Supplementary material

Supplementary Table 1. Causal associations of plasma Animo acids with total testosterone.

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| --- | --- | --- | --- | --- | --- |
| Exposures | Number of SNPs | β | LCI | UCI | *p* value |
| Alanine | 104 | −0.0096 | −0.0206 | 0.0014  | 0.0867  |
| Arginine | 84 | −0.0030 | −0.0150 | 0.0089  | 0.6178  |
| Asparagine | 104 | 0.0097 | −0.0096 | 0.0289  | 0.3249  |
| Aspartate | 115 | −0.0118 | −0.0272 | 0.0036  | 0.1322  |
| Cysteine | 105 | 0.0053 | −0.0050 | 0.0155  | 0.3152  |
| Glutamate | 106 | −0.0057 | −0.0153 | 0.0039  | 0.2462  |
| Glutamine | 104 | −0.0017 | −0.0130 | 0.0096  | 0.7653  |
| Glycine | 89 | 0.0021 | −0.0069 | 0.0111  | 0.6459  |
| Histidine | 85 | 0.0127 | −0.0099 | 0.0353  | 0.2695  |
| Isoleucine | 92 | −0.0073 | −0.0185 | 0.0039  | 0.2029  |
| Leucine | 107 | −0.0056 | −0.0179 | 0.0066  | 0.3672  |
| Lysine | 104 | 0.0017 | −0.0079 | 0.0113  | 0.7306  |
| Methionine | 109 | −0.0016 | −0.0112 | 0.0079  | 0.7363  |
| Phenylalanine | 101 | −0.0008 | −0.0118 | 0.0102  | 0.8850  |
| Proline | 104 | 0.0032 | −0.0057 | 0.0121  | 0.4794  |
| Serine | 109 | 0.0108 | −0.0068 | 0.0285  | 0.2289  |
| Threonine | 92 | 0.0138 | −0.0086 | 0.0361  | 0.2285  |
| Tryptophan | 92 | 0.0021 | −0.0094 | 0.0135  | 0.7227  |
| Tyrosine | 100 | 0.0125 | −0.0022 | 0.0272  | 0.0948  |
| Valine | 81 | −0.0086 | −0.0206 | 0.0033  | 0.1563  |

The causal estimates were combined by the inverse variance weighting method. SNPs: Single nucleotide polymorphisms; LCI: lower confidence interval; UCI: upper confidence interval.

Supplementary Table 2. Causal associations of plasma Animo acids with SHBG.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Exposures | Number of SNPs | β | LCI | UCI | *p* value |
| Alanine | 104 | −0.0068 | −0.0179 | 0.0042 | 0.2264 |
| Arginine | 84 | −0.0012 | −0.0131 | 0.0107 | 0.8465 |
| Asparagine | 104 | 0.0183 | −0.0086 | 0.0451 | 0.1829 |
| Aspartate | 115 | −0.003 | −0.0204 | 0.0144 | 0.7366 |
| Cysteine | 105 | −0.0024 | −0.0125 | 0.0078 | 0.6471 |
| Glutamate | 106 | −0.0048 | −0.0161 | 0.0065 | 0.4083 |
| Glutamine | 104 | −0.0015 | −0.0131 | 0.0101 | 0.7971 |
| Glycine | 89 | 0.0015 | −0.0093 | 0.0123 | 0.7844 |
| Histidine | 85 | 0.0214 | −0.0103 | 0.0532 | 0.1858 |
| Isoleucine | 92 | 0.0045 | −0.0067 | 0.0158 | 0.4309 |
| Leucine | 107 | −0.0001 | −0.0109 | 0.0107 | 0.9865 |
| Lysine | 104 | 0.0044 | −0.0047 | 0.0136 | 0.3440 |
| Methionine | 109 | 0.0024 | −0.0086 | 0.0134 | 0.6649 |
| Phenylalanine | 101 | −0.0035 | −0.0139 | 0.0069 | 0.5097 |
| Proline | 104 | −0.0008 | −0.0099 | 0.0083 | 0.8618 |
| Serine | 109 | 0.0119 | −0.0124 | 0.0363 | 0.3377 |
| Threonine | 92 | 0.0224 | −0.0079 | 0.0526 | 0.1468 |
| Tryptophan | 92 | 0.0028 | −0.0082 | 0.0138 | 0.6172 |
| Tyrosine | 100 | 0.0165 | −0.0027 | 0.0356 | 0.0914 |
| Valine | 81 | −0.0060 | −0.0189 | 0.0068 | 0.3556 |

