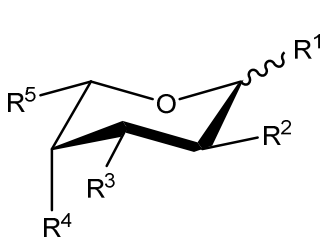
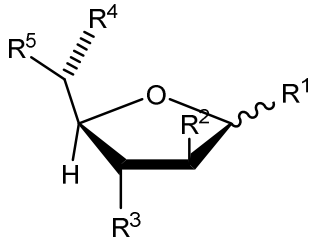
BRIEF SUMMARY OF THE DISCLOSURE

[0005] In one example**,** methods for producing T cells having reduced surface fucosylation are provided. In some examples, the methods include culturing T cells in the presence of a fucose analog in a cell culture medium; wherein the fucose analog has formula (**I**) or (**II**):



(**I**)



(**II**)

or a pharmaceutically acceptable salt or solvate form thereof, wherein each of formula (**I**) or (**II**) can be the alpha or beta anomer or the corresponding aldose form;

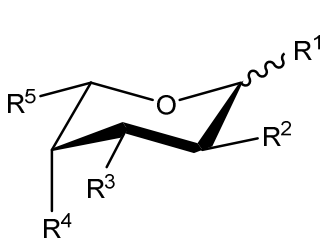
R^2 is halogen; each of R^1, R^3, and R^4 is independently –OH or a hydrolyzable ester group; and R^5 is –CH_3, or

each of R^1, R^2, R^3, and R^4 is independently -OH or a hydrolyzable ester group; and R^5 is -C≡CH; and

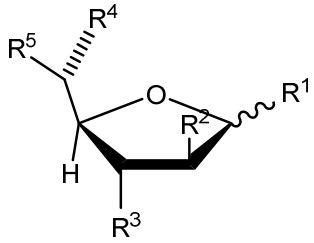
wherein the T cells having reduced surface fucosylation relative to T cells cultured in the absence of the fucose analog.

[0005a] In one aspect, the present disclosure refers to a method of producing T cells having reduced surface fucosylation, the method comprising:

culturing T cells in the presence of a fucose analog in a cell culture medium; wherein said fucose analog is selected from the group consisting of formulae (**I**) or (**II**):



(I)



(II)

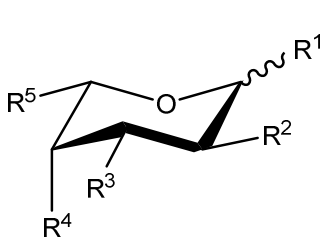
or a pharmaceutically acceptable salt or solvate form thereof, wherein each of formula (**I**) or (**II**) can be the alpha or beta anomer or the corresponding aldose form;

R^2 is halogen; each of R^1, R^3, and R^4 is independently –OH or a hydrolyzable ester group; and R^5 is $–CH_3$, or

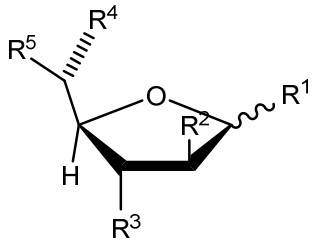
each of R^1, R^2, R^3, and R^4 is independently -OH or a hydrolyzable ester group; and R^5 is -C≡CH; and

wherein said T cells having reduced surface fucosylation relative to T cells cultured in the absence of said fucose analog.

[0006] In another example, methods for producing T cells having reduced surface fucosylation are provided. In some examples, the methods include providing a fucose analog to an animal and obtaining T cells having reduced surface fucosylation from the animal; wherein the fucose analog has formula (**I**) or (**II**):



(**I**)



(**II**)

or a pharmaceutically acceptable salt or solvate form thereof, wherein each of formula (**I**) or (**II**) can be the alpha or beta anomer or the corresponding aldose form;

R^2 is halogen; each of R^1, R^3, and R^4 is independently –OH or a hydrolyzable ester group; and R^5 is – CH_3, or

each of R^1, R^2, R^3, and R^4 is independently -OH or a hydrolyzable ester group; and R^5 is -C≡CH; and

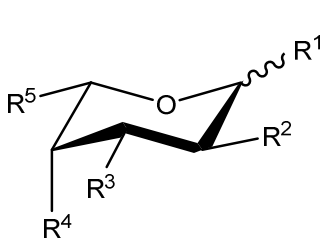
wherein the T cells obtained from the animal have reduced surface fucosylation relative to T cells present in or obtained from a control animal that was not provided with said fucose analog.

