**Appendix I**

Boxplots comparable to Figures 1A-5A from the main text, but for analysis with only the subset of sites sequenced at Washington University Sequencing Center.



**Figure A.1.1** Boxplots showing the average carbon (A), oxygen (B), nitrogen (C), and sulfur (D) content and C:N ratio (E) of microbial proteins as a function of the five major body sites. Results are for the subset of samples sequenced at Washington University Sequencing Center (compare to Figure 1 from the main text, which included all samples from all sequencing centers).

Boxplots comparable to Figures 1A,B-5A,B from the main text, but for analysis with only the side-chain, rather than the full amino acid (side chain + backbone).



**Figure A.1.2** Boxplots showing the average carbon content of microbial proteins as a function of human body site for (A) the five major sites and (B) the fifteen minor sites in our study (compare to Figure 1 from the main text). The number of samples from each site is indicated in square brackets on axis labels. Faded boxes are used for sites with fewer than 10 samples.



**Figure A.1.3** Boxplots showing the average oxygen content of microbial proteins as a function of human body site for (A) the five major sites and (B) the fifteen minor sites in our study (compare to Figure 2 from the main text). The number of samples from each site is indicated in square brackets on axis labels. Faded boxes are used for sites with fewer than 10 samples.



**Figure A.1.4** Boxplots showing the average nitrogen content of microbial proteins as a function of human body site for (A) the five major sites and (B) the fifteen minor sites in our study (compare to Figure 3 from the main text). The number of samples from each site is indicated in square brackets on axis labels. Faded boxes are used for sites with fewer than 10 samples.



**Figure A.1.5** Boxplots showing the average sulfur content of microbial proteins as a function of human body site for (A) the five major sites and (B) the fifteen minor sites in our study (compare to Figure 4 from the main text). The number of samples from each site is indicated in square brackets on axis labels. Faded boxes are used for sites with fewer than 10 samples.

****

**Figure A.1.6** Boxplots showing the average C:N ratio of microbial proteins as a function of human body site for (A) the five major sites and (B) the fifteen minor sites in our study (compare to Figure 5 from the main text). The number of samples from each site is indicated in square brackets on axis labels. Faded boxes are used for sites with fewer than 10 samples.

**Appendix II**

***Carbon Content***

**Table A.2.1** *z*-test statistics and *p-*values for carbon fraction comparisons across major body

sites; stars indicate significant differences. Dunn’s test was performed for multiple pairwise comparison after a Kruskal-Wallis test. Significant p-values for pairwise comparison were determined using Benjamini-Hochberg adjustment.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | **Skin** | **Stool** |
| **Oral** | -8.783814  0.0000\* | –  – | –  – | –  – |
| **Skin** | 1.025082  0.1527 | 6.278751 0.0000\* | –  – | –  – |
| **Stool** | -13.21415  0.0000\* | -7.702602  0.0000\* | -9.526591  0.0000\* | –  – |
| **Vaginal** | -12.10702  0.0000\* | -7.203398  0.0000\* | -9.705722  0.0000\* | -1.691673  0.0504 |

