



*–An Emerging Research Presence–*

*– Collaborative and Multidisciplinary–*

**Alzheimer's Disease: Causes of Cell Death**

**Infectious Disease: Vaccine Development**

**Characterization of Biological Materials**

**Development of Diagnostics and Therapeutics**

**Breast Cancer: Molecular Basis of Tumor Progression**

**Immune System and Inflammation**

**Athletic Injury Prevention**

**Tissue Engineering for Orthopedic Repair**

**Biocompatible Materials**

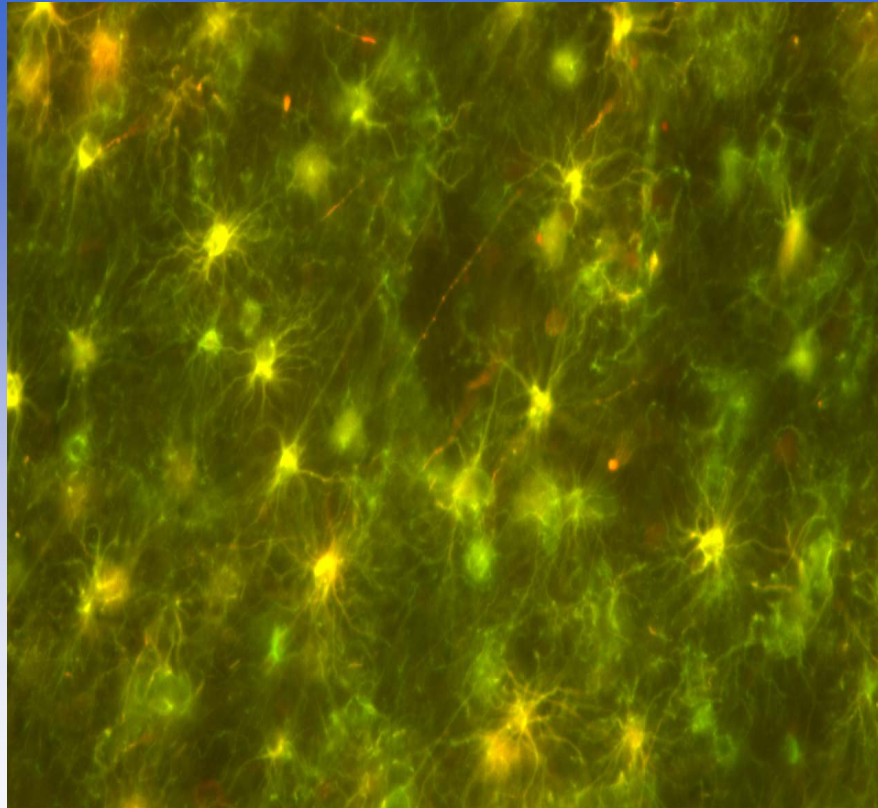
**Neural Development and Rett Syndrome**

