Thermotherapy is the use of superficial heat and cold as a therapeutic modality for the treatment of disease or trauma, and it may be applied using many different methods. Superficial heat and cold have been used for centuries to manage soft tissue and joint injuries with the specific goals of relieving pain, altering the physiologic processes underlying tissue healing, and affecting the elasticity of connective tissue, including muscle, tendon, ligament, and joint capsule. The primary goal of any thermal modality is to facilitate the ultimate therapeutic modality of exercise. A dog adjusts its temperature based on the information supplied by the peripheral receptors, and, based upon the information, activates mechanisms such as trembling, sweating, and modifying the local circulation. Thermotherapy works on this latter process. Thermotherapy applications may be simple or sophisticated, being delivered through hot or cold water, hot or cold packs, hot or cold whirlpools, ice massage, contrast baths, cold compression units, and other methods.1 Before the application of heat or cold, the skin should be checked for the level of sensation, and if decreased or absent, extreme care must be used when applying thermal modalities to prevent injury. The skin should also be checked for any redness, burns, scabs, or wounds because these may alter the thermal transmission or affect the method of treatment. The area being treated should be cleaned to remove dirt or any other substance on the skin that could decrease conductance or alter the uniformity of the modality. The skin should also be inspected a short time after applying the modality to check for excessive temperature changes, and the skin should be monitored throughout the treatment. Cryotherapy is most effectively used immediately following trauma (accidental or following surgical procedures) to provide analgesia, control bleeding, and reduce inflammation, edema, and muscle spasm.

Cryokinetics combines cryotherapy with motion (passive, active-assisted, or active) to facilitate normal, pain-free movement, and to reduce edema through a muscle pumping action to facilitate the return of lymphatic fluid to the vascular system. The primary benefit of cryokinetics is to facilitate the patient's ability to perform pain-free exercise early in the rehabilitation process as long as the level of exercise remains below that which causes further injury. As signs of acute inflammation begin to subside, the clinician may elect to transition to the use of heat if indicated. Superficial heat is best applied before performing stretches or exercises to improve range of motion (ROM). This is to take advantage of the benefits of tissue temperature elevation, including alteration of tissue viscoelastic properties, which results in increased soft tissue extensibility and decreased joint stiffness. In addition heat causes vasodilation, which increases tissue oxygenation and transport of metabolites to the exercising tissue, and increases the rate of enzymatic and biochemical reactions that may facilitate tissue healing. However, heat applied too early in the healing process may result in increased inflammation, increased enzymatic activity detrimental to cartilage (e.g., collagenase and gelatinase), and increased local metabolism.

Cryotherapy

Physiologic Effects of Cryotherapy

One of the oldest methods of physical therapy is cryotherapy, the application of cold after trauma or surgery. Cryotherapy is used not only during the acute phase of tissue injury and healing to mitigate the effects and sequelae of tissue injury, but also after exercise during rehabilitation to minimize adverse secondary inflammatory responses.

The most important physiologic effects are:

• Vasoconstriction

• Decreased blood flow

• Decreased swelling

• Reduced enzyme-mediated tissue damage

• Analgesia

Heat Therapy

Few therapeutic procedures have been historically used for as long as heat; it is one of the oldest forms of physical therapy. Superficial heating agents penetrate to tissue depths up to approximately 2 cm, whereas deep heating agents elevate tissue temperature to depths of 5 cm. Although skin temperature may increase 10° C or more, tissues at 1 cm in depth are typically raised less than 3° C and tissues at 2 cm less than 1° C.

Physiologic Effects of Heat

The effects of heat are opposite those of cold, except that heat and cold both may relieve pain and muscle spasm. With an increase in tissue temperature, there is a sedative and analgesic effect, increased leukocyte migration into the heated area, increased metabolic rate, and arteriolar dilation that results in increased capillary blood flow (which can promote edema) and decreased blood pressure (if heat is applied for a prolonged time or over a large surface area).1,34,41 Other benefits of superficial heat may include reducing edema (however, heat should not be used during acute inflammatory periods because edema may be exacerbated) and increasing patient comfort.

The most important beneficial physiologic effects of heat are:

• Increased circulation (vasodilation)

• Pain relief

• Increased soft tissue extensibility

• Relaxation of muscle spasm