**Table A.2.2** Significant differences (\*) for carbon fraction comparisons across minor body sites

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | | | | | | | | **Skin** | | **Stool** | **Vaginal** | |
| **Na** | **Ak** | **Bm** | **Sa** | **Sb** | **Sp** | **Td** | **Th** | **To** | **Lr** | **Rr** | **St** | **Mv** | **Pf** |
| **Ak** | **\*** | – | – | – | – | – | – | – | – | – | – | – | – | – |
| **Bm** | **\*** |  | – | – | – | – | – | – | – | – | – | – | – | – |
| **Sa** | **\*** |  |  | – | – | – | – | – | – | – | – | – | – | – |
| **Sb** | **\*** |  |  |  | – | – | – | – | – | – | – | – | – | – |
| **Sp** | **\*** | **\*** | **\*** |  |  | – | – | – | – | – | – | – | – | – |
| **Td** | **\*** |  | **\*** |  |  | **\*** | – | – | – | – | – | – | – | – |
| **Th** | **\*** |  |  |  |  | **\*** |  | – | – | – | – | – | – | – |
| **To** | **\*** |  |  |  |  | **\*** | **\*** |  | – | – | – | – | – | – |
| **Lr** |  | **\*** | **\*** | **\*** | **\*** |  | **\*** | **\*** | **\*** | – | – | – | – | – |
| **Rr** |  | **\*** | **\*** | **\*** | **\*** | **\*** | **\*** | **\*** | **\*** |  | – | – | – | – |
| **St** | **\*** |  |  |  |  | **\*** | **\*** |  |  | **\*** | **\*** | – | – | – |
| **Mv** | **\*** |  |  |  |  |  |  |  |  | **\*** | **\*** |  | – | – |
| **Pf** | **\*** |  |  |  |  | **\*** | **\*** |  |  | **\*** | **\*** |  |  | – |
| **Vi** | **\*** |  |  |  |  | **\*** |  |  |  | **\*** | **\*** |  |  |  |

**Table A.2.3** Levene’s test statistic (for comparing homogeneity of variance across groups) for carbon content (associated *p-*values shown below; stars indicate significance)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | **Skin** | **Stool** |
| **Oral** | 134.8277  0.0000\* | –  – | –  – | –  – |
| **Skin** | 3.8151  0.0533 | 16.4676  0.0001\* | –  – | –  – |
| **Stool** | 100.8623  0.0000\* | 7.5592  0.0062\* | 29.4770  0.0000\* | –  – |
| **Vaginal** | 32.4366  0.0000\* | 0.2341  0.6288 | 7.3152  0.0084\* | 1.5755  0.2109 |

****

**Figure A.2.1** Histograms showing the carbon fraction of microbial proteins by body site.

***Oxygen Content***

**Table A2.4** *z*-test statistics and *p-*values for oxygen fraction comparisons across major body

sites; stars indicate significant differences. Dunn’s test was performed for multiple pairwise comparison after a Kruskal-Wallis test. Significant p-values for pairwise comparison were determined using Benjamini-Hochberg adjustment.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | **Skin** | **Stool** |
| **Oral** | 7.498569  0.0000\* | –  – | –  – | –  – |
| **Skin** | -0.238796  0.4056 | -4.658364  0.0000\* | –  – | –  – |
| **Stool** | 7.980258  0.0000\* | 2.020700  0.0241\* | 5.355499  0.0000\* | –  – |
| **Vaginal** | 13.66887  0.0000\* | 10.14041  0.0000\* | 10.09271  0.0000\* | 7.902870  0.0000\* |

**Table A2.5** Significant differences (\*) for oxygen fraction comparisons across minor body sites

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | | | | | | | | **Skin** | | **Stool** | **Vaginal** | |
| **Na** | **Ak** | **Bm** | **Sa** | **Sb** | **Sp** | **Td** | **Th** | **To** | **Lr** | **Rr** | **St** | **Mv** | **Pf** |
| **Ak** | **\*** | – | – | – | – | – | – | – | – | – | – | – | – | – |
| **Bm** | **\*** |  | – | – | – | – | – | – | – | – | – | – | – | – |
| **Sa** |  |  |  | – | – | – | – | – | – | – | – | – | – | – |
| **Sb** | **\*** |  | **\*** |  | – | – | – | – | – | – | – | – | – | – |
| **Sp** | **\*** |  |  |  |  | – | – | – | – | – | – | – | – | – |
| **Td** | **\*** | **\*** | **\*** |  | **\*** | **\*** | – | – | – | – | – | – | – | – |
| **Th** | **\*** |  |  |  |  |  | **\*** | – | – | – | – | – | – | – |
| **To** | **\*** |  |  |  |  |  | **\*** |  | – | – | – | – | – | – |
| **Lr** |  | **\*** | **\*** |  | **\*** | **\*** |  | **\*** | **\*** | – | – | – | – | – |
| **Rr** |  | **\*** | **\*** |  | **\*** | **\*** |  | **\*** | **\*** |  | – | – | – | – |
| **St** | **\*** |  |  |  | **\*** |  | **\*** |  |  | **\*** | **\*** | – | – | – |
| **Mv** | **\*** |  |  |  |  |  | **\*** |  |  | **\*** | **\*** |  | – | – |
| **Pf** | **\*** |  | **\*** |  |  | **\*** | **\*** | **\*** |  | **\*** | **\*** | **\*** |  | – |
| **Vi** | **\*** |  | **\*** |  |  |  | **\*** |  |  | **\*** | **\*** |  |  |  |

