Tech Report 204:

Converting Sample Pressures to Forces

Document: Pressure Force Conversion Tech Report, Rev 1.1

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Culturing Cells in a Mechanically Active Environment™
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The actual pressure applied to a sample in the well of a BioPress™ compression plate is dependent on the surface area of the sample to which the force is being applied. Therefore, the FX-5000™ Compression System is designed to apply a force to three dimensional samples so that force is not dependent on sample size.

The FX-5000™ Compression System has a conversion calculator built into the software for converting pressure (kPa) to force (lbs), and vice versa. To access this calculator, select ***Calculate*** from the ***Regimens*** menu. Select the ***Convert Pressure to Force*** or ***Convert Force to Pressure*** calculator by clicking on the appropriate button beside the calculator label. For pressure to force conversions, enter the pressure in kPA in the ***Pressure (kPa)*** box and the sample diameter in millimeters in the ***Sample Diameter (mm)*** box. Click ***Calculate***. The calculated force in lbs will appear in the ***Force (lbs)*** box.

For force to pressure conversions, enter the force in lbs in the ***Force (lbs)*** box and the sample diameter in millimeters in the ***Sample Diameter (mm)*** box. Click ***Calculate***. The calculated pressure in kPA will appear in the ***Pressure (kPa) box***.

Alternatively, you can use the equation below to convert your desired pressure to a force. Simply plug the pressure that you wish to apply to your sample into the equation below, along with your sample diameter, and program the resulting force into the FlexSoft® software.

$$Force_{lbs} = 0.177*(P_{MPa})*(D_{mm}^2)$$

where $Force_{lbs}$ is the force applied to a single sample or cell in pounds, P_{MPa} is the pressure that you wish to apply to the sample in megapascals (MPa), and D_{mm} is the diameter of a single sample in mm.

If you wish to determine the pressure applied to your samples given the force programmed into the software, you can use the following equation:

$$P_{MPa} = (5.65* Force_{lbs})/(D_{mm}^2)$$

where P_{MPa} is the pressure applied to the sample in megapascals (MPa), $Force_{lbs}$ is the force entered into the regimen or displayed on the software screen in pounds, and D_{mm} is the diameter of a single sample in mm.