



# TERM | Update

Tissue Engineering and Regenerative Medicine



Volume 1

## Welcome

In May 2013, Instron® acquired TGT to become part of the Instron division of ITW's Test and Measurement business. In partnership, Instron TGT is excited to offer an instrumentation platform that is uniquely designed to cater to all aspects of tissue engineering. The broad range of applications include:

- Condition and engineer developing tissues
- Characterize tissue engineering components
- Reveal fundamental mechanisms of cell function
- Direct stem cell differentiation
- Provide an *in vitro* testbed for drug and cell therapy development

[Visit us on instron.com](http://www.instron.com) to see our products

## Product Showcase

LigaGen Bioreactor System – simulates mechanical tension/compression forces to a 3D sample. Current research applications include ACL tissue engineering and human hand tendon tissue engineering.



## Introduction to Tissue Engineering and Regenerative Medicine (TERM)

Replacing body parts is one of mankind's earliest aims, as patients and healers have attempted to cope with disabilities. Tissue Engineering and Regenerative Medicine are dedicated to creating new tissue engineered medical devices that replace and/or enhance tissue function that has been impaired by disease, injury, or age. Because these are expansive fields that incorporate a myriad of disciplines, definitions for each term can be confusing.

### What is Tissue Engineering?

Tissue engineering is the combination of cells, scaffolds (material on which to grow the cells), and an appropriate biological, chemical, and mechanical environment to grow or build 3D tissues that are similar to native tissue. Researchers in this field are interested in characterizing the native tissue and environment, identifying the appropriate recipe to grow new tissue, and evaluating the results of tissue engineering efforts. Tissue engineered products can be used as benchtop models of *in vivo* environments and to study disease and the effects of new therapies (pharmaceuticals) or in regenerative medicine applications.

### What is Regenerative Medicine?

Regenerative medicine is the application of these tissue engineered medical products as a clinical therapy. This field includes not only the tissue engineered medical device, but also the patients, health care providers, and associated clinical therapies necessary to integrate these services and products to improve health care options.



**PATIENT**

**CELL POPULATION HARVESTED FROM THE PATIENT**

**SCAFFOLD SELECTED**

**CELLS AND SCAFFOLD CULTURED IN A BIOREACTOR**

**TISSUE ENGINEERED PRODUCT IMPLANTED**

\* Courtesy of Nanofiber Solutions

## History

### EnduraTEC SYSTEM

Corporation founded:  
Designs and manufactures material test instruments

### BIOREACTOR

First generation tissue engineering system designed and manufactured

### REBRAND

Tissue Growth Technologies designs and manufactures bioreactors with its new identity

### DYNAGEN

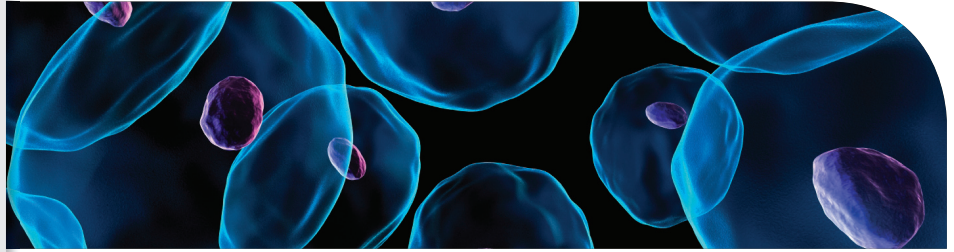
First commercial bioreactor solutions for tissue engineering and regenerative medicine research

### INSTRON TGT

Tissue Growth Technologies acquired by Instron

# TERM | Update

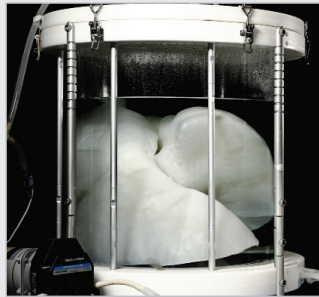
Tissue Engineering and Regenerative Medicine



## Why Use Mechanical Stimulation in Tissue Engineering?

Research has shown that stimulating cells and tissues during development *in vitro* results in tissue that is more similar to native tissue. This is because tissues are normally exposed to a variety of biomechanical signals *in vivo*.

For example, skeletal tissue, such as a muscle, tendon, and ligament cultured under cyclic strain, results in a stronger tissue with aligned fibers. Tissue engineered bone is enhanced by hydrostatic pressure and shear conditions, while tissue engineered cartilage is enhanced by dynamic compression.



Photograph: Courtesy of Massachusetts General Hospital: Dr. Harald Ott

The Instron® TGT DynaGen Bioreactor Series assists researchers in studying and developing the production of functional tissues for regenerative medicine. Mechanical stimulation for successful pre-conditioning and developmental support requires that bioreactors:

- Provide a controlled environment during mechanical stimulation
- Stimulate multiple samples with identical or individual waveforms
- Deliver repeatable and reliable displacements and loads to mimic *in vivo* developmental conditions and activities of daily living
- Adjust stimulation conditions based on changes in the developing tissue

## Today's News in Tissue Engineering

**7/19/2013**

Japan government approves stem cell for clinical trials – first in the world!

[Read more](#)

**6/17/2013**

Scientists growing livers, kidneys, and ears in labs amidst organ shortage

[Read more](#)

**5/12/2013**

\$325,000 Hamburger: Mark Post Maastricht University assembled the first tissue engineered hamburger from tiny bits of tissue engineered muscle

[Read more](#)

**4/30/2013**

Pediatric Tissue Engineered Trachea: 2 ½ year old patient receives a tissue engineered organ in Peoria, IL

[Read more](#)

## Events Calendar

Instron will be attending various conferences, exhibitions, and events throughout the year. Listed below is a small selection.

### AUGUST

Bioseminar: Osaka  
Japan  
August 28th

Bioseminar: Taipei  
Taiwan

Bioseminar: Seoul  
Korea

### OCTOBER

TERMIS AP  
Shanghai, China  
October 23 - 26th

### NOVEMBER

TERMIS NA  
Atlanta, Georgia, USA  
November 10th - 13th



## Contact Instron TGT

781-575-5003

[tissuegrowth@instron.com](mailto:tissuegrowth@instron.com)

James Ritchey | Director of Tissue Engineering Businesses

Anna Wynn | Business & Development Manager

Phil Levesque | Engineering Manager

Larry Nelson | Sales Engineer