

## **Introduce Nanotechnology 10<sup>-9</sup>**

Use slides from owl space as well as powers of 10 to illustrate the magnitude of the research.

Explain the many areas that are utilizing nanotechnology- from synthesis to microscopy development, bioengineering to drug design

- use Jennifer's talk as a guide to illustrate uses of cancer detection and treatment on the nanolevel.

## **Introduce a problem to solve using Nanotechnology**

Introduce the research on fibrin tissue to better characterize. The inflammatory response has recently been found to be a significant factor in heart attacks. By using nanotechnology to study fibrin, we may learn more about the onset of heart attacks as well as improve diagnostic skills to predict risk factors. Ultimately, heart attacks associated with the inflammatory response may be reduced.

## **Discuss heart Attacks- while not directly linked to nanotechnology, it is an import item to discuss**

- Only 33% of heart attack victims receive CPR; heart massage –C may be more important the pulmonary=P aspects for victims with fully oxygenated blood.

## **Discuss Heart Attack Cause and Treatments (see next page).**

- Introduce slides on Fibrin research
- <http://www.cs.unc.edu/Research/nano/fibrin/index.html>
- Microscopy at the nano-level
- Fibrin fiber is labeled with quantum dot fluorescence markers and is stretched to over 350% without breaking. Tracking of the discrete markers will allow us to measure internal strains. This is used o characterize the extensibility of the fibrin fibers

## Causes

Most heart attacks are caused by a **blood clot that blocks one of the coronary arteries**. The coronary arteries bring blood and oxygen to the heart. If the blood flow is blocked, the heart starves for oxygen and heart cells die.

A clot most often forms in a coronary artery that has become narrow because of the build-up of a substance called plaque along the artery walls. (See: [atherosclerosis](#)) Sometimes, the plaque cracks and triggers a blood clot to form.

It is difficult to estimate exactly how common heart attacks are because as many as 200,000 to 300,000 people in the United States die each year before medical help is sought. It is estimated that approximately 1 million patients visit the hospital each year with a heart attack. About 1 out of every 5 deaths are due to a heart attack.

Risk factors for heart attack and coronary artery disease include:

- Bad genes (hereditary factors)
- Being male
- [Diabetes](#)
- Getting older
- [High blood pressure](#)
- [Smoking](#)
- Too much [fat](#) in your diet
- Unhealthy [cholesterol](#) levels, especially high LDL ("bad") cholesterol and low HDL ("good") cholesterol

Higher-than-normal levels of homocysteine, [C-reactive protein](#), and [fibrin](#) may also increase your risk for a heart attack. Homocysteine is an amino acid. C-reactive protein and fibrinogen are linked to **inflammation**. Fibrin is also involved in blood clotting.

## Treatment for a Heart Attack may include:

- THROMBOLYTIC THERAPY

Depending on the results of the ECG, certain patients may be given blood thinners within 12 hours of when they first felt the chest pain. This is called thrombolytic therapy. The medicine is first given through an IV. Blood thinners taken by mouth may be prescribed later to prevent clots from forming.

- Antiplatelet medicines help prevent clot formation. Aspirin is an antiplatelet drug. Another one is clopidogrel (Plavix).
- Site to show the normal conduction path of the heart:

The heart's conduction system

<http://health.nytimes.com/health/guides/disease/heart-attack/overview.html?excamp=GGHLheartdisease>

ECG Tracing during a heart attack.

