BRAIN TINGLERS

edited by
ROD O'CONNOR
Texas A&M University
College Station, TX 77843

How Much Cholesterol Is In Your Body?

Jose Antonio Chamizo G.

Colegio Madrid, A.C.
Calle Puente 224
Mexico 22 D.F.

Cholesterol ($C_{27}H_{46}O$) is one of the most important steroids found in the tissues of animals. It has special importance to both the brain and spinal cord. If too much cholesterol accumulates, solid deposits may form. Gallstones, for example, may be primarily lumps of crystallized cholesterol. Cholesterol deposits in the arteries may restrict blood flow, with a resulting elevation of blood pressure. Both atherosclerosis and certain types of heart attack have been associated with excess cholesterol accumulation. It has been reported that, on the average, 1.0% of the dry weight of the human body is cholesterol.

(a) Given that the longest dimension of the cholesterol molecule is 22 Å, calculate the length of a chain that could be made by hooking together all the cholesterol molecules from an "average human" weighing 80 kg (176 lb), if the molecules could be connected as "links" corresponding to the longest dimension of the molecule. (Hint: You will need to find how the "normal weight" of a human body corresponds to the "dry weight.")
(b) Assuming negligible thickness of the "cholesterol chain," calculate how many times this chain could be wound around the earth at the equator. (You will need to find the circumference of the earth at the equator.)
(c) If we placed each turn of the "cholesterol chain" on top of the previous turn at a distance of 3 Å (to allow for "thickness" of the molecules), how thick would be the "cholesterol ring" around the earth's equator?

Answers

(1) 5.1×10^{11} mi (8.2×10^4 m)
(b) about 20 million turns
(c) about ¼ in. (6 mm)

Detailed solutions available. Address your requests to Rod O'Connor, Department of Chemistry, Texas A&M University, College Station, TX 77843.

Mathematical problems and theoretical questions relating to practical applications will tingle your brains and those of your students in this monthly mini-feature. Contributions to this feature are welcome and should be addressed to the feature editor, who will also send detailed solutions upon request.