Biotechnology Journal

Supporting Information for DOI 10.1002/biot.201100495

# Quantifying your body: A how-to guide from a systems biology perspective

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Larry Smarr Blood Variables 5 Years 2007 to 2012

| Subsystem | Variable | Units | Number of Measurements | Good Range | Low | High | Average | Most Recent | Out of Range |
|---|---|---|---|---|---|---|---|---|---|
| Electrolytes | | | | | | | | | |
| | Bicarbonate | mmol/L | 10 | 22-29 | 17 | 29 | 25 | 26 | |
| | Calcium | mg/dL | 29 | 8.6-10.5 | 8.7 | 10.1 | 9.2 | 9 | |
| | Chlorine | mmol/L | 29 | 98-107 | 100 | 108 | 103 | 106 | |
| | Magnesium | mg/dL | 2 | 1.8-2.4 | 2.3 | 2.5 | 2.4 | 2.4 | |
| | Phosphorus | mg/dL | 5 | 2.2-4.8 | 2.9 | 3.2 | 3.1 | 3.1 | |
| | Potassium | mmol/L | 29 | 3.5-5.1 | 4.0 | 5.2 | 4.5 | 4.5 | |
| | Sodium | mmol/L | 29 | 136-145 | 137 | 141 | 139 | 141 | |
| Trace Elements Inside RBC | | | | | | | | | |
| | Chromium | ng/g | 2 | 0.3-2 | 0.3 | 0.7 | 0.5 | 0.3 | |
| | Selenium | ng/g | 2 | 190-500 | 250 | 300 | 275 | 250 | |
| | Boron | ng/g | 2 | 10-110 | 30 | 63 | 47 | 63 | |
| | Vanadium | ng/g | 2 | 0.1-0.5 | 0.2 | 0.2 | 0.2 | 0.2 | |
| | Molybdenum | ng/g | 2 | 0.6-2.0 | 0.7 | 1.0 | 0.9 | 0.7 | |
| | Arsenic | ng/g | 2 | <10 | 6 | 6 | 6 | 6 | |
| | Cadmium | ng/g | 2 | <2.0 | 1 | 2 | 1.5 | 1 | |
| | Lead | ng/g | 2 | <60 | 19 | 32 | 26 | 32 | |
| | Mercury | ng/g | 2 | <10 | 4 | 21 | 13 | 21 | H |
| Trace elements in Stool | | | | | | | | | |
| | Antimony | ng/g | 4 | <80 | 30 | 85 | 51 | 44 | |
| | Arsenic | ng/g | 4 | <300 | 140 | 290 | 190 | 290 | |
| | Beryllium | ng/g | 4 | <9 | 1 | 9 | 6 | 8 | |
| | Bismuth | ng/g | 4 | <50 | 19 | 60 | 45 | 60 | H |
| | Cadmium | ng/g | 4 | <500 | 290 | 930 | 645 | 630 | H |
| | Copper | µg/g | 4 | <60 | 41 | 75 | 59 | 64 | |
| | Lead | ng/g | 4 | <500 | 340 | 920 | 688 | 710 | H |
| | Mercury | ng/g | 4 | <50 | 176 | 438 | 293 | 438 | VH |
| | Nickel | µg/g | 4 | <8 | 6 | 13 | 9 | 7.8 | |
| | Thallium | ng/g | 4 | <20 | 11 | 22 | 18 | 20 | |
| | Tungsten | ng/g | 4 | <90 | 57 | 740 | 326 | 57 | |
| | Uranium | ng/g | 4 | <120 | 123 | 173 | 152 | 123 | |
| Vitamins | | | | | | | | | |
| | Vitamin B12 | pg/mL | 4 | 211 - 946 | 631 | 821 | 725 | 821 | |
| | Vitamin D, 25-Hydroxy | ng/mL | 12 | 30-80 | 33 | 52 | 40 | 48 | |
| White Blood Cells | | | | | | | | | |
