

DoveLewis[®]
**Third Thursday
Rounds**

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**The Far-Reaching Effects of
Hypothermia**

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Hypothermia is a common finding in veterinary medicine, but often the negative impacts are greatly underestimated. This lecture will discuss the potential causes of hypothermia, the systemic consequences, and safe prevention and correction options. Attention will be given to at-risk patients including the critically ill, surgical, geriatric, neonatal, and exotic species.

This lecture will provide learning opportunities for both beginning and advanced technicians wanting a review on the thermoregulatory system and how to better provide for our patients.

Hypothermia:

Definition: subnormal body temperature

Primary Causes: environmental exposure

Secondary Causes: injury, illness, or drug induced

Thermoregulatory System:

Homeothermy= a balance between heat loss and heat gain

Cold and Warm receptors are located throughout the body

Pathways

Sensing

Located in the periphery

Afferent pathways: obtains signal and then transports to the CNS

Regulation

Centrally located

Hypothalamus- primarily responsible for central thermoregulation
(Central thermostat)

Responses

Efferent pathways: CNS system sends messages to the periphery

Stages of Hypothermia (Cat/Dog):

Mild Hypothermia	>98°F (36.7°C)
Moderate Hypothermia	96°F-98°F (35.6°C-36.7°C)
Severe Hypothermia	92°F-95°F (33.3°C-35°)
Critical Hypothermia	<92°F (33.3°C)

The Four Mechanisms of Heat Loss:

- 1) Radiation
- 2) Convection
- 3) Conduction
- 4) Evaporation

Patients at-risk for Hypothermia:

- Neonates
- Geriatrics
- Cachexic
- Anesthetized patients
- Patients experiencing:
 - Endocrinopathies
 - CNS disorders
 - Hypoperfusion
 - Decreased cardiac output
 - Immobility
 - Thermal Injury
- Exotic Species

Physiologic Consequences of Hypothermia:

- Cardiovascular effects
- Respiratory effects
- Immune System effects
- Metabolism effects
- Electrolyte Imbalances
- Hemoconcentration
- Coagulopathies
- Neurologic effects

The Relationship between Anesthesia and Hypothermia:

Interruption of normal thermoregulatory responses:

- Reduced metabolic rate
- Altered hypothalamic function
- Reduced muscle tone
- Loss of behavioral responses
- Significant thermal stresses on patients

Stages of anesthesia:

Induction:

- Largest rate of heat loss occurs from induction-1st 20 minutes
- Heat is redistributed from core to periphery
- Premedication/sedatives/ tranquilizers
 - Depress the hypothalamus
 - Can cause vasodilation (E.g., Acepromazine)

Maintenance/Perioperative:

- Isoflurane and Sevoflurane are potent vasodilators
 - Fully dilated vessels lose heat up to 8x faster than fully constricted vessels
- Inhaled oxygen contributes to hypothermia
- Adequate plane of anesthesia
 - Loss of centrally mediated thermoregulatory vasoconstriction
- Decreased metabolic rate (at approximately 15%-40%)
- Inhibition of muscular activity
- Decreased heat production

Recovery

- Hypothermia is primary contributor to prolonged recovery
 - Delayed metabolism
- Oxygen supplementation
- Heat support discontinued at 98.5°F (37°C)
 - Monitor temperature for 1-2 hours to watch for after-drop

Tips for Preventing Hypothermia in the OR

- Prepare and work efficiently
- Avoid over-wetting patient
- Use lowest achievable inhalant + oxygen flow rates
- Wrap extremities (bubble wrap/socks)
- Cover patient with warm blanket during prep
- Use warmed fluids for cavitory lavage
- Utilize heated table, BAIR hugger, or Hotdog and IV fluid warmers as available

Treatment of Hypothermia

Passive warming

Normothermic → mild hypothermia

Active internal warming

Mild → moderate hypothermia

Active external warming

Intraoperative & severe hypothermia

Precautions of Warming

Increased risk of thermal injury:

Misuse of equipment leads to increased risk of thermal injury

Debilitated animals with decreased peripheral hypoperfusion

Microwave use to warm rice bags, discs, or water bottles

Electric blankets/pads

Exotic Considerations

Extremely susceptible to hypothermia

High body surface-to-mass ratio

Many exotic species are equally susceptible to hyperthermia

Temperature is one of the easiest vitals to monitor

Thermometers may not go low enough for some exotic species

Use radiant heat lamps with extreme caution

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My Lecture Notes
