**Supplementary Information**

**Supplementary Table 1.** Contingency table of wine 1 for the Western group

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Positive frequency** | **Negative frequency** | **Balance** | **Translated frequency** |
| Acidic | 2 | 3 | −1 | 3 |
| Alcoholic | 1 | 0 | 1 | 5 |
| Astringent | 3 | 3 | 0 | 4 |
| Balanced | 2 | 2 | 0 | 4 |
| Bitter | 1 | 1 | 0 | 4 |
| Body | 1 | 4 | −3 | 1 |
| Caramel | 0 | 0 | 0 | 4 |
| Chemical | 0 | 0 | 0 | 4 |
| Complex | 1 | 1 | 0 | 4 |
| Earthy | 1 | 1 | 0 | 4 |
| Floral | 1 | 0 | 1 | 5 |
| Fruity | 6 | 1 | 5 | 9 |
| Herbaceous | 1 | 0 | 1 | 5 |
| Intense | 1 | 2 | −1 | 3 |
| Mature | 0 | 1 | −1 | 3 |
| Persistent | 2 | 2 | 0 | 4 |
| Salty | 0 | 0 | 0 | 4 |
| Spicy | 3 | 1 | 2 | 6 |
| Sweet | 1 | 2 | −1 | 3 |
| Umami | 0 | 0 | 0 | 4 |
| Woody | 1 | 4 | −3 | 1 |

For each semantic group, the balance was calculated as the difference between positive and negative frequencies. To avoid minus values, each semantic group was given a translated frequency which was the sum of the balance and 4 which is the smallest absolute balance value of the group (not shown in this wine sample).

**Supplementary Table 2.** Comparison between peak areas of 4-octanal in wine sample spiked with pooled Western and Chinese saliva sample.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Pool Western Saliva + Wine | Pooled Chinese Saliva + Wine | *p* value |
| Peak area | 305778 ± 45767 | 270388 ± 68696 | 0.499 |

Note: Peak areas were expressed as mean ± standard deviation. The *p* value was based on the result of Student t-test.

