Physiologic Status of Other Systems

Thermoregulation

Next to establishing respiration, heat regulation is most critical to the newborn's survival. Although the newborn's capacity for heat production is adequate, three factors predispose newborns to excessive heat loss:

- The newborn's large surface area facilitates heat loss to the environment, although this is partially compensated for by the newborn's usual position of flexion, which decreases the amount of surface area exposed to the environment.
- The newborn's thin layer of subcutaneous fat provides poor insulation for conservation of heat.
- The newborn's mechanism for producing heat is different from that of the adult, who can increase heat production through shivering. A chilled neonate cannot shiver but produces heat through **nonshivering thermogenesis (NST)**, which involves increased metabolism and oxygen consumption.

The principal thermogenic sources are the heart, liver, and brain. An additional source, once believed to be unique to newborns (Zingaretti, Crosta, Vitali, et al, 2009), is known as **brown adipose tissue**, or **brown fat**. Brown fat, which owes its name to its larger content of mitochondrial cytochromes, has a greater capacity for heat production through intensified metabolic activity than ordinary adipose tissue. Heat generated in brown fat is distributed to other parts of the body by the blood, which is warmed as it flows through the layers of this tissue. Superficial deposits of brown fat are located between the scapulae, around the neck, in the axillae, and behind the sternum. Deeper layers surround the kidneys, trachea, esophagus, some major arteries, and adrenals. The location of brown fat may explain why the nape of the neck often feels warmer than the rest of the infant's body.

Because of these factors predisposing infants to loss of body heat, it is essential that newly born infants are quickly dried and either placed skin-to-skin with their mothers or provided with warm, dry blankets after delivery.

Although newborns' ability to conserve heat is usually a matter of concern, they may also have difficulty dissipating heat in an