[0007] There is therefore a need to provide an improved delivery technique that overcomes the disadvantages mentioned above to enhance intracellular delivery of molecules, drugs and nucleic acids.

SUMMARY OF THE INVENTION

[0007a] In a first aspect, the present invention refers to a construct for promoting absorption of molecules by a cell located at the surface of the construct; wherein the construct comprises:

- a plurality of nanoscale protrusions located at the surface of the construct;
- wherein the protrusions have a size and are spaced apart from each other at a distance that promotes absorption of molecules by said cell;
- wherein the protrusions are in form of nanopillars;
- wherein the pitch between the nanopillars from edge to edge is between 150 to 300 nm such that the pitch of the protrusion is less than the size of the cells to be located at the surface of the construct,
- and wherein the protrusions are arranged in an isotropic pattern and are round or polygonal.

[0007b] In a second aspect, the present invention refers to a method of promoting absorption of molecules by cells, wherein the method comprises:

- providing a construct according to the present invention;
- seeding and culturing at least one cell at the surface of the construct under conditions suitable for absorption of molecules by the cells.

[0007c] In a third aspect, the present invention refers to the use of a construct according to the present invention for cell transfection, or drug-delivery or high-throughput screening arrays.

[0008] According to ~~a first aspect~~one example, there is provided a construct for promoting absorption of molecules by a cell located at the surface of the construct; wherein the construct comprises:

- a plurality of micro and/or nanoscale protrusions located at the surface of the construct;
- wherein the protrusions have a size and are spaced apart from each other at a distance that promotes absorption of molecules by said cell.

[0009] According to ~~a second aspect~~another example, there is provided a method of promoting absorption of molecules by cells, wherein the method comprises:

- providing a construct as defined above;
- seeding and culturing at least one cell at the surface of the construct under conditions suitable for absorption of molecules by the cells.

[0010] According to ~~a third aspect~~another example, there is provided a use of a construct as defined above for cell transfection, or drug-delivery or high-throughput screening arrays.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The invention will be better understood with reference to the detailed description when considered in conjunction with the non-limiting examples and the accompanying drawings, in which:

[0012] **Fig. 1** shows the verification of topographical structures on the substrate. Scanning electron microscopy of poly(methyl methacrylate) (PMMA) nano-and micro-structures used in this study shows (A) a 2 μm diameter pillar with 2 μm height (top view), (B) a 200 nm diameter pillar with 400 nm height (top view), (C) a 250 nm grating with 250 nm height (top view), (D) 2 μm PMMA pillars with residual layer (cross sectional view), (E) 200 nm Rhodamine-PS pillar without residual layer (cross sectional view) and (F) 2 μm Rhodamine--polystyrene collapse pillar (top view). It can be seen from Fig. 1 that all SEM images showed high fidelity and dimensions that were in accordance to the initial mold used.

[0013] **Fig. 2** shows magnified images of fluorescently stained F-actin (red – bright colour) hMSC (A-D), COS7 (E-H) and MCF7 (I-L) cultured on PMMA control, 2 μm pillars,

CLAIMS:

1. A construct for promoting absorption of molecules by a cell located at the surface of the construct; wherein the construct comprises:

- a plurality of nanoscale protrusions located at the surface of the construct;
- wherein the protrusions have a size and are spaced apart from each other at a distance that promotes absorption of molecules by said cell;
- wherein the protrusions are in form of nanopillars;
- wherein the pitch between the nanopillars from edge to edge is between 150 to 300 nm such that the pitch of the protrusion is less than the size of the cells to be located at the surface of the construct,
- and wherein the protrusions are arranged in an isotropic pattern and are round or polygonal.

2. The construct of claim 1, wherein the absorption of molecules is facilitated by endocytosis, or receptor mediated endocytosis, or pinocytosis, or phagocytosis.

3. The construct of any one of the preceding claims, wherein the protrusions are located at the surface of the construct in a detachable or non-detachable form.

