

epoch[®]
Wireless *telemetry* system

Product Catalog

epoch[®]

Wireless telemetry system



Wireless, simplified.

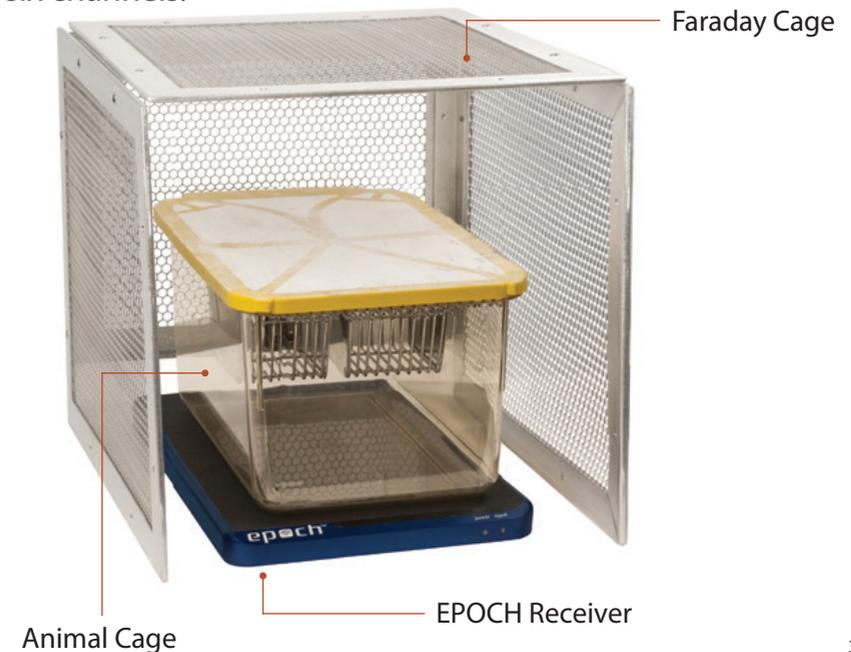
The EPOCH system offers the smallest, lightest and longest-lasting implantable neural wireless sensors on the market. To record, simply place the animal in its cage on an EPOCH receiver and data from the sensor is sent to a data acquisition system.

EPOCH is a wireless telemetry system for long-term biopotential recordings from small animals

EPOCH records multi-channel biopotentials of EEG, ECG, and/or EMG for up to six months

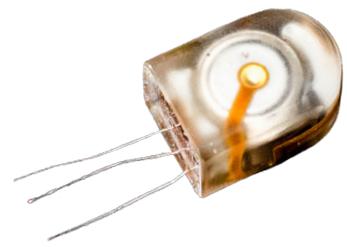


The complete EPOCH system includes a receiver tray, complimentary implantable sensor(s) and Faraday cage to collect data from an animal housed in industry standard caging. EPOCH sensors amplify and transmit up to six channels.



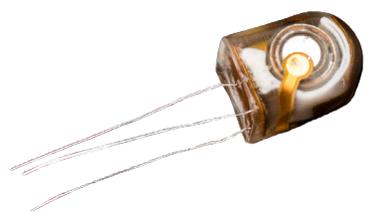


SIX-MONTH SENSOR



FOOTPRINT 9.3 mm x 12.4 mm
 HEIGHT 18 mm
 WEIGHT 4 g
 VOLUME 1.34 cc

TWO-MONTH SENSOR



FOOTPRINT 8.5 mm x 9.5 mm
 HEIGHT 14 mm
 WEIGHT 2.3 g
 VOLUME 0.76 cc

REUSABLE SENSOR

Transferable between animals with 2 months active recording



FOOTPRINT 8 mm x 13 mm
 HEIGHT 20 mm
 WEIGHT 2.6 g
 VOLUME 1.34 cc

TWO-WEEK SENSOR



FOOTPRINT 4 mm x 6 mm
 HEIGHT 8 mm
 WEIGHT 0.8 g
 VOLUME 0.19 cc

EPOCH sensors record **up to six channels** of wireless biopotentials with high signal-to-noise ratio **for up to six months** from rats and mice — even pups!