**Drug Development: Cancer Chemotherapeutics**

**Arthritis and Rheumatic Diseases**



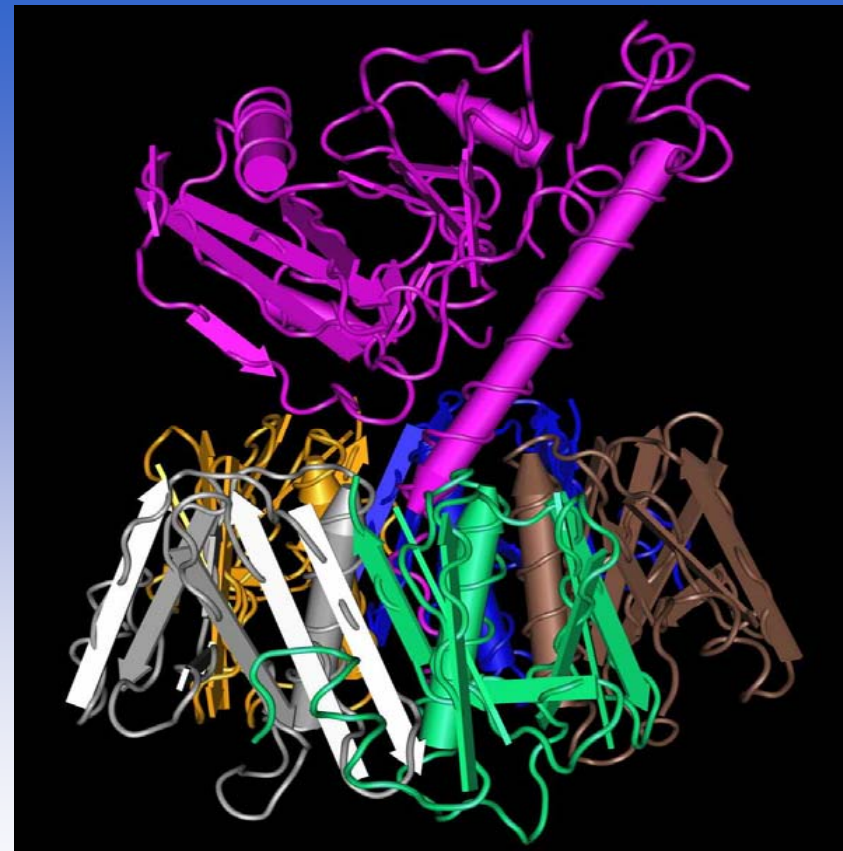
# Alzheimer's Disease: Causes of Cell Death



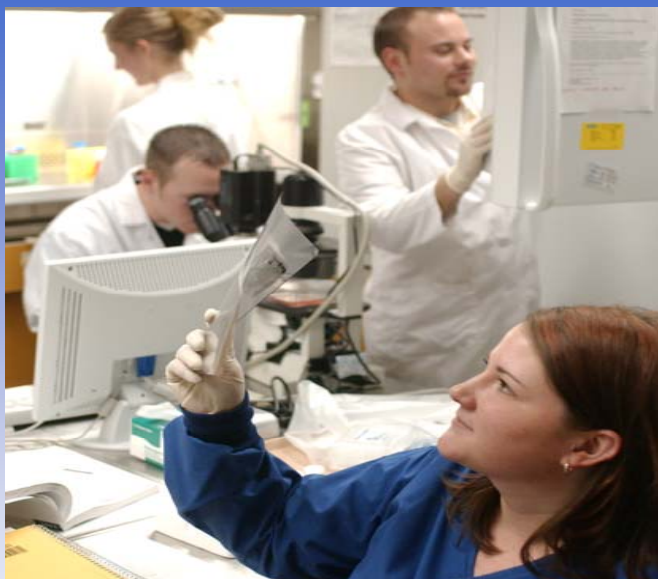
The fluorescent markers indicate the presence in neural astrocytes of fragments resulting from the activity of executioner caspases, which are active in the beginnings of the apoptosis that will, in the long term, result in dementia.

# Infectious Disease: Vaccine Development

Bacterial enterotoxins are potent mucosal immune stimulators. Boise State researchers fusing the non-toxic subunit of Cholera Toxin to a protein from a pathogen of interest to create a mucosal vaccine. Under development are potential vaccines against *Vibrio cholerae*, *Helicobacter pylori* and *Yersinia pestis*. Vaccines also have the potential to fight autoimmune disease and cancer.



# Characterization of Biological materials: Development of Diagnostics and Therapeutics



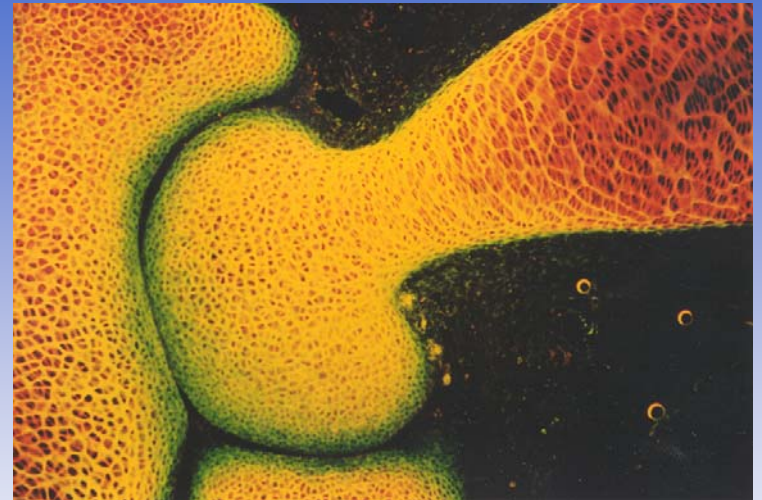
Boise State researchers are working to understand the biochemical and materials properties of biological tissues.

