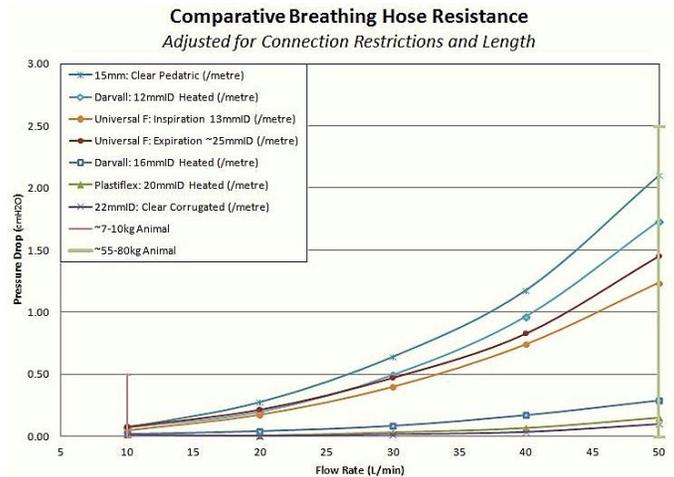


# Darvall Heated Smooth Wall Circuits A Totally New Solution for Hypothermia

**Darvall Smooth Wall Tubing (SWT)<sup>t</sup>:  
Low Resistance & Low Volume SWT = Efficient & Responsive breathing systems**

Tubing accounts for up to 1/2 the resistance of circle absorber systems<sup>1</sup>. Darvall SWT circuits use low resistance, small diameter tubes. SWT 16mm ID x 1.5M long can supporting animals up to 70kg with less than 0.5cm H<sub>2</sub>O pressure drop; SWT 12mm ID x 1.5M long can support animals up to 40kg<sup>2</sup>. SWT offers a huge efficiency advantage (volume of gas relative to the size of anima) requiring as little as 63% (SWT 16) and 32% (SWT 12) the volume of 22mm ID corrugated tubing or Universal F tubing. Breathing circuits are easily changed and low resistance, low volume, kink resistant Darvall SWT breathing circuits permit the use of circle systems on animals as small as 2 kg\* which compared to non-rebreathing systems are more economical, cause less environmental pollution and cause less respiratory heat loss.

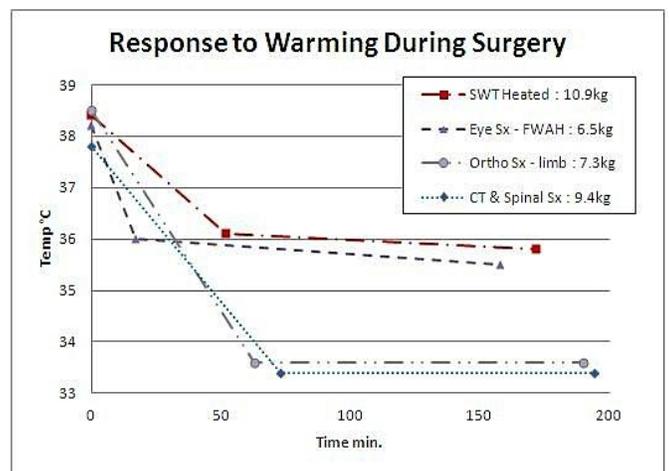


## Is surface warming the solution?

Hypothermia occurs in over 2/3 of anesthetized dogs and cats, resulting in slow and poor quality recovery from anesthesia, with increased mortality and a significant demand for nursing time, monitoring these animals during re-warming<sup>3</sup>. Traditionally heat loss during anesthesia is focused on body surface heat conservation and surface warming. However, warming and humidification of inspired gas accounts for a large proportion of heat loss in anesthetized, intubated animals. Normally the nose and pharyngeal mucosa transfer heat and moisture to the air during inspiration, which is largely recovered during expiration. Saturated air holds 44mg H<sub>2</sub>O/L at 37°C which requires 24 calories. A 10 kg dog taking 20 x 100ml breaths/min and ventilating 120L/hr could loose (24cal/L x 120L/hr) = 2880 calories/hr just warming cold inspired gas.

## Warm Inspired Air using Darvall Heated Smooth Wall Tubing<sup>t</sup> (SWTH)

SWTH tubing has a heating element imbedded into the ribbing of the tubing wall to enable heating to around 39.5°C. A sensor imbedded into the tubing at the Y piece connector monitors the air temperature and allows the micro-processor to control heating. An optional additional animal esophageal or rectal temperature sensor enables the microprocessor to respond directly to the animal's body temperature. Recent research shows that in animals as small as 3 kg, warming inspired air was as effective as the Darvall Forced Warm Air heating system at preventing heat loss during anesthesia<sup>4</sup>. Heated SWT can be used from the very start of anesthesia, during prep time where most temperature loss occurs. These results highlight the importance of prevention of heat loss from the start of anesthesia, rather than relying on warming devices to raise body temperature of hypothermic, anesthetized animals.



#### Footnotes:

\* Animals below 5kg - studies conducted using Darvall Low Resistance High Response circle breathing system

† Patents applied for

#### Captions for Graphs:

Graph 1: Pressure drop flowing medical air through straightened hoses with 1.5M patient length. Flows between 10 and 50 L/min were used to simulate peak flow rates in animals with weights in the range 7 to 80kg.

Graph 2: Average Temperature (T) of dogs & cats during anaesthesia for surgical procedures. Time 1 = T pre GA; Time 2 = T end CT/prep/start surgery (no warming) & start of warming (all Darvall forced warm air heating<sup>†</sup> except Heated Smooth Wall Tubing group); Time 3 = T end Sx. Ortho Sx = distal limb Sx; Eye Sx = intra-ocular surgery; SWT Heated = mix of all these Sx types. Average weights of animals are listed in the key.

#### References

1. Efficiency, Volume and Flow Resistance of Anesthesia Circle System Breathing Hose. CI Dunlop, JS Dunlop, T Wallis et al. Abstract submitted to: ACVA Annual Meeting, San Antonio TX, Sept 2012
2. A model for analysis of flow resistance in a circle system designed for small animals to 2kg. T Wallis, CI Dunlop, JS Dunlop et al. Abstract submitted to: WCVA Meeting, Capetown S Africa Sept 2012
3. Effect of hypothermia on recovery from general anaesthesia in the dog. Pottie RG, Dart CM, Perkins NR et al. Aust Vet J 85:158-162 2007
4. Can heated small volume, low resistance breathing tubing prevent hypothermia during anaesthesia and surgery of client-owned animals. CI Dunlop, BK Koster, RC Curtis, et al. Abstract submitted to: Aust Coll Vet Scientists Annual Meeting, Surfers Paradise, June 2012