Cardiovascular Solutions

DSI™
a division of
Harvard Bioscience, Inc.

Supporting Your Research Every Step of the Way

In Vitro

- **Spectrophotometry** Determine the presence, quantity, and molecular weight of solubilized proteins or nucleic acids (DNA, RNA) in cardiac tissue. The Ultrospec family of instruments from Biochrom cover all requirements in the UV/Visible spectrum.

Spectrophotometer

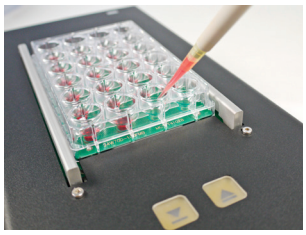
- **Patch Clamp** Perform cardiac action potential recordings on cells, SA nodes, and ventricular slices for characterization of bioactive compounds, including the hERG channel testing for early identification of QT interval prolongation. HEKA Elektronics, Warner Instruments, and Multichannel Systems have a variety of patch clamp solutions, tailored to meet your needs.

Patch Clamp Amplifier

- **Electrophoresis** Hoefer gel electrophoresis techniques determine the presence, quantity, and molecular weight of solubilized proteins or amino acids (DNA, RNA). Hoefer specializes in developing tools and complimentary accessories for gel electrophoresis and blotting applications.

Hoefer Electrophoresis

- **Microelectrode Array (MEA) and Multiwell** Multi Channel Systems offers fully integrated amplifier systems to analyze parameters including beat frequency, signal propagation (direction and speed), and QT-effects. The system can be used for in vitro and in vivo recordings including isolated/iPS derived cardiomyocytes, retrograde-perfused isolated organs in a Langendorff setup, and acute open thorax. These solutions serve basic research applications, safety pharmacology, and toxicology screening approaches.



Microelectrode Array System

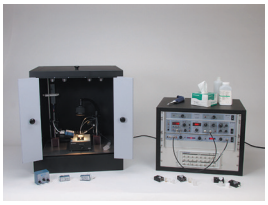
- **Oocyte Ion Channel** Screen ligand-gated and voltage-gated ion channels, as well as electrogenic transporters based on the standard Xenopus oocyte expression system. Applications include hERG currents, Na/K-ATPase transport, and GABAA receptor studies. Multi Channel Systems' line of solutions are optimized for high throughput experiments with automated, high-quality TEVC recording from 96 oocytes without supervision.

Oocyte System

- **Chambers and Perfusion Systems** Complement electrophysiology and imaging experiments with image chambers, recording chambers, and perfusion systems from Warner Instruments. Optional heating and cooling solutions for environmental control optimize these systems for screening studies.

Perfusion System

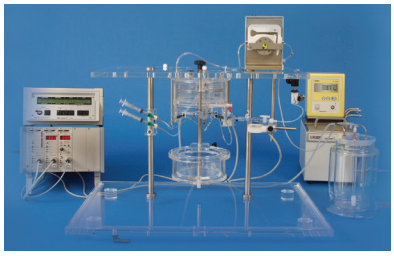
- **Planer Lipid Bilayer Systems** Warner Instruments provides a perfect synthetical system allowing you to define all parameters, including lipid mixture, working solutions, and temperature while working with your purified channel or transporter protein. Achieve a clear response on interactions between drugs, proteins, and lipids.



Planer Lipid Bilayer System

Ex Vivo

- **Isolated Heart Perfusion Systems** Hugo Sachs offers isolated heart systems for cardiac physiology measurements in both Langendorff and Working Ejecting Heart perfusion modes. These modular systems are tailored to your needs and can be used for hearts ranging in size from mouse to pig. This system is suitable for both GLP and non-GLP environments with the ability to combine DSI's Ponemah software with the Hugo Sachs platform.



Isolated Heart System

Anesthetized In Vivo

- **Hardwired Solutions** DSI offers easy to use hardwired solutions to collect a variety of cardiovascular endpoints in anesthetized models. Endpoints include coronary blood flow, systemic blood flow, pressure-volume loops, and more. DSI signal conditioners filter the data, eliminating inaccuracies and signal offsets. The data is then acquired through the powerful Ponemah Analysis Software platform where stable, accurate and robust data acquisition ensures you are getting the best results.

ACQ Signal Conditioner

- **Pumps** Harvard Apparatus syringe pumps are used in cardiovascular research involving drug discovery, tissue engineering, and microfluidic modeling. Our syringe pumps provide accurate and repeatable dosing for pharmaceutical drugs with the potential to alleviate cardiac arrythmia. Harvard Apparatus syringe pumps provide precise flow rates to allow high cell seeding yields for tissue engineering and successful lab-on-a-chip experiments for identification of cardiac markers.

Syringe Pumps

Conscious In Vivo

- **Implantable Telemetry** Collect and analyze continuous physiologic data from conscious, freely moving laboratory animals. DSI's telemetry can accommodate a wide variety of animal sizes, from transgenic mice to non-human primates. Available endpoints include blood pressure, left ventricular pressure, electrocardiogram (ECG), pulmonary pressure, temperature, activity, and more. Telemetry is used in many areas of cardiovascular research, including basic cardiovascular sciences, drug discovery, safety pharmacology, infectious disease, and toxicology.

