

Cerebral Tissue Monitoring System

Monitoring ischemia and metabolic crisis after
Traumatic Brain Injury and Subarachnoid Hemorrhage.

ordering information

	unit	shaft	membrane	Ref No
70 Brain Microdialysis Catheter	4/pkg	60 mm	10 mm	P000049
70 Brain Microdialysis Catheter	4/pkg	100 mm	10 mm	P000050
70 Microdialysis Bolt Catheter	4/pkg	130 mm	10 mm	P000131
Microvials	250/pkg			P000001
Microvial Rack	12/pkg			P000028
106 Microdialysis Pump	each			P000003
Batteries 6V (for 106)	each			8001788
106 Syringes	20/pkg			8010191
Perfusion Fluid CNS 5 mL	10/pkg			P000151
Rinsing Fluid 0.5L	8/pkg			8002171
Glucose Reagent 6 mL	5/pkg			P000023
Lactate Reagent 6 mL	5/pkg			P000024
Pyruvate Reagent 6 mL	5/pkg			P000063
Glycerol Reagent 6 mL	5/pkg			P000025
Glutamate Reagent 4 mL	5/pkg			P000064
Calibrator A 6 mL	10/pkg			P000057
LPG kit (incl. 1 Reagent for Lactate, Glucose, Pyruvate and 1 Calibrator A)				8010361
Reagent kit (incl. 1 Reagent for Glucose, Lactate, Pyruvate, Glycerol and 1 Calibrator A)				P000011
Reagent Set A (Rack incl. 1 Reagent for Glucose, Lactate, Pyruvate, Glycerol and 1 Calibrator A)				8002163
Reagent Set B (Rack incl. 1 Reagent for Glucose, Lactate, Pyruvate, Glycerol, Glutamate and 1 Calibrator A)				8002164
Reagent Set C (Rack incl. 1 Reagent for Glucose, Lactate, Pyruvate and 1 Calibrator A)				8002165
Control Samples, FDA cleared, 2 levels	5x2/pkg			8010306
ISCUS ^{flex} Microdialysis Analyzer, for Clinical Use				8003295
Incl.				
ISCUS ^{flex} Documentation				
Sample Cannula, Waste bottle,				
SD Memory card, 1ICUpilot software license				

For more information, please contact:

μ dialysis

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The Cerebral Tissue Monitoring System

Overview

Ischemia resulting from brain trauma and hemorrhage has been found to cause profound changes of Lactate and Pyruvate ratio in the interstitial fluid. The Cerebral Tissue Monitoring System monitors these levels continuously to help evaluate the effect of therapeutic interventions as well as detect secondary ischemic insults.

When used in conjunction with other techniques such as ICP and pO₂, the Cerebral Tissue Monitoring System can provide valuable information on the metabolic status of cerebral tissue.

The new Consensus paper (Hutchinson et al. Intensive Care Med. 2015) has concluded:

- An increase in the LP ratio in the presence of low pyruvate (and low oxygen) indicates ischemia
- An increase in LP ratio in the presence of normal or high pyruvate (and normal oxygen) indicates mitochondrial dysfunction
- Low brain glucose is associated with unfavorable outcome

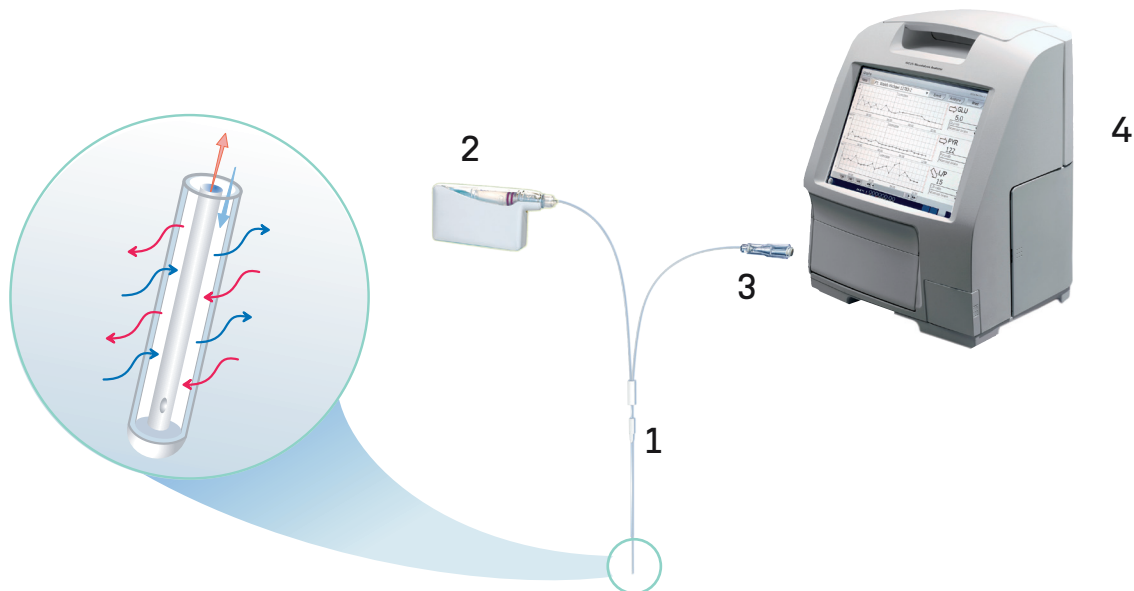
The Principle

The Cerebral Tissue Monitoring System uses the microdialysis technique to provide periodic samples of dialysate, which are analyzed and reported.

