In Vitro & In Vivo Solutions

DSI™
a division of
Harvard Bioscience, Inc.

Supporting Your Safety Pharmacology Studies Every Step of the Way

In Vitro

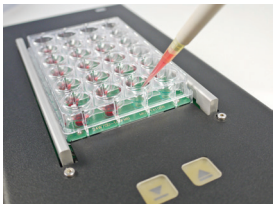
- **Patch Clamp Amplifiers** perform ion channel characterization of bioactive compounds, including the hERG channel testing for early identification of QT interval prolongation. Compound selectivity can be a challenge when targeting ion channels, so ensure you are correctly characterizing the compound by generating precise and high quality data to aid in data interpretation.

Patch Clamp Amplifier

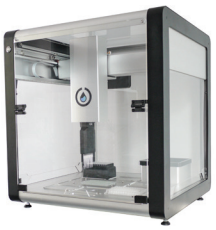
- **Microelectrode Array (MEA) technology systems** are used in the last steps before animal experiments, using cells, tissue cultures, or often acute slices to investigate drug effects (e.g. on synaptic plasticity). Our MEAs record extracellular field potential noninvasively and with high spatial resolution, for short or long term studies. With an easy-to use and fast functional screening approach, cell integrity is not affected and can be recorded directly for a longer period of time. Our technology allows monitoring of the lead compound's effect at a very early stage, allowing the researcher to kill compounds, saving both time and money.


Microelectrode Array System

- **Multiwell MEA Systems** can be used with neurons or cardiomyocytes (primary or derived stem cells) for high throughput investigation of toxicological effects, subtle changes in neuronal activity, or cardiac beating behavior. The automated Multiwell analysis software provides common parameters with a mouse click while maintaning full access to raw data for deeper analysis.

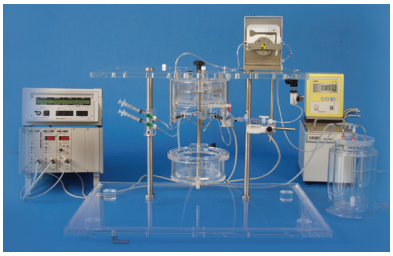

MEA Multiwell System

- **MEA Xpress** enables high throughput, automated liquid handling, removing the risk of pipetting errors. Combine the MEA Xpress with our Multiwell system and have the freedom to walk away from the bench and let the MEA Xpress do the work.


MEA Xpress

Ex Vivo

- **Isolated Heart Perfusion Systems** run Langendorff isolated perfused heart assays that provide rapid, economic, reproducible and sensitive predictions of QT prolongation. This allows for the assessment of the effects of a drug on left ventricular cardiac function and cardiac electrical activity without any disturbances from other biological interactions, like adrenalin. For safety pharmacology, these studies supplement in vivo dog and non-human primate studies that are done under GLP. Use an ME2100 system to get in-depth analysis of the recorded data. Combine the ME2100 FlexMEA approach from Multi Channel Systems with an IH system from Hugo Sachs Elektronik to obtain a more complete picture of cardiac physiology.


Isolated Heart System

DSI™ a division of Harvard Bioscience, Inc. HEKA multichannel systems

Anesthetized In Vivo

- **Hardwired Solutions** DSI offers easy to use hardwired solutions to collect a variety of cardiovascular, CNS, and respiratory 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.

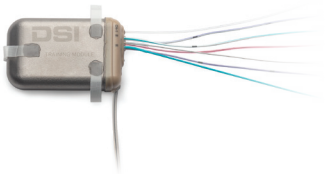
ACQ Signal Conditioner

- **Pumps** Harvard Harvard Apparatus syringe pumps are used in 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** continuously measures cardiovascular, respiratory and CNS activity to evaluate for Torsade's de pointes, core respiratory measurements and seizure liability in safety studies. Available endpoints include blood pressure, left ventricular pressure, electrocardiogram (ECG), electroencephalogram (EEG), video-EEG, electromyogram (EMG), respiratory (rate and volume through impedance), and heart rate in small and large animal safety studies.



Large Animal Implant

- **Respiratory Plethysmography Chambers and Exposure** reliably measure pulmonary function in conscious restrained or unrestrained models. Whole body plethysmography measures respiratory function in animals without the use of anesthesia or restraint. The restrained head out chambers include the patented Buxco® Allay™ restraint system which secures the subject without compressing the thorax, unlike most plunger-type solutions. In addition, researchers have the power to measure Accumulated Inhaled Aerosol (AIA) of each exposed subject, in real-time, creating critical dose-response relationships. This is accomplished by utilizing during-exposure respiratory endpoints, as well as post exposure analysis utilizing our respiratory and inhalation line of products. From precise, homogenous, digital, data-driven compound delivery, to gold standard pulmonary function assessment, DSI offers all-encompassing, turn-key systems.

Head-out Plethysmographs

- **Behavioral Research** products ranging from analgesia meters, paw volume tests, spontaneous pain tests, thermal tests, mechanical tests, automatic and manual foot misplacement tests, rota rod, and grip strength meter. These products fulfill the Functional Observational Battery and the Irwin Test required by the S7A guidelines and can be combined with other Harvard Bioscience products, like telemetry, to expedite studies.

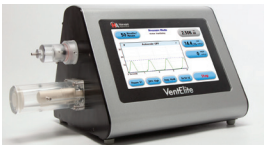
Grip Strength Meter

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

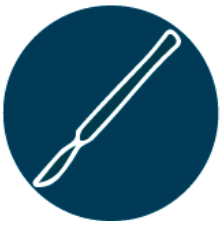
Services

- **Validation** DSI understands the difficulties you may encounter in GLP Validation and our team is here to help you validate with confidence, speed, and consistency. DSI offers validation services that let you choose where and how you'd like help. We provide master plan templates and test scripts, custom services and consultations, training and certification, and even on-site full service validation packages to help you manage the entire validation process and set you up for success.

- **Data Analysis** The data collected by DSI physiologic solutions can be exciting and interesting to see, but as your data sets get larger and larger, that excitement can turn to anxiety when you think about analyzing it. Whether you're a team of one or a team of one hundred, managing large amounts of data can be challenging, and make your research progress feel painstakingly slow. Our Data Services team lightens the load by analyzing your data and delivering accurate, consistent, comprehensive reports fast.

- **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 inhouse or partner laboratories.

  Surgical Education and Training
  Whether your goal is to learn the basics or fine-tune your skills, our surgical team is here to help. All recommended surgical procedures for DSI telemetry devices are developed by our surgical team, so you're literally being coached by those who "wrote the book".



  Surgery as a Service
  Sometimes it's not the procedure but time that's the problem. When doing large volumes of surgeries or complex procedures, sometimes you just wish you had an extra pair of hands. We understand, and our experienced surgical team is ready to assist with your animal preparation and implantation.

  Pre-Implantation
  Our pre-implanted program offers accredited facilities, on-staff veterinarians, and experienced surgeons to deliver healthy, telemetered small or large animals for your research. Our team will work closely with you using a pre-study consultation to review the study, desired outcomes, model requirements, and physiologic parameters to understand your goals.

- **Technical Support** Learning how to use sophisticated physiologic monitoring tools doesn't need to be a solo journey. Let our experienced support team be your partner to minimize system challenges and set you up for success. Whether you need help with start-up for new systems, on-site training for specific applications, or something in between, our support team tailors the training to meet your needs. Plus, by learning in your own facility or from the virtual comfort of your home office, training is also tailored to your unique environment.