The causal estimates were combined by the inverse variance weighting method. SHBG: Sex hormone binding globulin; SNPs: Single nucleotide polymorphisms; LCI: lower confidence interval; UCI: upper confidence interval.

Supplementary Table 3. Causal associations of plasma Animo acids with bioavailable testosterone.

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| --- | --- | --- | --- | --- | --- |
| Exposures | Number of SNPs | β | LCI | UCI | *p* value |
| Alanine | 104 | −0.0065  | −0.0167  | 0.0036  | 0.2069  |
| Arginine | 84 | −0.0057  | −0.0162  | 0.0048  | 0.2886  |
| Asparagine | 104 | −0.0040  | −0.0131  | 0.0052  | 0.3948  |
| Aspartate | 115 | −0.0103  | −0.0218  | 0.0013  | 0.0814  |
| Cysteine | 105 | 0.0052  | −0.0060  | 0.0163  | 0.3622  |
| Glutamate | 106 | −0.0023  | −0.0130  | 0.0085  | 0.6764  |
| Glutamine | 104 | 0.0011  | −0.0107  | 0.0130  | 0.8539  |
| Glycine | 89 | 0.0050  | −0.0037  | 0.0136  | 0.2607  |
| Histidine | 85 | −0.0019  | −0.0132  | 0.0093  | 0.7352  |
| Isoleucine | 92 | −0.0132  | −0.0244  | -0.0020  | 0.0212  |
| Leucine | 107 | −0.0091  | −0.0207  | 0.0024  | 0.1199  |
| Lysine | 104 | 0.0022  | −0.0090  | 0.0135  | 0.6967  |
| Methionine | 109 | −0.0054  | −0.0153  | 0.0045  | 0.2850  |
| Phenylalanine | 101 | 0.0056  | −0.0046  | 0.0157  | 0.2856  |
| Proline | 104 | 0.0023  | −0.0073  | 0.0118  | 0.6403  |
| Serine | 109 | 0.0039  | −0.0058  | 0.0136  | 0.4263  |
| Threonine | 92 | −0.0065  | −0.0178  | 0.0048  | 0.2574  |
| Tryptophan | 92 | 0.0035  | −0.0079  | 0.0148  | 0.5501  |
| Tyrosine | 100 | −0.0027  | −0.0122  | 0.0068  | 0.5794  |
| Valine | 81 | −0.0047  | −0.0156  | 0.0063  | 0.4016  |

The causal estimates were combined by the inverse variance weighting method. SNPs: Single nucleotide polymorphisms; LCI: lower confidence interval; UCI: upper confidence interval.

Supplementary Table 4. Causal associations of plasma Animo acids with erectile dysfunction.

