

CLAIMS:

1. A method of analyzing genomic DNA, comprising:
obtaining genomic DNA including a target;
5 fragmenting the genomic DNA volitionally to produce fragmented DNA;
 passing the fragmented DNA through at least one droplet generator to
generate aqueous droplets containing the fragmented DNA; and
 performing a digital assay on the droplets to determine a level of the
target.
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2. The method of claim 1, wherein the droplets have an average
volume of less than about 10 nanoliters.
3. The method of claim 1, wherein the droplets contain the
15 genomic DNA at a concentration of at least about 5 nanograms per microliter.
4. The method of claim 1, wherein the genomic DNA is disposed in
an aqueous sample, and wherein the droplets are generated at a flow rate of
greater than about 50 nanoliters per second of the aqueous sample through
20 the droplet generator.
5. The method of any of claims 1 to 4, wherein the droplets are
generated at a droplet generation frequency of at least about 50 droplets per
second.
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6. The method of claim 1, wherein the droplets have an average
volume of less than about 10 nanoliters and contain the genomic DNA at a
concentration of at least about 5 nanograms per microliter.
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7. The method of claim 1, wherein the droplets have an average volume of less than about 10 nanoliters, and wherein the genomic DNA is disposed in an aqueous sample, and wherein the droplets are generated at a flow rate of greater than about 50 nanoliters per second of the aqueous sample through the droplet generator.

8. The method of claim 1, wherein the droplets contain the genomic DNA at a concentration of at least about 5 nanograms per microliter, wherein the genomic DNA is disposed in an aqueous sample, and wherein the droplets are generated at a flow rate of greater than about 50 nanoliters per second of the aqueous sample through the droplet generator.

9. The method of claim 6, wherein the genomic DNA is disposed in an aqueous sample, and wherein the droplets are generated at a flow rate of greater than about 50 nanoliters per second of the aqueous sample through the droplet generator.

10. The method of claim 6, wherein the droplets are generated at a droplet generation frequency of at least about 50 droplets per second.

11. The method of claim 7, wherein the droplets are generated at a droplet generation frequency of at least about 50 droplets per second.

12. The method of claim 8, wherein the droplets are generated at a droplet generation frequency of at least about 50 droplets per second.

13. The method of claim 12, wherein the droplets have an average volume of less than about 10 nanoliters.

14. The method of claim 1, wherein the step of fragmenting includes a step of digesting the genomic DNA with a restriction enzyme.

15. The method of claim 14, wherein the restriction enzyme cuts the genomic DNA an average of less than about once every kilobase.

16. The method of claim 1, wherein the step of fragmenting includes
5 a step of shearing the genomic DNA.

17. The method of claim 1, wherein the step of fragmenting includes a step of sonicating the genomic DNA.

18. The method of claim 1, wherein the droplets contain an average
10 of less than about two copies of the target per droplet.

19. The method of claim 1, wherein the droplets contain an average
of less than about two genome-equivalents of the genomic DNA per droplet.

20. The method of claim 1, wherein the step of fragmenting does not
15 disrupt the target substantially.

21. The method of claim 1, wherein the step of performing a digital
20 assay includes a step of amplifying the target in the droplets.

22. The method of claim 21, wherein the target is amplified by PCR.

23. The method of claim 21, wherein the step of performing a digital
25 assay includes a step of detecting fluorescence from the droplets.

24. The method of any of claims 21 to 23, wherein the step of
performing a digital assay includes a step of determining a level of the target
with a Poisson algorithm.

25. The method of claim 1, wherein the droplets have an average
30 volume of about 0.1 to 10 nanoliters.

26. A method of partitioning an aqueous sample comprising DNA into droplets, the method comprising:

obtaining a sample comprising DNA at a concentration of at least about 5 ng per microliter;

5 fragmenting the DNA volitionally to produce fragmented DNA; and
passing the sample through a droplet generator, to generate aqueous droplets containing the fragmented DNA, the droplets being generated at a droplet generation frequency of at least about 50 droplets per second and having an average volume of less than about 10 nanoliters.

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27. A method of partitioning an aqueous sample comprising DNA into droplets, the method comprising:

obtaining a sample comprising genomic DNA;

fragmenting the DNA volitionally to produce fragmented DNA; and

15 passing the sample through a droplet generator, to generate aqueous droplets containing the fragmented DNA, the droplets being generated at a droplet generation frequency of at least about 50 droplets per second and having an average volume of less than about 10 nanoliters,

wherein the genomic DNA is at a concentration that interferes with
20 droplet generation if the step of passing is performed under the same conditions without fragmenting the DNA.

