



Using T-Stat VLS Tissue Oximeter in Neonatology

# noninvasive caring



*speed-up diagnosis*

*reduce complications*

*lower costs*

Spectros is the leader in innovative bio-medical optical design and the development of devices that improve outcome through continuous, real-time, noninvasive monitoring.



## Using T-Stat in Neonatology

### T-Stat VLS Tissue Oximeter

Spectros' T-Stat VLS Tissue Oximeter is the first device to be labeled as "sensitive to Ischemia" by the FDA. Multiple trials have proven it to be an easy-to-use and reliable tool for assessing oxygen delivery which is closely related to a local venous saturation measure.

The complete Spectros monitoring system consists of the T-Stat monitor and any of 8 single use probes (buccal, endoscopic and surface probes) designed for specific applications and measurement sites.

Each probe contains a visible white light source for illuminating the tissue and a fiber-optic bundle that transmits directly back to the monitor for real-time results.

The Neonatal Buccal Probe can be noninvasively placed on the cheek. The probe monitors the saturation of the buccal mucosa (inside the mouth) as a surrogate for gastrointestinal perfusion. GI perfusion is important, because the body's neuroprotection mechanisms will maintain brain perfusion until the limits of autoregulation are reached, but the GI tract will show decreased perfusion early, allowing the clinician to respond earlier, resulting in improved outcomes.

### Reading T-Stat

#### What should I normally see?

For healthy neonates, T-Stat normally reads 61-69%

T-Stat normals are very DIFFERENT than pulse oximeter normals. This is because the tissues of healthy patients normally remove enough oxygen from arterial blood to drop T-Stat levels to 25-35% below the pulse oximeter. Even a well-perfused child with a cardiac mixing lesion (and a low pulse oximeter reading of 70-85%) will still have a T-Stat reading 25-35% below the pulse oximeter, or a T-Stat reading of about 40-55%

#### What is abnormal, and what do these readings mean?

There are 2 important ways to think about abnormal T-Stat readings at the bedside. First, consider the T-Stat reading. T-Stat readings below 55% are rarely normal, and indicate an increased risk of inadequate oxygen delivery.

T-Stat values below 35% in children lead to metabolic acidosis by lactic acid production. If left untreated, T-Stat values below 30% may rapidly lead to organ failure.

Second, consider the gap between T-Stat and the Pulse Oximeter. The gap between tissue and Pulse Oximeter readings grows with impaired oxygen delivery.

A difference of 38% or more between T-Stat and Pulse Oximeter suggests an impaired delivery of oxygen to tissue.

#### Low T-Stat readings and widened Pulse-Tissue gaps may be caused by:

- Decreased systemic blood flow (hypovolemia, shock, heart dysfunction)
- Increased left-to-right shunts (intracardiac, open ductus)
- Anemia
- Increased metabolism (fever, stress, sepsis)
- Changes in drips, medications, or ventilator settings that worsen perfusion

The T-Stat has the dual advantage of using more than 250 wavelengths – 50 times more than other systems, and using a region of the light spectrum where the hemoglobin signal is 100 times stronger than it is in the near infrared.

The result is that the T-Stat provides substantially more accurate readings.

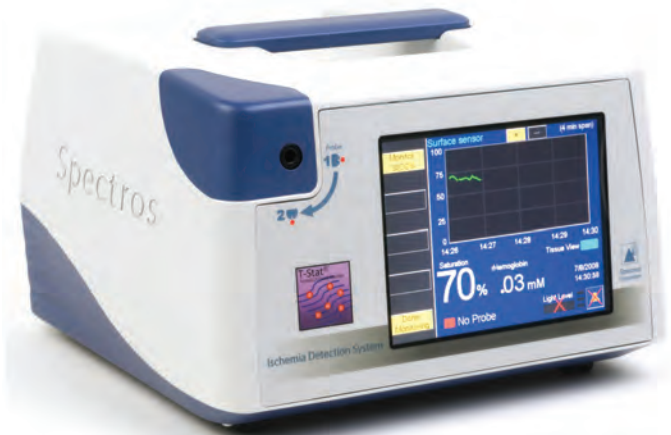
### T-Stat in Neonatology

T-Stat can be used for many applications in the NICU, PICU and CVICU. Some common examples include:

- Hemodynamically unstable preterm babies with decreased flow
- Babies with congenital heart defects (HLCS, PDA, TGA, or other mixing lesions)
- Resuscitation, when treating with fluids or vaso-active drugs.
- Ventilator management

### Why VLS and not NIRS?

When comparing the T-Stat VLS (Visible Light Spectroscopy) to NIRS (Near Infrared), there are many significant reasons why VLS is a superior means for monitoring.



