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| **Supplemental Table 1.** Fatty acid composition of cooked muscle (average of 4 cooked cuts\*) and fat following the beef intervention (g/100g). Data illustrated as means and standard deviations.  |
|   | Muscle |  |  | Fat |  |
|   | GRASS | GRN | CONC |  |  | GRASS | GRN | CONC |  |
|  | Mean | SD | Mean | SD | Mean | SD | P† |  | Mean | SD | Mean | SD | Mean | SD | P† |
| SFA | 1.78a | 0.36 | 2.12b | 0.45 | 2.55c | 0.49 | **<0.001** |  | 34.97 | 1.24 | 42.74 | 1.49 | 42.78 | 1.83 | 0.088 |
| MUFA | 1.83a | 0.37 | 2.05a | 0.49 | 2.89b | 0.56 | **<0.001** |  | 42.37 | 1.17 | 46.89 | 1.60 | 53.75 | 2.00 | 0.052 |
| PUFA | 0.27 | 0.04 | 0.24 | 0.04 | 0.26 | 0.03 | 0.058 |  | 3.19a | 0.12 | 2.76b | 0.10 | 2.12c | 0.08 | **<0.001** |
| *trans*-fat  | 0.20a | 0.06 | 0.15b | 0.04 | 0.15b | 0.04 | **<0.001** |  | 5.84a | 0.11 | 4.21b | 0.26 | 2.98c | 0.06 | **<0.001** |
| Total n-6 PUFA | 0.12a | 0.01 | 0.14b | 0.02 | 0.20c | 0.02 | **<0.001** |  | 0.69a | 0.02 | 0.87b | 0.03 | 1.27c | 0.02 | **<0.001** |
| Total n-3 PUFA  | 0.10a | 0.01 | 0.06b | 0.01 | 0.03c | 0.01 | **<0.001** |  | 0.56a | 0.02 | 0.47b | 0.02 | 0.30c | 0.01 | **<0.001** |
| LA:ALA | 0.16a | 0.01 | 0.26b | 0.04 | 0.62c | 0.11 | **<0.001** |  | 1.23a | 0.00 | 1.87b | 0.03 | 4.29c | 0.05 | **<0.001** |
| total n-6:total n-3 | 0.12a | 0.01 | 0.22b | 0.04 | 0.58c | 0.09 | **<0.001** |  | 1.23a | 0.00 | 1.87b | 0.03 | 4.29c | 0.05 | **<0.001** |
|   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C14:0 | 0.10a | 0.02 | 0.14b | 0.03 | 0.18c | 0.04 | **<0.001** |  | 2.66a | 0.16 | 3.87b | 0.13 | 3.68b | 0.24 | **0.029** |
| C15:0 | 0.01 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.106 |  | 0.55 | 0.03 | 0.58 | 0.03 | 0.49 | 0.02 | 1.000 |
| C16:0  | 0.95a | 0.19 | 1.21b | 0.28 | 1.51c | 0.30 | **<0.001** |  | 20.72a | 0.81 | 26.63b | 0.96 | 27.02b | 1.23 | **0.039** |
| C17:0 | 0.05a | 0.01 | 0.05a | 0.01 | 0.07b | 0.01 | **<0.001** |  | 0.89 | 0.03 | 0.99 | 0.04 | 1.10 | 0.04 | 0.117 |
| C18:0  | 0.67 | 0.14 | 0.70 | 0.13 | 0.77 | 0.15 | 0.869 |  | 10.16 | 0.23 | 10.66 | 0.34 | 10.48 | 0.30 | 1.000 |
| C14:1 | 0.02a | 0.01 | 0.03b | 0.01 | 0.05c | 0.01 | **<0.001** |  | 1.17a | 0.08 | 1.67b | 0.06 | 1.75b | 0.12 | **0.031** |
| C16:1c9 | 0.15a | 0.03 | 0.19b | 0.04 | 0.26c | 0.06 | **<0.001** |  | 5.04 | 0.21 | 6.38 | 0.25 | 6.58 | 0.39 | 0.089 |
| C16:1 c13 | 0.00a | 0.00 | 0.00a | 0.00 | 0.01b | 0.00 | **<0.001** |  | 0.34a | 0.01 | 0.37a | 0.01 | 0.43b | 0.01 | **0.033** |
| C18:1c9  | 1.59a | 0.31 | 1.75a | 0.42 | 2.43b | 0.47 | **<0.001** |  | 33.70 | 0.84 | 36.40 | 1.33 | 42.07 | 1.40 | 0.060 |