**Table A.2.6** Levene’s test statistic (for comparing homogeneity of variance across groups) for oxygen content (associated *p-*values shown below; stars indicate significance)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | **Skin** | **Stool** |
| **Oral** | 213.3282  0.0000\* | –  – | –  – | –  – |
| **Skin** | 8.3449  0.0047\* | 21.3340  0.3123 | –  – | –  – |
| **Stool** | 132.2383  0.0000\* | 46.0032  0.0000\* | 69.4282  0.0000\* | –  – |
| **Vaginal** | 30.3412  0.0000\* | 2.3862  0.1231 | 3.2406  0.0756 | 28.1916  0.0000\* |

****

**Figure A.2.2** Histograms showing the oxygen fraction of microbial proteins by body site.

***Nitrogen Content***

**Table A2.7** *z*-test statistics and *p-*values for nitrogen fraction comparisons across major body

sites; stars indicate significant differences. Dunn’s test was performed for multiple pairwise comparison after a Kruskal-Wallis test. Significant p-values for pairwise comparison were determined using Benjamini-Hochberg adjustment.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | **Skin** | **Stool** |
| **Oral** | 13.31326  0.0000\* | –  – | –  – | –  – |
| **Skin** | 0.411346  0.3404 | -7.349500  0.0000\* | –  – | –  – |
| **Stool** | 8.984084  0.0000\* | -3.567300  0.0002\* | 5.317669  0.0000\* | –  – |
| **Vaginal** | 11.95557  0.0000\* | 3.261703  0.0006\* | 8.243533  0.0000\* | 5.181325  0.0000\* |

**Table A.2.8** Significant differences (\*) for nitrogen fraction comparisons across minor body sites

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | | | | | | | | **Skin** | | **Stool** | **Vaginal** | |
| **Na** | **Ak** | **Bm** | **Sa** | **Sb** | **Sp** | **Td** | **Th** | **To** | **Lr** | **Rr** | **St** | **Mv** | **Pf** |
| **Ak** | **\*** | – | – | – | – | – | – | – | – | – | – | – | – | – |
| **Bm** | **\*** |  | – | – | – | – | – | – | – | – | – | – | – | – |
| **Sa** |  |  |  | – | – | – | – | – | – | – | – | – | – | – |
| **Sb** | **\*** | **\*** | **\*** |  | – | – | – | – | – | – | – | – | – | – |
| **Sp** | **\*** | **\*** | **\*** |  |  | – | – | – | – | – | – | – | – | – |
| **Td** | **\*** |  | **\*** |  |  | **\*** | – | – | – | – | – | – | – | – |
| **Th** | **\*** |  |  |  |  | **\*** |  | – | – | – | – | – | – | – |
| **To** | **\*** |  |  |  | **\*** | **\*** |  |  | – | – | – | – | – | – |
| **Lr** |  | **\*** | **\*** |  |  |  | **\*** | **\*** | **\*** | – | – | – | – | – |
| **Rr** |  | **\*** | **\*** |  |  |  | **\*** | **\*** | **\*** |  | – | – | – | – |
| **St** | **\*** | **\*** | **\*** |  |  | **\*** | **\*** |  | **\*** | **\*** | **\*** | – | – | – |
| **Mv** | **\*** |  |  |  |  | **\*** |  |  |  | **\*** | **\*** |  | – | – |
| **Pf** | **\*** |  | **\*** |  | **\*** | **\*** |  |  |  | **\*** | **\*** | **\*** |  | – |
| **Vi** | **\*** |  |  |  |  | **\*** |  |  |  | **\*** | **\*** |  |  |  |

