



CRYO 101 LECTURE

Cryosurgery using the CryoPen System

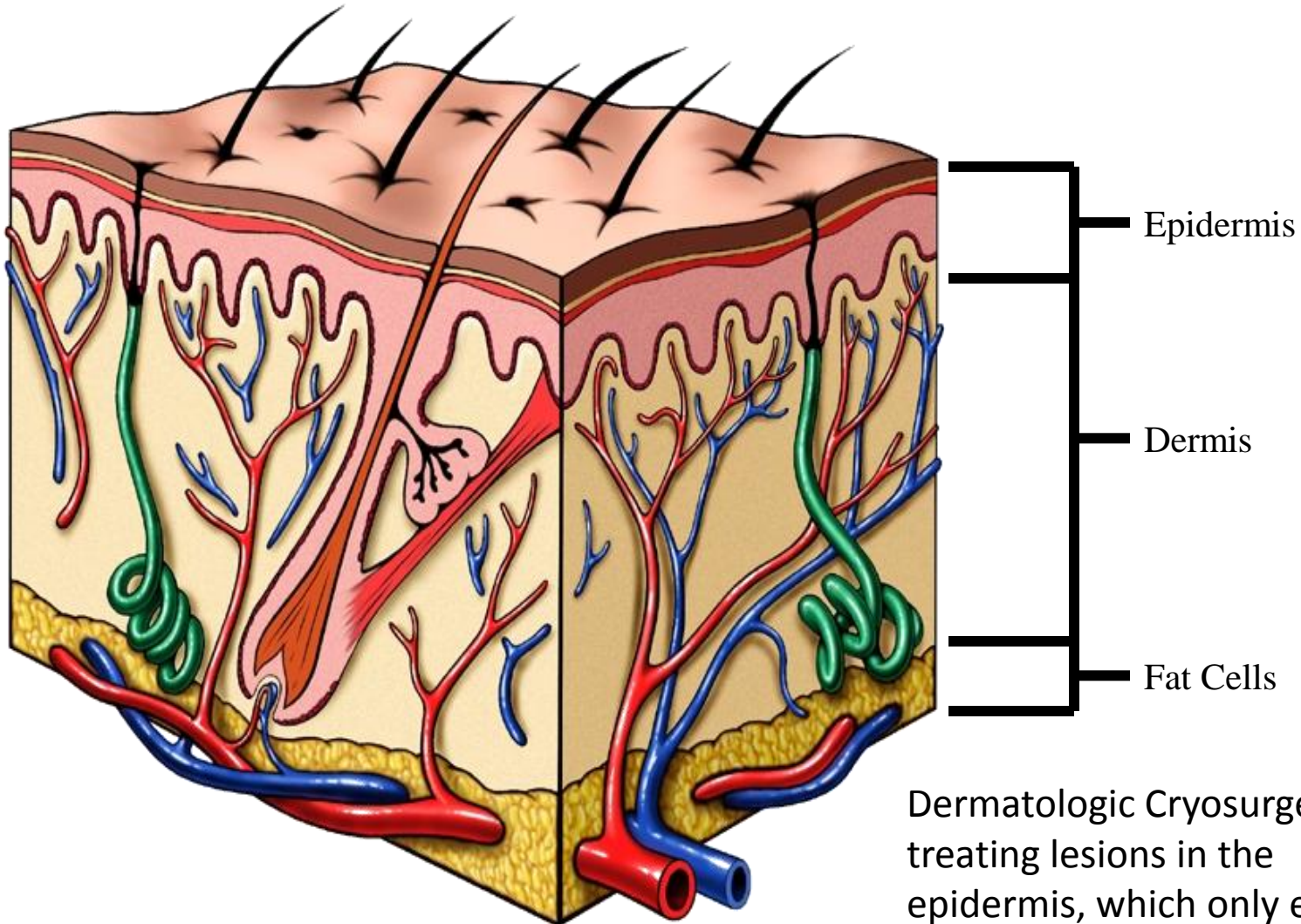
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how does cryosurgery work



- cryosurgery is the selective destruction of lesions by causing cryogenic cell death (killing cells with extreme cold temperatures)
- cryosurgery preserves the tissue matrix which is relatively cold resistant, and therefore allows for proper cosmetic healing with minimal scarring
- after dead tissue is sloughed off, re-epithelization occurs. This extends from the margins of the lesion and hair follicles.
- less office time is needed for lesion removal with cryosurgery as compared to electrocautery, cold knife or laser
- less after care is needed for the patient during the healing phase than electrocautery, cold knife or laser