Mouse-size Implant

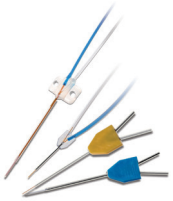
- **Jacketed External Telemetry (JET)** DSI's externally worn telemetry solution enables continuous collection of electrocardiogram (ECG) and activity from freely moving, unrestrained large animals, rats, and guinea pigs. Non-invasive ECG recording is ideal for animal models not fit for surgery and snapshot ECG for high throughput studies with increased statistical power. Expand your capabilities with add-ons for aquisition of accurate, continuous blood pressure and respiratory data.

JET with Blood Pressure Add-on

- **Multi- Lead ECG** Accurately condition up to twelve simultaneous surface ECG signals using an industry standard 10-lead cable. DSI's multi-lead snapshot ECG provides acute, noninvasive monitoring of conscious, restrained large animals.

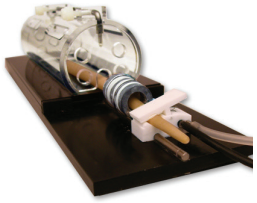
Multi-Lead ECG

- **Microdialysis** The use of microdialysis technology is an essential step in the drug development process for selecting the most promising compounds with optimum therapeutic effect. CMA offers reliable solutions for in vivo and ex vivo microdialysis research, including microdialysis probes, pumps, fraction collectors, and related accessories.



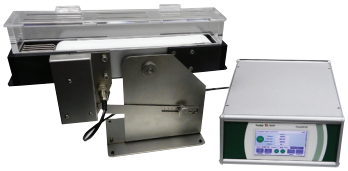
Microdialysis

- **Non-Invasive Blood Pressure** Reliably measure systemic blood pressure and cardiovascular parameters in rodents without catheterization using Panlab's non-invasive blood pressure system.



Non-Invasive Blood Pressure system

- **Behavioral Research Solutions** Treadmills and activity wheels are popular tools for studying the physiologic adaptations and possible benefits from exercise. Panlab and Coulbourn behavioral solutions can be enhanced with the integration of telemetry for measurement of cardiovascular endpoints to understand the full cardiovascular response. Treadmills can also be combined with respiratory metabolism (V02max) evaluation for real time observation of physiologic changes and performance during exercise.



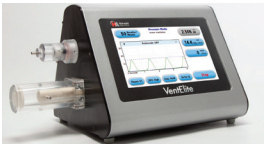
Treadmill

Surgical Instrumentation and Subject Monitoring

- **Physiological Monitoring** The Harvard Apparatus Small Animal Physiological Monitoring System (HPMS) provides superior monitoring results with a small footprint. The platform integrates monitoring of heart rate, rectal temperature, electrocardiogram (ECG), respiration, oxygen saturation (SpO2), blood pressure, and exhaled CO_2 ($EtCO_2$). It also includes a controlled heating surface to maintain desired body temperature.

HPMS

- **Ventilators** The Harvard Apparatus VentElite allows pressure or volume-controlled ventilation in animals ranging in size from mouse to guinea pig. The large touch screen features a real-time graphical representation of the measured pressure as well as numeric displays of pressure, tidal volume, and respiration rate. Features of the VentElite include manual or programmable sigh, inspiratory or expiratory hold, adjustable I:E, and audible alarms.



VentElite

- **Homeothermic Monitoring System** The Harvard Apparatus Homeothermic Monitoring System is a closed loop temperature control solution for small rodents. It features an easy-to-use touch screen, small flexible rectal probe, and heating pads available in several sizes to meet all your surgical needs.

Homeothermic Monitoring System

- **Surgical Instruments** Harvard Apparatus offers a full line of precise, high quality surgical tools ideal for animal and cellular research. These instruments are made from certified surgical grade German steel. They are forged and finished in a German ISO 9001-certified facility. Our selection includes a wide variety of tweezers, forceps, scissors, bone instruments, surgical/vascular clips and clamps, scalpels, retractors, wound closure systems, vascular access instruments, and more.

Surgical Instruments

- **Scavenging** Harvard Apparatus' MiniVac Gas Evacuation Unit is an active scavenging device that effectively removes waste gas from your surgical area. The MiniVac has an adjustable speed and can be interfaced with a wide variety of inhalation anesthetic delivery options. It is self-contained, remedying the need for ducting or special ventilation, traditional with active scavenging.

MiniVac

- **Anethesia** The complete anesthesia systems from Harvard Apparatus bundle products needed in popular configurations. Choose from a variety of options for both table top and mobile anesthesia systems.

Anesthesia System

Services

- **Validation** DSI's services team offers a variety of options for validation assistance, including master plan templates and test scripts, custom services and consultations, training and certification, as well as on-site full service validation packages to help manage the entire validation process and set you up for success.

- **Data Analysis** Managing large amounts of physiologic data can be time consuming and overwhelming. We are ready to help you simplify this process with an experienced team. No matter how complex your research is, DSI has the tools and expertise to help you successfully reach conclusions. Capabilities include ECG evaluation, heart rate variability, EEG analysis, respiration and inhalation analysis, body temperature, activity, continuous glucose, and more.

- **Surgical** Experience higher surgical success rates with DSI's flexible menu of surgical options to help you meet your research goals. Our experienced team will travel to your facility or accommodate your surgical request from our in-house or partner laboratories. Our pre-implanted program offers accredited facilities, on-staff veterinarians, and experienced DSI surgeons to deliver healthy, telemetered small or large animals for your research.