**Supplementary Table 3.** Comparison of the headspace relative concentrations wine volatiles after spiking for pooled Western and Chinese saliva samples.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Compound Name** | **Quantifier ion** | **Qualifier ions** | **1*t*R (min)** | **2*t*R (s)** | **RI (exp.)** | **RI (NIST)** | **Western Saliva + Wine** | **Chinese Saliva + Wine** |
| *Esters* |  |  |  |  |  |  |  |  |
| Ethyl propanoate | 57 | 75, 102 | 3.07 | 1.11 | 960 | 960 | 42.72±6.93 | 85.02±7.64\* |
| Ethyl 2-methylpropanoate | 71 | 116, 88 | 3.37 | 1.33 | 968 | 969 | 103.84±12.27 | 142.66±17.4\* |
| Isobutyl acetate | 56 | 73, 86 | 4.97 | 1.31 | 1010 | 1016 | 30.21±4.33 | 51.95±6.49\* |
| Ethyl butanoate | 71 | 88, 101, 116 | 5.77 | 0.64 | 1032 | 1039 | 199.15±25.85 | 278.99±44.03\* |
| Ethyl 2-methylbutanoate | 57 | 102, 85, 74 | 6.37 | 1.62 | 1047 | 1055 | 134.27±12.3 | 181.13±25.92\* |
| Ethyl 3-methylbutanoate | 88 | 57, 115 | 7.07 | 1.50 | 1066 | 1072 | 101.35±11.41 | 123.7±15.63 |
| 3-Methylbutyl acetate | 70 | 55, 87 | 9.17 | 1.40 | 1120 | 1126 | 1722.27±206.02 | 2255.47±357.24\* |
| Ethyl pentanoate | 85 | 57, 101 | 9.67 | 1.64 | 1133 | 1138 | 1.45±0.16 | 1.33±0.14 |
| Methyl hexanoate | 74 | 87, 59, 99 | 11.67 | 1.38 | 1185 | 1190 | 4.2±0.71 | 5.92±0.86\* |
| 3-Methylbutyl propanoate | 57 | 70, 87 | 11.77 | 1.66 | 1187 | 1192 | 5.56±0.93 | 7.64±0.83\* |
| Ethyl hexanoate | 88 | 99, 60 | 13.47 | 1.71 | 1232 | 1235 | 4172.99±365.54 | 5324.17±717.83\* |
| Isoamyl butanoate | 71 | 55, 89 | 14.67 | 1.81 | 1263 | 1266 | 4.6±0.67 | 4.62±0.57 |
| Hexyl acetate | 56 | 61, 84, 69 | 14.97 | 1.43 | 1271 | 1274 | 0.67±0.1\* | 0.32±0.04 |
| Ethyl heptanoate | 88 | 113, 101 | 17.17 | 1.67 | 1332 | 1334 | 7.66±0.59 | 8.33±1.03 |
| Isobutyl hexanoate | 99 | 56, 71, 117 | 17.87 | 1.90 | 1353 | 1351 | 1.52±0.25 | 1.84±0.27 |
| Methyl octanoate | 74 | 87, 127, 115 | 19.17 | 1.55 | 1391 | 1387 | 18.75±2.27 | 21.3±2.61 |
| Ethyl octanoate | 88 | 101, 127, 115 | 20.67 | 1.91 | 1436 | 1436 | 12544.28±1067.92 | 18173.2±2704.06\* |
| Isopentyl hexanoate | 70 | 99, 55, 117 | 21.47 | 2.01 | 1461 | 1453 | 23.41±2.97 | 23.74±1.91 |
| Ethyl decanoate | 88 | 101, 155 | 27.17 | 2.08 | 1643 | 1643 | 2070.48±177.98 | 2717.55±344.18\* |
| 3-Methylbutyl octanoate | 70 | 127, 145, 171 | 27.77 | 2.17 | 1663 | 1652 | 17.9±2.02 | 17.19±2.16 |
| Diethyl succinate | 101 | 129, 55, 73 | 28.27 | 1.19 | 1680 | 1681 | 926.48±63.5 | 1088.56±91.49\* |
| Ethyl 9-decenoate | 88 | 55, 69, 110 | 28.67 | 1.70 | 1693 | 1691 | 3.93±0.5 | 3.91±0.37 |
| Phenylethyl acetate | 104 | 91, 65 | 32.37 | 1.13 | 1826 | 1823 | 9.61±0.69 | 9.12±0.88 |