[0006a] In one aspect, the present disclosure refers to a method of producing T cells having reduced surface fucosylation, the method comprising:

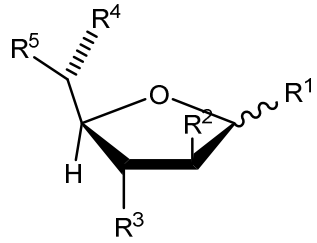
providing a fucose analog to an animal; and

obtaining T cells having reduced surface fucosylation from the animal,

said fucose analog is selected from the group consisting of formulae (**I**) or (**II**):



(**I**)



(**II**)

or a pharmaceutically acceptable salt or solvate form thereof, wherein each of formula (**I**) or (**II**) can be the alpha or beta anomer or the corresponding aldose form;

R^2 is halogen; each of R^1, R^3, and R^4 is independently –OH or a hydrolyzable ester group; and R^5 is – CH_3, or

each of R^1, R^2, R^3, and R^4 is independently -OH or a hydrolyzable ester group; and R^5 is -C≡CH; and wherein said T cells obtained from the animal have reduced surface fucosylation relative to T cells present in or obtained from a control animal that was not provided with said fucose analog.

[0007] In still another example, methods for providing an adoptive cell therapy to a subject are provided. In some aspects, the methods include administering a mixture having T cells with reduced surface fucosylation to the subject in need of the cell therapy.

[0007a] In one aspect, the present disclosure refers to use of a mixture comprising T cells with reduced surface fucosylation in the manufacture of a medicament for providing an adoptive cell therapy to a subject in need of the cell therapy.

[0008] In still another example, methods for treating a cancer are provided. In some examples, the methods include administering a mixture having T cells with reduced surface fucosylation to the subject in need of the cancer treatment.

[0008a] In one aspect, the present disclosure relates to use of a mixture comprising T cells with reduced surface fucosylation in the manufacture of a medicament for treating a cancer in a subject in need of said cancer treatment.

[0009] In still another example, methods for treating a cancer are provided. In some examples, the method include administering a mixture having T cells with reduced surface fucosylation to the subject in need of the cancer treatment, wherein the T cells with reduced surface fucosylation are produced according to any methods for producing such T cells.

[0010] These and other aspects of the disclosures provided herein can be more fully understood by reference to the following detailed description, non-limiting examples of specific embodiments, and the appended figures.

BRIEF DESCRIPTION OF THE DRAWINGS

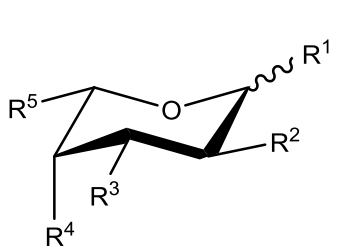
[0011] FIG. 1 shows a graph demonstrating *in vivo* effects of the adoptive transfer of splenocytes from KLH-A20 Id Fab vaccinated donor mice that were either treated or not with 2FF on the growth of IV implanted A20 mouse lymphoma cells in naïve BALB/c mice.

[0012] FIG. 2 shows a graph demonstrating *in vivo* effects of 2FF on the growth of SQ implanted A20 mouse lymphoma cells in naïve BALB/c mice that were used to generate isolated Cd3+ T cells.

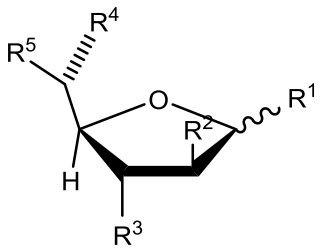
WHAT IS CLAIMED IS:

1. A method of producing T cells having reduced surface fucosylation, the method comprising:

culturing T cells in the presence of a fucose analog in a cell culture medium; wherein said fucose analog is selected from the group consisting of formulae (**I**) or (**II**):



(**I**)



(**II**)

or a pharmaceutically acceptable salt or solvate form thereof, wherein each of formula (**I**) or (**II**) can be the alpha or beta anomer or the corresponding aldose form;

R^2 is halogen; each of R^1, R^3, and R^4 is independently –OH or a hydrolyzable ester group; and R^5 is $–CH_3$, or

each of R^1, R^2, R^3, and R^4 is independently -OH or a hydrolyzable ester group; and R^5 is -C≡CH; and

wherein said T cells having reduced surface fucosylation relative to T cells cultured in the absence of said fucose analog.

2. The method of claim **1**, further comprising a step of isolating the T cells having reduced surface fucosylation.

3. The method of claim **1** or **2**, wherein R^2 is halogen; each of R^1, R^3, and R^4 is independently –OH or a hydrolyzable ester group; and R^5 is $–CH_3$; wherein optionally

R^2 is -F; each of R^1, R^3, and R^4 is independently –OH or a hydrolyzable ester group; and R^5 is $–CH_3$; wherein optionally

each of R^1, R^3 and R^4 is independently selected from the group consisting of -OH and $–OC(O)C_1$-C_{10} alkyl; wherein optionally

each of R^1, R^3 and R^4 is independently selected from the group consisting of -OH and $–OC(O)CH_3$; and wherein optionally

each of R^1, R^2, R^3, and R^4 is independently -OH or a hydrolyzable ester group; and R^5 is -C≡CH.