- Atomic Force Microscopy is used to assess nanoscale characteristics of cartilage such as tear resistance and compressibility.
- Tandem Mass Spectroscopy is used for proteomic analysis of biological tissues.
- Analytical ultracentrifugation is used to characterize protein purity, quaternary structure, size, and sedimentation coefficients.
- Field-flow fractionation combined with multi-angle light scattering is used to characterize molecular weight, size, and conformation.

# Arthritis and Rheumatic diseases

**Extracellular matrix assembly and organization is key in biological materials structure and function.**

**Age-related changes to the composition and organization of cartilage contribute to arthritis, changes in the vitreous of the eye may lead to retinal detachment and lens cataracts.**



# Breast Cancer: Molecular Basis of Tumor Progression

Studies to understand the process of cancer metastasis at the molecular level are essential in developing effective treatments and detection methods. Work at Boise State indicates that Oncostatin M facilitates angiogenesis and metastasis, an observation that is likely to change the present view of this compound as a potential therapeutic drug.



# Immune System and Inflammation



**BSU researchers study how regulators of the immune system contribute to the pathogenesis of asthma.  $\beta$ -adrenergic agonists found in common asthma medications alter the regulation in asthma subjects compared to healthy control subjects.**

# Athletic Injuries



The incidence injuries to the anterior cruciate ligament (ACL) is four to six times more common in female athletes than in male athletes. BSU researchers are examining the neuromotor strategies, specifically anticipatory postural adjustments when landing, using sEMG and motion analysis data. BSU researchers are also studying the biomechanics of human joints in both normal and pathological function to give an understanding how movement results in joint stresses and injuries.



# Tissue Engineering for Orthopedic Repair

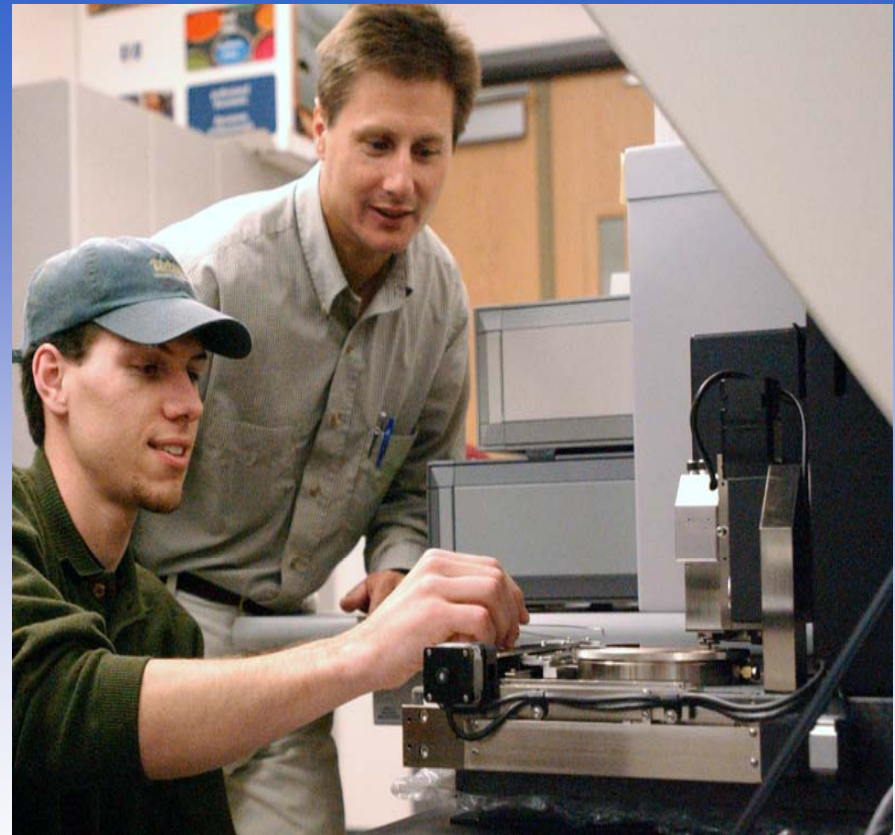


**A multidisciplinary team at Boise State is developing a process to create custom-shaped skeletal structures. MRI or CAT data is paired with rapid prototyping technology to produce 3-D models of skeletal structures. A biocompatible polymer scaffolding of the same shape could then be inoculated with living cells to create artificial tissue for implant to repair losses due to arthritis or injury.**

