SUPPLEMENTARY DATA

Table S1. Top 5 most abundant phyla of bacteria per site

Gum		*Larynx*		*Floor of Mouth*		*Base of Tongue*	
Phylum	**%Abundance**	**Phylum**	**%Abundance**	**Phylum**	**%Abundance**	**Phylum**	**%Abundance**
Firmicutes	39.21830742	Firmicutes	44.81632275	Firmicutes	37.45515106	Firmicutes	49.56800622
Proteobacteria	34.13179593	Proteobacteria	25.45113681	Proteobacteria	36.20189512	Actinobacteria	23.23762034
Actinobacteria	21.39169982	Actinobacteria	22.78344078	Actinobacteria	18.42266493	Proteobacteria	20.56653029
Bacteroidetes	1.729337977	Chlamydiae	3.469740474	Chlamydiae	2.69868666	Chlamydiae	3.494638344
Chlamydiae	1.704429754	Bacteroidetes	1.859114368	Bacteroidetes	1.882908951	Bacteroidetes	2.071086658
Others	1.82442911	Others	1.620244827	Others	3.338693284	Others	1.062118146

Table S2. Top 4 most abundant phyla of archaea per site

Gum		*Larynx*		*Floor of Mouth*		*Base of Tongue*	
Phylum	**%Abundance**	**Phylum**	**%Abundance**	**Phylum**	**%Abundance**	**Phylum**	**%Abundance**
Crenarchaeota	68.08664567	Crenarchaeota	68.48569661	Crenarchaeota	71.62208742	Crenarchaeota	72.19242138
Euryarchaeota	31.19733594	Euryarchaeota	30.56892336	Euryarchaeota	27.74306598	Euryarchaeota	26.91967846
Thaumarchaeota	0.715663744	Thaumarchaeota	0.945082596	Thaumarchaeota	0.634660785	Thaumarchaeota	0.887704674
Candidatus_Korarchaeota	0.00035464	Candidatus_Korarchaeota	0.00029743	Candidatus_Korarchaeota	0.000185818	Candidatus_Korarchaeota	0.000195487

Table S3. Top 5 most abundant family of viruses per site

Gum		*Larynx*		*Floor of Mouth*		*Base of Tongue*	
Phylum	**% Abundance**	**Phylum**	**% Abundance**	**Phylum**	**% Abundance**	**Phylum**	**% Abundance**
Papillomaviridae	73.82818828	Polydnaviridae	24.2428992	Polydnaviridae	26.0078109	Papillomaviridae	78.96583705
Polydnaviridae	8.441270311	Papillomaviridae	18.30046809	Herpesviridae	20.36099816	Polydnaviridae	7.79082805
Herpesviridae	3.246209	Herpesviridae	10.14932328	Alloherpesviridae	7.930111459	Herpesviridae	2.257689433
Alloherpesviridae	2.644015749	Alloherpesviridae	6.516849173	Betaflexiviridae	6.401573882	Alloherpesviridae	1.791547853
Phycodnaviridae	1.592466598	Betaflexiviridae	4.89568551	Partitiviridae	5.085861393	Phycodnaviridae	1.560380388
Others	10.247850006	Others	35.89477474	Others	34.21364421	Others	7.633717228

Table S4. Wilcoxon rank sum test results for tumor vs paired-normal bacteria abundance comparison at phylum-level

Phylum	W	p.value	p.adjusted*
Actinobacteria	116	0.06486518	0.71351697
Bacteroidetes	153	0.00032105	0.00353153
Chloroflexi	0	0.00032043	0.0035247
Firmicutes	146	0.00108951	0.01198466
Fusobacteria	117	0.05828818	0.64117002
Proteobacteria	111	0.10750801	1
Spirochaetes	35	0.05227497	0.57502469
Synergistetes	0	0.00031795	0.00349745
Tenericutes	12	0.00244846	0.0269331
Thermotogae	0	0.00032043	0.0035247
Verrucomicrobia	0	0.00032105	0.00353153

**p-value adjusted using Bonferroni correction*

Table S5. Wilcoxon rank sum test results for tumor vs paired-normal bacteria abundance comparison at genus-level

