Average Atomic Content of the Human Body

The average 70kg adult human body contains approximately $7x10^{27}$ atoms and contains at least detectable traces of 60 chemical elements. About 29 of these elements are thought to play an active positive role in life and health in humans.

The relative amounts of each element vary by individual, mainly due to differences in the proportion of fat, muscles and bone in their body. Persons with more fat will have a higher proportion of carbon and lower proportion of most other elements (the proportion of hydrogen will be about the same). The numbers in the table are averages of different numbers reported by different references.

The adult human body averages 53% water. This varies substantially by age, sex and adiposity. In a large sample of adults of all ages and both sexes, the figure for water fraction by weight was found to be 48 ± 6% for females and 58 ± 8% water for males. Water is 11% hydrogen by mass but 67% hydrogen by atomic percent, and there numbers along with the complementary % numbers for oxygen in water, are the largest contributors to overall mass and atomic composition figures. Because of water content, the human body contains more oxygen by mass than any other element, but more hydrogen by atom-fraction than any element.

Atomic Number	Element	Fraction of mass	Mass (kg)	Atomic Percentage	Positive health role in Mammals	Negative effects of excess
8	Oxygen	0.65	43	24	Yes (e.g. water, electron acceptor)	Reactive Oxygen Species
6	Carbon	0.18	16	12	Yes (Organic compounds are hydrocarbon derivatives)	
1	Hydrogen	0.10	7	62	Yes (e.g. water)	
7	Nitrogen	0.03	1.8	1.1	Yes (e.g. DNA and Amino Acids)	
20	Calcium	0.014	1.0	0.22	Yes (e.g. Calmodulin and Hydroxylapatite in bones)	
15	Phosphorus	0.011	0.78	0.22	Yes (e.g. DNA and phosporylation)	

409 Lake Rd, Takapuna, Auckland Ph: (+64) 9 488 0208
www.globalhealthclinics.co.nz

Atomic Number	Element	Fraction of mass	Mass (kg)	Atomic Percentage	Positive health role in Mammals	Negative effects of excess
19	Potassium	0.0025	0.14	0.033	Yes (e.g. Na*/K*-ATPase)	
16	Sulfur	0.0025	0.14	0.038	Yes (e.g. Cysteine, Methionine, Biotin, Thiamine)	
11	Sodium	0.0015	0.10	0.037	Yes (e.g. Na*/K*-ATPase)	
17	Chlorine	0.0015	0.95	0.024	Yes (e.g. CI-transporting ATPase)	
12	Magnesium	500x10-6	0.019	0.0070	Yes (e.g. binding to ATP and other nucleotides)	
26	Iron	60x10-6	0.0042	0.00067	Yes (e.g. Hemoglobin, Cytochromes)	
9	Fluorine	37x10-6	0.0026	0.0012	Yes (topically hardens teeth)	Toxic in high amount