CLAIMS

1. A method for culturing microorganisms, comprising:
   i. providing microorganisms that have been transformed with at least one nucleic acid coding for a casein, wherein expression of said nucleic acid is inducible by lactose, wherein the microorganisms are gal+ *E. coli*, wherein the nucleic acid coding for a casein is under the control of a promoter fused with the laco operator region of the lactose operon, and wherein the microorganisms express the lacI repressor of said operon,
   ii. culturing said microorganisms, in a culture medium comprising glucose as a source of carbon, wherein expression of the nucleic acid is not induced
   iii. depleting the culture medium of glucose when the microorganisms are in the exponential phase growth, wherein lactoserum is present in the culture medium at the time of said depletion, thereby providing the lactose present in the lactoserum as a source of carbon, and wherein expression of the nucleic acid is induced by the lactose present in the lactoserum
   iv. further culturing the microorganisms in the presence of a source of carbon.

2. The method of claim 1, wherein lactoserum is added to reach a lactose concentration of at least 1% (w/v).

3. The method of claim 1 or 2, wherein the lactoserum is a lactoserum permeate.

4. The method of any one of claims 1 to 3, wherein lactoserum is acid lactoserum, and wherein pH of culture medium is adjusted around pH=7, during microorganism culture.

5. The method of any one of claims 1 to 4, wherein lactose represents at least 2% (w/w, wet weight) of the lactoserum.

6. The method of any one of claims 1 to 5, wherein glucose and lactoserum are present in the culture medium of ii.

7. The method of any one of claims 1 to 5, wherein lactoserum is not present in the culture medium of ii and is added in iii.

8. The method of any one of claims 1 to 7, wherein depletion of glucose in iii is performed by consumption of the glucose by the microorganisms, in the absence of refeed of glucose.

9. A method for obtaining a casein composition, comprising:
   i. performing the method of any one of claims 1 to 8,
   ii. thereby providing a microorganism composition wherein the pH of the composition is equal or above 6.5 and preferably below 9
   iii. heating the microorganism composition so as to reduce the amount of the other proteins in soluble fraction of the composition, wherein heating is performed at a temperature equal or above 75°C,
   iv. recovering the soluble fraction from the heated cell composition of iii),
   thereby obtaining a casein composition in the soluble fraction.

10. The method of claim 9, further comprising washing the microorganism composition to remove the culture medium before heating in step iii).

11. The method of claim 9 or 10, further comprising lysing the microorganism composition before iii).

12. The method of claim 9 or 10, wherein the microorganisms in the microorganism composition are not lysed before iii) and heating in step iii) lyses the microorganisms.

13. The method of any one of claims 9 to 12, comprising further processing the soluble fraction by adding at least one step chosen among addition of activated charcoal, membrane filtration, chromatography or casein precipitation, thereby obtaining a casein composition that is purified.

14. The method of any one of claims 9 to 13, wherein heating in in step iv) of said method for obtaining a casein composition is performed at a temperature equal or higher than 95°C.

15. The method of any one of claims 9 to 14, wherein the casein is selected from beta casein, alpha-S1 casein, alpha-S2 casein and mixture of these caseins, in particular wherein the casein is selected from beta casein, alpha-S1 casein and mixture of these caseins.

16. The method of any one of claims 9 to 15, wherein the microorganisms are transformed with a nucleic acid coding for alpha-casein and another nucleic acid coding for beta casein, wherein expression of the two nucleic acids is induced by lactose.

17. The method of any one of claims 9 to 16, wherein the microorganisms are not transformed with a nucleic acid coding for kappa-casein.

18. The method of any one of claims 9 to 17, wherein the ratio of casein as compared to the total proteins is increased in the soluble fraction as compared to the ratio in the microorganism composition.

19. A method for reducing environmental impact of a casein composition prepared by fermentation of transgenic microorganisms, comprising

i. providing microorganisms that have been transformed with at least one nucleic acid coding for a casein, , wherein the microorganisms are gal+ *E. coli*, wherein the nucleic acid coding for a casein is under the control of a promoter fused with the laco operator region of the lactose operon, and wherein the microorganisms express the lacI repressor of said operon

ii. culturing said microorganisms, using a medium comprising lactoserum so as to express and produce casein,

iii. thereby providing a microorganism composition wherein the pH of the composition is equal or above 6.5 and preferably below 9

iv. heating the microorganism composition so as to reduce the amount of the other proteins in soluble fraction of the composition, wherein heating is performed at a temperature at a temperature equal or above 75°C,

v. recovering the soluble fraction from the heated cell composition of iv),

thereby obtaining a casein composition in the soluble fraction, wherein the environmental impact is reduced as compared to the environmental impact of a casein composition obtained by the same steps, except that glucose or sucrose or molasses are used in place of lactoserum in b.

20. The method of claim 19, wherein the reduction in environmental impact is observed for at least one criteria selected from (i) Climate change, (ii) acidification, (iii) Ecotoxicity, (iv) Use of non-renewable energy resources, (v) Eutrophication of freshwater, (vi) Eutrophication of marine water, (vii) Eutrophication of terrestrial land, (viii) Human toxicity, carcinogenic, (ix) Human toxicity, non-carcinogenic, (x) Ionizing radiation, impact on human health, (xi) Land use, (xii) Use of material resources, (xiii) Ozone depletion potential, (xiv) Particulate matter formation, (xv) Photochemical oxidant formation, and (xvi) Water use, preferably (i) climate change.

21. A method for obtaining a dairy substitute, comprising performing the method according to any one of claims 9 to 18, mixing the casein composition with at least one other ingredient comprising at least one component selected from the group consisting of proteins, water, calcium, lipids, and carbohydrate to obtain a liquid pre-curd composition (LpCC), and further processing the liquid pre-curd composition (LpCC) to obtain a dairy substitute.

22. The method of claim 21, wherein processing of the LpCC comprises

v. adding at least one curdling agent to the liquid composition so as to obtain a curd, and

vi. further processing said curd in order to obtain a dairy substitute, wherein the dairy substitute is a cheese substitute or a yoghourt substitute.

23. The method of claim 22, wherein the further step in vi) comprises acidic precipitation of casein, at room temperature or by heating at 90°C at pH=4.6.