TECH REPORT

107:

ScanFlex™ with XyFlex™

An automated method to measure gel compaction in three dimensional bioartificial tissues

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Culturing Cells in a Mechanically Active Environment™
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ScanFlex™, an automated image collection system, allows users to periodically scan items placed on a scanner bed. The ScanFlex™ software controls a digital scanner (Fig. 1) and allows users to program the number of times and the time intervals when digital scans are taken (Fig. 2). The users can set image parameters such as resolution, quality, and file format. Captured images are automatically saved to a user assigned location for image analysis.

Figure 1. *Tissue Train® culture plates arranged on the scanner bed for scanning.*

ScanFlex™ can be used to determine the change in area of a three-dimensional cell seeded-gel construct, or bioartificial tissue (BAT) when used in conjunction with Flexcell®'s Tissue Train® culture plates.

NOTE: *See "Tech Report 100: Tissue Train Culture System. A Method for Culture and Mechanical Loading of Cells in a Linear 3D Matrix" for creating BAT constructs. This technical report is available on-line at http://www.flexcellint.com/reports.htm.*

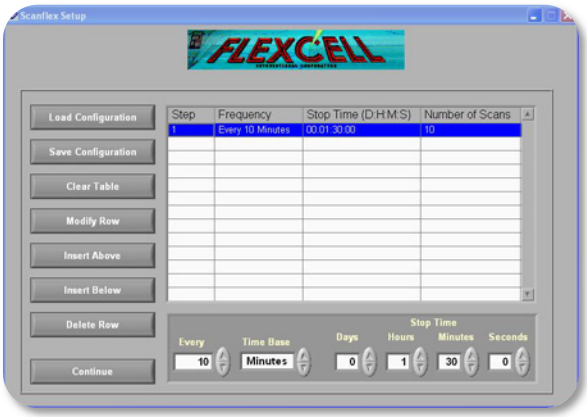

Figure 2. *"Frequency Setup" screen in the ScanFlex™ software allows users to program in the total time and time interval for capturing digital scans.*

Four 6-well or 24-well Tissue Train® culture plates can be placed on the scanner bed using provided frames. The scanner can then be placed in a CO_2 incubator at 37 °C. ScanFlex™ can then capture and save images of the Tissue Train® plates at user specified times (e.g., every 2 hours for 24 hours). Saved images can then be analyzed to determine the change in area of each BAT over time.

The area of a BAT can be measured using Flexcell's XyFlex™ image analysis software (Fig. 3). XyFlex™ software allows the user to automatically measure the BAT area in a large sequence of images, taking away the laborious task of measuring the images manually. These area data can be used to determine changes in gel compaction, a measure of tissue remodeling. Gel compaction curves can be plotted as gel culture area vs. time (Fig. 4).

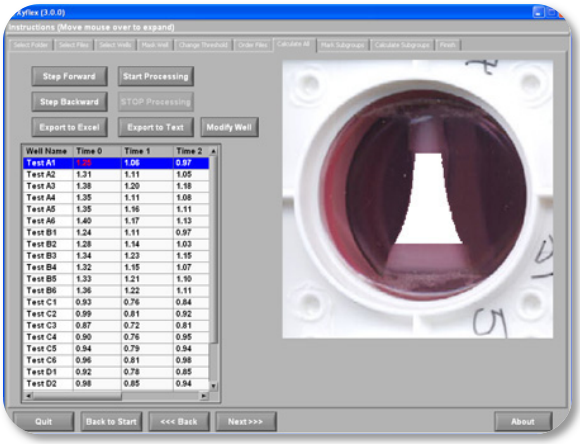

Figure 3. *XyFlex™ software for automated gel compaction measurement.*

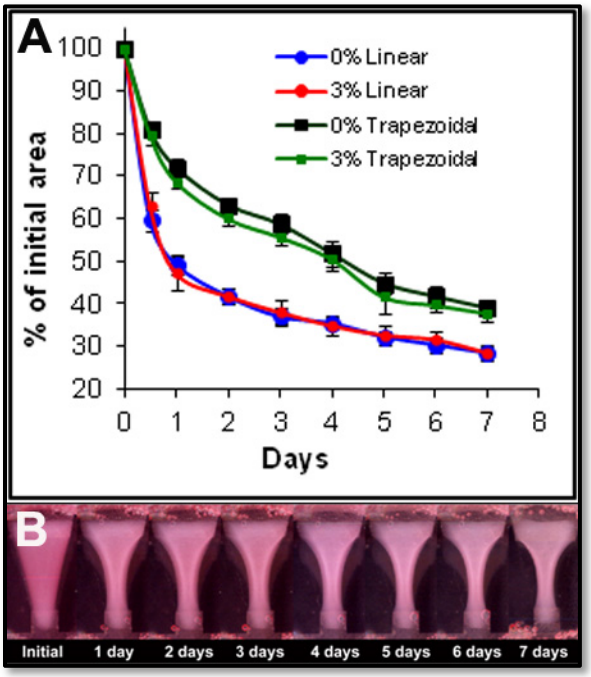

Figure 4. *Bioartificial tissue compaction. A) Plot illustrating the progressive compaction of linear and trapezoidal BATs subjected to ±uniaxial stretch over time. B) Change in the size of trapezoidal BATs in culture over time due to compaction. (Sumanasinghe et. al., 2009)*

Compaction rate can also be calculated with the following equation:

$$\upsilon = (S_0 - S_t)/S_0 * 100\% /t,$$

where S_0 is the gel area at time *0*, S_t is the gel area at time *t*, and ***t*** is the culture time (Qi et al., 2007).

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