| Ethyl dodecanoate | 88 | 101, 183 | 32.97 | 2.09 | 1848 | 1848 | 15.65±1.62\* | 12.03±1.05 |
| Diethyl phthalate | 149 | 177, 105 | 45.77 | 1.39 | 2373 | 2372 | 10.68±1.77 | 10.44±1.43 |
| **Total ester** |  |  |  |  |  |  | 22173.63±1914.6 | 30550.13±4081.07\* |
| *Alcohols* |  |  |  |  |  |  |  |  |
| 1-Propanol | 59 | − | 5.77 | 1.34 | 1031 | 1037 | 33.66±5.38 | 48.24±2.14\* |
| 1-Butanol | 56 | 73 | 9.97 | 0.58 | 1141 | 1144 | 19.88±1.7 | 26.21±3.95\* |
| 3-Methyl-1-butanol | 55 | 70 | 12.47 | 0.75 | 1205 | 1204 | 17290.83±1619.55 | 25747.16±3395.33\* |
| 1-Pentanol | 55 | 70,87 | 13.97 | 0.66 | 1245 | 1246 | 0.53±0.1 | 1.83±0.19\* |
| 4-Methyl-1-pentanol | 55 | 69, 84 | 15.97 | 0.70 | 1309 | 1317 | 12.46±1.96 | 18.06±2.66\* |
| 3-Ethyl-1-butanol | 56 | 69, 84 | 16.77 | 0.73 | 1321 | 1325 | 24.06±2.9 | 32.18±3.32\* |
| 1-Hexanol | 56 | 69, 84, 102 | 17.67 | 0.77 | 1347 | 1348 | 499.99±53.61 | 701.84±94.85\* |
| *trans*-2-Hexenol | 57 | 82, 100 | 19.57 | 0.77 | 1403 | 1401 | 0.14±0.01 | 0.59±0.06\* |
| 1-Heptanol | 70 | 56, 83, 98 | 21.17 | 0.84 | 1451 | 1452 | 2.07±0.36 | 2.51±0.37 |
| 2-Ethyl-1-hexanol | 57 | 70, 83, 98 | 22.37 | 0.88 | 1488 | 1489 | 8.87±0.57\* | 6.76±0.93 |
| 2,3-Butanediol | 57 | 75, 90 | 24.07 | 0.61 | 1542 | 1542 | 13.89±2.35\* | 10.39±0.5 |
| Phenylethyl alcohol | 91 | 122, 65, 51 | 34.87 | 0.85 | 1899 | 1902 | 779.18±63.22 | 800.64±90.11 |
| **Total alcohol** |  |  |  |  |  |  | 18685.54±1731.81 | 27396.42±3581.18 |
| *Aldehydes* |  |  |  |  |  |  |  |  |
| Octanal | 56 | 84, 69, 100 | 15.57 | 1.36 | 1287 | 1290 | 2.79±0.4 | 2.85±0.27 |
| Nonanal | 57 | 70, 98, 82 | 19.37 | 1.47 | 1397 | 1397 | 0.14±0.01 | 0.57±0.07\* |
| Furfural | 96 | 95, 67 | 21.77 | 0.70 | 1470 | 1471 | 4.7±0.74 | 6.3±0.22\* |
| Benzaldehyde | 77 | 106, 51 | 23.77 | 0.88 | 1532 | 1532 | 1.87±0.32 | 3.24±0.37\* |
| **Total aldehyde** |  |  |  |  |  |  | 9.5±1.26 | 12.95±0.54\* |
| *Acid* |  |  |  |  |  |  |  |  |
| Octanoic acid | 60 | 73, 101, 85 | 38.97 | 0.84 | 2080 | 2087 | 1.04±0.16 | 1.27±0.07\* |
| **Total acid** |  |  |  |  |  |  | 1.04±0.16 | 1.27±0.07\* |
| *Terpenes* |  |  |  |  |  |  |  |  |
| Limonene | 68 | 93, 107, 121 | 12.07 | 1.92 | 1195 | 1199 | 6.2±0.89\* | 2.96±0.42 |
| γ-Terpinene | 93 | 136, 121, 77 | 13.87 | 1.91 | 1242 | 1245 | 16.75±1.26 | 18.25±2.59 |
| Styrene | 104 | 78, 51, 63 | 14.37 | 0.99 | 1255 | 1256 | 6.75±0.97 | 11.37±1.46\* |
| **Total terpene** |  |  |  |  |  |  | 29.71±2.75 | 32.58±3.3 |
| *Ketones* |  |  |  |  |  |  |  |  |
| 4-Octanone | 57 | 71, 85, 128 | 13.17 | 1.57 | 1224 | 1224 | 6.53±1.11 | 6.57±0.86 |
| Butyrolactone | 86 | 56 | 27.17 | 0.87 | 1643 | 1647 | 13.4±1.4 | 13.96±1.68 |
| **Total ketone** |  |  |  |  |  |  | 19.93±2.45 | 20.53±2.25 |