~~4. The construct of claim 1, wherein the pillars have a diameter or maximal width of between about 10 nm to about 5 µm or between about 50 nm to 4 µm, or between about 200 nm to about 2 µm.~~

~~5.~~4. The construct of any one of claims 1 to 3, wherein the pillars are extending substantially perpendicular from the surface of the construct or wherein the pillars are

collapsed pillars lying at the surface of the construct; wherein in case the pillars are collapsed pillars they have a length of between about 50 nm to about 5 μm.

~~6.~~5. The construct of any one of claims 1 to ~~4~~5, wherein the pillars are extending between about 50 nm to 4 μm, or between about 100 nm to about 2 μm above the surface of the construct.

~~7. The construct of any one of the preceding claims, wherein the protrusions are spaced apart from each other by between 200 nm to 12 μm, or 400 to 10 μm, or 5 nm to about 1 μm.~~

~~8.~~6. The construct of any one of the preceding claims~~claim 7~~, wherein the pitch between the nanopillars from edge to edge would be between 200 nm to 250 nm.

~~9.~~7. The construct of any one of the preceding claims, wherein a residual layer is arranged between the pillars and the surface of the construct.

~~10.~~8. The construct of any one of the preceding claims, wherein the construct is obtained via nano-imprinting lithography.

~~11.~~9. The construct of claim ~~8~~10, wherein the nano-imprinting lithography is thermal nano-imprinting lithography or UV nano-imprinting lithography.

~~12.~~10. The construct of any one of the preceding claims, wherein the construct and/or the protrusions are made of a polymer.

~~13.~~11. The construct of claim 10~~12~~, wherein the polymer is a synthetic polymer, or a rigid synthetic polymer, or a bioresorbable polymer, or a biodegradable polymer.

~~14.~~12. The construct of claim 10~~12~~, wherein the synthetic polymer is selected from the group consisting of poly(methyl methacrylate) (PMMA), polydimethylsiloxane (PDMS), polystyrene (PS) and mixtures thereof.

~~15.~~13. The construct of claim 12~~14~~, wherein the biodegradable polymer is selected from the group consisting of chitosan, poly(ε-caprolactone), polyglycolic acid, poly(lactic acid), polyphosphoester (PPE) and mixtures thereof.

~~16.~~14. The construct of claim 12~~14~~ wherein the rigid synthetic polymer is polystyrene.

~~17.~~15. The construct of claim 12~~14~~, wherein the polystyrene is tissue-culture grade polystyrene (TCPS).

~~18.~~16. The construct of any one of claims 11~~13~~ to 15~~17~~, wherein during manufacture the polymer is mixed with molecules which are to be absorbed by the cell to be located on the construct or wherein the molecules are attached to the surface of the protrusions.

~~19.~~17. A method of promoting absorption of molecules by cells, wherein the method comprises:

- providing a construct according to any one of claims 1 to 16~~18~~;
- seeding and culturing at least one cell at the surface of the construct under conditions suitable for absorption of molecules by the cells.

~~20.~~18. The method of claim 17~~19~~, wherein the absorption of molecules is via endocytosis, or pinocytosis, or phagocytosis.

~~21.~~19. The method of claim 18~~20~~, wherein absorption of the molecules uses a non-viral carrier or a viral carrier.

~~22.~~20. The method of claim 17~~19~~ to 19~~21~~, wherein the molecules to be absorbed are selected from the group consisting of nucleic acid, nucleic acid vectors, siRNA, microRNA, magnetic nanoparticles, gold nanoparticles, fluorescent nanoparticles, quantum dots, aptamers (oligonucleic acid or peptide), peptides, growth factors, therapeutically active substances, biomarkers, colouring agents, and any one of the aforementioned molecules attached to a microparticles.

~~23.~~21. Use of a construct according to any one of claims 1 to 16~~18~~ for cell transfection, or drug-delivery or high-throughput screening arrays.