| | white blood cell count | 1000/ µl | 15 | 4.0-10.0 | 4.2 | 7.0 | 5.3 | 4.4 | |
| | neutrophils | % | 15 | 34-71 | 56 | 75 | 65 | 59 | |
| | lymphocytes | % | 15 | 19-53 | 13 | 33 | 22 | 23 | |
| | eosinophils | % | 15 | 1.0-7.0 | 1 | 10 | 6.0 | 10 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | monocytes | % | 15 | 5.0-12.0 | 3 | 9 | 6 | 7 |
| | basophils | % | 15 | 0.0-2.0 | 0.0 | 2.0 | 0.7 | 1 |
| Red Blood Cells | | | | | | | | |
| | red blood cell count | million/ µl | 15 | 4.6-6.1 | 4.6 | 5.1 | 4.9 | 4.7 |
| | hemoglobin | g/dL | 15 | 13.7-17.5 | 13.8 | 15.2 | 14.7 | 15.2 |
| | hematocrit | % | 15 | 40-50 | 42 | 50 | 46 | 44 |
| | mean corpuscular volume | fl | 15 | 79-95 | 89 | 100 | 93 | 93 |
| | mean corpuscular hemoglobin | pg | 15 | 26-32 | 29 | 31 | 30 | 31 |
| | mean corpuscular hemoglobin conc. | g/dL | 15 | 32-36 | 30 | 35 | 33 | 35 |
| | red cell distribution width | % | 15 | 12 to 14 | 13 | 17 | 15 | 15 |
| Platelets | | | | | | | | |
| | platelet count | 1000/ µl | 15 | 140-370 | 161 | 243 | 207 | 190 |
| | mean platelet volume | fL | 15 | 9.4-12.4 | 10 | 11 | 11 | 11 |
| Iron complex | | | | | | | | |
| | Iron | µg/dL | 13 | 59-158 | 45 | 96 | 68 | 75 |
| | Ferritin | ng/mL | 6 | 30-400 | 56 | 154 | 104 | 62 |
| | RBC Folate | ng/mL | 3 | 468 - 1258 | 1141 | 1644 | 1310 | 1141 |
| | Folate | | 3 | | 16 | 23 | 18 | 16 |
| | total iron-binding capacity | µg/dL | 4 | 148-506 | 307 | 373 | 330 | 331 |
| | unbound iron-binding capacity | µg/dL | 4 | 112-346 | 233 | 277 | 255 | 256 |
| | Iron saturation | % | 4 | | 18 | 26 | 23 | 23 |
| Blood Sugar Cycle | | | | | | | | |
| | fasting glucose | mg/dL | 28 | 70-115 | 74 | 110 | 93 | 106 |
| | Insulin | µUnit/mL | 3 | 3 to 27 | 3.0 | 4.4 | 3.8 | 4.4 |
| | hemoglobin a1c | % | 8 | 3-6.1 | 5.4 | 5.8 | 5.6 | 5.7 |
| Hormones | | | | | | | | |
| | TSH (3rd generation) | mIU/L | 1 | 0.3-3.0 | 2.5 | 2.5 | 2.5 | 2.5 |
| | TSH (2nd generation) | mIU/L | 2 | 0.35-5.5 | 1.8 | 1.9 | 1.9 | 1.9 |
| | T3 Uptake | % | 2 | 22.5-37 | 38 | 40 | 39 | 38 |
| | Thyroxine (T4) | µg/dL | 2 | 4.5-12 | 5.4 | 7.7 | 6.6 | 5.4 |
| | Free Thyroxine Index (T7) | µg/dL | 2 | 4.5-12 | 6.2 | 9.4 | 7.8 | 6.2 |
| | Free Thyroxine (FT4) | ng/dL | 2 | 0.6-1.6 | 1.0 | 1.1 | 1.1 | 1.1 |
| | cortisol | µg/dL | 1 | 6 to 23 | 12 | 12 | 12 | 12 |
| | free testosterone | ng/dL | 1 | 0.8-3.5 | 1.1 | 1.1 | 1.1 | 1.1 |
| | total testosterone | ng/dL | 2 | 241-827 | 311 | 428 | 370 | 311 |
