



# VitalSense®

PATENTED

## Integrated Physiological Monitoring System



*Shown  
actual size*

### Jonah™ Ingestible Core Temperature Capsule



### Wireless Dermal Temperature Patch



...and other **vital sign** wireless sensors  
under development.

**No Wires. No Probes.**



*Heat Stress*



*Military Medicine*



*Peri-operative Monitoring*



*Ambulatory Healthcare  
Telemedicine*

# VitalSense



## The VitalSense Monitor: THE SYSTEM HUB

- Activates the sensors
- Tracks and records sensor data
- Serves as the computer interface

After initialization and sensor activation, the monitor is worn by the subject/patient. Each monitor can track and record up to 10 sensors.

Incoming data are displayed in real-time, either graphically or numerically as the user selects.

### Special Function Medic Mode™

Medic Mode was created to allow the VitalSense Monitor to detect and record signals from any VitalSense sensor that is within reception range. It displays and records data from each device that it detects, together with a time stamp indicating when the datum was detected.

## The Dermal Patch:

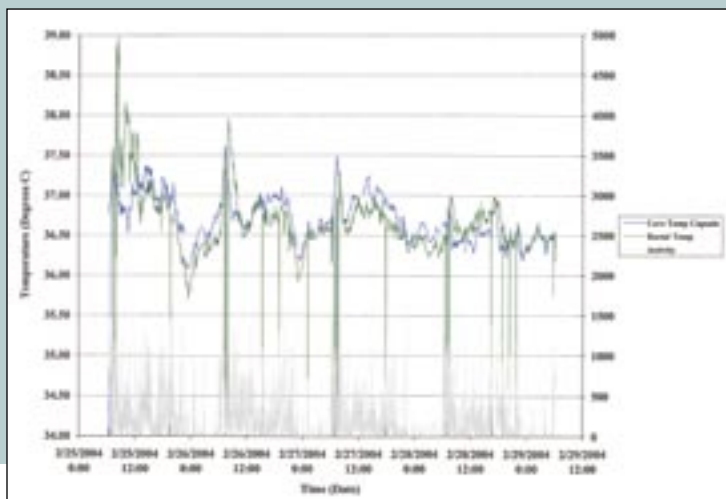
Waterproof and hypoallergenic, dermal patches are smooth, comfortable and easy-to-use. They must be activated with the VitalSense Monitor before applying. Multiple dermal patches may be monitored simultaneously.

*Shown  
actual size*



## VitalSense Applications

- Thermoregulation Studies - Personal Heat Stress, Clothing and Environmental Effects
- Continuous, 24/7, Unobtrusive Patient Monitoring
- Track Circadian Rhythms with Core and Dermal Temperatures
- Infectious Disease Research and Assessment
- Women's Health - Document Ovulation, Detect Hot Flashes
- Clinical Trials - Continuous, Ambulatory Acquisition of Critical Endpoint Data



*Representative graph of Jonah Core Body Temperature Capsule (CBTC) temperature, rectal temperature, and activity (Mini Mitter Actiwatch®) over time demonstrating the circadian rhythm of core body temperature during four days. The green downward lines represent probe slippage or removal for showering.*

# A Breakthrough Medical Device for Ambulatory Monitoring of Core and Dermal Temperatures

...other wireless sensors under development

## Jonah™: The Ingestible Capsule:

Jonah, the disposable, ingestible core temperature sensor, is about the same size as a standard vitamin or mineral capsule.



