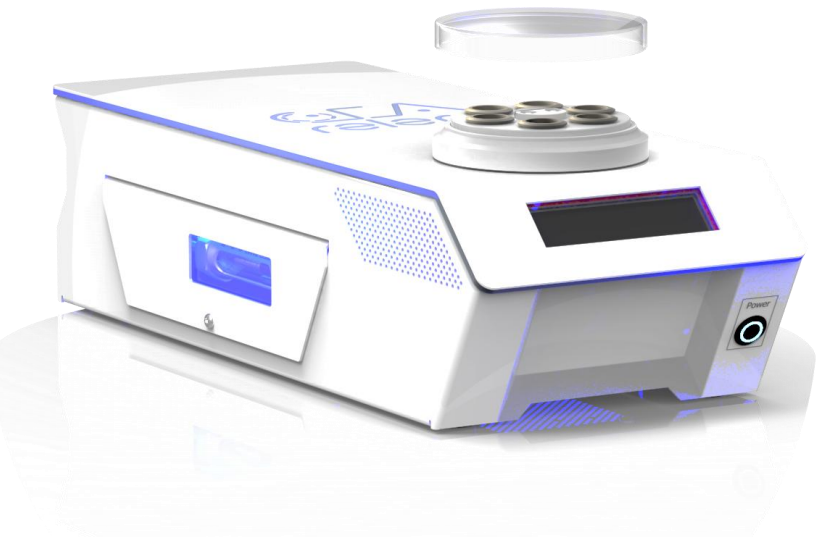
CFA_{refer}- Bench-top auto-analyzer for cell force measurement



The Cell Force Analyzer (CFA_{refer}) precisely measures mechanical forces in eukaryotic cell layers and their changes under biochemical, pharmacological, or mechanical interventions. Its compact design fits easily on a laboratory bench or under a clean hood. At the core of the system is the CellDrum™, an ultra-thin, flexible, and biocompatible PDMS membrane that mimics physiological conditions for cell growth. In addition to biological studies, the system can also be applied to non-biological material testing.

To make this technology accessible in the way that best fits your needs, there are two flexible paths:

1. **Contract Research Services:** Our team designs and performs your experiments, delivering high-quality, reproducible data without the need for in-house equipment. This option is ideal for fast results, limited budgets, or specialized studies.
2. **In-Lab Operation:** For groups who prefer to run their own experiments, the CFA_{refer} system is available for purchase or lease, complete with training, support, and customizable membrane options.

Whichever path you choose, you benefit from the same precision technology, expert knowledge, and commitment to advancing your research.

Areas of application

- **Pharmaceutical applications** [1,2,3]
  Pharmaceutical and biochemical substances, dose-response, kinetic studies, reversibility.
- **Medical research** [4,5,6,7]
  Hypertension, Cardiovascular System, Sepsis, Wound healing bioavailability tests with patient´s blood plasma.
- **Non-biological material testing** [8]
  Curing time detection for adhesives/dyes/sprays, phase transitions of polymers.

Advantages of CFA_{refer}

- **Compact and versatile use**
- **Autoclavable & Sterilizable**
- **Precisely controlled temperature environment**
- **Incubator safe components**
- **Highly reproducible data**
- **Any adherent cell types can be examined**
- **Fast measurement with automated data analysis**
- **Designed for six consecutive measurements in one run**

Measurement Principle

The CFA_{refer} measures the tensile stress of cultured cell layers in the CellDrum™. Its highly flexible membrane mimics the soft mechanical "environment" of cells in tissues and creates near physiological mechanical conditions for cell growth on it. The CFA measures a physically defined mechanical stress in mN/mm^2 and is therefore independent of the device setup. Thus, it serves as reference method for any other less defined "cell force" system.

Measurements are carried out in a controlled environment at 37°±0.2 °C. Due to using the soft and µm-thin membrane on which the cell layers adhere and are cultivated, the deflection of the membrane reacts to induced, extremely small cell force changes of the sum of all cells in the layer. After cell culturing and positioning the CellDrums™ in the CFA_{refer}, it performs and analyses these measurements semi-automatically. Media and substance changes are possible at any time.