| | progesterone | nmol/L | 1 | 0.9-1 | 0.5 | 0.5 | 0.5 | 0.5 |
| | FSH | IU/L | 1 | 1.0-8 | 4 | 4 | 4 | 4 |
| Liver | | | | | | | | |
| | Aspartate transaminase (AST) | U/L | 30 | 0-40 | 22 | 63 | 33 | 35 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Alanine transaminase (ALT) | U/L | 30 | 0-41 | 23 | 57 | 35 | 29 | |
| | AST/ALT ratio | n.a. | 30 | 1.0-2 | 0.6 | 1.4 | 1 | 1.2 | |
| | Alkaline phosphatase | U/L | 29 | 40-129 | 38 | 92 | 59 | 46 | |
| | g-Glutamyl-transpeptidase (GGTP) | IU/L | 6 | 2 to 65 | 15 | 19 | 17 | 19 | |
| | Lactate dehydrogenase (LDH) | IU/L | 6 | 100-242 | 126 | 150 | 141 | 126 | |
| | Total Protein | g/dL | 29 | 6.0-8.0 | 6.4 | 7.9 | 7.2 | 6.9 | |
| | Albumin | g/dL | 29 | 3.5-5.2 | 3.6 | 4.8 | 4.1 | 4.5 | |
| | Globulin | g/dL | 7 | 2.0-4.5 | 2.6 | 3.1 | 2.8 | 2.8 | |
| | Albumin/Globulin ratio | n.a. | 7 | 1.1-2.3 | 1.4 | 1.7 | 1.5 | 1.5 | |
| | Total Bilirubin | mg/dL | 29 | 0.2-1.0 | 0.3 | 0.8 | 0.6 | 0.6 | |
| | Direct Bilirubin | mg/dL | 8 | 0-0.2 | 0.1 | 0.2 | 0.2 | 0.2 | |
| Kidneys | | | | | | | | | |
| | Blood Urea Nitrogen (BUN) | mg/dL | 29 | 6 to 20 | 15 | 28 | 21 | 16 | |
| | Creatinine | mg/dL | 29 | 0.7-1.2 | 0.7 | 1.1 | 0.9 | 0.9 | |
| | BUN/Creatinine Ratio | n.a. | 29 | 10.0-20 | 14 | 34 | 24 | 19 | |
| | Uric Acid | mg/dL | 8 | 4.0-8.5 | 4.8 | 6.5 | 6.0 | 6.3 | |
| Cardiovasular System | | | | | | | | | |
| | Low Density Lipoprotein | mg/dL | 28 | <130 | 39 | 99 | 63 | 51 | |
| | High Density Lipoprotein | mg/dL | 28 | >40 | 50 | 73 | 60 | 63 | |
| | Very Low Density Cholesterol | mg/dL | 24 | <30 | 6 | 13 | 11 | 12 | |
| | Total Cholesterol | mg/dL | 28 | <200 | 111 | 169 | 134 | 125 | |
| | Large LDLs (LDL1+LDL2) | mg/dL | 17 | | 1.0 | 38 | 16 | 19 | |
| | Small LDLs (LDL3+LDL-4) | mg/dL | 17 | | 22 | 64 | 39 | 22 | |
| | Real-LDL Size Pattern | mg/dL | 21 | A | A | B | n.a. | A | |
| | Triglycerides | mg/dL | 28 | <150 | 28 | 55 | 39 | 41 | |
| | TG/HDL | n.a. | 28 | <2 | 0.5 | 1.0 | 0.7 | 0.7 | |
| | Chol/HDL | n.a. | 28 | <4.5 | 1.8 | 2.9 | 2.2 | 2.0 | |
| | Total apotB100 | mg/dL | 19 | <100 | 46 | 82 | 60 | 48 | |
| | Lp(a) Chloresterol | mg/dL | 20 | <10 | 4 | 14 | 8 | 6 | |
| | Homocysteine | µmol/L | 10 | 5 to 15 | 7 | 15 | 11 | 14 | |
| Essential Fatty Acids* | | | | | | | | | |
| | Eicosapentaenoic Acid (EPA) | PPL Frac. | 6 | 7.0-9 | 6.2 | 7.7 | 7.1 | 7 | |