Genera	W	p.value	p.adjusted*
Simonsiella	0	0.00915169	1
Treponema	75	0.96224376	1
Campylobacter	98	0.32017407	1
Helicobacter	0	0.00032105	0.05522032
Paracoccus	0	0.00032105	0.05522032
Comamonas	0	0.0004824	0.08297331
Pseudomonas	0	0.00032105	0.05522032
Xanthomonas	0	0.00032105	0.05522032
Agrobacterium	0	0.00032105	0.05522032
Bradyrhizobium	0	0.00032105	0.05522032
Acinetobacter	0	0.00032105	0.05522032

Neisseria	70	0.77638843	1
Psychrobacter	0	0.00109705	0.1886927
Eikenella	19	0.41482307	1
Citrobacter	0	0.00032105	0.05522032
Enterobacter	0	0.00032105	0.05522032
Escherichia	0	0.00032105	0.05522032
Klebsiella	0	0.00032105	0.05522032
Shigella	0	0.00032105	0.05522032
Actinobacillus	0	0.00032043	0.05511345
Haemophilus	98	0.32017407	1
Pasteurella	0	0.00032105	0.05522032
Bacteroides	0	0.00032105	0.05522032
Butyrivibrio	0	0.00072651	0.12496039
Porphyromonas	75	0.96224376	1
Prevotella	153	0.00032105	0.05522032
Roseburia	0	0.03603169	1
Fusobacterium	130	0.0121101	1
Desulfovibrio	0	0.00032105	0.05522032
Acidaminococcus	0	0.18144921	1
Megasphaera	29	0.08322308	1
Selenomonas	62	0.50750125	1
Capnocytophaga	108	0.14224517	1
Afipia	0	0.0004824	0.08297331
Peptostreptococcus	39	0.41444622	1
Ruminococcus	0	0.00072651	0.12496039
Staphylococcus	0	0.00032105	0.05522032
Streptococcus	21	0.00922515	1
Enterococcus	0	0.00032105	0.05522032

Gemella	54	0.7547525	1
Atopobium	103	0.21840113	1
Clostridium	0	0.00032105	0.05522032
Lactobacillus	16	0.0045073	0.77525638
Actinomyces	134	0.00697004	1
Bifidobacterium	0	0.00032105	0.05522032
Brevibacterium	0	0.00385729	0.66345437
Corynebacterium	0	0.00032105	0.05522032
Eubacterium	0	0.00072651	0.12496039
Propionibacterium	17	0.005223	0.89835666
Mycobacterium	0	0.00032105	0.05522032
Mobiluncus	0	0.00385729	0.66345437
Gordonia	0	0.00109705	0.1886927
Mycoplasma	17	0.005223	0.89835666
Thermosipho	0	0.02249427	1
Gardnerella	0	0.00072651	0.12496039
Cardiobacterium	0	0.02249427	1
Sinorhizobium	0	0.00032105	0.05522032
Rikenella	0	0.00915169	1
Veillonella	111	0.10750801	1
Helcococcus	0	0.05905823	1
Leptotrichia	82	0.81289688	1
Rothia	124	0.02608855	1
Kingella	0	0.02249427	1
Phascolarctobacterium	0	NA	NA
Coprococcus	0	0.05905823	1
Streptobacillus	0	0.00252617	0.43450197
Acetivibrio	0	0.00032043	0.05511345

Bilophila	0	0.00032043	0.05511345
Dietzia	0	0.00166169	0.28581145
Dialister	50	0.41011699	1
Sutterella	0	0.00032105	0.05522032
Brevundimonas	0	0.00032105	0.05522032
Johnsonella	0	0.00592154	1
Catonella	23	0.22401538	1
Polynucleobacter	0	0.18144921	1
Filifactor	0	0.01426619	1
Abiotrophia	0	0.03603169	1
Lautropia	0	0.03603169	1
Mitsuokella	0	0.00385729	0.66345437
Chryseobacterium	0	0.00032105	0.05522032
Empedobacter	0	0.00072471	0.12465093
Bergeyella	0	0.00109705	0.1886927
Holdemania	0	0.10034825	1
Mannheimia	0	0.00032105	0.05522032
Actinobaculum	0	0.03603169	1
Delftia	0	0.0004824	0.08297331
Centipeda	0	0.03603169	1
Leclercia	0	0.03603169	1
Slackia	0	0.00592154	1
Eggerthella	0	0.03603169	1
Cryptobacterium	0	0.05905823	1
Pedobacter	0	0.00032105	0.05522032
Mogibacterium	0	0.00592154	1
Coprobacillus	0	0.00032105	0.05522032
Collinsella	0	0.00032105	0.05522032