Abbreviations: 1*t*R: First dimension retention time, 2*t*R: Second dimension retention time, RI: Retention index.

Note: RI (exp.) values (Van den Dool and Kratz) were calculated based the retention times of a series of alkane standards and the retention time of each compound on the 1D column. RI (NIST) values were extracted from the database of the National Institute of Standards and Technology (NIST17). Volatile concentrations are expressed as mean ± standard deviation of three replicates in μg/L 4-octanol equivalent. Values significantly higher (*p* < 0.05) than the other group tested by Student t-test are marked with “\*”.

**Supplementary Table 4.** Salivary proteins with significantly (FDR = 0.01, s0 = 2) different relative concentrations in different comparisons.

|  |  |
| --- | --- |
| **Ethnicity** | |
| *Western (n = 13)* | *Chinese (n = 13)* |
| Basic salivary proline-rich protein 2  Basic salivary proline-rich protein 3  Salivary acidic proline-rich phosphoprotein1 | Immunoglobulin heavy variable 3-15  Immunoglobulin J chain  Ig kappa chain C region  Ig gamma-2 chain C region  Ig gamma-3 chain C region  Ig mu chain C region  Catalase  Protein S100-A8  Myeloperoxidase  Protein S100-A9  Glucose-6-phosphate isomerase  L-lactate dehydrogenase B chain  Heat shock protein HSP 90-alpha  Neutrophil elastase  Immunoglobulin alpha-2 heavy chain  Ig gamma-1 chain C region  Immunoglobulin lambda-like polypeptide 5  Ig lambda-1 chain C regions  Immunoglobulin lambda constant 3  Glucose-6-phosphate 1-dehydrogenase  Plastin-2  Pyruvate kinase PKM  Myeloblastin  Protein S100-P  Protein S100-A4  Transketolase  Lipocalin-1  Coronin-1A  Transaldolase  Neutrophil defensin 3  Actin, cytoplasmic 2  Lysozyme C  Histone H3.2  BPI fold-containing family B member 1  Deleted in malignant brain tumors 1 protein |
| **Gender** | |
| *Female (n = 12)* | *Male (n = 14)* |
| Salivary acidic proline-rich phosphoprotein 1 | Cystatin-A  Immunoglobulin J chain  Ig alpha-1 chain C region  Glutathione S-transferase P  Immunoglobulin alpha-2 heavy chain  Protein S100-A12  Calcitermin |
| **Age groups** | |
| *25*−*30 (n = 7; W = 0, C = 7 / F = 4, M = 3)* | *31*−*40 (n = 7; W = 3, C = 4 / F = 4, M = 3)* |
| − | Basic salivary proline-rich protein 2 |
| *25*−*30 (n = 7; W = 0, C = 7 / F = 4, M = 3)* | *41*−*55 (n = 7; W = 6, C = 1 / F = 3, M = 4)* |
| Lipocalin-1  Lysozyme C | Basic salivary proline-rich protein 2 |
| *25*−*30 (n = 7; W = 0, C = 7 / F = 4, M = 3)* | *56+ (n = 4; W = 4, C = 0 / F = 1, M = 3)* |
| − | − |
| *31*−*40 (n = 7; W = 3, C = 4 / F = 4, M = 3)* | *41*−*55 (n = 7; W = 6, C = 1 / F = 3, M = 4)* |
| Protein S100-A8  Protein S100-A9  Lipocalin-1  Lysozyme C | − |
| *31*−*40 (n = 7; W = 3, C = 4 / F = 4, M = 3)* | *56+ (n = 4; W = 4, C = 0 / F = 1, M = 3)* |
| Haptoglobin  Ig gamma-2 chain C region  Ig gamma-3 chain C region  Apolipoprotein A-I  Protein S100-A8 processed  Protein S100-A9  Neutrophil elastase  Leukotriene A-4 hydrolase  Ig gamma-1 chain C region  Glucose-6-phosphate 1-dehydrogenase  Plastin-2  Myeloblastin  Protein S100-A4  Transketolase  Coronin-1A  Rho GDP-dissociation inhibitor 2  Neutrophil defensin 3  Actin  cytoplasmic 2  Protein S100-A12  Zymogen granule protein 16 homolog B | − |
| *41*−*55 (n = 7; W = 6, C = 1 / F = 3, M = 4)* | *56+ (n = 4; W = 4, C = 0 / F = 1, M = 3)* |
| − | − |

Abbreviations: W: Western, C: Chinese, F: Female and M: Male.

