110 μl water were added to wells containing MCF-10a cells and incubated at room temperature while rocking for 30 minutes. The media was removed and 110 μmol green 8 nm diameter semiconductor nanocrystals in 110 μl water were added to wells containing MDA-MB-231 cells and incubated at room temperature while rocking for 30 minutes. Appropriate media was added back and replaced in 37° C. incubator overnight to allow cells to recover.

[0182] On Day 3, 4-well chambered coverglass was coated with 70 μl (or 8-well chambered coverglass with 35 μl) growth factor reduced BD MATRIGEL™ Matrix. The coverglass was placed in incubator to polymerize. The cells that had taken up the semiconductor nanocrystals from the 1.5 cm well were then trypsinized (trypsin obtained from GIBCO, Invitrogen, Carlsbad, Calif.). The cells were pelleted and the supernatant was aspirated.

[0183] For co-cultures to be viewed in 24 hours, 1.1 ml mammary epithelial basal medium (MEBM) (Clonetics Corp., San Diego, Calif.) supplemented with 10% fetal bovine serum was added to pellets then 400 μl of both cell types per well (1:1 ratio) were plated. The following ratios also worked when added 970 μl to pellets: 180 μl MCF 10A cells with 360 μl MDA-MB-231 cells (1:4 ratio), 180 μl MCF 10A cells with 180 μl MDA-MB-231 cells (1:1 ratio), 180 μl MCF 10A cells with 90 μl MDA-MB-231 cells (2:1 ratio), 180 μl MCF 10A cells with 45 μl MDA-MB-231 cells (4:1 ratio).

[0184] For co-cultures to be viewed in 4 to 10 days, add 1.1 ml MEBM supplemented with 0.4% Bovine pituitary extract, 0.01 μg/ml human epidermal growth factor, 5 μg/ml insulin, and 0.5 μg/ml hydrocortisone to MCF 10A pellets then plate 50 μl of to 300 μl per well. Once colonies begin to form, MDA-MB-231 cells were plated into 1.5 cm wells on plastic and treated with semiconductor nanocrystals as described above. On Day 3, MDA-MB-231 semiconductor nanocrystal-labeled cells were pelleted, 1.1 ml MEBM supplemented with 10% fetal bovine serum was added to pellet, and 50 μl or 300 μl was added to established doped MCF 10A colonies on top of Matrigel.

[0185] The color photograph in **FIG. 6** shows the mixed colonies formed by MCF 10A cells when co-cultured with MDA-MB-231cells. The normal mammary epithelial MCF-10A cells are labeled in red, while the mammary epithelial tumorigenic MDA-MD-231 cells are labeled in green.

[0186] The present examples, methods, procedures, treatments, cell types, specific compounds and molecules are meant to exemplify and illustrate the invention and should in no way be seen as limiting the scope of the invention. Various modifications and variations of the described method and apparatus of the invention will be apparent to those skilled in the art without departing from the scope and spirit of then invention.

[0187] Any patents or publications mentioned in this specification are indicative of levels of those skilled in the art to which the paten pertains and are hereby reference to the same extent as if each was specifically and individually incorporated by reference.

What is claimed is:

1. A method for determining metabolic properties of living cells, comprising:

a. providing a culture surface for supporting biological activity of said cells;

b. depositing of semiconductor nanocrystals on said culture surface;

c. seeding—of said cells to the culture surface;

d. detecting changes in said semiconductor nanocrystals after sufficient time has elapsed to allow the seeded cells to take up said semiconductor nanocrystals;

2. The method of claim 1, further comprising the step of detecting changes in said semiconductor nanocrystals caused by movement of said cells.

3. The method of claim 1, further comprising the step of adding a marker to be taken up by the cells in addition to the semiconductor nanocrystals, wherein said marker is selected from the group consisting of: semiconductor nanocrystals with a detectable property that is different from the semiconductor nanocrystals recited in step (b), and an organic fluorescent dye.

4. The method of claim 3, wherein said organic fluorescent dye is selected from the group consisting of: actinomycin D, acridine orange, bisbenzimide, 4',6-Diamidino-2-phenylindole (DAPI), propidium iodide, ethidium bromide, carbocyanines, pyridinium dibromides, tetramethylrhodamine ethyl ester (TMRE), ceramides, fluorescein-labeled phalloidin, GFP, DsRed, YCP, CFP and BFP.

5. The method of claim 1, wherein said imaging of step (d) takes place over a time period between ten minutes and 10 days.

6. The method of claim 1, wherein said semiconductor nanocrystals comprise a core semiconductor covered by a hydrophilic outermost shell.

7. The method of claim 6, wherein said core is CdSe.

8. The method of claim 7 wherein the outermost shell is a siloxane.

9. The method of claim 8 further comprising an intermediate shell of ZnS or CdS.

10. The method of claim 6 wherein said outermost shell further comprises a stabilizing group which carries a positive or negative charge.

11. The method according to claim 1, further comprising the addition of more than one size of semiconductor nanocrystal.

12. The method according to claim 1, wherein said semiconductor nanocrystals are deposited in patterned arrangements onto said culture surface.

13. The method according to claim 1, wherein said semiconductor nanocrystals are deposited in linear arrangements onto said culture surface.

14. The method according to claim 1, wherein said semiconductor nanocrystals is deposited homogenously onto said culture surface.

15. The method according to claim 1, wherein said culture surface is comprised of extracellular matrix.

16. The method according to claim 15, wherein said extracellular matrix is comprised of proteins.

17. The method according to claim 16, wherein said proteins are selected from the group consisting of collagen, laminin, fibronectin, elastin, nidogen, enactin and proteoglycan.

18. The method according to claim 1, wherein said cells are cancerous.

19. The method according to claim 1, wherein said metabolic property is correlated with metastatic potential.