Ensifer	0	0.00032105	0.05522032
Pseudoramibacter	0	0.03603169	1
Granulicatella	21	0.30655627	1
Bulleidia	0	0.0038398	0.66044562
Solobacterium	68	0.02536986	1
Olsenella	17	0.005223	0.89835666
Raoultella	0	0.00032105	0.05522032
Peptoniphilus	15	0.01149007	1
Anaerococcus	0	0.0004824	0.08297331
Sneathia	0	0.00032105	0.05522032
Shuttleworthia	21	0.30655627	1
Varibaculum	0	0.10034825	1
Dorea	0	0.03603169	1
Allofustis	0	0.18144921	1
Tannerella	45	0.24464807	1
Scardovia	0	0.00252617	0.43450197
Parascardovia	0	0.03603169	1
Tepidiphilus	0	0.01426619	1
Anaerostipes	0	0.18144921	1
Morococcus	0	0.00252617	0.43450197
Histophilus	0	0.00032105	0.05522032
Faecalibacterium	0	0.01426619	1
Ottowia	0	0.02249427	1
Alistipes	0	0.0004824	0.08297331
Akkermansia	0	0.02249427	1
Anaerotruncus	0	0.37109337	1
Marvinbryantia	0	0.10034825	1
Anaerofustis	0	0.10034825	1

Oribacterium	100	0.10334981	1
Catabacter	0	0.00252617	0.43450197
Odoribacter	0	0.00385729	0.66345437
Subdoligranulum	0	1	1
Parabacteroides	0	0.00032105	0.05522032
Gulbenkiania	0	0.00032105	0.05522032
Barnesiella	0	0.00252617	0.43450197
Aggregatibacter	17	0.005223	0.89835666
Alloscardovia	0	0.00166169	0.28581145
Adlercreutzia	0	1	1
Oscillibacter	0	0.0004824	0.08297331
Cloacibacillus	0	1	1
Sharpea	0	0.01426619	1
Parvimonas	125	0.02307267	1
Blautia	0	0.00032105	0.05522032
Butyricimonas	0	0.00032105	0.05522032
Paraprevotella	0	0.00072471	0.12465093
Butyricicoccus	0	0.37109337	1
Robinsoniella	0	0.18144921	1
Pyramidobacter	0	0.02249427	1
Gordonibacter	0	0.05905823	1
Necropsobacter	0	0.00032105	0.05522032
Phocaeicola	0	0.37109337	1
Christensenella	0	0.37109337	1
Pseudoflavonifractor	0	1	1
Lachnoanaerobaculum	27	0.11655196	1
Stomatobaculum	46	1	1
Eggerthia	0	0.00915169	1

Alloprevotella	75	0.96224376	1
Lelliottia	0	0.00592154	1
Coprobacter	0	1	1
Intestinimonas	0	0.18144921	1
Dielma	0	1	1
Kallipyga	0	0.18144921	1
Senegalimassilia	0	0.18144921	1
Intestinibacter	0	0.03603169	1
Erysipelatoclostridium	0	0.05905823	1
Lachnoclostridium	0	0.0004824	0.08297331
Tyzzerella	0	0.37109337	1
Holdemanella	0	0.37109337	1
Faecalicoccus	0	0.37109337	1
Sanguibacteroides	0	0.00032105	0.05522032
Mageeibacillus	0	0.00166169	0.28581145
Hungatella	0	0.00109705	0.1886927
Levyella	0	0.03603169	1
Faecalibaculum	0	0.37109337	1
Sellimonas	0	1	1
Lawsonella	0	0.05905823	1
Clostridioides	0	0.00072651	0.12496039
Ruthenibacterium	0	NA	NA
Mycolicibacterium	0	NA	NA
Gabonibacter	0	NA	NA
Pseudopropionibacterium	0	NA	NA
Peptoanaerobacter	1	1	1
Gabonia	0	NA	NA
Bariatricus	0	NA	NA