Dermatologic Cryosurgery is treating lesions in the epidermis, which only extends down a few millimeters



effective cryosurgery

- **Tissue temperature changes must be extremely fast (50-100°C/min)**
- **Final temperature of tissue cells must be colder than -20°C**

Cell death starts at -20°C. Holding the temperature below -20°C for some duration, depending on the cell type, allows intracellular changes to occur and cell destruction to adequately take place.



during freeze

- **ice crystals form in the cell**
- **osmotic gradient occurs**
- **rupture of membranes & organelles**
- **vascular changes**

When the liquids inside the cells freeze, an increased concentration of solutes outside the cell wall causes a transmembrane osmotic gradient. Membranes rupture from ice crystals and osmotic pressure changes. Vascular changes include an initial decrease in flow due to the cold, with flushing after thawing.



after freeze

- **erythema occurs**
- **blister formation**
- **crust formation**
- **hypo-pigmented skin**

After freezing, the lesion appears white due to the frozen water in the tissue. As the ice ball thaws, the area becomes erythematous and hyperemic. A blister forms 2-24 hours after freeze. Blister may take several days to drain or dissolve. Once blister breaks, a crust will form over the lesion. Healing occurs from 1-6 weeks depending on depth of freeze and size of lesion.



clinical change

- **re-epithelization**
- **up to 6 weeks of weeping (0-6)**
- **loss of pigment**

Re-epithelization occurs from lesion margins and hair follicles. Healing occurs from 1-6 weeks depending on depth of freeze and size of lesion. Hypo-pigmented area may persist for 2-6 months. This color loss may take longer to return in darker pigmented skin.



ABCDs of Moles and Melanomas

- **Melanoma or suspected**
- **Recurrent Basal Cell Carcinoma**
- **Locations/ Pigment cells**
- **Tissue documentation**
- **Certain disease states**
 - **Chronic inflammatory disease**
 - **Chronic infections**
 - **Neoplasms**
 - **Diabetes**
 - **others**
- **Poor circulation**

Regular self-examination is the best way to become familiar with the many moles and spots on the skin. You should inspect your moles and pay special attention to their sizes, shapes, edges and color.

A handy way to remember these features is to think of ABC and D

- A- asymmetry
- B- border
- C- color
- D- diameter



Asymmetry Border Color Diameter

Concept and Photographs: Robert J. Friedman, M.D., Alfred W. Kopf, M.D., Darrell S. Rigel, M.D. Photographs reproduced courtesy of The Skin Cancer Foundation, New York, NY,

modality temperature



- **LN₂** **-196°C**
- **CryoPen** **-105°C to -110°C**
- **N₂O** **-88°C**
- **CO₂** **-78°C**
- **Organic**
 Compressed gases **-55°C~ -75°C**

Each modality has a different and characteristic temperature and relative effectiveness profile. These temperatures are not the actual temperatures on the surface of the skin.

refrigerant spray

- Verruca Freeze, Freon 12
- Evaporate at -70 degrees C
- OTC Wartner, Dimethyl-ether and propane
- (Histo-Freezer)
- Evaporate at -57 degrees C
- Advantages: no storage tank, initial cost low
- very portable for off site use
- Disadvantages: need longer freeze times, not good for malignant lesions