- Smallest, lightest and most affordable sensors on the market
- Earliest implantable sensors on the market, P10 mice and P6 rat pups
- Long-term continuous recordings up to 6 months on a single battery — no recharging required
- Record up to 6 channels of EEG with a common reference
- Record 2 simultaneous biopotentials (EEG, ECG or EMG) with differential references
- Quick and easy skull-mounted implants reduce surgery time to minutes
- Compatible with PlasticsOne® wired system mount, creating reusable, removable, transferable sensors
- Sensors are activated on demand
- Customizable with 4 gain setting options per sensor channel
- Longest lasting sensors on the market

EPOCH SENSOR OVERVIEW

	Adult Rats	Adult Mice	Pups (Rats P6/Mice P10)	Applications
2-Ch EEG	✓	✓	✓	Epilepsy
4-Ch EEG	✓	✓	✓	Hypsarhythmia
6-Ch EEG	✓	✓		Traumatic Brain Injury
Reusable 2-Ch EEG	✓	✓		Short Term Studies
ECG/ECG ⁺ <small>*Only one channel used</small>	✓	✓		Arrhythmias
EMG/EMG ⁺	✓	✓		Peripheral Nerve Regeneration
EEG/EEG ⁺	✓	✓		EEG Background Suppression
EMG/ECG ⁺	✓	✓		Fear Conditioning
EEG/ECG ⁺	✓	✓		Sudden Unexplained Death in Epilepsy (SUDEP)
EEG/EMG ⁺	✓	✓		Sleep

Common reference (EEG)

Example 2-Ch
Ch 1 = A - C
Ch 2 = B - C



+Differential reference (Various)

Example 2-Ch
Ch 1 = A - B
Ch 2 = C - D



Differential sensors require a compatible EPOCH2 receiver (100/200 Hz or 200/200 Hz)

GAIN SETTINGS & USES

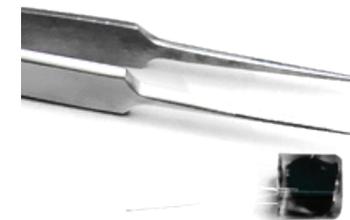
Make each sensor specialized to your study

Customizable gain settings give you four options per sensor channel

Total Gain	Input Range	Input to Output Range	Typical Use
400 x	±5.0 mV	5.0 mV in = 2 V out	Low gain applications
800 x	±2.5 mV	2.5 mV in = 2 V out	High amplitude biopotentials
2000 x	±1.0 mV	1.0 mV in = 2 V out	Standard EEG, EMG, ECG
4000 x	±0.5 mV	0.5 mV in = 2 V out	Low amplitude EEG for immature rodents

PUP SENSORS

Record from mice as young as postnatal day 10 (P10) and rats as young as postnatal day 6 (P6)