**Supplementary Table 5.** Wine headspace volatile concentrations after spiking in BLG at different concentrations.

|  |  |  |  |
| --- | --- | --- | --- |
| **Compound Name** | **Buffer + Wine** | **100 μg/L BLG + Wine** | **100 ng/L BLG + Wine** |
| *Esters* |  |  |  |
| Ethyl propanoate | 67.99±7.38 | 65.24±8.17 | 65.83±5.22 |
| Ethyl 2-methylpropanoate | 90.01±9.89 | 92.07±12.02 | 94.23±22.87 |
| Isobutyl acetate | 31.62±2.74 | 31.46±5.16 | 30.68±4.69 |
| Ethyl butanoate | 191.67±11.81 | 208.79±33.52 | 185.99±40.47 |
| Ethyl 2-methylbutanoate | 142.45±22.98 | 157.1±31.02 | 166.67±41.66 |
| Ethyl 3-methylbutanoate | 100.92±9.7 | 102.58±19.65 | 99.26±26.2 |
| 3-Methylbutyl acetate | 1544.11±141.27 | 1702.79±273.33 | 1725.38±253.88 |
| Ethyl pentanoate | 1.39±0.26 | 1.55±0.32 | 1.54±0.13 |
| Methyl hexanoate | 4.65±0.15 | 5.54±0.88 | 5.43±1.28 |
| 3-Methylbutyl propanoate | 6.9±0.59 | 7.65±0.9 | 7.93±1.55 |
| Ethyl hexanoate | 2842.28±116.12 | 2968.02±331.67 | 3145.33±334.37 |
| Isoamyl butanoate | 4.77±0.42 | 5.71±1.07 | 5.36±0.93 |
| Hexyl acetate | 1.22±0.24 | 1.09±0.27 | 1.38±0.12 |
| Ethyl heptanoate | 6.28±0.73 | 6.9±0.48 | 6.4±0.36 |
| Isobutyl hexanoate | 1.5±0.2 | 1.75±0.14 | 1.61±0.28 |
| Methyl octanoate | 16.18±1.38 | 18.44±1.58 | 16.9±3.01 |
| Ethyl octanoate | 7847.95±268.08 | 7898.38±539.57 | 8740.15±691.63 |
| Isopentyl hexanoate | 19.84±1.69 | 21.87±1.61 | 22.26±2.36 |
| Ethyl decanoate | 1843.49±149.64 | 1918.94±111.93 | 1869.49±191.12 |
| 3-Methylbutyl octanoate | 16.02±2.38 | 18.66±2.4 | 16.56±2.97 |
| Diethyl succinate | 885.72±144.23 | 942.52±71.01 | 879.84±54.31 |
| Ethyl 9-decenoate | 4.88±1.16 | 5.62±0.39 | 5.76±0.66 |
| Phenylethyl acetate | 8.67±1.25 | 9.22±0.35 | 9.05±1.13 |
| Ethyl dodecanoate | 11.96±1.13 | 14±0.84 | 12.44±1.43 |
| Diethyl phthalate | 7.84±0.97 | 8.55±1.36 | 7.64±1.15 |
| **Total ester** | 15700.34±522.46 | 16213.81±1304.65 | 17123.08±1523.78 |
| *Alcohols* |  |  |  |
| 1-Propanol | 30±1.54 | 33.37±2.69 | 32.26±6.96 |
| 1-Butanol | 8.26±0.75 | 8.52±1.23 | 8.81±2.27 |
| 3-Methyl-1-butanol | 10623.3±1297.51 | 11375.04±1602.46 | 11873.88±1209.25 |
| 1-Pentanol | 1.88±0.33 | 1.86±0.3 | 1.92±0.24 |
| 4-Methyl-1-pentanol | 13.63±0.44 | 14.79±2.05 | 12.86±4.52 |
| 3-Ethyl-1-butanol | 27.62±4.02 | 28.95±3.1 | 28.4±1.25 |
| 1-Hexanol | 523.73±22.54 | 570.03±74.2 | 555.59±38.13 |
| trans-2-Hexenol | 0.56±0.22 | 0.61±0.25 | 0.51±0.44 |
| 1-Heptanol | 3.16±0.12 | 3.7±0.24 | 3.56±0.36 |
| 2-Ethyl-1-hexanol | 4.52±0.24 | 5.13±0.39 | 3.64±2.48 |
| 2,3-Butanediol | 23.18±2.89 | 21.62±3.08 | 19.89±3.21 |
| Phenylethyl alcohol | 796.99±91.01 | 840.39±34.91 | 768.67±102.56 |
| **Total alcohol** | 12054.96±1255.81 | 12902.14±1702.35 | 13308.07±1143.17 |
| *Aldehydes* |  |  |  |
| Octanal | 3.29±0.25 | 3.27±0.35 | 3.35±0.49 |
| Nonanal | 1.33±0.07 | 1.2±0.15 | 1.42±0.13 |
| Furfural | 5.13±0.51 | 5.79±0.77 | 5.42±0.72 |
| Benzaldehyde | 0.49±0.06 | 0.52±0.09 | 0.64±0.05 |
| **Total aldehyde** | 9.75±0.27 | 10.26±0.83 | 10.18±1.12 |
| *Acid* |  |  |  |
| Octanoic acid | 1.35±0.23 | 1.8±0.21 | 1.66±0.12 |
| **Total acid** | 1.35±0.23 | 1.42±0.23 | 1.4±0.16 |
| *Terpenes* |  |  |  |
| Limonene | 2.76±0.5 | 3.2±0.59 | 2.4±1.65 |
| γ-Terpinene | 17.41±2.46 | 18.69±1.86 | 18.51±2.75 |
| Styrene | 6.2±1.2 | 7.27±1.36 | 7.16±1.63 |
| **Total terpene** | 26.37±2.05 | 29.16±3.13 | 28.08±2.77 |
| *Ketones* |  |  |  |
| 4-Octanone | 6.17±0.72 | 5.4±0.42 | 5.23±0.72 |
| Butyrolactone | 14.63±0.48 | 16.24±2.51 | 14.6±2.69 |
| **Total ketone** | 20.8±0.92 | 21.63±2.87 | 19.83±2.46 |

Note: volatile concentrations are expressed as mean ± standard deviation of three replicates in μg/L 4-octanol equivalent. One-way ANOVA indicated no significant (*p* < 0.05) difference in concentrations amongst the tested groups