

Claims

1. A method for determining a change in the mobility of a population of organisms over time, said method comprising:
 - a) obtaining a first image (I1) of the population at a first time point (T1)
 - b) obtaining a second image (I2) of the population at a second time point (T2)
 - c) calculating the absolute differences between I1 and I2 ($\Delta D1$)
 - d) obtaining a third image (I3) of the population at a third time point (T3)
 - e) obtaining a fourth image (I4) of the population at a fourth time point (T4)
 - f) calculating the absolute differences between I3 and I4 ($\Delta D2$).
 - g) calculating the change between $\Delta D1$ and $\Delta D2$ to calculate a change in the mobility of the population as a whole.
2. The method according to claim 1, wherein the time period between I1 and I2 is about 100ms to about 5 minutes, about 140ms to about 3 minutes, about 200ms to about 90s, about 300ms to about 1 minute, about 400ms to about 45s, about 500ms to about 30s, about 600ms to about 15s, about 700ms to about 10s, about 750ms to about 5s, about 800ms to about 3s, about 850ms to about 2s, about 900ms to about 1s or about 1s to about 2s.
3. The method according to claim 1 or claim 2, wherein the time period between I2 and I3 is at least about 6 hours, at least about 12 hours, at least about 1 day, at least about 2 days, at least about 3 days, at least about 4 days, at least about 5 days, at least about 6 days, at least about 7 days, at least about 8 days, at least about 9 days, at least about 10 days, at least about 11 days or at least about 12 days.
4. The method according to any one of claims 1 to 3, wherein the time period between I2 and I3 is at least about 4 days.
5. The method according to any preceding claim, wherein $\Delta D1$ is calculated from images obtained on day 0
6. The method according to any preceding claim, wherein $\Delta D2$ is calculated from images obtained on day 4.
7. The method according to any preceding claim, wherein the time period between I1 and I2 is about 1s.

8. The method according to any one of claims 1 to 5 wherein $\Delta D2$ is calculated from images obtained on day 6.
9. The method according to claim 8, wherein the time period between I1 and I2, is about 10s.
10. The method according to any preceding claim, wherein the population comprises at least about 2, at least about 5, at least about 10, at least about 20, at least about 50, at least about 75, at least about 100, at least about 110, at least about 120, at least about 150, at least about 175, at least about 200, at least about 250, at least about 300, at least about 350, at least about 400, at least about 450, at least about 500, at least about 550, at least about 600, at least about 650, at least about 700, at least about 750, at least about 800, at least about 850, at least about 900, at least about 950 or at least about 1000 organisms.
11. The method according to any preceding claim, wherein the organisms are labelled.
12. The method according to claim 11, wherein the organisms are labelled with green fluorescent protein (GFP).
13. The method according to any preceding claim, wherein the organisms are *C. elegans* or *Danio rerio*.
14. The method according to any one of claims 11 to 13, wherein the label is localised to one particular area within the organisms.
15. The method according to any preceding claim, wherein the organisms are *C. elegans* MYO2bus-5.
16. The method according to any preceding claim, wherein the population is maintained in a single well or multi-well plate.
17. The method according to claim 16, wherein the plate is a 6 well, 12 well, 24 or 96 well plate.
18. The method according to any preceding claim, for assessing the effect of at least one test compound or at least one environmental factor on the mobility of the population of organisms.
19. The method according to claim 18, wherein the at least one test compound comprises a small molecule or biological composition.

- 5 20. The method according to claim 18, wherein the at least one environmental factor is selected from the group comprising, an atmospheric factor, a nutritional supplement or nutritional deficiency, a light condition, and/or a temperature condition.
21. A method for assessing a change in the viability of a population comprising undertaking the method of any one of claims 1 to 17.
- 10 22. A method for assessing aging of a population comprising undertaking the method of any one of claims 1 to 17.
23. Use of the method of anyone of claims 1-22 in drug discovery and/or toxicology.
- 15 24. A computer program comprising instructions operable to configure a data processing apparatus to perform the method according to any of claims 1-22.

