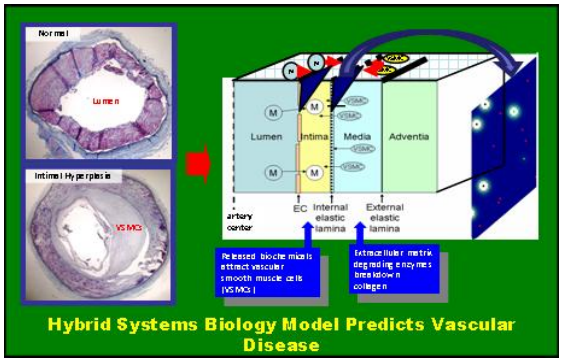
OAK RIDGE NATIONAL LABORATORY FACT SHEET
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

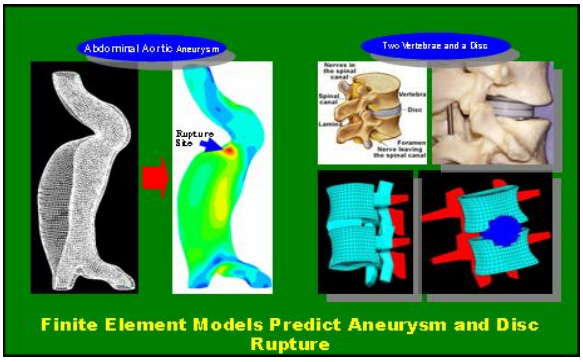
Scientific Computing Within the ORNL Modeling & Simulation Group: Biomedical Engineering and Informatics

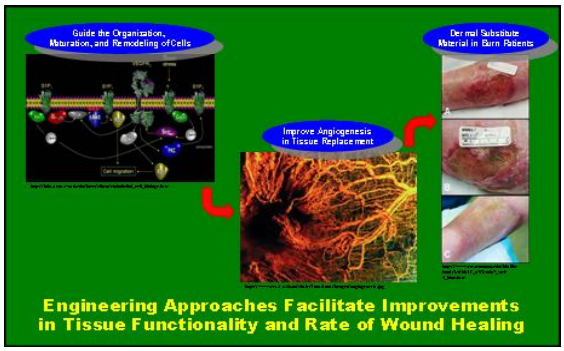
The ORNL Modeling and Simulation Group (MSG) develops sophisticated numerical solutions for a wide range of scientific, engineering, and operational applications. MSG's core competency is computational physics and engineering, and within this context we have leveraged our scientific computing expertise to develop significant biomedical engineering and informatics capabilities. Our problem solving scope includes advanced computational methods for biomedical applications such as (a) prediction of outcomes based on biomedical models, (b) three-dimensional organ and tissue modeling, (c) knowledge discovery and intelligent agents for data mining and analysis, (d) integration of models at multiple temporal and spatial scales, (e) distributed computing environments, and (f) biomedical informatics. Specific examples include:

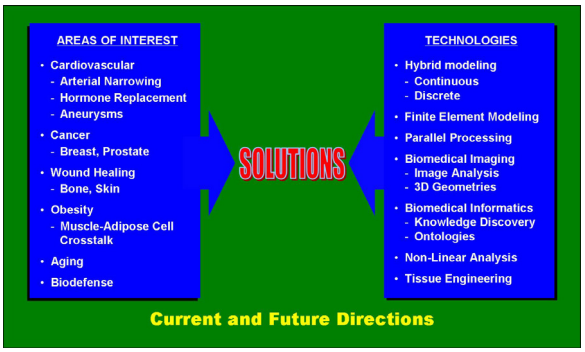
- Predictive multi-scale models for medical decision making, using discrete event simulations and hybrid model approaches (example: Hybrid Model for Intimal Hyperplasia)
- Physics-based engineering simulations of (a) organ systems such as airflow and species concentration in pig lungs, (b) aortic aneurysm rupture and endoleak, and (c) transendothelial cellular motility. Geometry models used in such analyses can be generated directly from Visual Human databases and/or patient-specific imaging data such as CT scans.
- Advanced web-based visualization environments (example: DARPA's Virtual Soldier Project).
- Joint ORNL/UT Center for Musculoskeletal Research. Mathematical modeling and image processing of contact pressures and stresses (knee, hip, and spine). Recently awarded NIH grant (R01) to study lumbar stresses (with University of Tennessee and Vanderbilt University).
- Created the ORNL Biomedical Science and Technology Initiative (BS&T), an interdisciplinary, cross-divisional collaboration of biomedical researchers.

These applied scientific computing capabilities represent an extremely versatile modeling and simulation resource for a broad range of R&D, medical, homeland defense, and military applications. We welcome the opportunity to discuss your potential applications and ways MSG's Biomedical Engineering Program can contribute to a solution.









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