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Oral microbiome-based feline dental health test - workflow

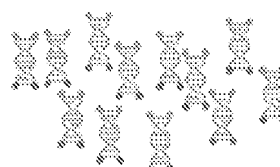
Oral swab collected
from the cat



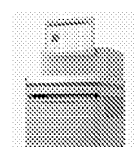
DNA extraction



Metagenomic NGS
library preparation



Shotgun metagenomic
NGS



Data analysis and results
report generation
(4-6 weeks from sample to report)

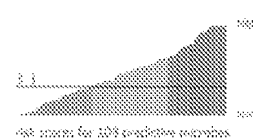
Risk for periodontal disease

Periodontal disease affects the tissues surrounding the teeth. Initial stages are classified as gingivitis, while advanced cases are known as periodontitis.

low risk: 0 - 5.3 medium risk: 5.4 - 6.6 high risk: 6.7 - 10

OVERALL RISK:

- ☐ LOW
☒ MEDIUM
☐ HIGH

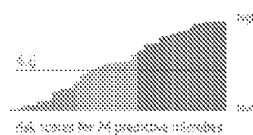


Risk for tooth resorption

Tooth resorption is a relatively common condition characterized by progressive erosion enamel.

OVERALL RISK:

- ☐ LOW
☒ MEDIUM
☐ HIGH



Risk for bad breath (halitosis)

When bad breath is a persistent problem for a cat, this could be indicative of more serious general health issues.

OVERALL RISK:

- ☒ LOW
☐ MEDIUM
☐ HIGH

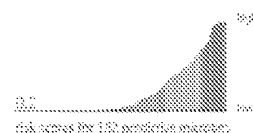


FIG. 1A

SUBSTITUTE SHEET (RULE 26)

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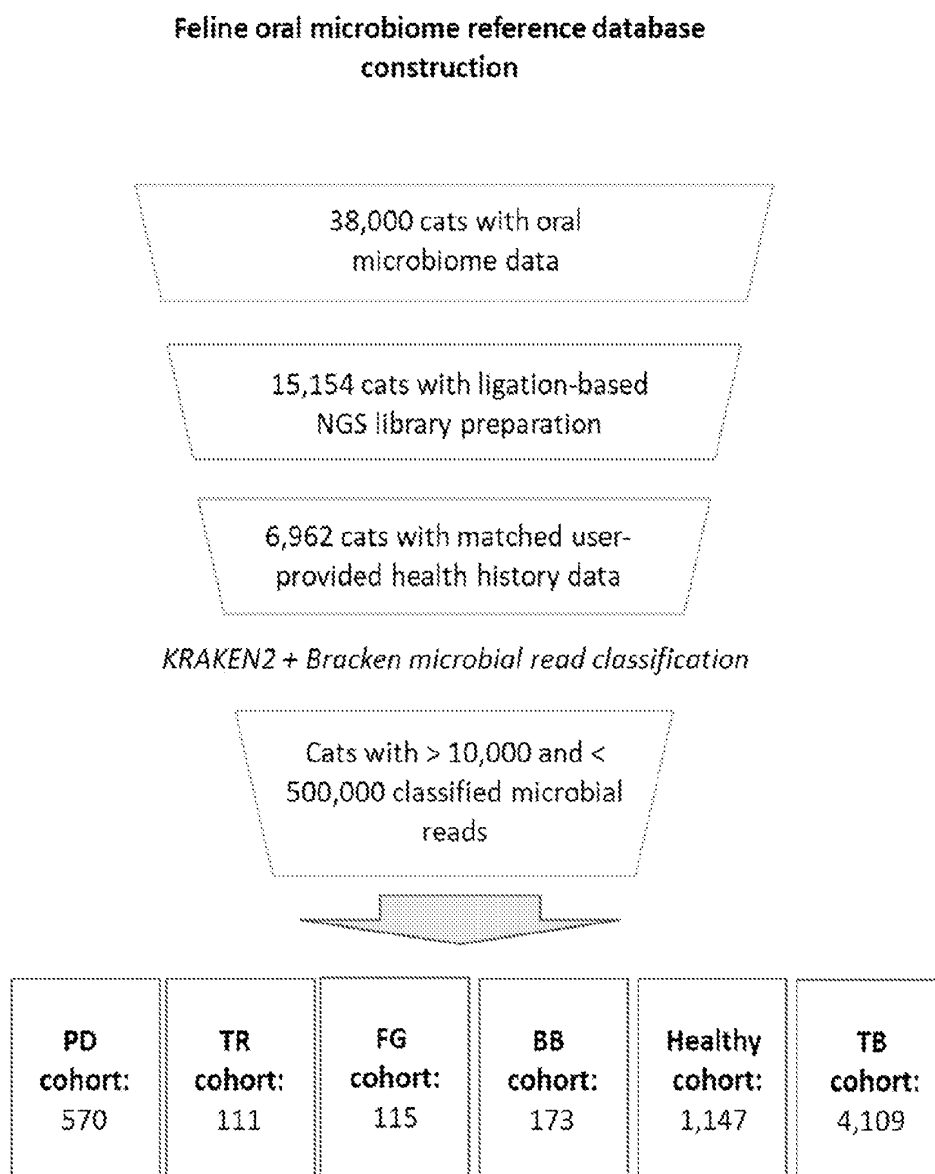


