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The human Oral – nasopharynx Microbiome as a Risk Screening Tool for Nasopharyngeal Carcinoma

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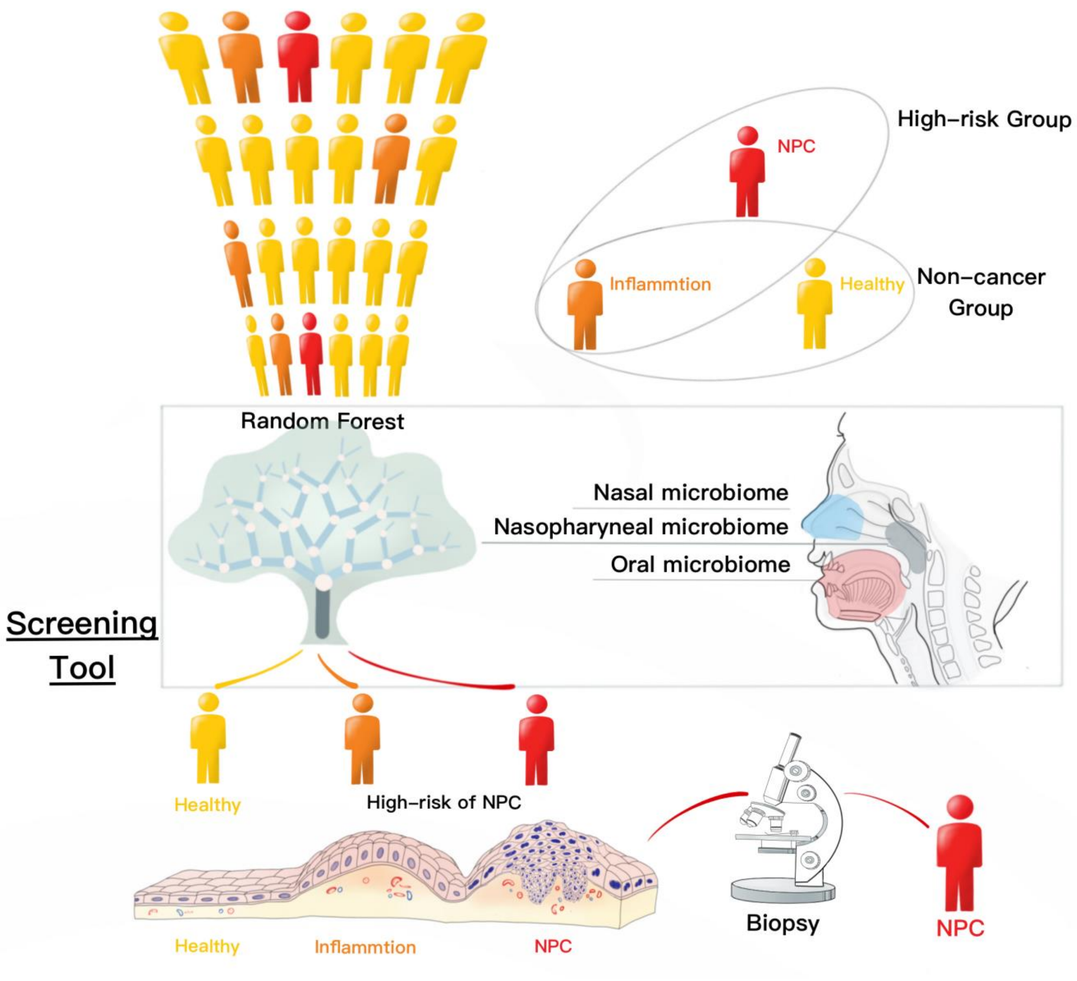
Introduction

NPC is an aggressive malignant tumor of the head and neck mucosal epithelium, and the prognosis of NPC patients with locally advanced or distant metastasis is poor. Early diagnosis and treatment are vital for the prognosis of NPC patients to reduce the mortality rate significantly. Therefore, early NPC screening is critical.



Methods

A total of 139 microbial samples were collected from 40 healthy people and 39 patients with nasopharyngeal biopsy, including 40 and 39 oral, eight and 27 nasal cavity, nine and 16 nasopharyngeal microbial samples. A risk screening tool for NPC was established by 16S rDNA sequencing and random forest.

Results

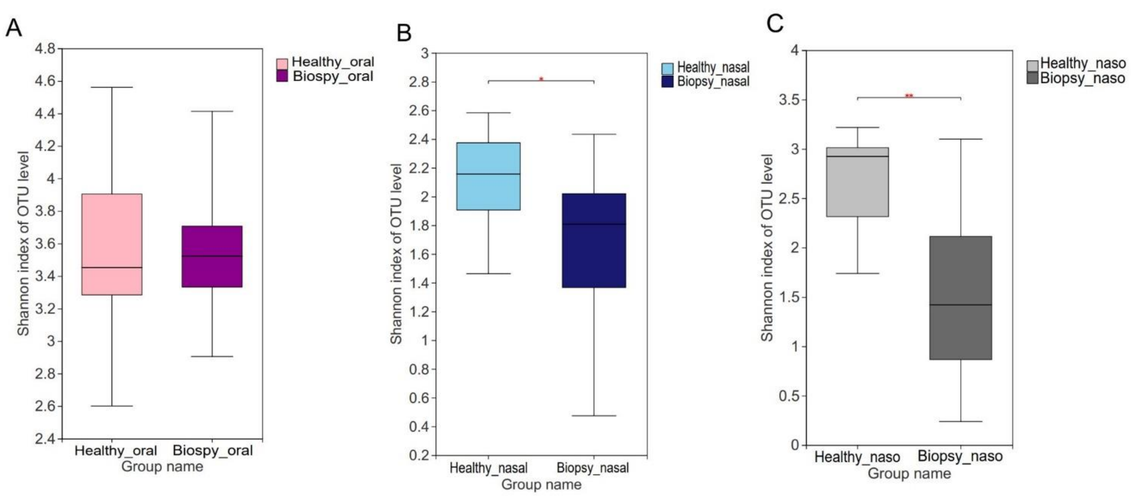


Figure 1 There nasal and nasopharyngeal microbiome of patients with nasopharyngeal biopsy were significantly lower than healthy counterparts ($P < 0.05$, $P < 0.01$)