4. The method of claim **1**, wherein the fucose analog is 2-deoxy-2-fluoro-L-fucose or alkynyl fucose peracetate.

5. The method of any one of claims **1-4**, wherein said T cells having reduced surface fucosylation are T cells comprising at least 5% reduction of surface fucosylation relative to T cells cultured in the absence of said fucose analog; wherein optionally

the culture medium comprises CD3 and CD28 antibodies; wherein optionally

the culture medium further comprises interleukin 2 (IL2); wherein optionally

said T cells comprise human peripheral T cells; and wherein optionally

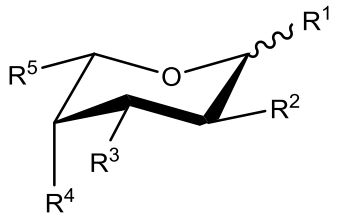
said produced T cells having reduced surface fucosylation are configured to be used in an adoptive cell therapy.

6. A method of producing T cells having reduced surface fucosylation, the method comprising:

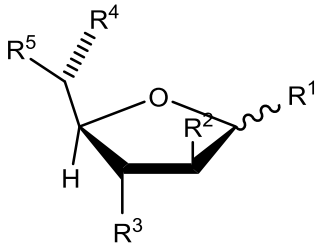
providing a fucose analog to an animal; and

obtaining T cells having reduced surface fucosylation from the animal,

said fucose analog is selected from the group consisting of formulae (**I**) or (**II**):



(**I**)



(**II**)

or a pharmaceutically acceptable salt or solvate form thereof, wherein each of formula (**I**) or (**II**) can be the alpha or beta anomer or the corresponding aldose form;

R^2 is halogen; each of R^1, R^3, and R^4 is independently –OH or a hydrolyzable ester group; and R^5 is $–CH_3$, or

each of R^1, R^2, R^3, and R^4 is independently -OH or a hydrolyzable ester group; and R^5 is -C≡CH; and

wherein said T cells obtained from the animal have reduced surface fucosylation relative to T cells present in or obtained from a control animal that was not provided with said fucose analog.

7. The method of claim **6**, wherein R^2 is halogen; each of R^1, R^3, and R^4 is independently –OH or a hydrolyzable ester group; and R^5 is $–CH_3$; wherein optionally

R^2 is -F; each of R^1, R^3, and R^4 is independently –OH or a hydrolyzable ester group; and R^5 is $–CH_3$; wherein optionally

each of R^1, R^3 and R^4 is independently selected from the group consisting of -OH and $–OC(O)C_1$-C_{10} alkyl; wherein optionally

each of R^1, R^3 and R^4 is independently selected from the group consisting of -OH and $–OC(O)CH_3$; and wherein optionally

each of R^1, R^2, R^3, and R^4 is independently -OH or a hydrolyzable ester group; and R^5 is -C≡CH.

8. The method of claim **6**, wherein the fucose analog is 2-deoxy-2-fluoro-L-fucose or alkynyl fucose peracetate.

9. The method of any one of claims **6**-**8**, wherein said T cells having reduced surface fucosylation are T cells comprising at least 5% reduction of surface fucosylation relative to T cells cultured in the absence of said fucose analog; wherein optionally the T cells are obtained from a spleen of the animal; wherein optionally

said fucose analog is provided to the animal via feeding; wherein optionally

the method further comprises enriching T cells from the T cells obtained from the animal; wherein optionally said produced T cells having reduced surface fucosylation are configured to be used in an adoptive cell therapy; and wherein optionally

the animal is a human.

10. Use of a mixture comprising T cells with reduced surface fucosylation in the manufacture of a medicament for providing an adoptive cell therapy to a subject in need of the cell therapy.

11. The use of claim **10**, wherein said T cells with reduced surface fucosylation are produced according to the method of any one of claims **1**-**9**; wherein optionally

said T cells comprises at least 5% reduction of surface fucosylation relative to normal T cells; wherein optionally

the subject is a human; wherein optionally

said T cells comprise human peripheral T cells; wherein optionally

said T cells with reduced surface fucosylation originated from said subject; wherein optionally

said T cells with reduced surface fucosylation originated from an animal different from said subject; wherein optionally

said mixture is substantially free of red blood cells; wherein optionally

the cell therapy is configured to treat a cancer; wherein optionally

the mixture is to be administered locally (at or in the vicinity of cancer cells); and wherein optionally

the mixture is to be administered systematically (administration routes).

12. Use of a mixture comprising T cells with reduced surface fucosylation in the manufacture of a medicament for treating a cancer in a subject in need of said cancer treatment.

13. The use of claim **12**, wherein said T cells with reduced surface fucosylation are produced according to the method of any one of claims **1**-**9**; wherein optionally

said T cells comprises at least 5% reduction of surface fucosylation relative to normal T cells; wherein optionally

the subject is a human; wherein optionally

said T cells comprise human peripheral T cells; wherein optionally

said T cells with modified surface fucosylation originated from said subject; wherein optionally

said T cells with modified surface fucosylation originated from an animal different from said subject; wherein optionally

said mixture is substantially free of red blood cells; wherein optionally

the cell therapy is configured to treat a cancer; wherein optionally

the mixture is to be administered locally; and wherein optionally

the mixture is to be administered systematically.