| | Docosahexaenoic Acid (DHA) | PPL Frac. | 6 | 4.5-6 | 4.6 | 7.3 | 5.9 | 5.9 | |
| | ALA | PPL Frac. | 6 | | 0.0 | 0.5 | 0.2 | 0.0 | |
| | Omega 3 Score | PPL Frac. | 6 | >7.2 | 12.7 | 17.8 | 14.8 | 14.1 | |
| | EPA+DHA | PPL Frac. | 6 | >4.5 | 10.7 | 14.9 | 13.0 | 13.0 | |
| | AA | PPL Frac. | 6 | | 8.5 | 11.9 | 9.8 | 11.9 | |
| | Ratio AA/EPA | n.a. | 6 | <3 | 1.2 | 1.7 | 1.4 | 1.7 | |
| Inflammation Markers | | | | | | | | | |
| | Complex Reactive Protein | mg/L | 31 | <1 | 1.3 | 27.1 | 8.5 | 3.0 | H |
| | Sedimentation Rate | mm/hour | 7 | <15 | 1.0 | 16.0 | 5.6 | 3.0 | |
| | Lipoprotein-assoc. phospholipase A2 | ng/mL | 6 | <200 | 180 | 232 | 202 | 180 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Stool Biomarkers | | | | | | | | | |
| | Lactoferrin | µg/mL | 18 | <7.3 | 15 | 899 | 177 | 107 | VH |
| | Calprotectin | µg/g | 7 | <50 | 88 | 2500 | 666 | 88 | H |
| | Lysozyme | ng/mL | 18 | <600 | 228 | 1210 | 750 | 741 | H |
| | Secretory Immunoglobulin A | mg/dL | 18 | 51-204 | 56 | 1460 | 342 | 622 | VH |
| Good Gut microbes | | | | | | | | | |
| | Bifidobacerium | n.a. | 18 | 3 to 4 | 0 | 4 | 2.3 | 2 | L |
| | E. coli spp. | n.a. | 18 | 3 to 4 | 4 | 4 | 4.0 | 4 | |
| | Lactobacillus spp | n.a. | 18 | 3 to 4 | 0 | 4 | 2.4 | 2 | L |
| | Enterococcus spp. | n.a. | 18 | 3 to 4 | 0 | 4 | 1.4 | 1 | L |
| | Bacteroides fraglis group | n.a. | 14 | 3 to 4 | 0 | 4 | 2.9 | 4 | |
| | Clostridium spp | n.a. | 14 | 3 to 4 | 1 | 4 | 1.7 | 1 | L |
| Dysbiotic Gut Microbes | | | | | | | | | |
| | Gamma Hemolytic Streptococcus | n.a. | 18 | 0 | 0 | 4 | 0.8 | 1 | H |
| | Alpha hemolytic strep | n.a. | 18 | 0 | 0 | 4 | 2.0 | 1 | H |
| | Morganellla morganii | n.a. | 18 | 0 | 0 | 4 | 0.2 | 0 | |
| | Klebsiella pneumonia | n.a. | 18 | 0 | 0 | 4 | 0.7 | 0 | |
| | Klebsiella oxytoca | n.a. | 18 | 0 | 0 | 4 | 0.2 | 0 | |
| | Comamonas testosteroni | n.a. | 18 | 0 | 0 | 4 | 0.9 | 0 | |
| | Providencia rettgeri | n.a. | 18 | 0 | 0 | 4 | 0.9 | 0 | |
| | Providencia stuartii | n.a. | 18 | 0 | 0 | 4 | 0.7 | 0 | |
| | Pseudomonas aeruginosa | n.a. | 18 | 0 | 0 | 2 | 0.1 | 0 | |
| | Mucoid e coli | n.a. | 18 | 0 | 0 | 3 | 0.2 | 0 | |
| | Hemolytic Escherichia coli | n.a. | 18 | 0 | 0 | 2 | 0.1 | 0 | |
| | Enterobacter cloacae | n.a. | 18 | 0 | 0 | 4 | 0.3 | 2 | H |
| Short Chain Fatty Acids | | | | | | | | | |
| | Butyrate | mg/mL | 18 | 0.8-3.8 | 0.3 | 2.7 | 1.4 | 1.1 | |

Notes:
*Measured in plasma phospholipid fractions