| C18:1 c11 | 0.06a | 0.01 | 0.06a | 0.01 | 0.11b | 0.02 | **<0.001** |  | 1.10a | 0.03 | 1.18a | 0.04 | 1.91b | 0.06 | **<0.001** |
| C18:1 c12 | 0.00a | 0.00 | 0.00b | 0.00 | 0.00b | 0.00 | **<0.001** |  | 0.35a | 0.01 | 0.41b | 0.02 | 0.77c | 0.02 | **<0.001** |
| C18:1 c13 | 0.00a | 0.00 | 0.01b | 0.01 | 0.03c | 0.01 | **<0.001** |  | 0.29a | 0.01 | 0.27b | 0.01 | 0.00 | 0.00 | **<0.001** |
| C18:1 c15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.108 |  | 0.38 | 0.01 | 0.21 | 0.18 | 0.25 | 0.01 | 1.000 |
| C18:2t10,c15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.721 |  | 0.00a | 0.00 | 0.33b | 0.01 | 0.00a | 0.00 | **<0.001** |
| C18:2t11,c15 | 0.01a | 0.01 | 0.01b | 0.01 | 0.00c | 0.00 | **<0.001** |  | 0.60a | 0.00 | 0.00b | 0.02 | 0.00b | 0.00 | **<0.001** |
| C18:2c9,12 (LA) | 0.09a | 0.01 | 0.11b | 0.02 | 0.16c | 0.02 | **<0.001** |  | 0.69a | 0.02 | 0.87b | 0.00 | 1.27c | 0.00 | **<0.001** |
| C18:2c9,t11(CLA) | 0.04a | 0.01 | 0.02b | 0.01 | 0.02b | 0.01 | **<0.001** |  | 1.34a | 0.02 | 0.84b | 0.02 | 0.55c | 0.01 | **<0.001** |
| C18:2t10,c12(CLA) | 0.002a | 0.002 | 0.001b | 0.000 | 0.000b | 0.000 | **<0.001** |  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 |
| C18:3 c9,12,15 (ALA) | 0.06a | 0.01 | 0.04b | 0.01 | 0.03c | 0.01 | **<0.001** |  | 0.56a | 0.02 | 0.47b | 0.03 | 0.30c | 0.02 | **<0.001** |
| C20:4 (AA) | 0.03a | 0.00 | 0.03a | 0.00 | 0.04b | 0.00 | **<0.001** |  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 |
| C20:5 (EPA) | 0.02a | 0.00 | 0.01b | 0.00 | 0.001c | 0.00 | **<0.001** |  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 |
| C22:5 (DPA) | 0.02a | 0.00 | 0.01b | 0.00 | 0.00c | 0.00 | **<0.001** |  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 |
| C22:6 (DHA) | 0.001a | 0.000 | 0.002b | 0.001 | 0.000a | 0.000 | **<0.001** |  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.000 |
| C16:1t9 | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 1.000 |  | 0.49 | 0.00 | 0.45 | 0.00 | 0.34 | 0.00 | 0.429 |
| C16:1t10-12 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 1.000 |  | 0.31a | 0.01 | 0.31a | 0.02 | 0.26b | 0.02 | **0.021** |
| C17:1 t11 | 0.032a | 0.002 | 0.027b | 0.005 | 0.029ab | 0.003 | **<0.001** |  | 0.79 | 0.02 | 0.86 | 0.01 | 1.05 | 0.01 | 0.512 |
| C18:1 t9 | 0.003a | 0.002 | 0.005b | 0.004 | 0.098c | 0.003 | **<0.001** |  | 0.24 | 0.01 | 0.14 | 0.13 | 0.00 | 0.00 | 1.000 |
| C18:1 t10 | 0.00a | 0.00 | 0.00a | 0.00 | 0.02b | 0.01 | **<0.001** |  | 0.24a | 0.02 | 0.27a | 0.04 | 0.46b | 0.01 | **0.040** |