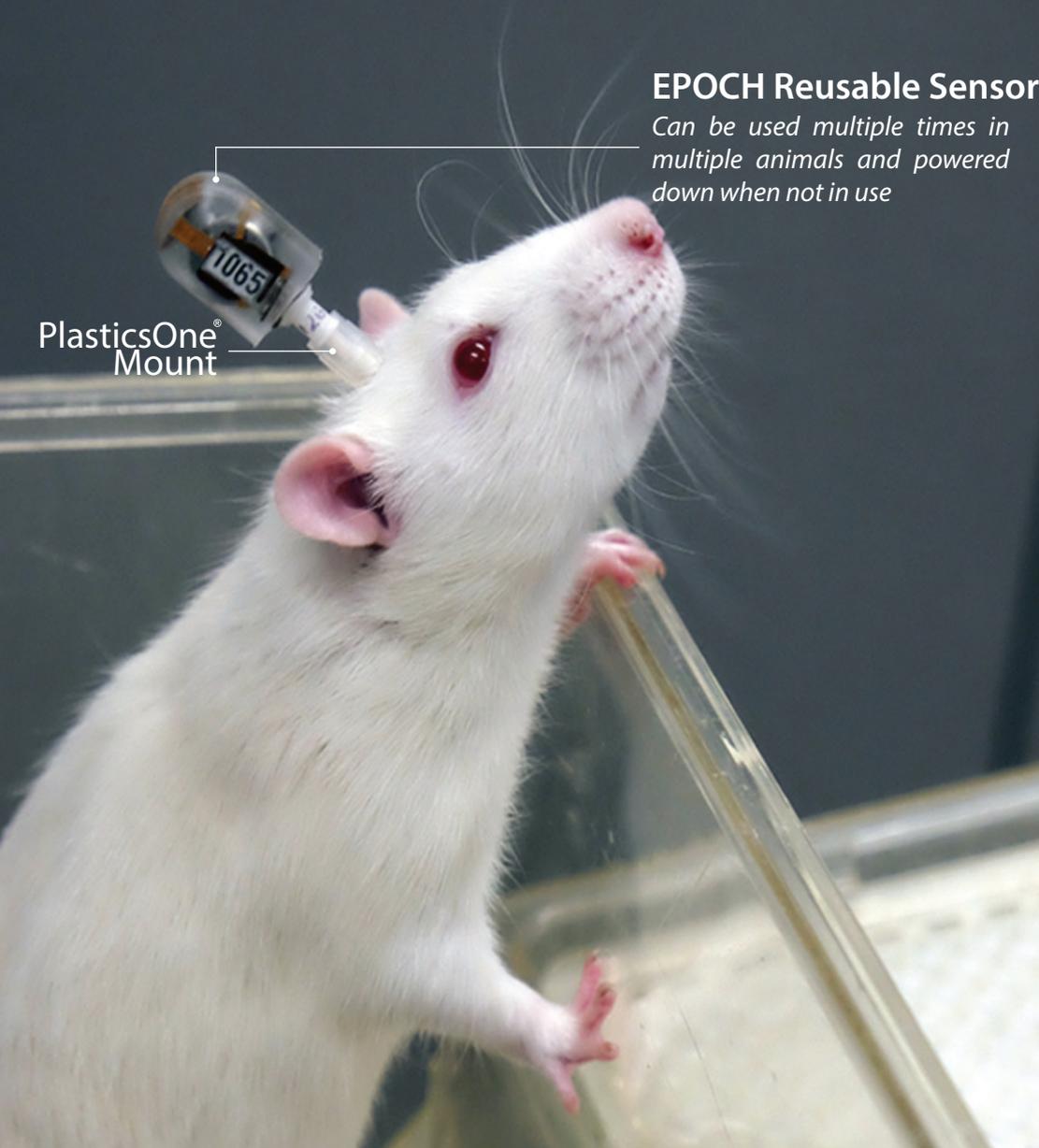


2-week sensor
0.5 g and 0.19 cc



Implanted P10
Mouse

Photo courtesy of Dr. Christopher Dulla

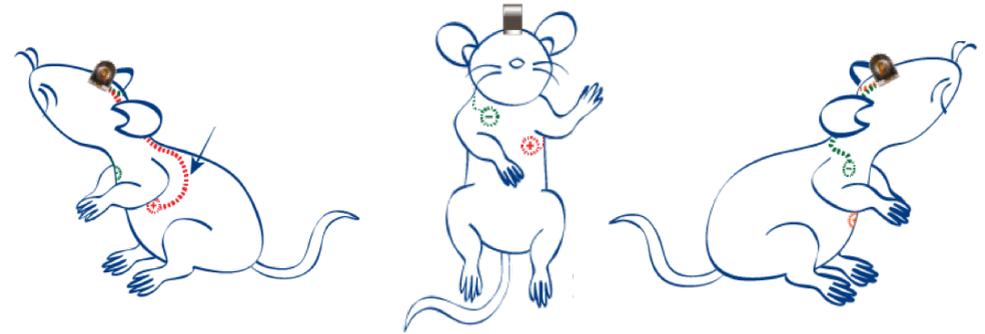


EPOCH Reusable Sensor

Can be used multiple times in multiple animals and powered down when not in use

PlasticsOne®
Mount

SELF-GUIDED SURGERY



Surgery is fast and easy

Implantation can be completed by following provided guides and videos

For those who seek further assistance, on-site training is available.