**Table A.2.9** Levene’s test statistic (for comparing homogeneity of variance across groups) for nitrogen content (associated *p-*values shown below; stars indicate significance)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | **Skin** | **Stool** |
| **Oral** | 55.2010  0.0000\* | –  – | –  – | –  – |
| **Skin** | 0.2483  0.6193 | 29.6170  0.0000\* | –  – | –  – |
| **Stool** | 173.9578  0.0000\* | 105.1199  0.0000\* | 130.0917  0.0000\* | –  – |
| **Vaginal** | 31.2524  0.0000\* | 5.4492  0.0200 | 22.5416  0.0000\* | 43.6027  0.0000\* |

****

**Figure A.2.3** Histograms showing the nitrogen fraction of microbial proteins by body site.

***Sulfur content***

**Table A.2.10** *z*-test statistics and *p-*values for sulfur fraction comparisons across major body

sites; stars indicate significant differences. Dunn’s test was performed for multiple pairwise comparison after a Kruskal-Wallis test. Significant p-values for pairwise comparison were determined using Benjamini-Hochberg adjustment.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | **Skin** | **Stool** |
| **Oral** | 6.694494  0.0000\* | –  – | –  – | –  – |
| **Skin** | -1.395317  0.0905 | -5.462449  0.0000\* | –  – | –  – |
| **Stool** | -7.774525  0.0000\* | -18.75802  0.0000\* | -3.514537  0.0003\* | –  – |
| **Vaginal** | 4.835870  0.0000\* | 0.232205  0.4082 | 4.805238  0.0000\* | 11.94946  0.0000\* |

**Table A2.11** Significant differences (\*) for sulfur fraction comparisons across minor body sites

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | | | | | | | | **Skin** | | **Stool** | **Vaginal** | |
| **Na** | **Ak** | **Bm** | **Sa** | **Sb** | **Sp** | **Td** | **Th** | **To** | **Lr** | **Rr** | **St** | **Mv** | **Pf** |
| **Ak** |  | – | – | – | – | – | – | – | – | – | – | – | – | – |
| **Bm** | **\*** |  | – | – | – | – | – | – | – | – | – | – | – | – |
| **Sa** |  |  |  | – | – | – | – | – | – | – | – | – | – | – |
| **Sb** |  |  | **\*** |  | – | – | – | – | – | – | – | – | – | – |
| **Sp** | **\*** |  | **\*** |  |  | – | – | – | – | – | – | – | – | – |
| **Td** |  |  | **\*** |  |  | **\*** | – | – | – | – | – | – | – | – |
| **Th** |  |  | **\*** |  |  | **\*** |  | – | – | – | – | – | – | – |
| **To** |  |  | **\*** |  |  | **\*** |  |  | – | – | – | – | – | – |
| **Lr** |  |  | **\*** |  |  | **\*** |  |  |  | – | – | – | – | – |
| **Rr** |  |  | **\*** |  |  | **\*** |  |  |  |  | – | – | – | – |
| **St** | **\*** | **\*** | **\*** |  | **\*** | **\*** | **\*** |  | **\*** |  | **\*** | – | – | – |
| **Mv** |  |  |  |  |  |  |  |  |  |  |  |  | – | – |
| **Pf** | **\*** |  | **\*** |  |  |  | **\*** |  |  | **\*** | **\*** | **\*** |  | – |
| **Vi** |  |  |  |  |  |  |  |  |  |  |  | **\*** |  |  |

**Table A.2.12** Levene’s test statistic (for comparing homogeneity of variance across groups) for sulfur content (associated *p-*values shown below; stars indicate significance)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | **Skin** | **Stool** |
| **Oral** | 98.1237  0.0000\* | –  – | –  – | –  – |
| **Skin** | 7.6392  0.0067\* | 0.5779  0.4476 | –  – | –  – |
| **Stool** | 91.2023  0.0000\* | 61.3032  0.0000\* | 27.8986  0.0000\* | –  – |
| **Vaginal** | 25.0704  0.0000\* | 4.4543  0.0354\* | 2.2010  0.1419 | 7.6362  0.0063\* |