CLAIMS

1. A method of analyzing genomic DNA, comprising:
obtaining genomic DNA including a target;
fragmenting the genomic DNA volitionally to produce fragmented DNA;
passing the fragmented DNA through at least one droplet generator to generate aqueous droplets containing the fragmented DNA;
detecting fluorescence from the droplets; and
determining a concentration of the target based on the fluorescence detected.
2. The method of claim 1, wherein the droplets have an average volume of less than about 10 nanoliters.
3. The method of claim 1, wherein the droplets contain the genomic DNA at a concentration of at least about 5 nanograms per microliter.
4. The method of claim 1, wherein the genomic DNA is disposed in an aqueous sample, and wherein the droplets are generated at a flow rate of greater than about 50 nanoliters per second of the aqueous sample through the droplet generator.
5. The method of any of claims 1 to 4, wherein the droplets are generated at a droplet generation frequency of at least about 50 droplets per second.
6. The method of claim 1, wherein the droplets have an average volume of less than about 10 nanoliters and contain the genomic DNA at a concentration of at least about 5 nanograms per microliter.
7. The method of claim 1, wherein the droplets have an average volume of less than about 10 nanoliters, and wherein the genomic DNA is disposed in an aqueous sample, and wherein the droplets are generated at a flow rate of greater than about 50 nanoliters per second of the aqueous sample through the droplet generator.

8. The method of claim 1, wherein the droplets contain the genomic DNA at a concentration of at least about 5 nanograms per microliter, wherein the genomic DNA is disposed in an aqueous sample, and wherein the droplets are generated at a flow rate of greater than about 50 nanoliters per second of the aqueous sample through the droplet generator.

9. The method of claim 6, wherein the genomic DNA is disposed in an aqueous sample, and wherein the droplets are generated at a flow rate of greater than about 50 nanoliters per second of the aqueous sample through the droplet generator.

10. The method of claim 6, wherein the droplets are generated at a droplet generation frequency of at least about 50 droplets per second.

11. The method of claim 7, wherein the droplets are generated at a droplet generation frequency of at least about 50 droplets per second.

12. The method of claim 8, wherein the droplets are generated at a droplet generation frequency of at least about 50 droplets per second.

13. The method of claim 12, wherein the droplets have an average volume of less than about 10 nanoliters.

14. The method of claim 1, wherein the step of fragmenting includes a step of digesting the genomic DNA with a restriction enzyme.

15. The method of claim 14, wherein the restriction enzyme cuts the genomic DNA an average of less than about once every kilobase.

16. The method of claim 1, wherein the step of fragmenting includes a step of shearing the genomic DNA.

17. The method of claim 1, wherein the step of fragmenting includes a step of sonicating the genomic DNA.

18. The method of claim 1, wherein the droplets contain an average of less than about two copies of the target per droplet.

19. The method of claim 1, wherein the droplets contain an average of less than about two genome-equivalents of the genomic DNA per droplet.

20. The method of claim 1, wherein the step of fragmenting does not disrupt the target substantially.

21. The method of claim 1, further comprising a step of amplifying the target in the droplets.

22. The method of claim 21, wherein the target is amplified by PCR.

23. The method of claim 21 or 22, wherein the step of determining a concentration includes a step of determining a level of the target with a Poisson algorithm.

24. The method of claim 1, wherein the droplets have an average volume of about 0.1 to 10 nanoliters.

25. A method of partitioning an aqueous sample comprising DNA into droplets, the method comprising:

obtaining a sample comprising DNA at a concentration of at least about 5 ng per microliter;

fragmenting the DNA volitionally to produce fragmented DNA; and

passing the sample through a droplet generator, to generate aqueous droplets containing the fragmented DNA, the droplets being generated at a droplet generation frequency of at least about 50 droplets per second and having an average volume of less than about 10 nanoliters.

26. A method of partitioning an aqueous sample comprising DNA into droplets, the method comprising:

obtaining a sample comprising genomic DNA;

fragmenting the DNA volitionally to produce fragmented DNA; and

passing the sample through a droplet generator, to generate aqueous droplets containing the fragmented DNA, the droplets being generated at a droplet generation frequency of at least about 50 droplets per second and having an average volume of less than about 10 nanoliters,

wherein the genomic DNA is at a concentration that interferes with droplet generation if the step of passing is performed under the same conditions without fragmenting the genomic DNA.