Please contact BIOPAC to discuss options for training by an EPOCH surgical technician.

ACTIVATOR & TESTER

- Activates and tests sensors when you need them
- Test recording setup before implanting
- Deactivates reusable sensors when not in use



Carrier board used with activation and testing



The activator provides separate sine wave signals that can be used to test the transmitter with the receiver prior to implanting the transmitter

REUSABLE SENSOR ADVANTAGE

- Includes PlasticsOne® mount MS333/3-A/SPC ELECT SS .005" 3C UNTW
- Interchangeable between animals and can be used multiple times
- Easily activated and deactivated with the EPOCH Activator
- ON/OFF function conserves battery life for longer use and prolonged animal life

Receivers



The **only patented capacitive coupling system on the market**. Receivers are available in various sizes to match the cage size of the implanted animal.

- No crosstalk between receivers — allows for dense housing
- No amplifier required
- Low initial investment, easily scalable to suit your needs
- Standard, easily adaptable BNC connectors for biopotential output
- Faraday cage included for added noise reduction
- Compatible with existing data analysis packages
- Compatible with existing standard rodent cages

RECEIVER DIMENSIONS

PUP	181 mm x 175 mm x 21 mm
MOUSE	345 mm x 210 mm x 21 mm
RAT	429 mm x 216 mm x 21 mm

EPOCH RECEIVER ADVANTAGE

EPOCH was created by researchers for researchers — leveraging a deep understanding of the challenges with existing wireless implant systems and resolving them with our patented capacitive coupling.

EPOCH capacitive coupling solves these common complaints: tangled wires, constant recharging, wire artifact, bulky sensors, inability to record in pups, start-up costs as a non-starter, and lengthy refurbishing time — the list goes on!

Capacitive coupling has an extremely low power requirement. With this affordable simplicity, a disposable primary cell battery lasts up to 6 months and the minimal circuitry is small enough to implant in a pup. EPOCH sensors use the animal's body as an antenna to couple with the receiver — thus three receiver sizes to match the animal's body size.

	EPOCH Pup	EPOCH2	EPOCH6
Receiver Size(s)	Pup	Mouse, Rat	Mouse, Rat
Channels	Up to 4	Up to 2	Up to 6
Experiment Type	Record EEG in pups	Mixed biopotentials or differential sensors	Need more than 2 channels of EEG
Biopotentials	EEG	EEG, EMG and/or ECG	EEG
Sensor Reference <small>(See page 6)</small>	Common	Common or differential	Common
High-Pass Bandwidth Filter	0.1 Hz	0.1 Hz	0.1 Hz
Low-Pass Bandwidth Filter	100 Hz	100 Hz (EEG+) 200 Hz (ECG/EMG)	60 Hz
Recording Time	<i>Mouse</i> Up to 2 weeks <i>Rat</i> Up to 2 months	<i>Mouse</i> Up to 2 months <i>Rat</i> Up to 6 months	<i>Mouse</i> Up to 2 months <i>Rat</i> Up to 6 months
Reusable Sensor Compatible		✓	✓

