

CLAIMS

WHAT IS CLAIMED IS:

1. A method of detecting presence or absence of endometriosis in a female subject, comprising:
 - (a) detecting in a bodily fluid sample from the female subject an expression profile of a panel of miRNAs associated with endometriosis, wherein the panel of miRNAs associated with endometriosis comprises miR-342 or miR451a;
 - (b) applying a machine learning algorithm to the expression profile of the panel of miRNAs associated with endometriosis, wherein the machine learning algorithm has importance measures assigned to miRNA features, and wherein:
 - i. an importance measure is assigned to miR-342 and the importance measure assigned to miR-342 is greater than the importance measure assigned to at least one miRNA selected from the group consisting of: miR-150, miR-3613, miR-451a, let-7b, and miR-125b; or
 - ii. an importance measure is assigned to miR-451a and the importance measure assigned to miR-451a is greater than the importance measure assigned to at least one miRNA selected from the group consisting of: miR-3613, miR-125b, and let-7b; and
 - (c) using the machine learning algorithm to detect presence or absence of endometriosis in the female subject.
2. The method of claim 1, wherein the female subject has symptoms of endometriosis.
3. The method of claim 1, wherein the female subject has symptoms of endometriosis selected from the group consisting of: abdominal pain, gastrointestinal upset, excessive bleeding, infertility and menstrual disturbance.
4. The method of any one of the preceding claims, wherein the subject has not been previously diagnosed with endometriosis.
5. The method of any one of the preceding claims, wherein the subject has been previously diagnosed with endometriosis and the method confirms presence of endometriosis in the female subject.
6. The method of any one of the preceding claims, further comprising diagnosing endometriosis in the female subject when the presence of endometriosis is detected.
7. The method of any one of the preceding claims, further comprising prognosing or monitoring endometriosis in the female subject when the presence of endometriosis is detected.
8. The method of any one of the preceding claims, wherein a treatment for endometriosis is to be administered to the female subject when the presence of endometriosis is detected.

9. The method of any one of the preceding claims, further comprising determining that the female subject has a condition that is not endometriosis when the absence of endometriosis is detected.
10. The method of any one of the preceding claims, wherein a treatment for a non-endometriosis condition is to be administered to the female subject when the absence of endometriosis is detected.
11. The method of any one of the preceding claims, wherein the importance measure assigned to miR-342 is greater than the importance measure assigned to at least one miRNA selected from the group consisting of: miR-150, miR-3613, miR-451a, let-7b, and miR-125b.
12. The method of claim 11, wherein the importance measure assigned to miR-342 is less than the importance measure assigned to at least one other miRNA.
13. The method of any one of the preceding claims, wherein the importance measure assigned to miR-342 is greater than the importance measure assigned to at least two miRNA selected from the group consisting of: miR-150, miR-3613, miR-451a, let-7b, or miR-125b.
14. The method of any one of the preceding claims, wherein the importance measure assigned to miR-342 is greater than the importance measure assigned to at least three miRNA selected from the group consisting of: miR-150, miR-3613, miR-451a, let-7b, or miR-125b.
15. The method of any one of the preceding claims, wherein the importance measure assigned to miR-342 is greater than the importance measure assigned to at least four miRNA selected from the group consisting of: miR-150, miR-3613, miR-451a, let-7b, and miR-125b.
16. The method of any one of the preceding claims, wherein the importance measure assigned to miR-342 is greater than the importance measure assigned to miR-150, miR-3613, miR-451a, let-7b, and miR-125b.
17. The method of claim 1, wherein the importance measure assigned to miR-451a is greater than the importance measure assigned to at least one miRNA selected from the group consisting of: miR-3613, miR-125b and let-7b.
18. The method of claim 1, wherein the importance measure assigned to miR-451a is greater than the importance measure assigned to at least two miRNA selected from the group consisting of: miR-3613, miR-125b and let-7b.
19. The method of claim 1, wherein the importance measure assigned to miR-451a is greater than the importance measure assigned to miR-3613, miR-125b and let-7b.
20. The method of any one of the preceding claims, wherein the importance measures are assigned such that the ranking of the importance measures from highest to lowest is: miR-342, miR-451a, miR-3613, miR-125b, let-7b, and miR-150.

21. The method of any one of the preceding claims, wherein the bodily fluid sample is a cell-free sample.
22. The method of any one of the preceding claims, wherein the bodily fluid sample is a blood sample, a plasma sample, a saliva sample, or a serum sample.
23. The method of any one of the preceding claims, wherein the panel of miRNA are cell-free miRNA
24. The method of any one of the preceding claims, wherein the applying a machine learning algorithm to the expression profile comprises applying a machine learning algorithm with specific importance measure rankings assigned to the miRNA features, wherein the ranking from highest to lowest is miR-342, miR-451a, miR-3613, miR-125b, let-7b, and miR-150.
25. The method of any one of the preceding claims, wherein the machine learning algorithm is a random forest algorithm, k-nearest-neighbors algorithm (KNN), support vector machine (SVM), or Naive Bayes.
26. The method of any one of the preceding claims, wherein the machine learning algorithm is a random forest algorithm.
27. The method of any one of the preceding claims, wherein the method detects endometriosis in a population of women with a specificity of greater than 80%.
28. The method of claim 27, wherein the population of women is premenopausal women.
29. The method of claim 27, wherein the population of women comprises women with leiomyomas, cystadenomas, chronic pelvic infections, teratomas, endometriomas, or paratubal cysts.
30. The method of claim 27, wherein the population of women comprises women with Stage I/II endometriosis.
31. The method of claim 27, wherein the population of women comprises women with Stage III/IV endometriosis or women with all four stages of endometriosis (Stage I/II/III/IV).
32. The method of claim 27, wherein the population of women comprises women having received hormone therapy within 3 months of the date on which the sample was obtained or women at any phase of their menstrual cycle.
33. The method of claim 27, wherein the population of women comprises a cohort comprising at least 100 women, at least 500 women, or at least 1000 women.
34. The method of any one of the preceding claims, wherein the machine learning algorithm is trained on expression data from at least 100 samples, at least 500 samples, or at least 1000 samples.
35. The method of any one of the preceding claims, wherein the machine learning algorithm is trained on a population of women comprising women having stages I-IV endometriosis.

36. The method of any one of the previous claims, wherein the method has an AUC for detecting endometriosis of greater than 0.85 in a population of women, greater than 0.90 in a population of women, or greater than 0.92 in a population of women.
37. The method of any one of the preceding claims, wherein the method detects endometriosis in a population of women with a specificity of greater than 85%, greater than 90%, or greater than 95%.
38. The method of any one of the preceding claims, wherein the method detects endometriosis in a population of women with a sensitivity of greater than 80%, a sensitivity greater than 85%, or a sensitivity greater than 90%.
39. The method of any one of the preceding claims, wherein the method detects endometriosis in a population of women with a specificity of greater than 90% and a sensitivity of less than 85%.
40. The method of any one of the preceding claims, wherein the method detects endometriosis in a population of women with a sensitivity of less than 90%, less than 85%, or less than 80%.
41. The method of any one of the preceding claims, wherein the miRNA expression level is detected by quantitative real-time polymerase chain reaction (RT-PCR), microarray, sequencing, or Next Generation sequencing.