contact probe-cryopen CT-2000

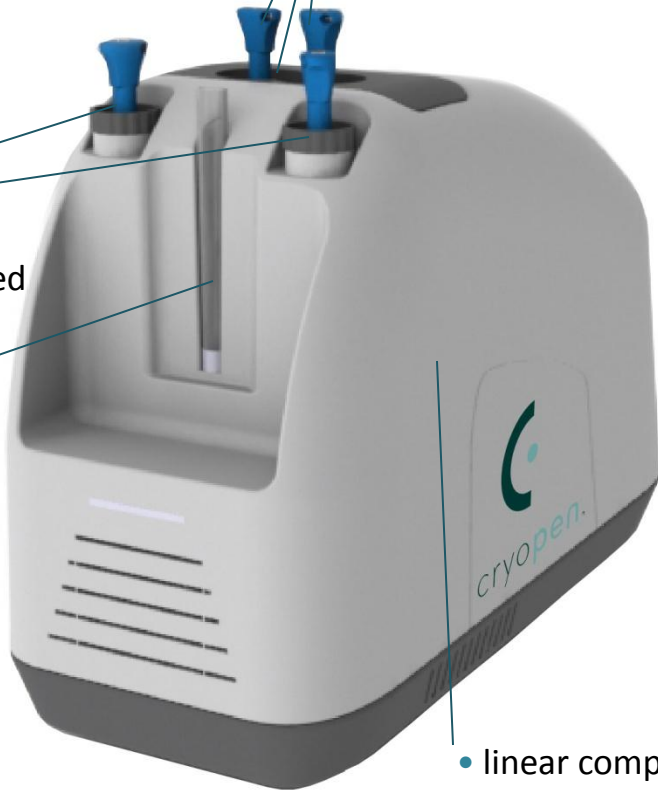


The CryoPen employs a state-of-the-art linear compressor to cool the CryoPen Pen Cores. Using this technology, the CryoPen is able to reach temperatures of $-105^{\circ}\text{C} \sim -110^{\circ}\text{C}$