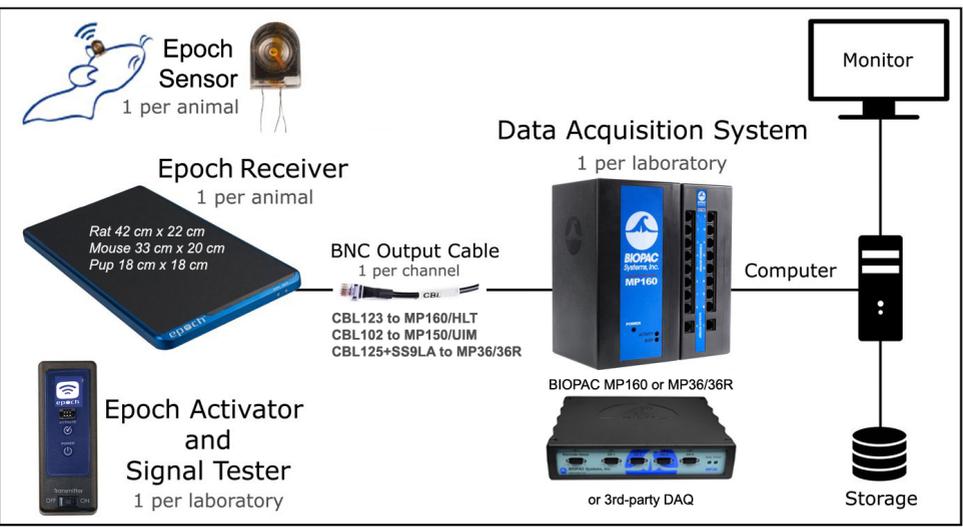
† EPOCH2 receivers are available as 100/100 Hz, 100/200 Hz and 200/200 Hz. EPOCH2 200/200 Hz is recommended for those considering a differential EEG/EEG receiver, but may need to record ECG or EMG in the future. Applying a simple real-time or post-process 100 Hz low-pass filter will remove the high-frequency content for recording EEG at 200 Hz.



Plan Your EPOCH System

Build your system at biopac.com/epoch-wizard

System Components



Use the EPOCH Wizard to select specifications for your study and we'll recommend the best system for you!

EPOCH SYSTEM BUILDER

Please make a selection for each question in the following series to review compatible/recommended system components:

Select Data Acquisition System:

Select Epoch Receiver Tray:

Select Animal:

Select Biopotential:

Select Channels:

Channel 1 Gain:

Channel 2 Gain:

Channel 3 Gain:

Channel 4 Gain:

Select Duration:



RECOMMENDED EPOCH SYSTEM RESULTS:

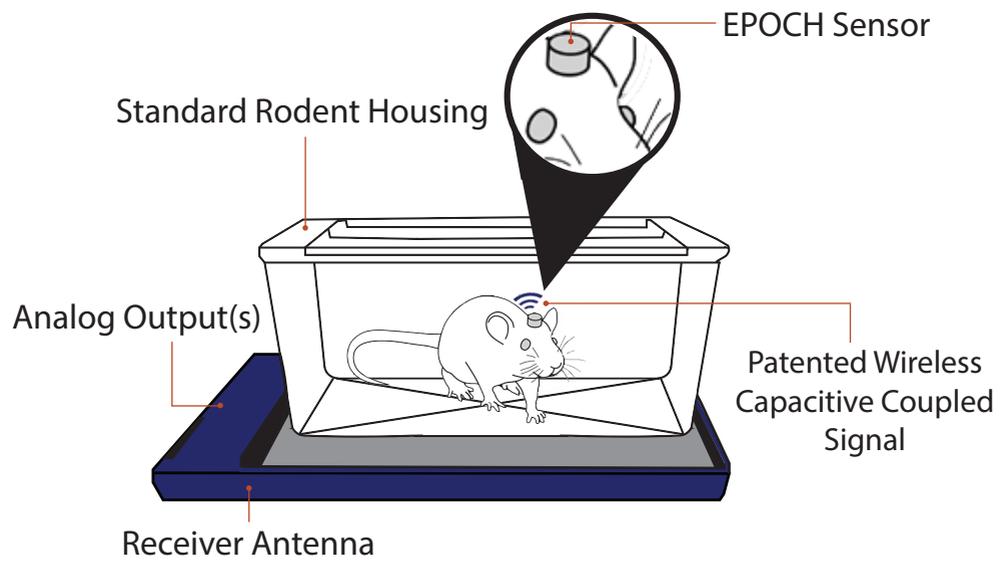
EPOCH System Component	BIOPAC Part #	Epitel Part #	Notes	Qty
DAQ	MP160			1
Epoch Receiver Tray	EP6RCVR-M6-60	10198	Provides up to 6 channels of EEG (60Hz) for mice.	1
Epoch Sensor	EPTX10210-00171	10210-02-02-02-00-00	2 complimentary sensors are included with a new receiver, add more as necessary.	2
BIOPAC Cable	CBL123		One per channel.	4
Epoch Sensor Activator	EPOCH-ACTI	10029	One per lab.	1