FIG. 1B

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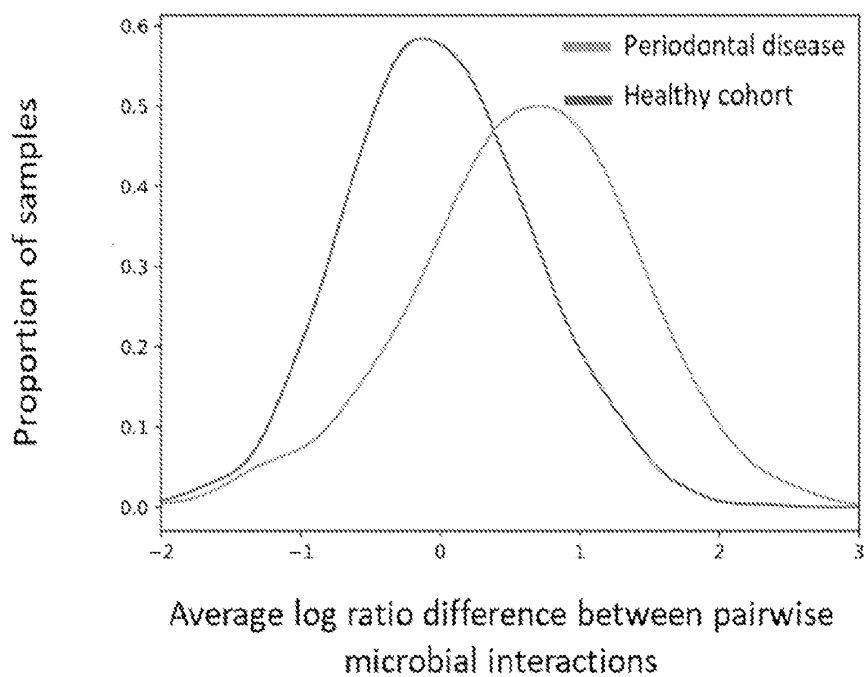


FIG. 2A

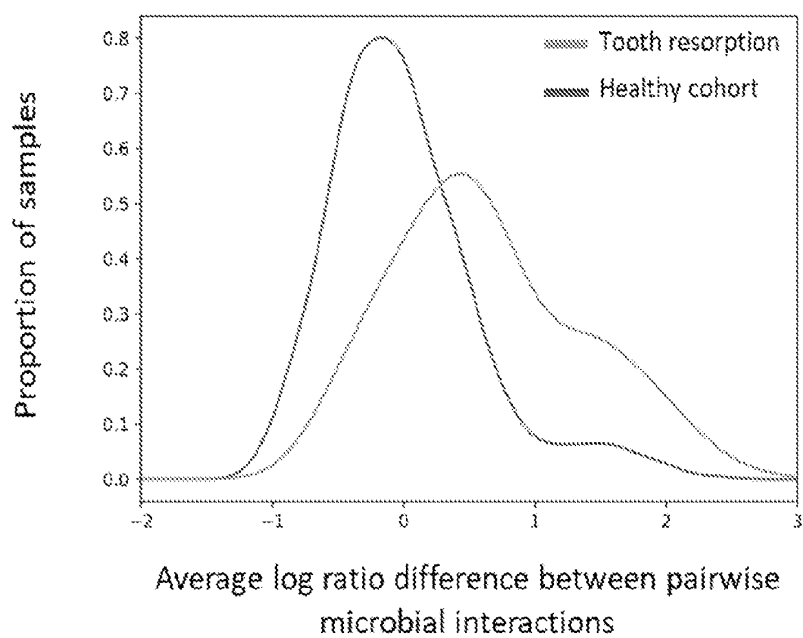


FIG. 2B

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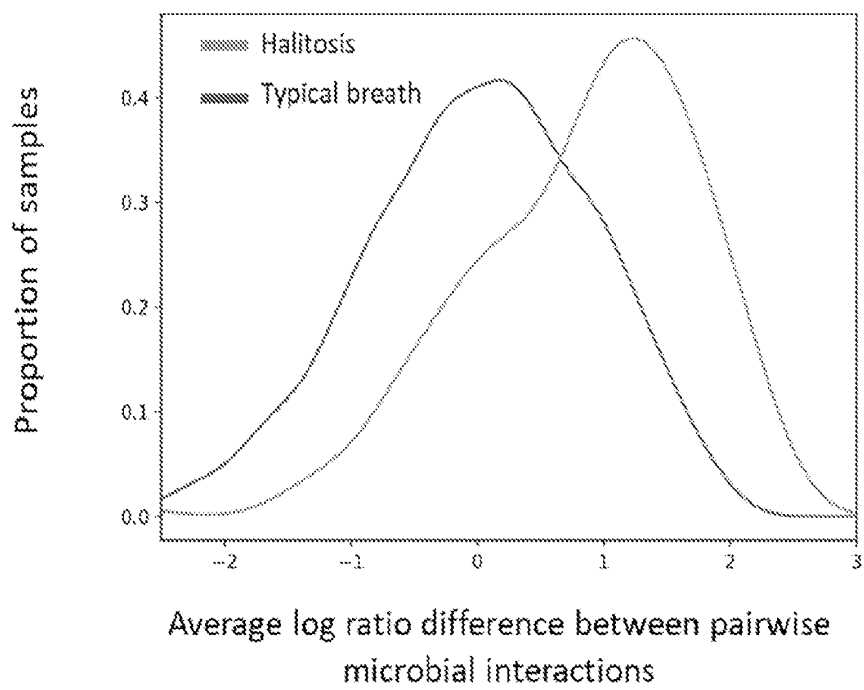


