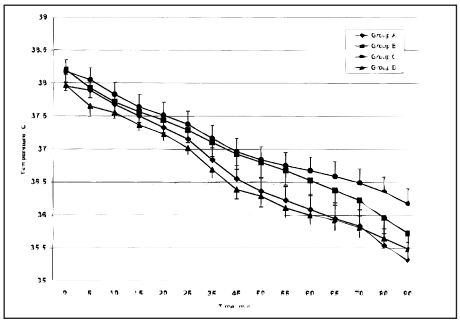
Anaesthesia Pre-Warming©: a Darvall Solution for hypothermia

Peri-Anaesthesia Hypothermia

Hypothermia (body temperature below 36°C) occurs in up to 80% of anaesthetized cats and dogs. Causes include small body size relative to body surface area, vasodilation, inhaling cold, dry anaesthetic gases, loss of heat from open body cavities in surgery and lack of shivering during anaesthesia. All of these combine to create the complex and difficult to manage syndrome: peri-anaesthesia hypothermia.

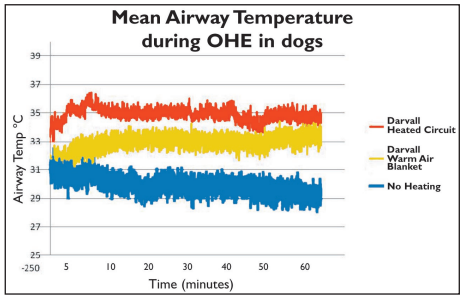
The Pre-Warming Solution

The AAHA Guidelines for Anesthesia include monitoring body temperature and providing thermal support from pre-anaesthetic through to recovery. Providing thermal support before anaesthesia may seem counter-intuitive, but recent research shows that regardless of the premedication drugs used, smaller dogs and cats lose over 1°C before anaesthesia and then rapidly lose twice that fifteen to thirty minutes after induction (Graph 1). Fortunately studies also show that effectively warming patients from the time of premedication to the time of induction (for at least 30 minutes) can prevent that initial drop in body temperature and may slow the early stage rapid heat loss immediately following induction[1]. Heating hypothermic animals during anaesthesia is difficult and time consuming.



Graph 1. Mean body temperature (°C) +/- SEM of anesthetised cats covered with a forced air warming blanket in trials A though D. Trial A (off/off); Trial B (on/off); Trial C (on/on) amd Trail D (off/on). Machon R. et al, Vet Surg 28:301-310;1999

Pre-warming small animals is highly beneficial and can easily be done by placing the pre-medicated patient in a warmed cage. Cage heating devices not specifically designed for sedated or anaesthetized animals such as jugs of warm water or heated wheat bags, can cause burns. The margin of safety for causing significant thermal injury is surprisingly narrow. Forced warm air blanket systems are ideal for use in pre-warming cages because they deliver a large flow of warm air at constant, thermostatically controlled temperatures. However forced warm air systems designed for use in humans are not designed with appropriate blankets or to duct warm air into a cage. Darvall has solved this problem with an innovative Cage Door Adapter* that lets the door open/shut properly with 2 sizes of blankets to fit cages. In addition One Cocoon® heater can warm up to 3 cage blankets simultaneously and blankets can be re-used between animals



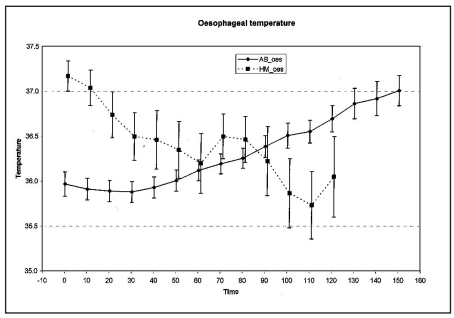
Graph 2. Prevention of Intra-Operative Hypothermia during OHE in dogs. Darvall Heated Circuit, Darvall Forced Warm Air Blanket or no heating. 9 dogs/treatment, 6.2±3.1(Mean±SD)kg, 20±17 months, Surgery Time 96±27 minute. Lee S. Honours Thesis, University of Sydney, 2013.

Warmed Inspired Anaesthetic Gas

There are many ways to reduce patient heat loss during anaesthesia including minimizing surgical prep. time, insulating an animal's feet, warming IV fluids and use of electric, hot water or forced warm air blankets. However none of these methods adequately address the rapid heat loss occurring in the first fifteen to thirty minutes after induction. Darvall's innovative Heated Smooth Wall Anaesthesia Breathing Circuits* target this critical heat loss from inspiring cold, dry air by warming the inspired gases immediately from the time of intubation (Graph 2).

Next Generation Forced Warm Air Blanket System

Forced warm air blanket systems for humans are most effective during recovery, when the patient's vasomotor function, increased cardiac function and shivering have returned. Studies show these systems don't prevent hypothermia in anaesthesia in cats and small dogs (Graph 1).



Graph 3. Plot of oesophageal temperature vs. time comparing Darvall forced warm air blanket and electric heat mat. Lau A. et al, Honours Thesis, University of Sydney, 2008.

The Darvall Vet Cocoon®* warm air blanket system is designed for cats or dogs either during surgery or in cages before and after anaesthesia. The contact surface is porous, rather than punched with small holes, resulting in low surface air flow. When positioned over or underneath animals, warm air diffuses across the blanket's surface and the patient's hair-coat traps the warmth close to the animal. A recent study in dogs anaesthetised for surgery showed that the Darvall VetCocoon® system consistently increased body temperature during surgery but there is a lag period of 30-45 min. before the animal's body temperature starts to rise (Graph 3).

Reference 1. Read M. et al Conductive warming prevents the development of hypothermia in anaesthetised dogs (Abst.). Vet Anaesth Analg 41:A22;2014

Peri-Anaesthesia Thermal Support Selector©

Chart for selecting effective warming treatment options by type and length of procedure.

Procedure	OHE – young animal	Long Orthopedic Surgery	Dental Procedure
Duration of Anaesthesia	30 to 60 min	90 to 150 min	60 to 180 min
Premedication - Start Pre-Warming (> 30 min)	Darvall Cocoon® CAGE over-blanket*	Darvall Cocoon® CAGE over-blanket*	Darvall Cocoon® CAGE over-blanket*
Patient clip, catheter placement , induction	Circulating warm water or insulated electric blanket	Circulating warm water or insulated electric blanket	Circulating warm water or insulated electric blanket
Intubation – Start Heating inspired gas	Darvall Heated Smooth-Wall Circuits*	Darvall Heated Smooth-Wall Circuits*	Darvall Heated Smooth-Wall Circuits*
OR / Procedure Table	Circulating warm water or insulated electric blanket	Darvall Cocoon® SURGERY under-blanket*	Darvall Cocoon® DENTAL under-blanket*
Recovery Warming to < 37°C	Darvall Cocoon® CAGE over-blanket*	Darvall Cocoon® CAGE over-blanket*	Darvall Cocoon® CAGE over-blanket*

*Patents granted & pending