Neglecta	0	NA	NA
Emergencia	0	NA	NA
Culturomica	0	NA	NA
Mediterranea	0	NA	NA
Phocea	0	NA	NA
Prevotellamassilia	0	NA	NA
Traorella	0	NA	NA
Tidjanibacter	0	NA	NA
Bittarella	0	NA	NA
Neofamilia	0	NA	NA
Angelakisella	0	NA	NA
Libanicoccus	0	NA	NA
Merdibacter	0	NA	NA
Massilioclostridium	0	NA	NA
Criibacterium	0	NA	NA
Fournierella	0	NA	NA
Lagierella	0	NA	NA
Urmitella	0	NA	NA
Colibacter	0	NA	NA
Alterileibacterium	0	NA	NA
Negativibacillus	0	NA	NA
Duodenibacillus	0	NA	NA

**p-value adjusted using Bonferroni correction*

Table S6. Kruskal-Wallis Test result of Genus-Level Comparison of Top Virus Normalized Abundance Values per Site

	Gum		Larynx		Floor of Mouth		Base of Tongue	
	p value	p.adjusted*	p value	p.adjusted*	p value	p.adjusted*	p value	p.adjusted*
Ichnovirus	0.50	1	0.09	0.3	0.50	1	0.52	1
Cytomegalovirus	0.77	1	0.54	1	0.31	0.94	0.50	1
Gammaretrovirus	0.50	1	0.77	1	0.66	1	0.27	0.81

**p-value adjusted using Bonferroni correction*

Table S7. Kruskal-Wallis Test result of Genus-Level Comparison of Top Bacteria Normalized Abundance Values per Site

	Gum		Larynx		Floor of Mouth		Base of Tongue	
	p value	p.adjusted*	p value	p.adjusted*	p value	p.adjusted*	p value	p.adjusted*
Bacteroides	0.77	1	0.66	1	0.80	1	0.35	1
Pseudomonas	0.63	1	0.57	1	0.96	1	0.13	0.39
Terrabacter	0.21	0.63	0.27	0.81	0.01	0.03	0.94	1

**p-value adjusted using Bonferroni correction*

Table S8. Kruskal-Wallis Test result of Genus-Level Comparison of Top Archaea Normalized Abundance Values per Site

	Gum		Larynx		Floor of Mouth		Base of Tongue	
	p value	p.adjusted*	p value	p.adjusted*	p value	p.adjusted*	p value	p.adjusted*
Candidatus	0.10	0.30	0.53	1	0.98	1	0.51	1
Sulfolobus	0.63	1	0.08	0.54	0.36	1	0.69	1
Methanosarcina	0.38	1	0.86	1	0.98	1	0.17	0.51

**p-value adjusted using Bonferroni correction*

Table S9. Mean Normalized Abundance Value of Virus per Site at Genus-level

Genus	Gum		Larynx		Floor of Mouth			Base of Tongue	
	Alive	Dead	Alive	Dead	Alive	Dead	Unknown	Alive	Dead
Ichnovirus	9.98	10.4	10.0	10.0	9.91	NA	8.21	10.2	9.93
Cytomegalovirus	8.68	8.96	8.59	8.76	8.37	NA	7.91	8.77	8.52
Gammaretrovirus	9.48	10.6	9.63	9.95	9.74	NA	6.15	9.84	10.0

Table S10. Mean Normalized Abundance Value of Bacteria per Site at Genus-level

Genus	Gum		Larynx		Floor of Mouth			Base of Tongue	
	Alive	Dead	Alive	Dead	Alive	Dead	Unknown	Alive	Dead
Bacteroides	17.1	16.7	17.0	17.1	16.9	NA	15.6	17.1	16.9
Pseudomonas	17.4	18.9	17.5	17.6	17.6	NA	17.1	17.1	17.4
Terrabacter	17.4	17.2	17.5	17.8	17.5	NA	15.9	17.4	17.5

Table S11. Mean Normalized Abundance Value of Archaea per Site at Genus-level

Genus	Gum		Larynx		Floor of Mouth			Base of Tongue		
	Alive	Dead	Alive	Dead	Alive	Dead	Unknown	Alive	Dead	Unknown
Candidatus	8.36	8.74	8.52	8.69	8.63	NA	7.96	8.45	8.67	9.04
Sulfolobus	7.43	7.37	7.86	7.98	7.70	NA	6.91	7.45	8.11	7.63
Methanosarcina	7.21	7.43	7.30	7.22	7.13	NA	6.54	7.33	7.55	7.27