FIG. 2C

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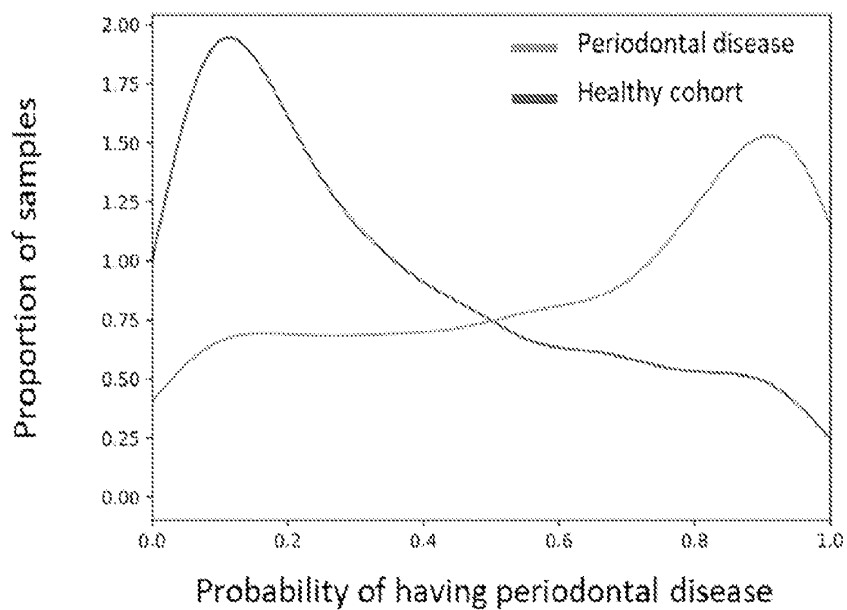