Whether you're starting from scratch or adding EPOCH wireless telemetry to an existing data acquisition system, it's easy to build the perfect system for your lab!

Use the EPOCH Wizard to select system components or simply to check sensor compatibility when you're ready to add animals or run another study.

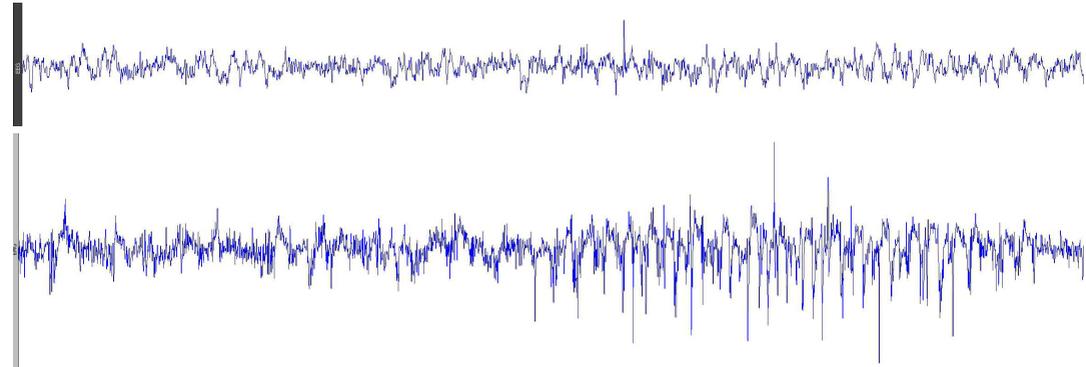


Example Recordings



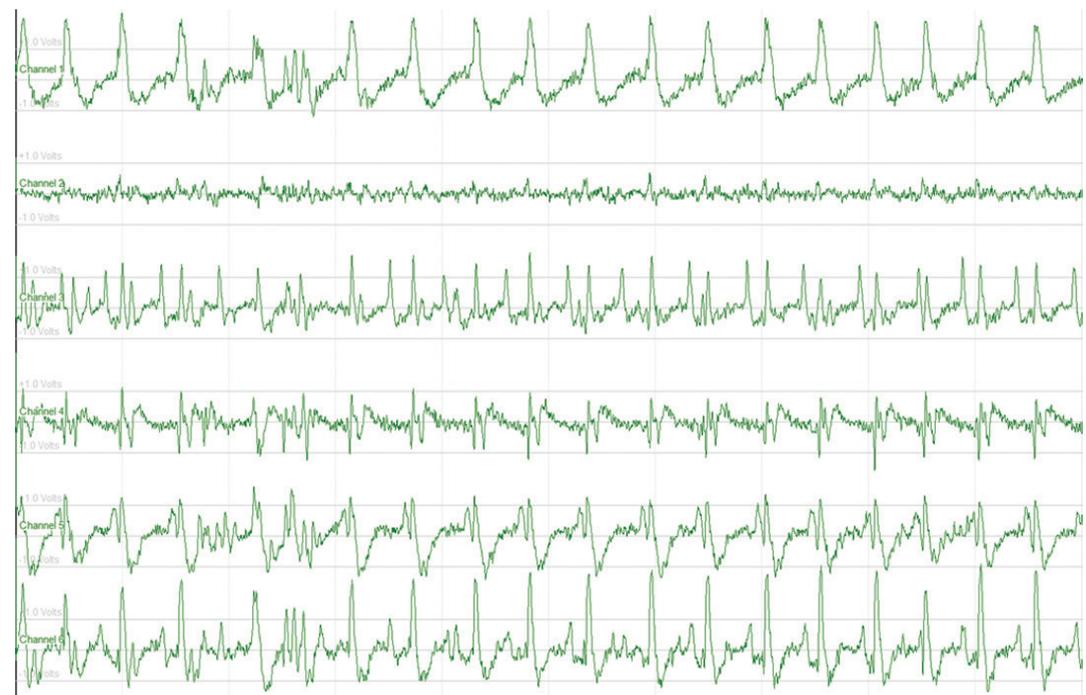
EEG/EMG

EPOCH wireless recording of EEG and EMG data retrieved from an EPOCH-implanted mouse