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| --- | --- | --- | --- | --- | --- |
| Exposures | Number of SNPs | β | LCI | UCI | *p* value |
| Alanine | 89 | −0.0431  | −0.1060  | 0.0198  | 0.1790  |
| Arginine | 64 | −0.0128  | −0.0870  | 0.0614  | 0.7361  |
| Asparagine | 81 | 0.0034  | −0.0623  | 0.0690  | 0.9196  |
| Aspartate | 85 | 0.0213  | −0.0443  | 0.0868  | 0.5246  |
| Cysteine | 70 | −0.0266  | −0.0919  | 0.0387  | 0.4255  |
| Glutamate | 73 | −0.0288  | −0.1031  | 0.0455  | 0.4467  |
| Glutamine | 86 | −0.0051  | −0.0729  | 0.0627  | 0.8825  |
| Glycine | 76 | −0.0214  | −0.0818  | 0.0390  | 0.4874  |
| Histidine | 66 | 0.0377  | −0.0351  | 0.1104  | 0.3106  |
| Isoleucine | 76 | −0.0613  | −0.1264  | 0.0039  | 0.0652  |
| Leucine | 85 | 0.0552  | −0.0192  | 0.1296  | 0.1459  |
| Lysine | 97 | −0.0714  | −0.1286  | -0.0141  | 0.0146  |
| Methionine | 79 | −0.0418  | −0.1087  | 0.0250  | 0.2201  |
| Phenylalanine | 82 | −0.0049  | −0.0719  | 0.0621  | 0.8859  |
| Proline | 83 | −0.0317  | −0.1037  | 0.0404  | 0.3890  |
| Serine | 90 | −0.0052  | −0.0676  | 0.0572  | 0.8696  |
| Threonine | 77 | −0.0210  | −0.0855  | 0.0434  | 0.5225  |
| Tryptophan | 85 | 0.0276  | −0.0346  | 0.0899  | 0.3845  |
| Tyrosine | 89 | −0.0271  | −0.0858  | 0.0316  | 0.3660  |
| Valine | 61 | 0.0157  | −0.0663  | 0.0976  | 0.7076  |

The causal estimates were combined by the inverse variance weighting method. SNPs: Single nucleotide polymorphisms; LCI: lower confidence interval; UCI: upper confidence interval.

Supplementary Table 5. Causal associations of plasma Animo acids with male infertility.

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| --- | --- | --- | --- | --- | --- |
| Exposures | Number of SNPs | β | LCI | UCI | *p* value |
| Alanine | 154 | 0.0376  | −0.0391  | 0.1142  | 0.3365  |
| Arginine | 131 | 0.0599  | −0.0176  | 0.1374  | 0.1297  |
| Asparagine | 140 | 0.0201  | −0.0546  | 0.0948  | 0.5979  |
| Aspartate | 153 | −0.0051  | −0.0862  | 0.0760  | 0.9021  |
| Cysteine | 148 | −0.0201  | −0.0833  | 0.0431  | 0.5329  |
| Glutamate | 140 | 0.0021  | −0.0936  | 0.0977  | 0.9661  |
| Glutamine | 154 | 0.0470  | −0.0334  | 0.1273  | 0.2520  |
| Glycine | 134 | −0.0103  | −0.0920  | 0.0714  | 0.8044  |
| Histidine | 144 | 0.0294  | −0.0456  | 0.1044  | 0.4427  |
| Isoleucine | 138 | 0.0735  | 0.0070  | 0.1400  | 0.0304  |
| Leucine | 148 | 0.0884  | 0.0227  | 0.1541  | 0.0083  |
| Lysine | 151 | 0.0307  | −0.0408  | 0.1022  | 0.4005  |
| Methionine | 172 | 0.0504  | −0.0167  | 0.1175  | 0.1410  |
| Phenylalanine | 151 | 0.0415  | −0.0357  | 0.1188  | 0.2918  |
| Proline | 145 | 0.0289  | −0.0423  | 0.1001  | 0.4263  |
| Serine | 138 | 0.0069  | −0.0749  | 0.0886  | 0.8693  |
| Threonine | 129 | 0.0651  | −0.0217  | 0.1518  | 0.1415  |
| Tryptophan | 149 | −0.0322  | −0.1041  | 0.0396  | 0.3796  |
| Tyrosine | 137 | 0.0863  | 0.0072  | 0.1654  | 0.0325  |
| Valine | 129 | 0.0668  | −0.0130  | 0.1466  | 0.1011  |

The causal estimates were combined by the inverse variance weighting method. SNPs: Single nucleotide polymorphisms; LCI: lower confidence interval; UCI: upper confidence interval.