FIG. 3A

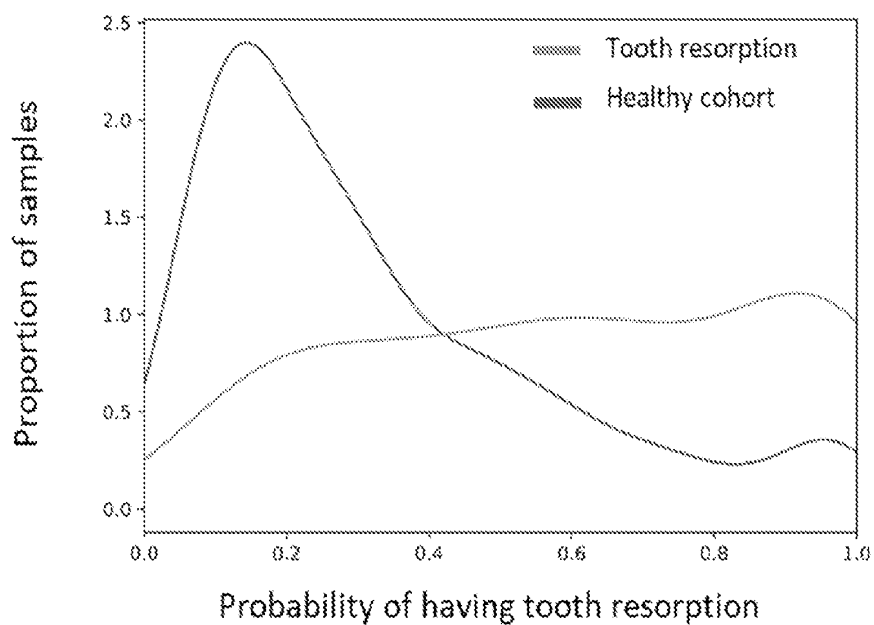


FIG. 3B

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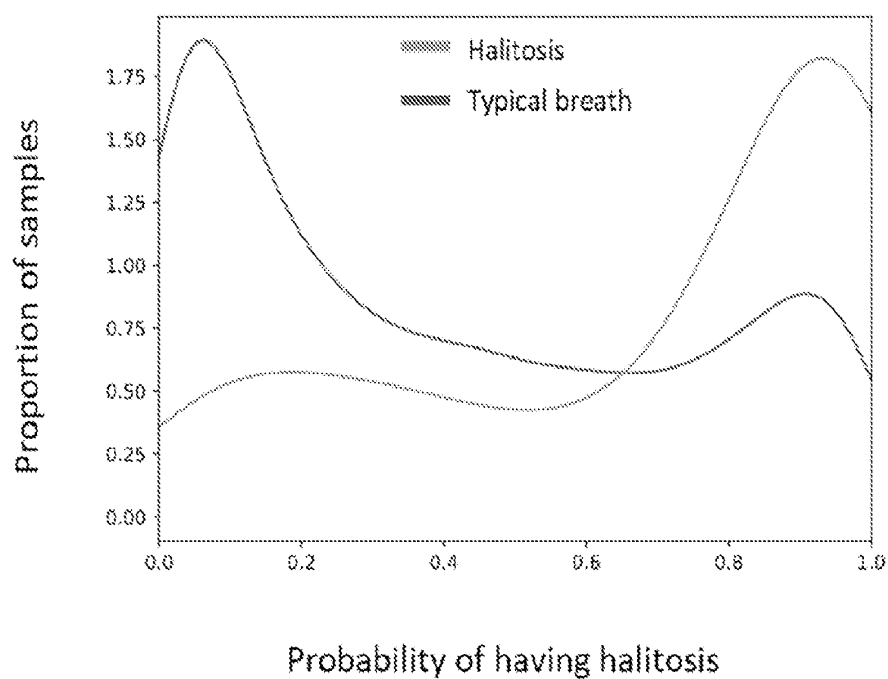


FIG. 3C

Condition	Sensitivity	Specificity
Periodontal disease	66%	70%
Tooth resorption	63%	78%
Halitosis	72%	62%

Sensitivity = percentage known positive samples classified as medium or high risk

Specificity = percentage known negative samples classified as low risk

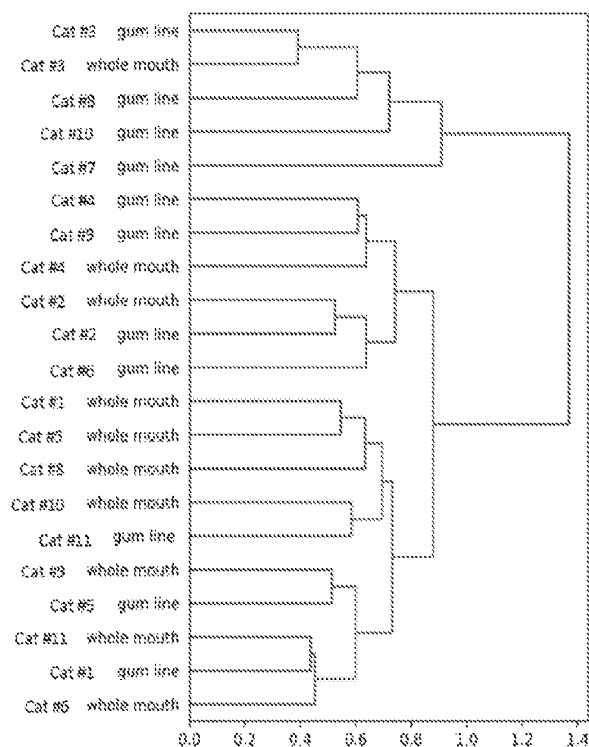
FIG. 3D

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Overlap of predictive microbes between feline periodontal disease, tooth resorption and halitosis

**FIG. 4**

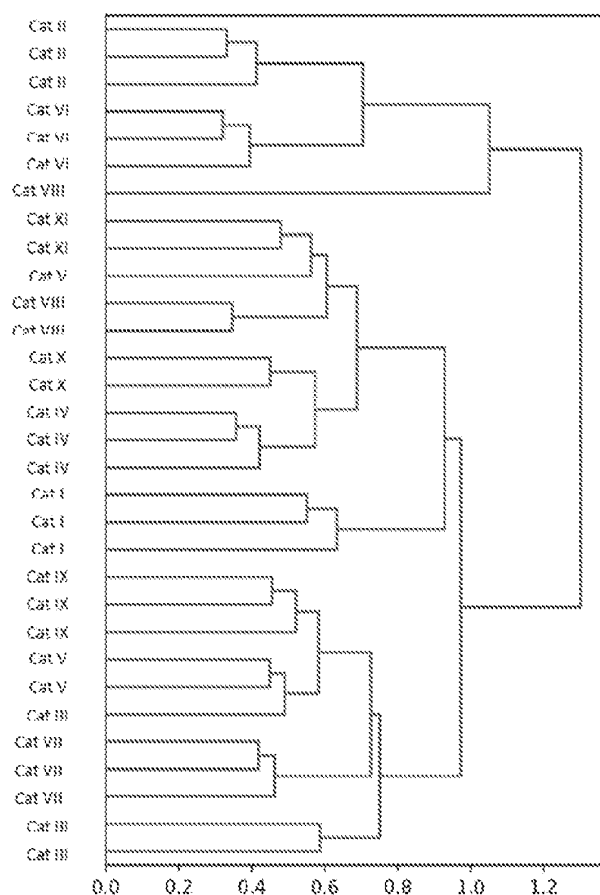
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Cat	Dental condition	Swab condition	
		Gum line	Whole mouth
Cat #1	Periodontal disease	0.028	0.017
Cat #1	Tooth resorption	0.14	0.06
Cat #1	Halitosis	0	0.0002
Cat #2	Periodontal disease	0.006	0.07
Cat #2	Tooth resorption	0.06	0.06
Cat #2	Halitosis	0	0
Cat #3	Periodontal disease	0.92	0.98
Cat #3	Tooth resorption	0.88	0.89
Cat #3	Halitosis	0.7	0.84
Cat #4	Periodontal disease	0.54	0.57
Cat #4	Tooth resorption	0.83	0.332
Cat #4	Halitosis	0	0.003
Cat #5	Periodontal disease	0.34	0.23
Cat #5	Tooth resorption	0.1	0.08
Cat #5	Halitosis	0.006	0.06
Cat #6	Periodontal disease	0.02	0.28
Cat #6	Tooth resorption	0.06	0.13
Cat #6	Halitosis	0.0003	0.0003
Cat #7	Periodontal disease	1	NA
Cat #7	Tooth resorption	1	NA
Cat #7	Halitosis	0.82	NA
Cat #8	Periodontal disease	0.77	0.74
Cat #8	Tooth resorption	0.22	0.15
Cat #8	Halitosis	0.58	0.06
Cat #9	Periodontal disease	0.25	0.14
Cat #9	Tooth resorption	0.13	0.06
Cat #9	Halitosis	0.0001	0.002
Cat #10	Periodontal disease	0.05	0.02
Cat #10	Tooth resorption	0.066	0.06
Cat #10	Halitosis	0.338	0.002
Cat #11	Periodontal disease	0.08	0.23
Cat #11	Tooth resorption	0.06	0.097
Cat #11	Halitosis	0.0009	0.0009