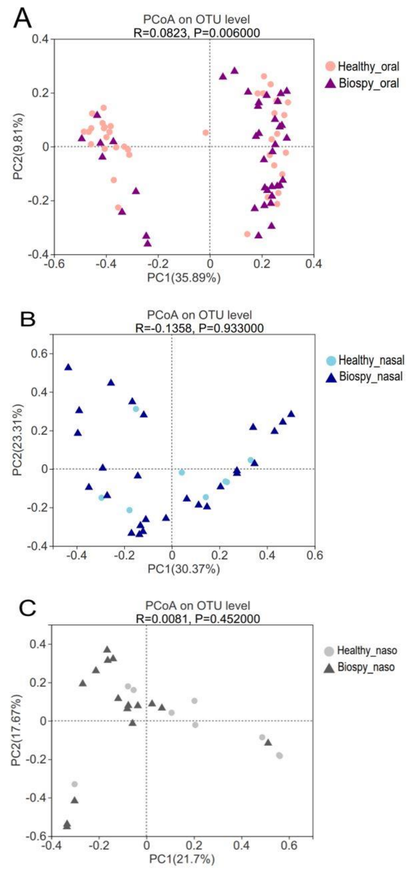


Table 1. Analysis of similarity among groups.

Microbiome	Groups	R value	P value
Oral	Hea vs. Bio	0.0823	0.006
	Can vs. non-Can	-0.0168	0.732
	Hea vs. Can	0.0015	0.405
	Hea vs. Inf	-0.0083	0.481
	Inf vs. Can	-0.0456	0.7
Nasal Cavity	Hea vs. Bio	-0.1358	0.933
	Can vs. non-Can	0.0767	0.066
	Hea vs. Can	-0.0612	0.705
	Hea vs. Inf	-0.077	0.839
	Inf vs. Can	0.0369	0.211
Naso-pharynx	Hea vs. Bio	0.0081	0.452
	Can vs. non-Can	0.1041	0.131
	Hea vs. Can	0.1877	0.029
	Hea vs. Inf	0.2832	0.003
	Inf vs. Can	0.0611	0.239

Figure 2 The oral microbiome of patients with nasopharyngeal biopsy and healthy counterparts were significantly different ($R > 0$; $P < 0.05$). The oral, nasal cavity and nasopharynx microbial composition between the inflammation and the cancer groups were not significantly different (Table2, $P > 0.05$).

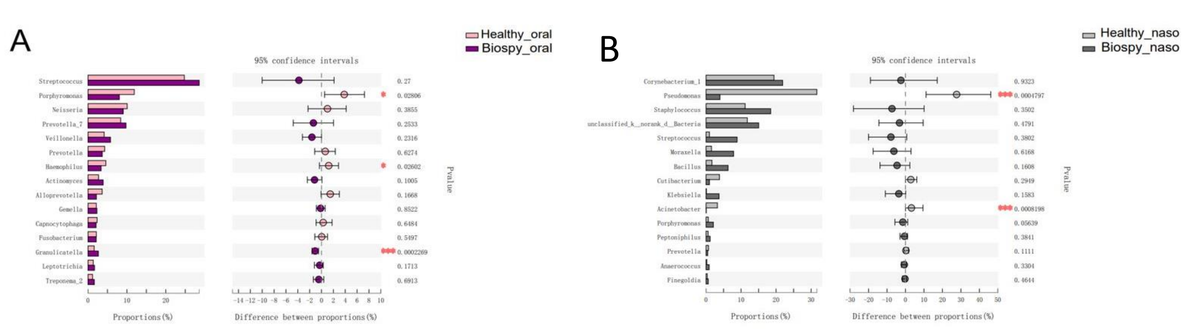


Figure 3 The oral microbiome of patients with nasopharyngeal biopsy had higher *Granulicatella* relative abundance ($P < 0.001$), In the nasopharynx, the healthy counterparts had the higher relative abundances of *Pseudomonas* and *Acinetobacter* ($P < 0.001$)

Table 2. Accuracy rates of NPC risk screening models.

The accuracy rate of the risk screening model based on oral microbiome or nasopharyngeal microbiome was 77.22% and 88%, respectively.

Microbial Samples	Accuracy rate	AUC	Sensitivity	Specificity
139 samples (oral+nasal+nasopharyngeal)	79.86%	0.85	0.8537	0.7193
114 samples (oral+nasal)	78.95%	0.82	0.8636	0.6875
104 samples (oral+nasopharyngeal)	78.85%	0.85	0.7818	0.7959
60 samples (nasal+nasopharyngeal)	83.33%	0.83	0.9535	0.5294
79 samples (oral)	77.22%	0.81	0.7692	0.775
35 samples (nasal)	82.86%	0.66	1	0.25
25 samples (nasopharyngeal)	88%	0.83	0.875	0.8889

Conclusion

This study established the NPC risk screening models based on the oral and nasopharyngeal microbiome. The model is non-invasive, simple, radiation-free, and low cost. The models are beneficial to guide people with a high NPC risk for further examination, improve early NPC detection, and save public health costs.

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