Claims

1. A method for determining a change in the mobility of a population of organisms over time, said method comprising:
 - a) obtaining a first image (I1) of the population at a first time point (T1),
 - b) obtaining a second image (I2) of the population at a second time point (T2),
 - c) calculating the absolute differences between I1 and I2 ($\Delta D1$),
 - d) obtaining a third image (I3) of the population at a third time point (T3),
 - e) obtaining a fourth image (I4) of the population at a fourth time point (T4),
 - f) calculating the absolute differences between I3 and I4 ($\Delta D2$), and
 - g) calculating the change between $\Delta D1$ and $\Delta D2$ to calculate a change in the mobility of the population as a whole.
2. The method according to claim 1, wherein the time period between I1 and I2 is 100ms to 5 minutes, 140ms to 3 minutes, 200ms to 90s, 300ms to 1 minute, 400ms to 45s, 500ms to 30s, 600ms to 15s, 700ms to 10s, 750ms to 5s, 800ms to 3s, 850ms to 2s, 900ms to 1s, or 1s to 2s.
3. The method according to claim 1 or claim 2, wherein the time period between I2 and I3 is at least 6 hours, at least 12 hours, at least 1 day, at least 2 days, at least 3 days, at least 4 days, at least 5 days, at least 6 days, at least 7 days, at least 8 days, at least 9 days, at least 10 days, at least 11 days or at least 12 days.
4. The method according to claim 1 or claim 2, wherein the time period between I2 and I3 is at least 4 days.
5. The method according to any preceding claim, wherein $\Delta D1$ is calculated from images obtained on day 0.
6. The method according to any preceding claim, wherein $\Delta D2$ is calculated from images obtained on day 4.
7. The method according to any preceding claim, wherein the time period between I1 and I2, and the time period between I3 and I4, are each 500ms to 10s; or preferably about 1s.
8. The method according to any one of claims 1 to 5, wherein $\Delta D2$ is calculated from images obtained on day 6.

9. The method according to any preceding claim, wherein the population comprises at least 5, at least 10, at least 20, at least 50, at least 75, at least 100, at least 110, at least 120, at least 150, at least 175, at least 200, at least 250, at least 300, at least 350, at least 400, at least 450, at least 500, at least 550, at least 600, at least 650, at least 700, at least 750, at least 800, at least 850, at least 900, at least 950 or at least 1000 organisms.
10. The method according to any preceding claim, wherein the organisms are labelled.
11. The method according to claim 10, wherein the organisms are labelled with green fluorescent protein (GFP).
12. The method according to claim 10 or 11, wherein the label is localised to one particular area within the organisms.
13. The method according to any of claims 1 to 12, wherein:
the term population refers to a plurality of organisms that belong to the same group or species, and
the organism is any suitable organism, being an animal, a micro-organism, or a single-celled life form, which is capable of movement.
14. The method according to any of claims 1 to 12, wherein:
the term population refers to a plurality of organisms that belong to the same group or species, and
the organism is any suitable animal which is capable of movement.
15. The method according to claim 13 or 14, wherein the term movement refers to locomotion.
16. The method according to any of claims 1 to 12, wherein the organisms are *Caenorhabditis elegans* or *Danio rerio*.
17. The method according to claim 10, 11 or 12, wherein the organisms are *Caenorhabditis elegans*, and the population of *Caenorhabditis elegans* is fluorescently labelled by any suitable means.
18. The method according to claim 11 or 12, wherein the organisms are *Caenorhabditis elegans* expressing green fluorescent protein (GFP), wherein the GFP expression is localised to one particular area within the labelled organisms.

19. The method according to claim 11, wherein the organisms are: drug sensitive *Caenorhabditis elegans* worms expressing green fluorescent protein (GFP) in their pharynx (*Caenorhabditis elegans* MYO2*bus-5*); or *Caenorhabditis elegans* with GFP expression in their body wall muscle.
20. The method according to any preceding claim, wherein the population is maintained in a single well or multi-well plate.
21. A method according to any preceding claim, which is for assessing the effect of at least one test compound or at least one environmental factor on the mobility of the population of organisms.
22. The method according to claim 21, which is for assessing the effect of at least one test compound on the mobility of the population of organisms, and wherein the at least one test compound comprises a small molecule or biological composition.
23. The method according to claim 21, which is for assessing the effect of at least one environmental factor on the mobility of the population of organisms, and wherein the at least one environmental factor comprises an atmospheric factor, a nutritional supplement or nutritional deficiency, a light condition, and/or a temperature condition.
24. A method for assessing a change in the viability of a population comprising undertaking a method according to any one of claims 1 to 20.
25. A method for assessing aging of a population comprising undertaking a method according to any one of claims 1 to 20.
26. Use of a method according to any one of claims 1 to 25 in drug discovery and/or toxicology.
27. A computer program comprising instructions operable to configure a data processing apparatus to perform a method according to any of claims 1 to 25.