



AMERICAN
UNIVERSITY OF BEIRUT
CENTER FOR ADVANCED
MATHEMATICAL SCIENCES

MATHEMATICAL BIOLOGY

MATHEMATICAL MODELING OF ATHEROSCLEROSIS

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5:00 pm (Beirut time) | ONLINE

Atherosclerosis is an inflammatory disease which starts when low density lipoproteins (LDL) enter the intima of blood vessel where they are oxidized (ox-LDL). The ox-LDL is considered as a dangerous agent by the immune system provoking an anti-inflammatory response. This immune response triggers the recruitment of monocytes into the intima where they differentiate into macrophages and foam cells. The latter amplifies the production of inflammatory cytokines and further recruitment of monocytes. This auto-amplified process is compensated by the secretion of anti-inflammatory cytokines (biochemical anti-inflammation) and triggers the migration of smooth muscle cells to form a fibrous cap that covers the lipid core. This fibrous cap with the lipid core are called atherosclerosis plaque. It changes the geometry of the blood vessel by narrowing it and interacts with the blood flow. This interaction may have dangerous consequences related to the plaque rupture or to the formation of blood clot. The talk is devoted to the mathematical modeling, analysis and numerical simulations of these phenomena.



NADER EL KHATIB
Lebanese American University, Lebanon

Nader El Khatib is an associate professor of applied and pure mathematics at the Lebanese American University. He worked previously as a temporary professor at Ecole Centrale de Lyon and as a Post Doc researcher at the French National Institute for Research in Computer Science and Control (INRIA). His research interests are applied mathematics, partial differential equations, mathematical modeling, bio-mathematics and modeling cardiovascular diseases.