FIG. 5A

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Cat	Dental condition	Replicate		
		#1	#2	#3
Cat I	Periodontal disease	0.009	0.015	0.027
Cat I	Tooth resorption	0.06	0.06	0.06
Cat I	Halitosis	0.0002	0.004	0.0009
Cat II	Periodontal disease	0.56	0.19	0.53
Cat II	Tooth resorption	0.098	0.064	0.079
Cat II	Halitosis	0.8	0.77	0.8
Cat III	Periodontal disease	0.14	0.16	0.46
Cat III	Tooth resorption	0.11	0.07	0.5
Cat III	Halitosis	0.0003	0	0
Cat IV	Periodontal disease	0.12	0.12	0.065
Cat IV	Tooth resorption	0.07	0.06	0.06
Cat IV	Halitosis	0.12	0.23	0.03
Cat V	Periodontal disease	0.2	0.67	0.1
Cat V	Tooth resorption	0.28	0.15	0.06
Cat V	Halitosis	0.0002	0.02	0
Cat VI	Periodontal disease	0.85	0.63	0.87
Cat VI	Tooth resorption	0.36	0.13	0.36
Cat VI	Halitosis	0.79	0.76	0.8
Cat VII	Periodontal disease	0.95	0.99	0.99
Cat VII	Tooth resorption	1	1	1
Cat VII	Halitosis	0.004	0.003	0.02
Cat VIII	Periodontal disease	0.95	0.95	0.75
Cat VIII	Tooth resorption	0.99	0.99	0.99
Cat VIII	Halitosis	0.1	0.04	0.2
Cat IX	Periodontal disease	0.1	0.06	0.73
Cat IX	Tooth resorption	0.12	0.096	0.48
Cat IX	Halitosis	0.0002	0.0002	0.003
Cat X	Periodontal disease	0.43	0.88	NA
Cat X	Tooth resorption	0.29	0.2	NA
Cat X	Halitosis	0.096	0.12	NA
Cat XI	Periodontal disease	0.39	0.34	NA
Cat XI	Tooth resorption	0.066	0.06	NA
Cat XI	Halitosis	0.05	0.008	NA