Shown actual size

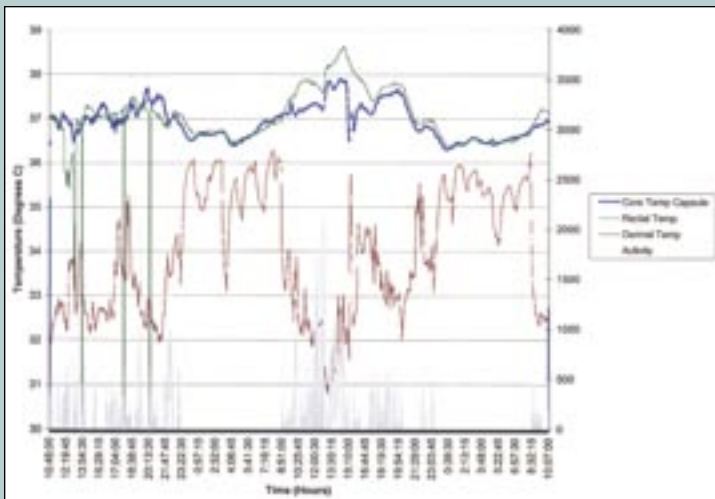
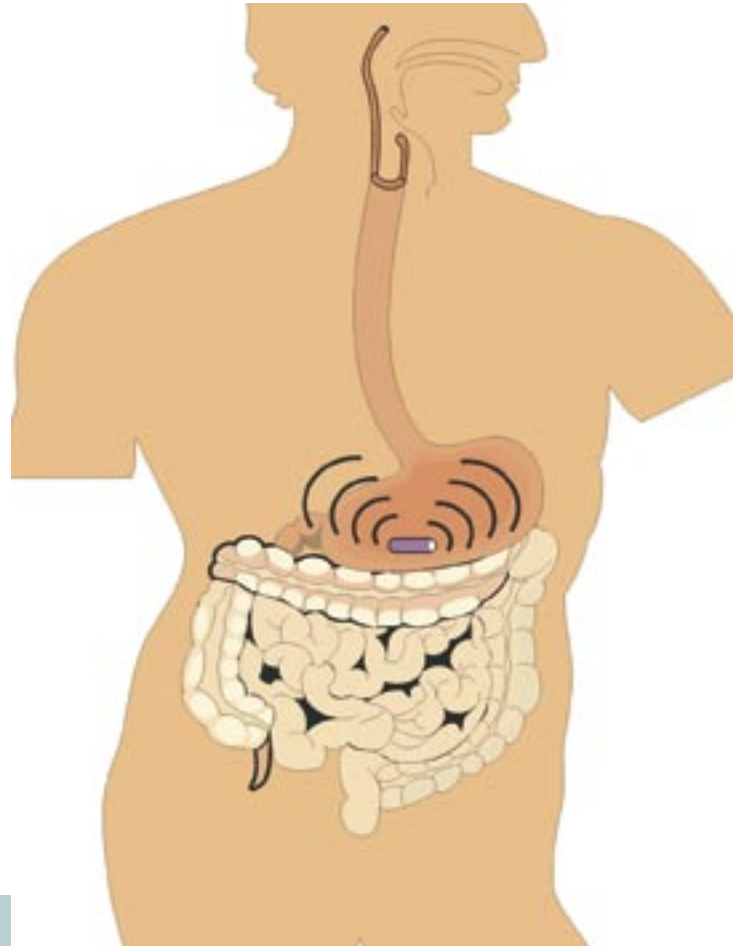
To use:

- Activate Jonah with the monitor
- Swallow with water

Transmissions begin approximately one minute after activation and occur approximately every 15 seconds thereafter.

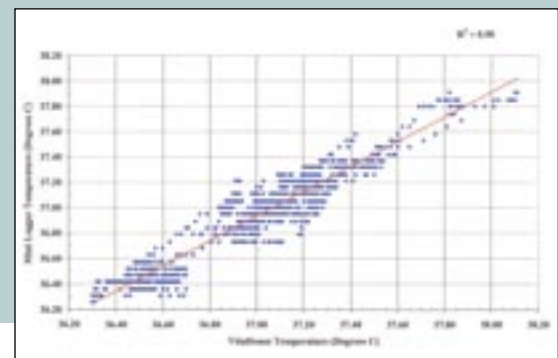
Battery life is 10 days: normal passage time is 1 to 5 days.