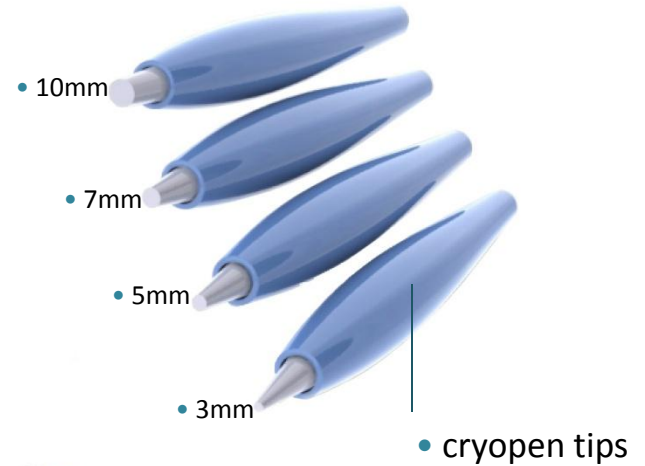
• chilling wells w/pen core inserted

• holding area w/pen core inserted

• reservoir tube



• linear compressor
no cryogenic gases or liquids



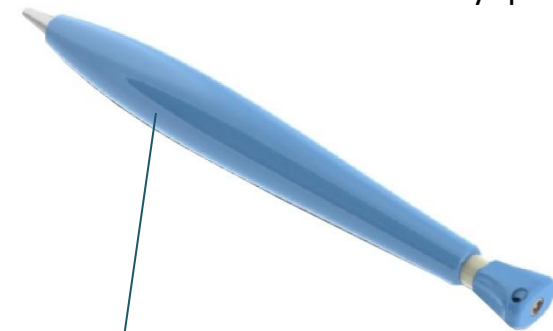
• 10mm

• 7mm

• 5mm

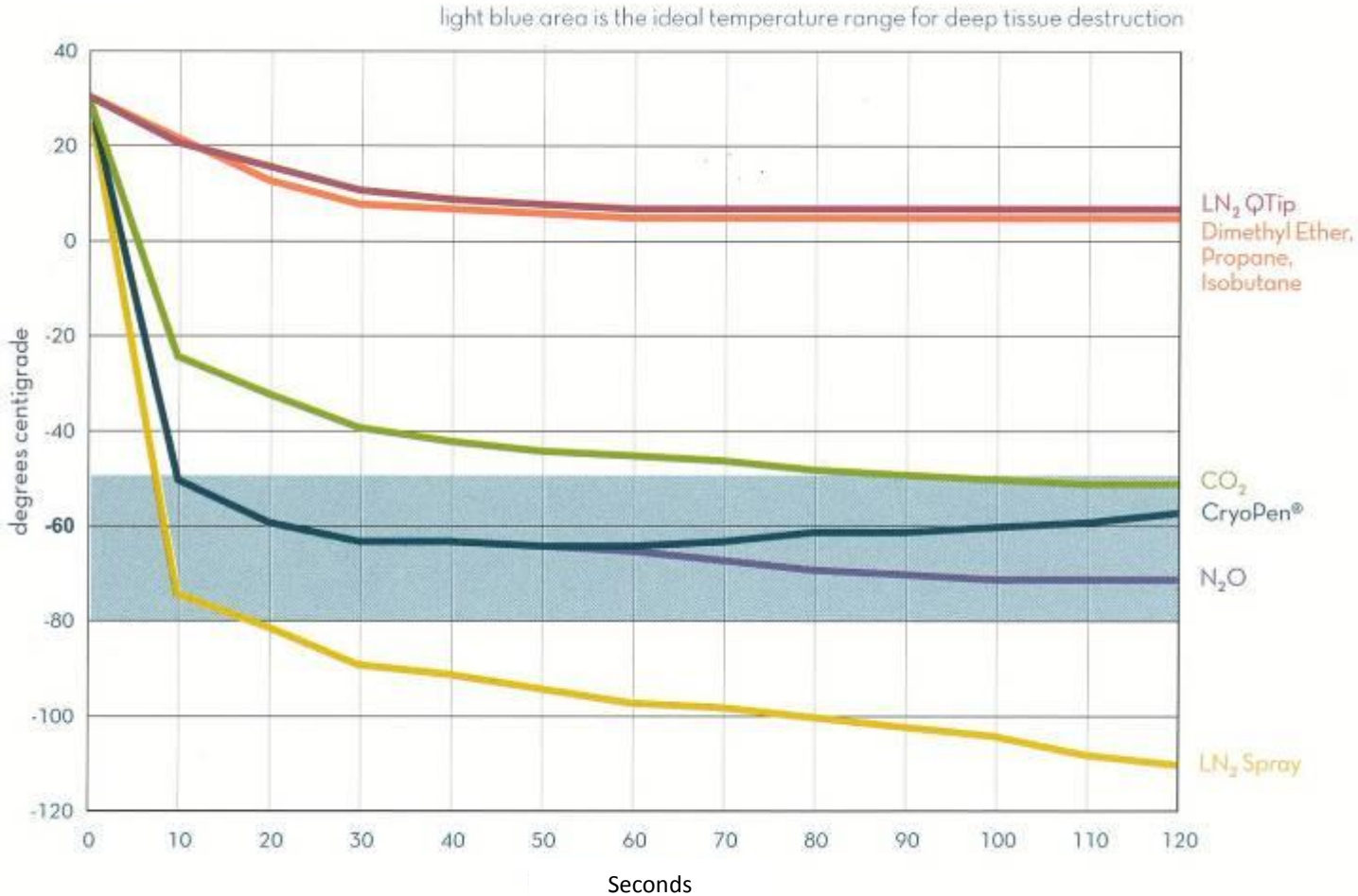
• 3mm

• cryopen tips



• cryopen tip w/pen core inserted

skin surface temperature chart



This chart compares skin surface temperatures obtained using the specified techniques. A surface tissue temperature range of -50°C to -80°C is ideal for effective deep tissue destruction

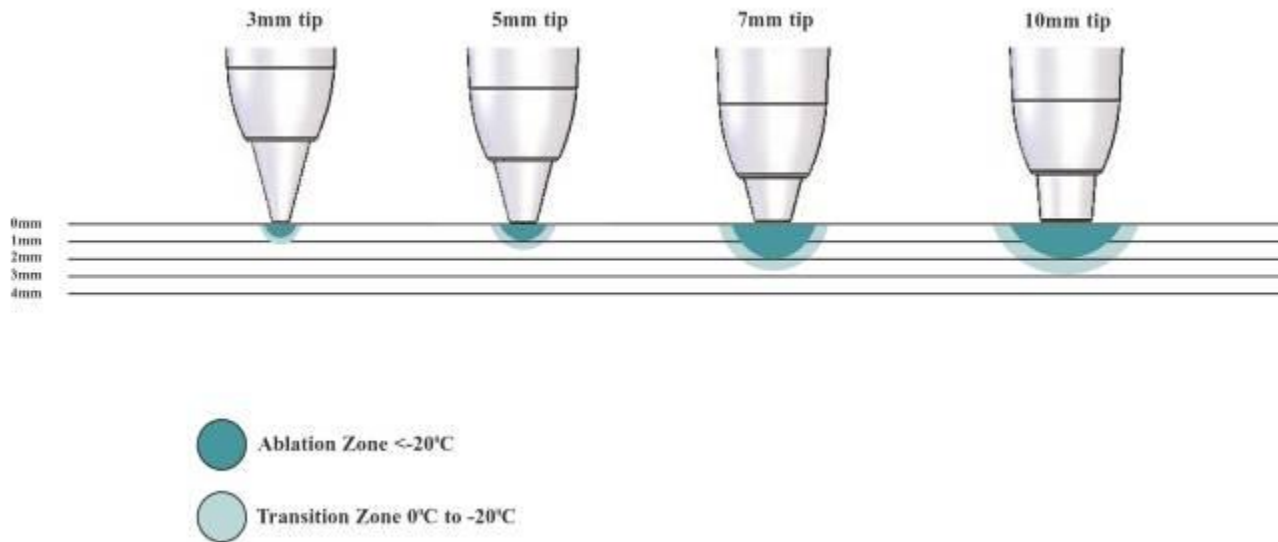
Chart data derived from Cimex Medical Innovations, L.C. bench tests