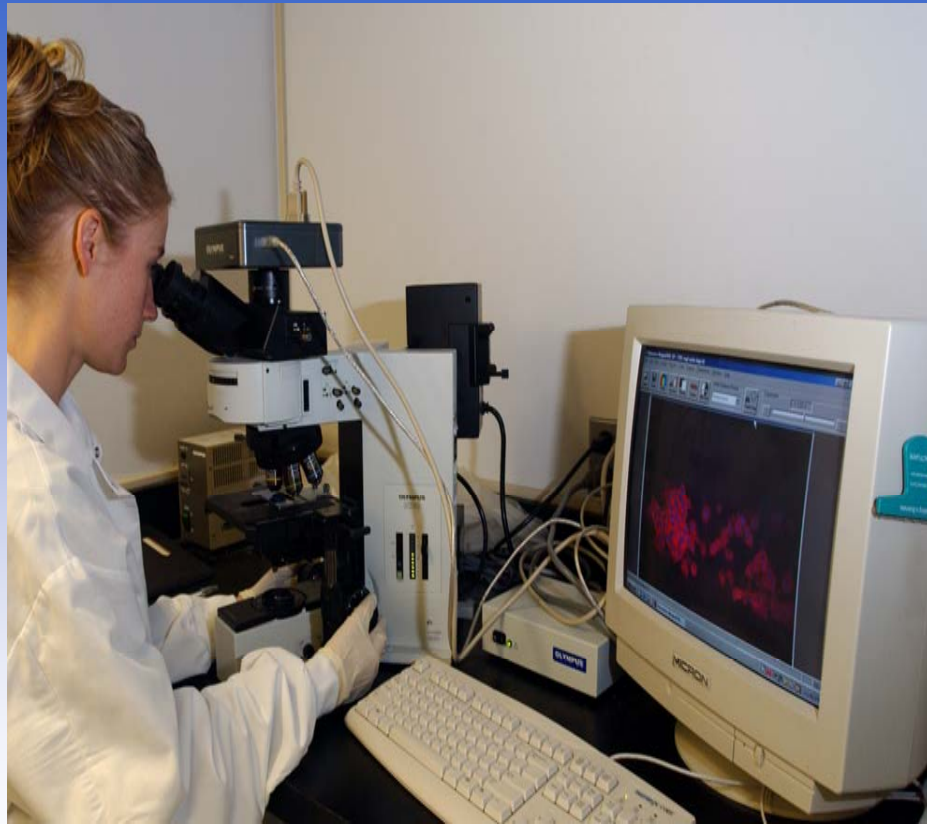
# Biocompatible Materials

**BSU researchers are developing:**

- **biocompatible polymeric gels that can be used to prevent post-surgical adhesions and can be used in the extended release of pharmaceuticals.**
- **polymeric scaffoldings to be used for artificial blood vessels used in vascular and cardiac surgery.**
- **antimicrobial polymers that can be used to coat implantable medical devices.**



# Neural Development and Rett Syndrome



**BSU researchers are examining the role of methylated DNA-binding proteins as a cause of the insufficiency in neuronal maturation that is manifest as Rett Syndrome.**

# Drug Development: Cancer Chemotherapeutics

**Anthracyclines are cancer chemotherapeutics that have irreversible, cumulative cardiotoxicity side effects. Structural analogs of anthracyclines with reduced cardiotoxicity are being developed at Boise State.**

**Basic research into the mechanism of cardiotoxicity includes focus on enzymatic pathways and on calcium regulation by calsequestrin in the heart. These efforts may lead to prevention of cardiotoxicity.**



# Future growth in research

Past 5 years: demonstration of growth

Recognition of the importance of research in the future of Boise State