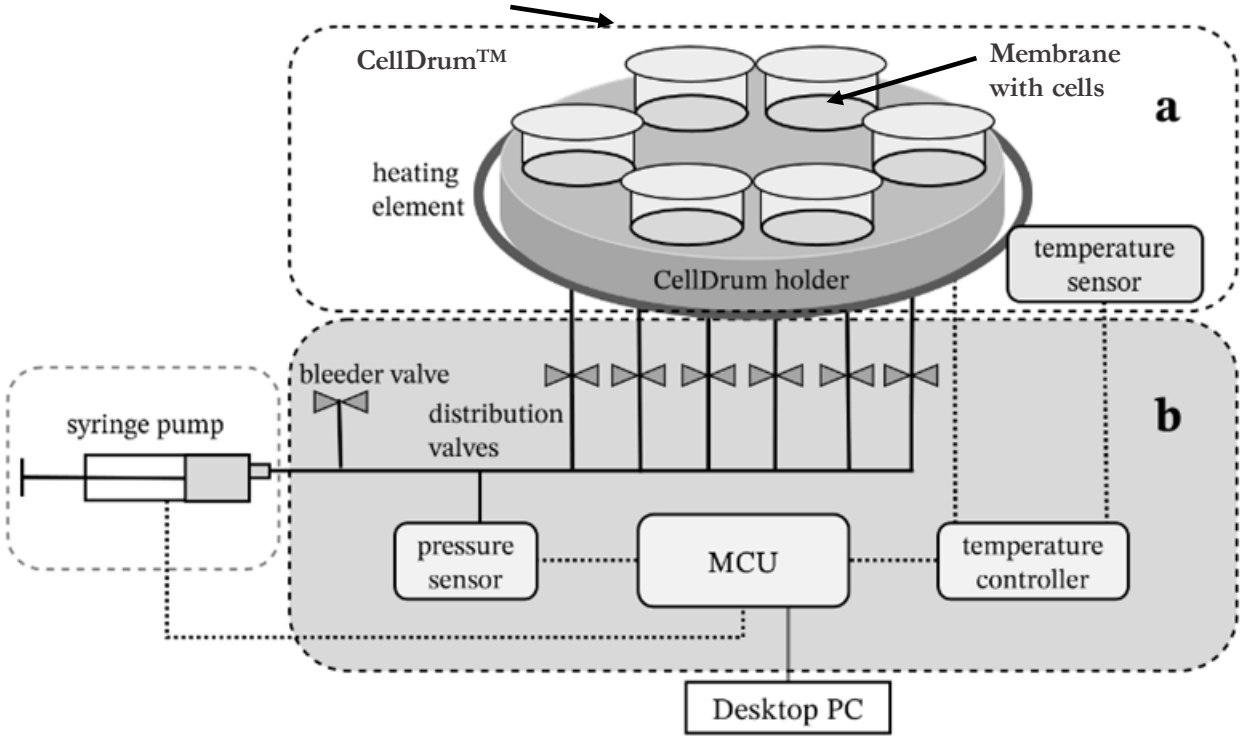
Customer Services

We offer a range of services to provide our customers with the best possible support. These include workshops, training courses and a telephone hotline for CFA_{refer} applications and help you plan experiments.

Contract Services

We offer the option to commission our experienced team to carry out your experiments and drug studies, providing reliable results without the need for in-house equipment. This contract research approach saves time, reduces cost, and ensures expert handling of your samples.

For groups who prefer independent work, leasing or purchasing the CFA_{refer} remains commercially available, along with optional customized CellDrum™ membranes tailored to specific cell adhesion needs.



User interface

To use CFA$_{refer}$, the user would need to install the software on a computer to establish connection with the CFA$_{refer}$, to facilitate the execution of experiments and to monitor those experiments in real-time. Key software modules are:

Section 1:Measurement
Section 2:Setup Measurements
Section 3:Post-data processing

In ***section one***, the user must enter crucial information as experiment title, substances, concentrations, medium type, medium volume, and cell type as well as membrane thickness. Without this input the measurement will not start. Users also have the option to include additional commentary on samples.
To prevent measurements from being accidentally started when entries are still incomplete, the user must check the "Setup complete" box and activate each channel that is eligible for measurement. After completing these steps, the measurement can be started.

In ***section two***, the measurements are carried out. The experimenter can follow the process on the screen at the same time (see Figure). This way, any errors occurring during a measurement can be detected in a timely manner.

In the event of an obvious error, the user can interrupt the measurement and cancel it. After a successful measurement, all data is saved manually. There is the option of saving or exporting a comprehensive report with both raw data and graphics for further processing.

In ***section three***, the stored results can be visualized, filtered and further processed.

Technical Data

Cell culture media volume: 6 x 500 µl
Culture surface area: 6 x 200 mm²
Pressure range: -125 to +125 Pa
Output value: Sample Compliance (Pa^{-1})
Tension (Pa), Strain (%)
E-Modulus (Pa)
Zero-point accuracy (sensor): 0.08 Pa
Accuracy: 3% of measured value
typically ±2.9kPa (tension)
Measurement time (6 CellDrums™): 190 s
Calibration: Automatic
Temperature: 30 bis 40°C (+/- 0,2 °C)
Dimensions (HxWxD): 140x185x435 mm
Weight (with shock-absorbing base): 7.1 kg

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