/or activation of $CD4^+$ and/or $CD8^+$ T cells than mature dendritic cells prepared by maturation of immature dendritic cells with a composition comprising effective concentrations of the dendritic cell maturation agent; with or without IFNγ; without the inflammation-activating lipid under conditions suitable for the maturation of the dendritic cells.

18. The composition of any one of claims 15-17, wherein:

a) the cell population enriched for hyperactive mature dendritic cells produces an enhanced antigen specific Th1 response when measured *in vitro* or *in vivo* and wherein the enhanced Th cell response is an increase in effector and memory T cell generation; an increase in terminal differentiation and/or activation of $CD4^+$ and/or $CD8^+$ T cells; and/or an increase in the secretion of IL1β, IL-2, and/or TNFα;

b) wherein the dendritic cell maturation agent is a Toll-like Receptor (TLR) agonist, preferably wherein the TLR agonist is a TLR2 agonist, a TLR3 agonist, a TLR4 agonist, a TLR7 agonist ,and/or a TLR8 agonist, or a TLR9, more preferably wherein the TLR4 agonist is LPS, or BCG, the TLR7 and/or TLR8 agonist is an imidazoquinoline compound, preferably, a imidazoquinoline-4-amine compound, more preferably 4-amino-2-ethoxymethyl-α,α-dimethyl-1H-imidazol[4,5-c]quinolin-1-ethanol (R848) or 1-(2-methylpropyl)-lH-imidazo[4,5-c]quinolin-4-amine (R837), and their derivatives, the TLR3 agonist is a synthetic double stranded polyribonucleotide, preferably poly I:C or poly[I]:poly[C(12)U], or the TLR9 agonist is a sequence of nucleic acids containing unmethylated CpG motifs known to induce the maturation of DC, or any combination thereof;

c) wherein the inflammation-activating lipid is one or more of oxidized 1-palmitoyl-2-arachidonyl-*sn*-glycero-3-phosphorylcholine (oxPAPC), 1-palmitoyl-2-(5-oxovaleroyl)-*sn*-glycero-3-phosphatidylcholine (POV-PC), 1-palmitoyl-2-glutaroyl-*sn*-glycero-3-phosphatidylcholine (PGPC) and 1-palmitoyl-2-(5,6-epoxyisopropane E_2)-*sn*-glycero-3-phosphatidylcholine (PEIPC), 1-palmitoyl-2-(5-hydroxy-8-oxo-6-octenedioyl) *sn*-glycero-3-phosphocholine (HOdiA-PC), 1-palmitoyl-2-(5-keto-6-octene-dioyl)-*sn*-glycero-3-phosphocholine (KOdiA-PC), 1-palmitoyl-2-(5-hydroxy-8-oxooct-6-enoyl)-*sn*-glycero-3-

phosphocholine (HOOA-PC), 1-palmitoyl-(5-keto-8-oxo-6-octenoyl)-*sn*-glycero-3-phosphocholine (KOOA-PC); and/or

d) the predetermined antigen is a tumor specific antigen, a tumor associated antigen, a viral antigen, a bacterial antigen, a tumor cell, a bacterial cell, a recombinant cell expressing an antigen, a bacterial or tumor cell lysate, a bacterial or tumor cell membrane preparation, a recombinantly produced antigen, a peptide antigen, or an isolated antigen, wherein the recombinantly produced antigen, peptide antigen or isolated antigen are a bacterial, a viral, a tumor associated, or a tumor specific antigen.

19. The cell population of claim 16, further comprising a predetermined antigen, isolated T cells or isolated lymphocytes, optionally wherein the T cells are naïve T cells.

20. The use of claim 5, wherein:

a) the immature dendritic cells and T cells are autologous or allogeneic to the animal;

b) wherein the immature dendritic cells and T cells have the same MHC haplotype;

c) wherein the animal is human;

d) wherein the administration is parenteral; optionally wherein parenteral administration is intravenous, intradermal, subcutaneous, oral, transdermal, transmucosal, intratumoral, or rectal; or

e) wherein the inflammation-activating lipid is to be applied to the site of administration.

21. The method of claim 6, wherein the cell population comprising the $CD14^-$ dendritic cells is obtained from skin, spleen, bone marrow, thymus, lymph node, umbilical cord blood, or peripheral blood; or

wherein the cell population comprising the $CD14^-$ dendritic cells is obtained from an individual to be treated or from a healthy individual HLA-matched to the individual to be treated.

22. The use of claim 8, wherein:

a) the cell population comprising the $CD14^-$ dendritic cells is obtained from skin, spleen, bone marrow, thymus, lymph node, umbilical cord blood, or peripheral blood or

wherein the cell population comprising the $CD14^-$ dendritic cells is obtained from the individual to be treated or from a healthy individual HLA-matched to the individual to be treated; and/or

b) wherein the mature dendritic cells are cryopreserved and are thawed prior to administration.

23. The use of claim 9, wherein:

a) the cell population comprising the $CD14^-$ dendritic cells is obtained from skin, spleen, bone marrow, thymus, lymph node, umbilical cord blood, or peripheral blood; or

wherein the cell population comprising the $CD14^-$ dendritic cells is obtained from the individual to be treated or from a healthy individual HLA-matched to the individual to be treated; or

the isolated maturing dendritic cells are cryopreserved and are thawed prior to administration; and/or

b) wherein the isolated maturing dendritic cells and the inflammation-activating lipid are to be administered simultaneously or sequentially in any order; optionally

wherein the inflammation-activating lipid is in the same composition, or in separate compositions optionally

wherein the inflammation-activating lipid is in a separate composition and is to be applied topically to the site of administration.