| C18:1 t11 (TVA)  | 0.14a | 0.05 | 0.08b | 0.02 | 0.06c | 0.02 | **<0.001** |  | 3.54a | 0.10 | 2.04b | 0.11 | 0.88c | 0.02 | **<0.001** |
| C18:1 t16 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.759 |  | 0.24 | 0.00 | 0.14 | 0.12 | 0.00 | 0.00 | 1.000 |
| GRASS, grass-fed; GRN, grass and concentrate fed; CONC, concentrate-fed; LA, linoleic acid; CLA; conjugated linoleic acid; ALA, α-linolenic acid; AA, arachidonic acid; EPA, eicosapentaenoic acid; DPA; docosapentaenoic acid; DHA, docosahexaenoic acid; TVA, *trans-*vaccenic acid. Total n-6 PUFA:LA+AA; Total n-3 PUFA: ALA+EPA+DPA+DHA.  a,b,c Indicates significant differences between dietary interventions (P<0.05) \* striploin, eye of the round, fillet, chuck tender † One-way ANOVA for comparison of means between beef interventions. Bonferroni correction was applied by multiplying the P value by the number of rows in the table. P values that exceeded 1.0 have been marked down to 1.000.  |

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| **Supplemental Table 2.** Intakes of dietary fat (g/d and %TE) by beef intervention type in an Irish cohort including non-consumers (*n*=1500) (means and standard deviations) |
|   | **GRASS** | **GRN** | **CONC** |   |
|  | Mean | SD | Mean | SD | Mean | SD | P\* |
| **g/d** |  |  |  |  |  |  |  |
| Total Fat | 76.36 | 29.67 | 76.42 | 29.60 | 77.04 | 29.82 | 1.000 |
| SFA | 29.71 | 13.04 | 30.02 | 13.12 | 30.16 | 13.16 | 1.000 |
| MUFA | 28.18 | 11.59 | 28.20 | 11.59 | 28.75 | 11.84 | 1.000 |
| PUFA | 13.51 | 6.56 | 13.29 | 6.35 | 13.27 | 6.35 | 1.000 |
| *Trans-*fat  | 0.40a | 0.36 | 0.32b | 0.27 | 0.25b | 0.21 | **<0.001** |
| ALA | 1.36 | 1.01 | 1.32 | 0.99 | 1.31 | 0.99 | 1.000 |
| EPA | 0.55 | 4.04 | 0.54 | 4.04 | 0.54 | 4.04 | 1.000 |
| DHA | 0.58 | 3.95 | 0.58 | 3.95 | 0.58 | 3.95 | 1.000 |
| **%TE** |  |  |  |  |  |  |  |
| Total Fat | 34.03 | 6.61 | 34.05 | 6.50 | 34.33 | 6.54 | 1.000 |
| SFA | 13.21 | 3.60 | 13.35 | 3.60 | 13.41 | 3.61 | 1.000 |
| MUFA | 12.52 | 2.81 | 12.53 | 2.76 | 12.77 | 2.84 | 1.000 |
| PUFA | 6.07 | 2.23 | 5.97 | 2.15 | 5.96 | 2.16 | 1.000 |
| *Trans-*fat | 0.18a | 0.16 | 0.14b | 0.12 | 0.11c | 0.09 | **<0.001** |
| ALA | 0.62 | 0.45 | 0.60 | 0.44 | 0.59 | 0.44 | 1.000 |
| EPA | 0.31 | 2.71 | 0.31 | 2.71 | 0.30 | 2.71 | 1.000 |
| DHA | 0.32 | 2.65 | 0.32 | 2.65 | 0.32 | 2.65 | 1.000 |
| GRASS, grass-fed; GRN, grass and concentrate fed; CONC, concentrate-fed; ALA, α-linolenic acid; EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid. a,b,c Indicate significant differences between beef interventions (P<0.05) \*One-way ANOVA for comparison of means between beef interventions. Bonferroni correction was applied by multiplying the P value by the number of rows in the table. P values that exceeded 1.0 have been marked down to 1.000. |