****

**Figure A.2.4** Histograms showing the sulfur fraction of microbial proteins by body site.

***C:N Ratio***

**Table A.2.13** *z*-test statistics and *p-*values for C:N ratio comparisons across major body

sites; stars indicate significant differences. Dunn’s test was performed for multiple pairwise comparison after a Kruskal-Wallis test. Significant p-values for pairwise comparison were determined using Benjamini-Hochberg adjustment.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | **Skin** | **Stool** |
| **Oral** | -12.84991 0.0000\* | –  – | –  – | –  – |
| **Skin** | -0.284739  0.3879 | 7.217539  0.0000\* | –  – | –  – |
| **Stool** | -9.794785  0.0000\* | 1.892776  0.0324 | -5.968785  0.0000\* | –  – |
| **Vaginal** | -12.45646  0.0000\* | -4.246096  0.0000\* | -8.724376  0.0000\* | -5.023286  0.0000\* |

**Table A2.14** Significant differences (\*) for C:N ratio comparisons across minor body sites

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | | | | | | | | **Skin** | | **Stool** | **Vaginal** | |
| **Na** | **Ak** | **Bm** | **Sa** | **Sb** | **Sp** | **Td** | **Th** | **To** | **Lr** | **Rr** | **St** | **Mv** | **Pf** |
| **Ak** | **\*** | – | – | – | – | – | – | – | – | – | – | – | – | – |
| **Bm** | **\*** |  | – | – | – | – | – | – | – | – | – | – | – | – |
| **Sa** |  |  |  | – | – | – | – | – | – | – | – | – | – | – |
| **Sb** | **\*** |  | **\*** |  | – | – | – | – | – | – | – | – | – | – |
| **Sp** | **\*** | **\*** | **\*** |  |  | – | – | – | – | – | – | – | – | – |
| **Td** | **\*** |  | **\*** |  |  | **\*** | – | – | – | – | – | – | – | – |
| **Th** | **\*** |  |  |  |  | **\*** |  | – | – | – | – | – | – | – |
| **To** | **\*** |  |  |  | **\*** | **\*** |  |  | – | – | – | – | – | – |
| **Lr** |  | **\*** | **\*** |  |  |  | **\*** | **\*** | **\*** | – | – | – | – | – |
| **Rr** |  | **\*** | **\*** |  |  |  | **\*** | **\*** | **\*** |  | – | – | – | – |
| **St** | **\*** |  | **\*** |  |  | **\*** | **\*** |  | **\*** | **\*** | **\*** | – | – | – |
| **Mv** | **\*** |  |  |  |  | **\*** |  |  |  | **\*** | **\*** |  | – | – |
| **Pf** | **\*** |  |  |  | **\*** | **\*** | **\*** |  |  | **\*** | **\*** | **\*** |  | – |
| **Vi** | **\*** |  |  |  |  | **\*** |  |  |  | **\*** | **\*** |  |  |  |

**Table A.2.15** Levene’s test statistic (for comparing homogeneity of variance across groups) for C:N ratio (associated *p-*values shown below; stars indicate significance)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Nasal** | **Oral** | **Skin** | **Stool** |
| **Oral** | 33.3824  0.0000\* | –  – | –  – | –  – |
| **Skin** | 1.6607  0.2002 | 30.0674  0.0000\* | –  – | –  – |
| **Stool** | 161.0433  0.0000\* | 98.2921  0.0000\* | 136.4319  0.0000\* | –  – |
| **Vaginal** | 24.7079  0.0000\* | 5.7012  0.0174 | 22.5242  0.0000\* | 31.2558  0.0000\* |

****

**Figure A.2.5** Histograms showing the C:N ratio of microbial proteins by body site.

**Appendix III**

GC content, number of coding sequences, and average coding sequence length across each of the major body sites.



**Figure A.3.1** Boxplots showing the GC content of coding sequences (A), number of coding sequences (B) and number of amino acids per coding sequence (C) for microbial proteins from samples across the five major body sites. The number of samples from each site is indicated in square brackets on axis labels.

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