FIG. 5B

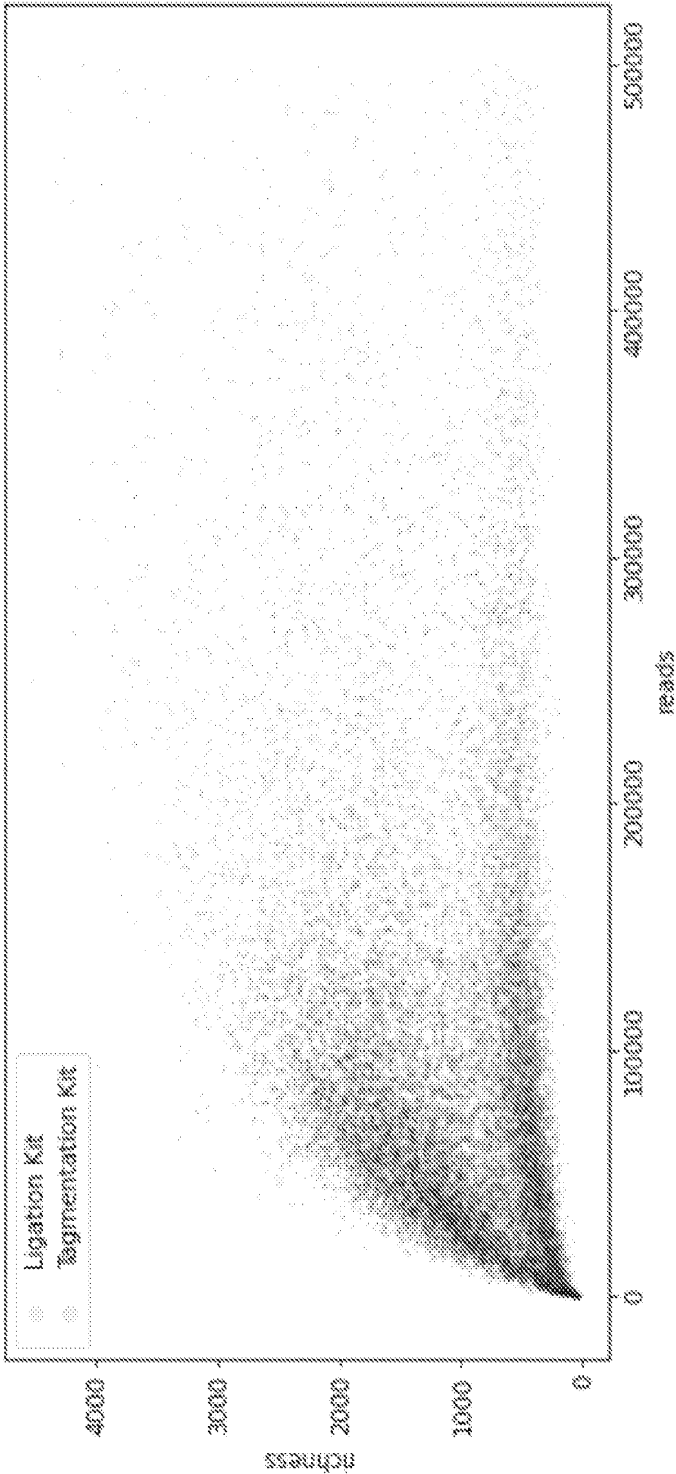


FIG. 6

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Oral microbiome based periodontal disease risk assessment