COMPANY	SPECTROS	SOMANETICS	CAS MEDICAL	HUTCHINSON
DEVICE	T-Stat	INVOS	FORE-SIGHT	InSpectra
Range of Normal	+/- 3	+/- 9	+/- 9	+/- 9
Correlated to SvO2?	Yes	Yes	No	No
Changes Outcome?	Yes	Yes	No	No
Range of Probes?	Yes	No	No	No
Probe Life Span	30 days	24 hrs	24 hrs	3 days
Probe Placement Sensitive?	No	Yes	Yes	Yes
Site Measured	Mucosal	Cortical	Cortical	Muscle
Wavelengths Measured	260	2	4	4
Data Collection Rate	1 second	3 seconds	2 seconds	2 seconds
Date Storage	30 days	28 days	21 days	96 hours
Reading Depth	2-3 mm	2-3 cm	8 - 15.7 mm	0-14 mm

### Advantages with VLS:

- Absolute values
- Tighter range of normals
- Correlation to SvO2
- Early detection
- Probe is not sensitive to placement
- Monitoring is not dependant on flow
- Multiple wavelengths
- Probes can be used on a patient for up to 30 days
- Variety of probes

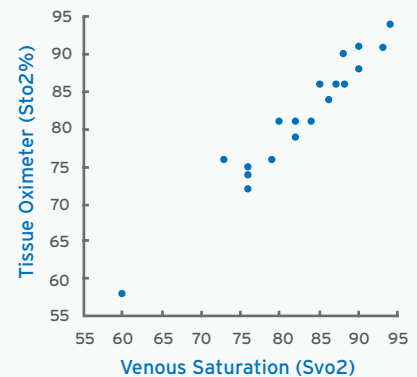
■ VLS - Visible Light Spectroscopy  
 ■ NIRS - Near Infrared

# Case Studies

## { CASE STUDY 1 }

### The Comparison of $Sto_2$ as measured with VLS to $Svo_2$ measured with Swan-Ganz

Subjects undergoing cardiac surgery on cardiopulmonary bypass were monitored using noninvasive VLS monitoring. Seven subjects were tested with 20 measurements total. T-Stat VLS measurements correlate to measures of central venous oxygen. The relationship of  $Svo_2$  to  $Sto_2$  in normoxia to hyperoxia appears to be linear. Using the T-Stat VLS monitor allows for noninvasive measurements that correlate to  $Svo_2$ .



## Contact Us

The T-Stat can be purchased directly from Spectros or from any of our distributors.

For more information, please visit our website [www.spectros.com](http://www.spectros.com), call toll-free 1-877-TSTAT-303, or email [sales@spectros.com](mailto:sales@spectros.com).

## { CASE STUDY 2 }

### T-Stat on Newborn Full-Term Infant with Cardiac Failure

Infants were monitored using VLS noninvasive Spectroscopy with the T-Stat. These infants were with cardiac failure due to ventricular aneurysm with an initial  $Sto_2$  of 4%. After intubation the  $Sto_2$  rose 30% within five minutes and by the end of day one of life, the  $Sto_2$  was at 60%, normalizing no higher than 65%. Monitoring with the T-Stat allows for real-time and continual  $Sto_2$  monitoring to help understand effectiveness of treatments.

## { CASE STUDY 3 }

### T-Stat vs. Somanetics during Brief Cardiac Arrest

When using the T-Stat VLS buccal probe to monitor  $Sto_2$  compared to the Somanetics cranial patch on a patient at Stanford University during cardiac arrest, the results show that the first warning sign of cardiac arrest was when the buccal probe reading dropped 9.7% as opposed to the cranial measurements that dropped 2.5%. The T-Stat using VLS detects rapid on-set events within seconds enabling improved physician response times than with the slower NIR technologies.