cryosurgery procedures



- **basic procedure for cryosurgery is straight forward. Specific procedures are dependent on product used**
 - 1. lesion is identified**
 - 2. heat is extracted from the desired tissue at a rapid rate**
 - 3. ice ball forms**
 - 4. in some situations a five minute waiting period occurs, then second freeze could be performed**

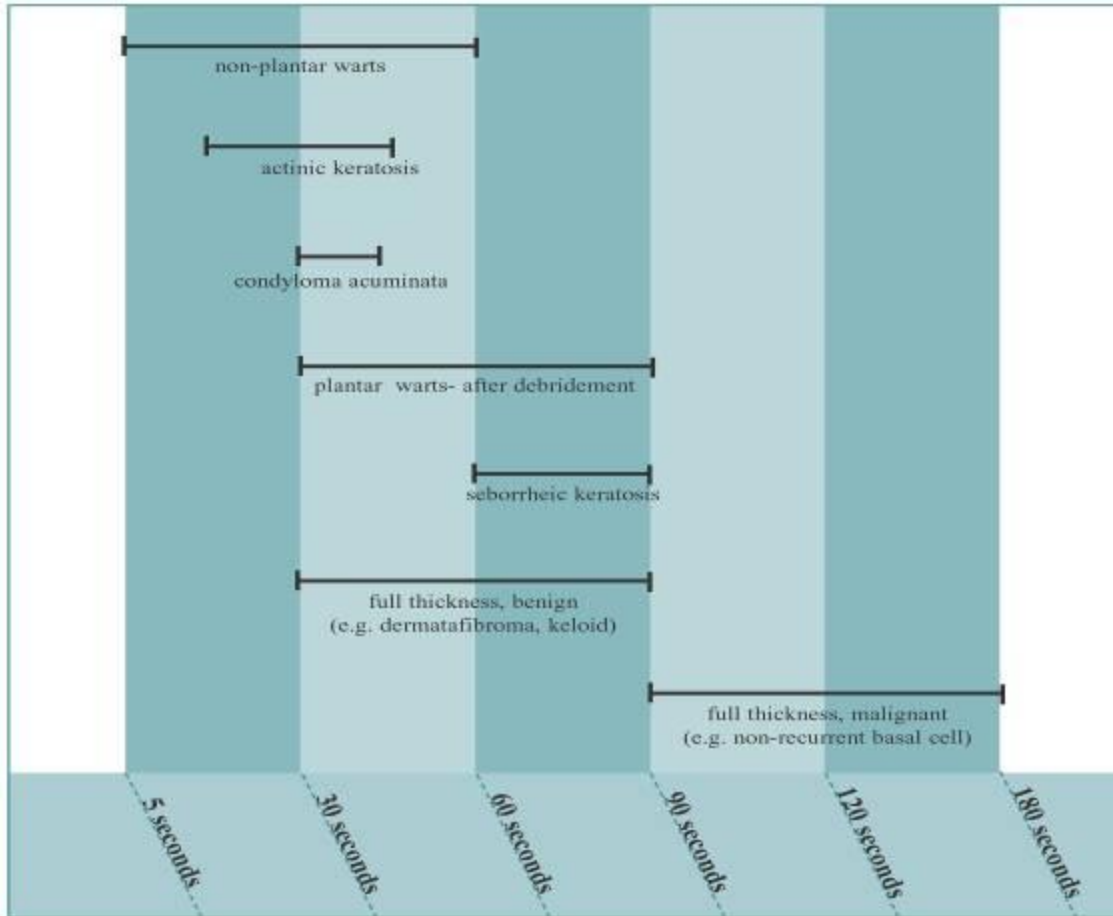
how deep does the cryopen freeze



When selecting a CryoPen, desired depth of freeze should be considered. As shown in the diagram, the larger the tip, the deeper and wider the ablation zone.