Validation data are in press



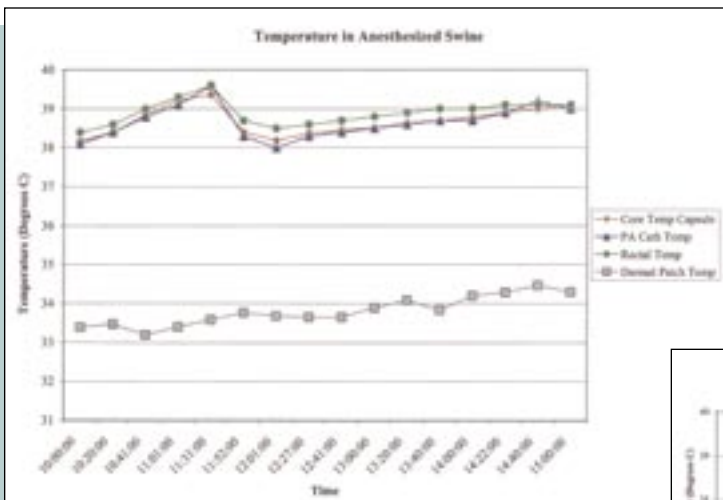
Jonah Core Body Temperature Capsule (CBTC) temperature, rectal temperature, Dermal Patch temperature, and activity (recorded by the Actiwatch®) over time. Note increased rectal temperature response during strenuous exercise. The green downward lines represent rectal probe slippage.

X-Y plot demonstrating the relationship between simultaneous measurement of core body temperature with the Jonah Core Body Temperature Capsule (CBTC) and rectal temperature measured with the Mini-Logger®. The correlation coefficient or  $R^2=0.90$  is significant at  $p<0.01$



# VitalSense® Technical Data

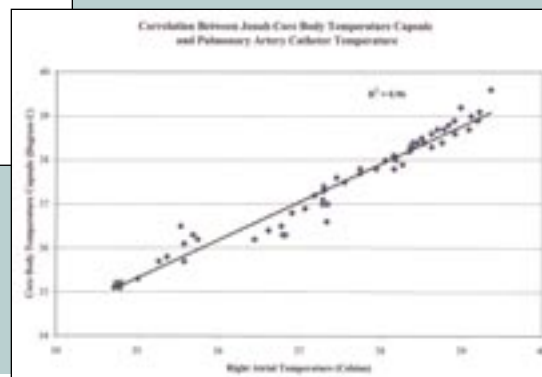
PARAMETER	VALUE	CONDITION/NOTE
<b>MONITOR PHYSICAL ATTRIBUTES</b>		
Size	120 x 90 x 25 mm	
Weight	200 grams	
<b>CAPSULE PHYSICAL ATTRIBUTES</b>		
Size	8.7 mm diameter x 23 mm length	
Weight	1.6 grams	
Capsule Material	Medical grade plastic	
<b>PATCH PHYSICAL ATTRIBUTES</b>		
Size	57.2 mm diameter x 5.3 mm thickness	
Weight	7.5 grams	
<b>FUNCTIONAL ATTRIBUTES</b>		
Temperature sensing range	25 °C to 50 °C -20 °C to 60 °C	Capsule Patch
Temperature sensing accuracy	± 0.10 °C      32 °C to 42 °C ± 0.25 °C      - 20 °C to 32 °C ± 0.25 °C      42 °C to 60 °C	
Temperature display resolution	± 0.01 °C	
Display update rate	15 seconds	Average
Monitor battery life	10 days with 10 sensors on line plus 20 days standby	Battery life increases with fewer sensors
Sensor battery life	1-year storage plus 10 days active	Capsule/Patch
Sensor calibration/identification	Automatic	Capsule/Patch
Number of co-active sensors	1 to 10	Per monitor
<b>TRANSMISSION RANGE</b>		
	Maximum 1 meter Maximum 2 meters	Capsule Patch
<b>SOFTWARE/PC ATTRIBUTES</b>		
Software features	Data transfer, ASCII conversion	
Compatibility	Windows® 2000, NT, XP	
Communications interface	RS-232 cable	



## Pre-clinical Data

Core Body Temperature measured in anesthetized swine using the Jonah Core Body Temperature Capsule (CBTC), Swan-Ganz pulmonary artery catheter measuring temperature at the right atrium, and a rectal probe. The Dermal Temperature is shown on the bottom of the graph. The insert demonstrates the relationship between the Jonah Core

Body Temperature Capsule and right atrial temperature. The correlation coefficient  $R^2=0.96$ ,  $p<0.001$ .



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