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| **Supplemental Table 3.** Percentage contribution of food groups to dietary fat intakes in an Irish adult population (n=1500) |
|  | **Total Fat**  | **SFA** | **MUFA** | **PUFA** | **ALA** |
|  | % | % | % | % | % |
|  |  |  |  |  |  |
| **Unprocessed red meat** | **10.17** | **10.86** | **11.66** | **6.61** | **8.90** |
| **Processed red meat** | **7.13** | **7.24** | **8.83** | **5.83** | **4.41** |
|  |  |  |  |  |  |
| Butters, fat spreads and hard cooking fats | 9.84 | 12.00 | 9.38 | 7.38 | 11.26 |
| Biscuits, cakes and pastries | 6.65 | 7.75 | 6.91 | 5.08 | 5.51 |
| Chips and processed potatoes | 5.78 | 3.43 | 6.41 | 9.39 | 4.16 |
| Cheeses | 5.03 | 7.82 | 3.98 | 1.48 | 0.92 |
| Soups, sauces and condiments | 4.41 | 2.55 | 5.29 | 6.85 | 8.58 |
| Whole milk | 4.27 | 6.47 | 3.11 | 0.77 | 0.95 |
| Vegetables and vegetable dishes | 4.25 | 2.24 | 3.83 | 9.00 | 9.97 |
| Savoury snacks | 3.82 | 1.57 | 4.35 | 7.95 | 4.25 |
| Fish, fish dishes and products | 3.60 | 2.01 | 4.01 | 5.72 | 3.59 |
| Unprocessed white meat | 3.52 | 2.79 | 4.19 | 4.13 | 4.73 |
| Confectionary | 3.47 | 4.97 | 3.44 | 1.24 | 0.95 |
| Savouries | 3.30 | 3.33 | 3.42 | 3.05 | 3.00 |
| White bread, rolls, scones and croissants | 3.20 | 2.93 | 2.47 | 3.01 | 6.46 |
| Egg and egg dishes | 3.10 | 2.59 | 3.57 | 2.34 | 1.79 |
| Processed white meat | 2.54 | 1.70 | 2.85 | 3.65 | 4.38 |
| Creams, ice creams, rice puddings & custards, desserts | 2.52 | 3.78 | 2.02 | 1.02 | 1.54 |
| Low fat spreads and oils | 2.49 | 1.69 | 2.54 | 4.53 | 1.57 |
| Wholemeal, brown bread and rolls | 2.15 | 1.92 | 1.04 | 2.85 | 4.40 |
| Low fat and skimmed milks | 1.93 | 3.11 | 1.77 | 0.01 | 0.85 |
| Other breakfast cereals | 1.49 | 1.45 | 1.13 | 1.49 | 1.00 |
| Yogurts | 1.02 | 1.64 | 0.80 | 0.25 | 0.56 |
| RTEBC | 1.01 | 0.65 | 0.95 | 1.73 | 1.52 |
| Other milks and milk based beverages | 0.89 | 1.30 | 0.59 | 1.11 | 0.35 |
| Potatoes | 0.86 | 1.14 | 0.54 | 0.97 | 0.57 |
| Rice, pasta, flours and starches | 0.52 | 0.30 | 0.35 | 1.18 | 0.15 |
| Fruit | 0.37 | 0.20 | 0.26 | 0.44 | 1.54 |
| Low energy beverages | 0.17 | 0.30 | 0.03 | 0.01 | 0.02 |
| Fruit juices and smoothies | 0.07 | 0.02 | 0.01 | 0.06 | 0.99 |
| Alcoholic beverages | 0.04 | 0.07 | 0.03 | 0.01 | 0.00 |
| Sugars, syrups, preserves and sweeteners | 0.03 | 0.02 | 0.05 | 0.02 | 0.46 |
| High energy beverages | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ALA, α-linolenic acid; RTEBC, ready-to-eat breakfast cereal |