penetration depth at 30 seconds
deeper penetration can be achieved with longer freeze times

how long do you freeze lesions



cryopen freeze time guidelines

Initial freezes should be treated conservatively. Adjustments can be made according to the patient's response to freezing.

variables to consider:

- skin type
- lesion type
- lesion height
- vascularity
- malignancy

what can be frozen using the cryopen



non-recurrent basal cell

basal cell carcinoma may be treated with cryosurgery. But if there is a history of basal cell the patient should have biopsy & surgical excision.

Freeze time:
90-180 seconds



actinic keratosis

actinic keratosis due to sun damage is typically responsive to cryotherapy. Some consider it pre squamous cell.

Freeze time:
10-45 seconds



dermatofibroma

is a dense raised lesion. It is responsive to treatment but usually requires 2-3 repeat treatments with 2-3 weeks healing intervals between treatments.

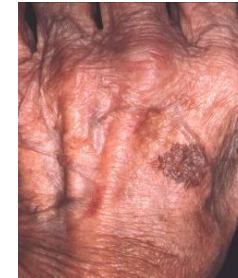
Freeze time:
30-60 seconds



seborrheic keratosis

seborrheic keratosis due to sun damage is typically quite responsive to cryotherapy.

Freeze time:
60-90 seconds



lentigo

depending on size and location, test freezes may be helpful to determine freeze times.

Freeze time:
20-30 seconds



plantar warts

multiple treatments after debridement and or chemical treatment are usually needed.

Freeze time:
60-90 seconds



warts

warts are epidermal but push and extend by displacement deeper into dermal tissue-usually requiring multiple freeze sessions.

Freeze time:
45-60 seconds



keloid

scars and keloids frequently respond better if preceded by adjunctive therapy with intralesional steroids and multiple cryo procedures.

Freeze time:
30-90 seconds



skin tag

make sure to freeze the base of the skin tag.

Freeze time:
10-30 seconds

Other lesions that can be treated using the CryoPen

molluscum contagiosum

Freeze Time:
3-5 second

condyloma accuminatum

Freeze time:
30-45 seconds

“Photographs: Robert J. Friedman, M.D., Alfred W. Kopf, M.D., Darrell S. Rigel, M.D. Photographs reproduced courtesy of The Skin Cancer Foundation, New York, NY. www.skincancer.org”

Above freeze times are guidelines. Times vary according to many factors such as, but not limited to: lesion size, height, skin type, age and concurrent medical conditions.

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dermatologic cryosurgery products



Product	Advantages	Disadvantages
Cryopen	<ul style="list-style-type: none"> • No cryo gasses or liquids • Simple, safe, effective • Ideal temperature • \$2 procedure cost 	<ul style="list-style-type: none"> • Capital investment required
Pressurized Organics	<ul style="list-style-type: none"> • Small • Low capital cost 	<ul style="list-style-type: none"> • Expensive - \$4-6 procedure cost • Technique dependent – requires training or experience • Inadequate freezing temperature
Compressed (N ₂ O)	<ul style="list-style-type: none"> • Good freezing temperature 	<ul style="list-style-type: none"> • Dangerous (impairs judgment, reduces fertility) • Massive, heavy tanks and large equipment • Requires ordering and maintaining gas supply
Compressed (CO ₂)		<ul style="list-style-type: none"> • Inadequate freezing temperature • Massive, heavy tanks and large equipment • Requires ordering and maintaining gas supply
LN ₂ (spray)	<ul style="list-style-type: none"> • Effective with good technique • Low procedural cost 	<ul style="list-style-type: none"> • Too cold – can be dangerous • Capital investment required • Technique dependent – requires training • Requires ordering, maintaining, storing and handling liquid nitrogen. • Liquid nitrogen not widely available worldwide
LN ₂ (q-tip)	<ul style="list-style-type: none"> • Low procedural cost 	<ul style="list-style-type: none"> • Inadequate freezing temperature • Technique dependent – requires training or experience • Requires ordering and maintaining LN2 supply

Thank You



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