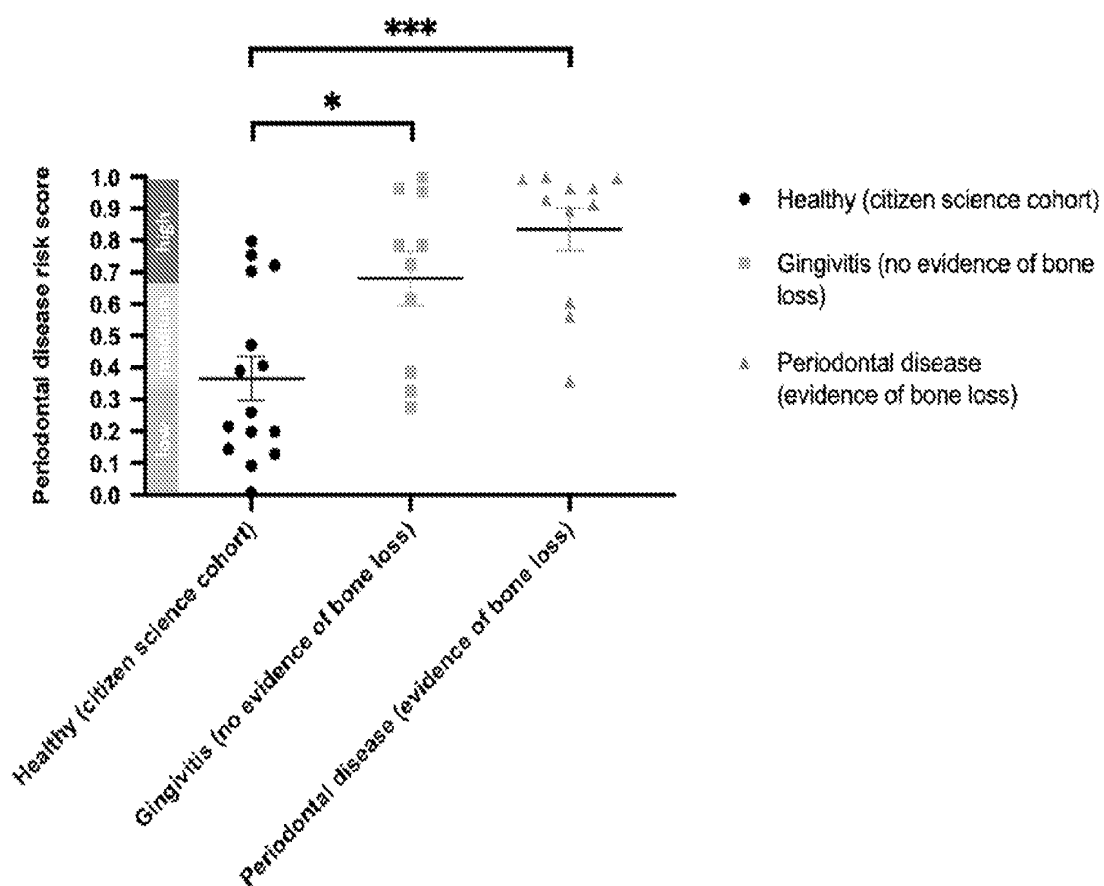


FIG. 7

Oral microbiome based bad breath risk assessment

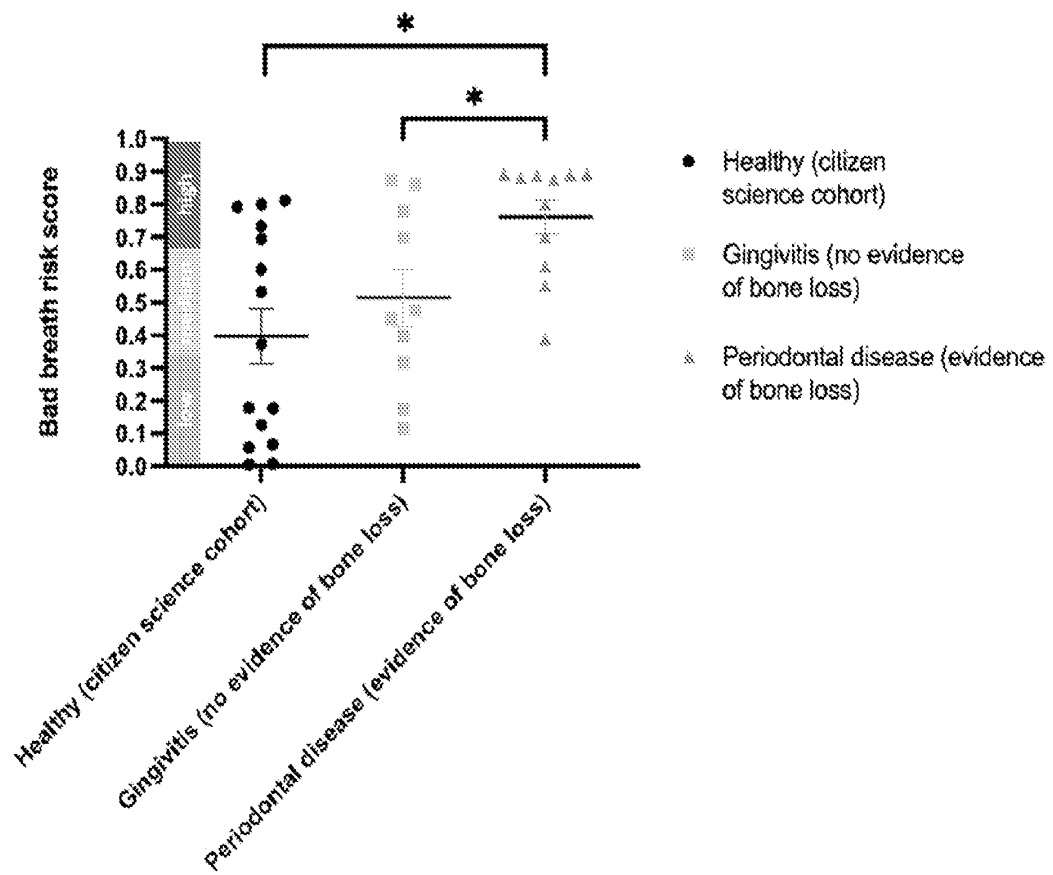


FIG. 8

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Oral microbiome based tooth resorption risk assessment

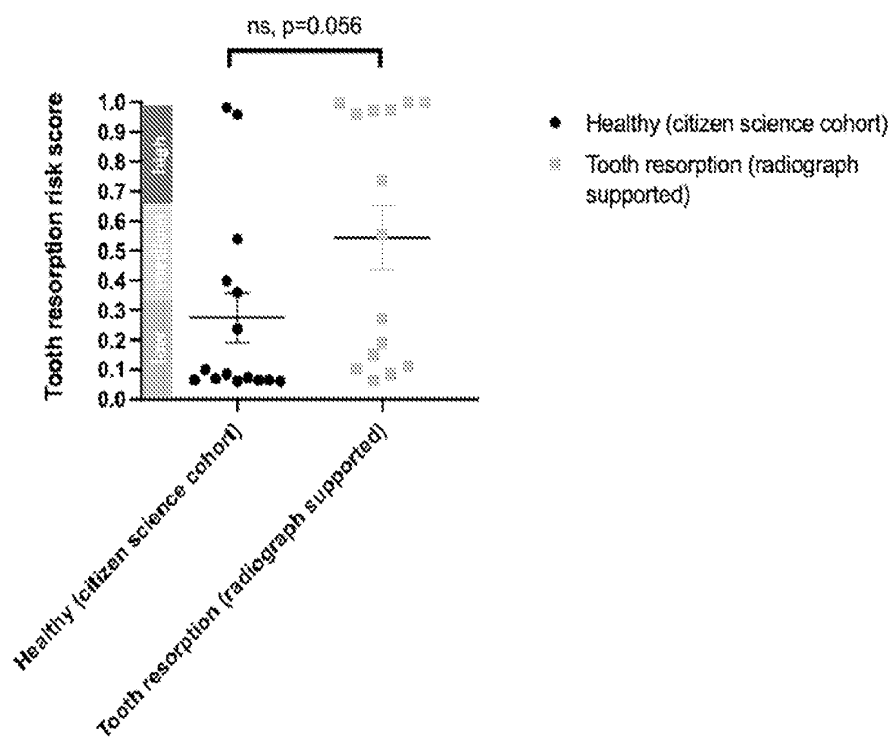


FIG. 9A

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Oral microbiome based tooth resorption risk assessment

