# Keynote Forum
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# James B Hoying

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## Biofabrication of tissues for biomedical applications

Regenerative medicine promises to revolutionize medicine through the repair or replacement of dysfunctional tissues and organs with engineered biological or biohybrid systems. Current, 1st generation regenerative and biomedical tissue solutions utilize relatively simple uniform tissue constructs formed with cells cultured in or on biocompatible scaffolds. Future regenerative therapies will require the fabrication of complex three-dimensional constructs containing multiple cell types, extracellular matrices, and other elements via customized strategies. We envision a process by which tissue components are fabricated, including via 3D and 4D bioprinting, and assembled in a manufacturing workflow resulting in a final tissue product. This requires a spectrum of biofabrication capabilities. We've developed a technology platform enabling these advanced biomanufacturing processes that is being employed to build tissues for assays, tissue models, and replacement tissues.

### Speaker Biography

James B Hoying, PhD FAHA is the Chief of the Division of Cardiovascular Therapeutics at the Cardiovascular Innovation Institute (CII) and Professor in the Department Physiology at the University of Louisville. He has over 25 years of experience, having published over 116 papers and book chapters, in basic and applied biological sciences with a focus in vascular biology and repair. He holds a number of patents related to repairing and manipulating capillaries and cell-based therapies. He is President and co-founder of Angiomics Inc., a biotech company advancing vascular health through its patented isolated microvessel technology. He is also Chief Scientist and a Partner of Advanced Solutions Life Sciences, a Louisville company advancing 3D bioprinting and tissue fabrication. He is a Fellow of the American Heart Association.

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# Gean Vitor Salmoria

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## 3D laser printing of implantable drug delivery for cancer treatment

In recent years, Additive Manufacturing (also known as 3D printing) processes such as Selective Laser Sintering (SLS) has shown great prominence in the biomedical field, and several researchers have conducted studies showing a wide diversity of materials and applications, such as the additive manufacturing of medical products, scaffolds and drug delivery devices (DDDs). The increase in the number of people affected by genetic and infectious diseases resistant to conventional treatments has led to the need to develop new medical treatments by understanding the mechanisms of action and the targets of pharmacological action at the molecular level. As well as, to develop more specific transport systems for existing hydrophobic and hydrophilic drugs in order to increase the therapeutic efficacy of these drugs. Implantable drug delivery devices (DDDs) technology offer several advantages over conventional methods such as oral or parenteral dosage form, allowing specific drug administration at the target site, minimizing potential side effects. This therapy may provide controlled release of a medicine for acute and chronic treatments.

Hormone cancer therapy is a form of systemic therapy that works to add, block or remove hormones from the body to slow or stop the growth of cancer cells. The use of hormone therapy in combination with other cancer treatments, such as chemotherapy and radiation therapy can be applied to fight various forms of cancer. Progesterone consistently suppressed the expression of genes required for cell proliferation and metastasis and increased the expression of many tumor-suppressor genes. The hormone therapy using progesterone in the treatment of different types of cancer, such as breast, ovarian, uterus and prostate cancers have been investigated.

Chondrosarcoma is a malignant cartilaginous tumor. It is the second largest group of primary bone tumors. Highest prevalence is found between the fourth and sixth decade, with an equal male to female ratio. Approximately 90% of chondrosarcoma are described as conventional type. They arise centrally in the metaphysial region of long bones, but can also develop in flat bones such as pelvis, rib and scapula. A minority (up to 15%) of conventional chondrosarcoma develops from the surface of bone as a result of malignant transformation within the cartilage cap of a pre-existent osteochondroma and is therefore called secondary or peripheral chondrosarcoma. For all grades of non-metastatic chondrosarcoma en-block resection offers the best recurrence free survival, surgical management is related to grade, type and site. Chemotherapy is possibly effective in mesenchymal chondrosarcoma, and of uncertain value in dedifferentiated chondrosarcoma. Local drug delivery systems can be an option to the cartilage-bone cancer treatment. Minimally invasive, intratumoral strategies for the treatment of solid tumors promise to substantially improve the therapeutic outcomes for many cancers.

SLS is a good alternative to controlling the porosity of bio-inert and bio-absorbable polymeric matrices and, consequently, control the drug release of implantable DDDs. In this study, DDDs with polymeric matrices, hydrophilic and hydrophobic drugs for cancer therapy were manufactured and characterized. The structure and properties of the manufactured DDDs were evaluated and correlated with the processing conditions.

### Speaker Biography

Gean Vitor Salmoria has a Chemistry Graduation and MSc from the Federal University of Santa Catarina (UFSC) in Brazil and Microwave Processing PhD from the Institut National Polytechnique de Toulouse in France. He is a specialist in eletrothermal processes and organic material chemistry. His research interest includes fabrication using microwave, ultra-violet and infra-red lasers, additive manufacturing and rapid tooling for extrusion and injection molding applied to automobile, aerospace and biomedical industries. He is a Professor on design with plastics at the Mechanical Engineering Department of UFSC since 2001. He has published more than 70 papers in reputed journals and has been serving as an editorial board member of the Journal of Advanced Manufacturing Research.

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