The technology is minimally-invasive, easy to handle, and may be used continuously over a period of several days.



ISCUS^{flex} Microdialysis Analyzer is dedicated for analyzing Microdialysis samples. The analysis is rapid, and data from several patients may be displayed on one unit.



A Microdialysis Catheter (1) is inserted into the tissue and connected to the 106 Microdialysis Pump (2). Perfusion fluid from the pump equilibrates with the extracellular fluid through the dialysis membrane of the catheter. Samples are collected approximately hourly in Microvials (3), and rapidly analyzed at the point of care in the ISCUS^{flex} Microdialysis Analyzer (4).

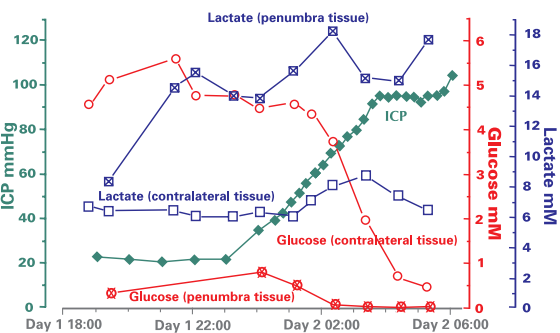


The 70 Brain Microdialysis Catheter is a flexible catheter designed for implantation in brain tissue. The 10 mm dialysis membrane is suitable for different target areas in the brain. The shaft is available in several different lengths, making it possible to implant intraoperatively, through a burr hole, or with a bolt.



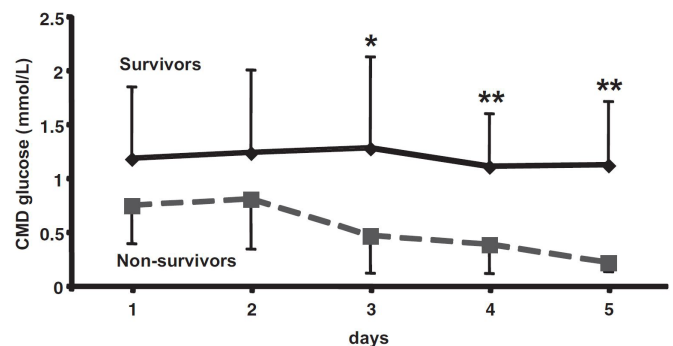
The 106 Microdialysis Pump is a small, lightweight, battery-powered syringe pump. It can be attached to the patient or placed on the bed. Its unique design makes operation simple, and the preset 0.3 μ L/min flow results in high recovery of the substances from the extracellular fluid.

Severe ischemia Distinct changes in ischemic markers accompany rising ICP



Stahl et. al. Acta Anaesthesiol Scand 2001

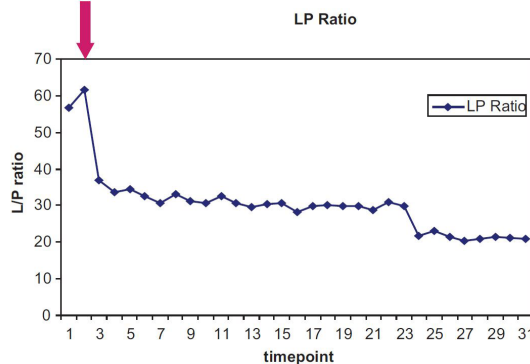
Glucose Impact of tight glycemic control on cerebral glucose metabolism after severe brain injury:



Oddo et al. CCM 2008

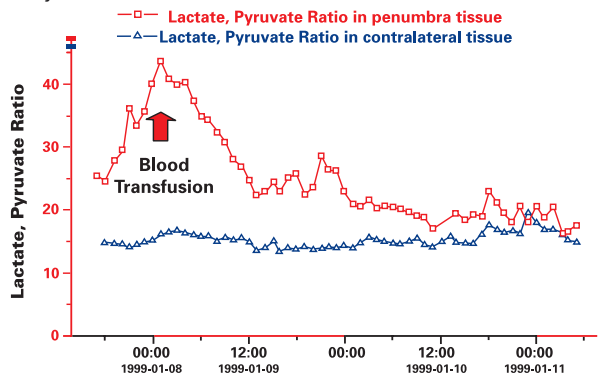
Clinical Data: Catheters are placed in the penumbra region surrounding a contusion in TBI patients or into the region most likely to be affected by vasospasm in SAH patients. A reference catheter may be placed in contralateral tissue where the chemistry is essentially normal. Microdialysis displays distinct changes in tissue chemistry due to tissue ischemia, mitochondrial dysfunction and therapeutic interventions.

Severe TBI Lactate Pyruvate Ratio (LPR) is initially high. LPR is immediately decreased to normal values after decompressive craniectomy



Chen et al. Surgical Neurology International 2012

Secondary insult Penumbra tissue shows pathological lactate, pyruvate ratio (ischemia) due to insufficient volume compensation after bleeding. Normal chemistry is restored by blood transfusion.



Stahl et. al. Acta Neurol Scand 2003

Important Publications:

1. Consensus statement from the 2014 International Microdialysis Forum. Hutchinson et al. Intensive Care Med. 2015
2. Implementation of cerebral microdialysis at a community-based hospital: A 5-year retrospective analysis. Chen et al. Surg Neurol Int. 2012
3. Neuromonitoring with microdialysis in severe traumatic brain injury patients. Sanchez et al. Acta Neurochir Suppl. 2013
4. International Multidisciplinary Consensus Conference on Multimodality Monitoring: Cerebral Metabolism. Hutchinson et al. Neurocrit Care. 2014