SIX-CHANNEL EEG

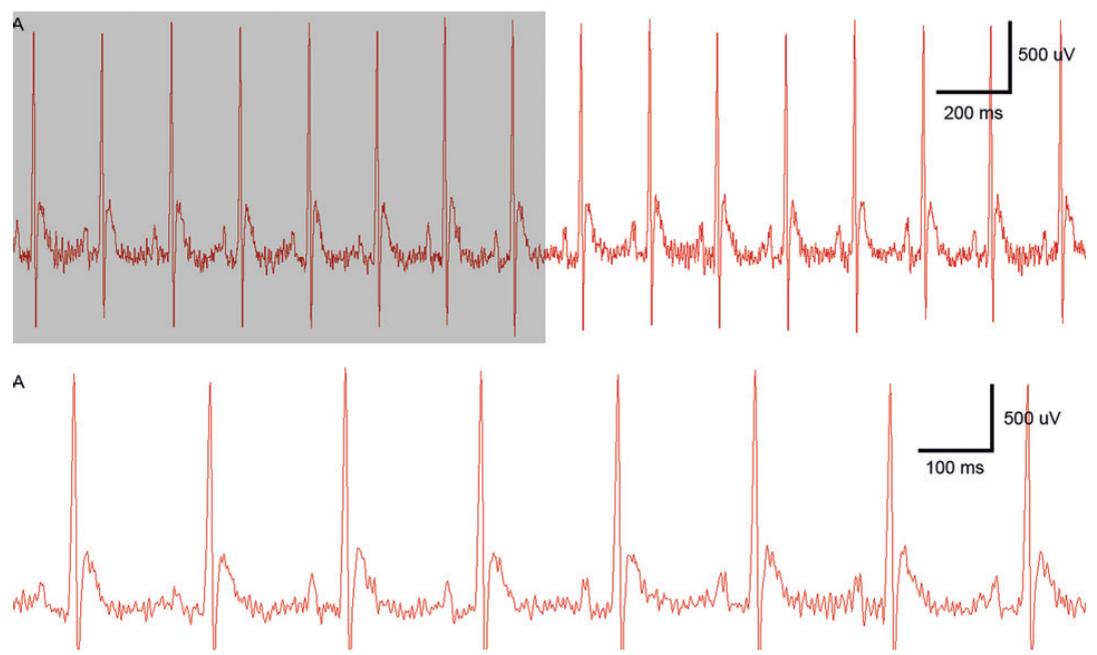
EPOCH six-channel recordings of status epilepticus in a kainate-treated adult rat showing spatially disparate epileptiform activity



Data courtesy of Dr. Jay Spamanato and Melissa Morris

WIRELESS ECG

Wireless electrocardiogram recording from implanted mice and rats



EPOCH Wireless Telemetry
Orders & Pricing at
biopac.com/epoch-wizard

☎ (805) 685 - 0066

✉ info@biopac.com



Wireless Telemetry for Small Animal
EEG, ECG, and EMG