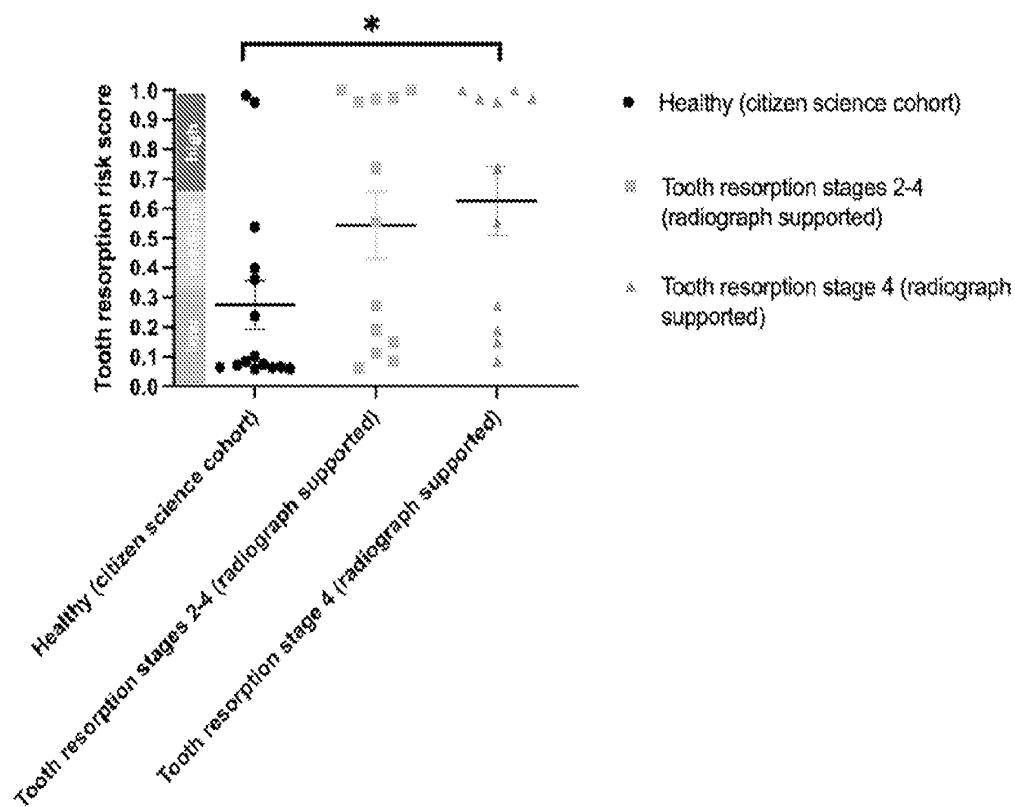


FIG. 9B

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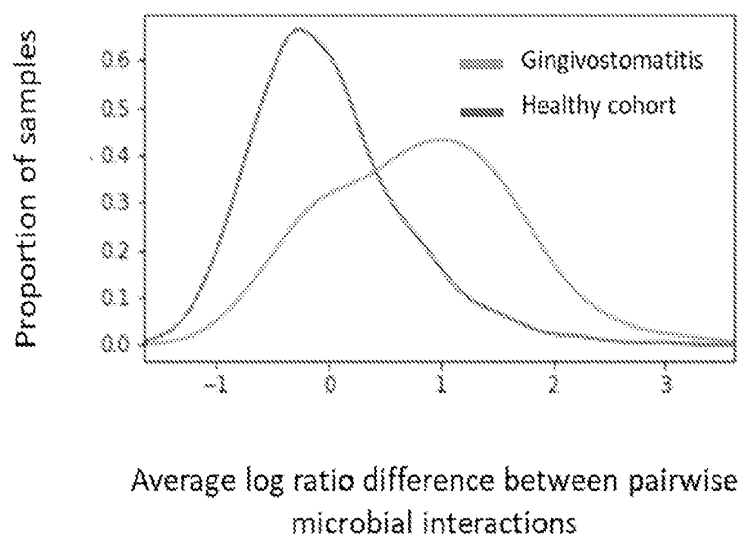
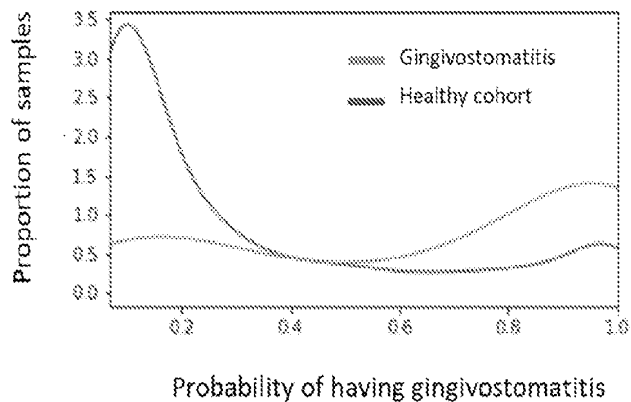


FIG. 10A



Sensitivity = percentage known positive samples classified as medium or high risk = **72%**

Specificity = percentage known negative samples classified as low risk = **71%**

FIG. 10B