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# SUPERFICIAL HYPERTHERMIA IN CLINICAL ONCOLOGY

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# HYPERTHERMIA

## OVERVIEW

Superficial hyperthermia involves heating the tumor to a temperature of 42 to 44 degrees C for approximately one hour by means of electromagnetic radiation. The local heating increases perfusion in the tumor, which improves the efficacy of radiation therapy or chemotherapy. The surrounding healthy tissue is able to tolerate the higher temperatures.

## INDICATIONS

Superficial hyperthermia is appropriate for treatment of recurrent or progressive tumors located no more than three centimeters below the skin. This treatment is particularly appropriate when used in conjunction with radiation therapy to treat inoperable head and neck (ENT) tumors, recurrent or progressive breast cancer, and melanomas. Pyrexar Medical has developed a special applicator to apply heat therapy in the case of chest wall recurrence due to mammary carcinoma.

## TREATMENT

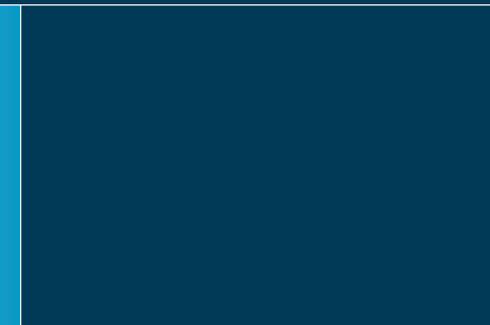
Every applicator includes a bolus which is placed on the patient's skin. For treatment, this bolus is filled with circulating water that can be heated as necessary. The bolus serves to physically couple the electromagnetic waves to the patient's body. The temperature in the tumor is measured by temperature sensors during the treatment. The temperature is then optimized continuously using automatic computer-controlled regulation of the applicator power output. The preparatory and warm-up phase lasts about 30 minutes. The heat therapy itself lasts 60 minutes.

## FREQUENCY

Depending on the indications, the hyperthermia treatment is given once or twice a week. The number of sessions depends on the tumor characteristics and ranges between 5 and 10 per patient. When combined with hyperthermia treatment, chemotherapy is administered concurrently; radiation therapy must closely precede or follow the hyperthermia treatment by up to 120 minutes.

## APPLICATION

Application of superficial hyperthermia treatment is relatively simple. For the most part, the system is controlled automatically by the computer, which can be operated either via a touchscreen or by means of a mouse and keyboard. First, the patient is placed in a horizontal position. The temperature sensors are affixed to the skin above the tumor or inserted into the tissue through an implantable catheter. The number of temperature sensors used depends on the size of the tumor. The applicator, which is selected on the basis of the size and location of the tumor lesion, is held in the treatment position with the aid of either a support arm or holding straps.



## A PROVEN THERAPEUTIC APPROACH

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### THE EFFECTIVENESS OF SUPERFICIAL HYPERTHERMIA

A number of clinical studies have demonstrated a significant improvement in clinical outcome without an increase in toxicity from the addition of superficial hyperthermia to chemotherapy and/or radiation treatment for treating patients with various tumors. Apart from the impressive tumor remissions, these studies also revealed an additional positive effect from the addition of hyperthermia.

Even if a tumor remission was not achieved, the use of hyperthermia frequently resulted in a significant reduction in the adverse effects associated with both radiation and chemotherapy, thus decisively enhancing the patient's quality of life.

## HYPERTHERMIA CLINICAL STUDIES

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### BENEFITS OF HYPERTHERMIA

On our website you will find hyperthermia clinical studies from the past three decades on the effectiveness of adding superficial and regional hyperthermia to radiation therapy and/or chemotherapy. The successes of hyperthermia treatment can be summarized as follows:

- ▶ Improvement and extension of medical tumor control
- ▶ Significantly higher success rates for treatment of chemotherapy and radiotherapy
- ▶ Reduction of the size of the tumor to enable removal by surgery
- ▶ Destruction of tumor cells, especially in cases of previously treatment-resistant tumors
- ▶ Increased remission rates and improvement in the quality of life
- ▶ Long-term improvement in the course of the illness
- ▶ Reduction of the risk of metastases

# BSD-500 BY PYREXAR MEDICAL



## KEY FEATURES



### 5-POINT PNEUMATIC APPLICATOR ARM

Provides rock-steady placement of Hyperthermia applicators at any angle with a total reach of 104 cm (41").

### SOLID PERFORMANCE



### INTERCHANGEABLE SUPERFICIAL APPLICATORS

Applicators available in multiple configurations to treat a range of tumor sizes and locations.

### FOCUSED TREATMENT AREA

## A COMPREHENSIVE SYSTEM

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Pyrexar Medical, the leading supplier of hyperthermia systems, has developed a special system for hyperthermia treatment of tumors located directly beneath the surface of the skin. In addition, Pyrexar supplies the applicators that are designed to fit almost every body and tumor contour, providing a high degree of comfort during treatment and thus representing a major step forward in the use of hyperthermia to treat tumors.

### HIGH-FREQUENCY GENERATOR

The BSD-500 Microwave Hyperthermia System features a 915 MHz generator with eight channels, with phase and amplitude of each adjustable individually. Using the three-way splitter in the eight-channel generator, up to 24 antennas can be powered. The eight signals from the individual channels (each capable of delivering up to 60 watts) can be combined to provide a total output of up to 400 watts.

### PROVIDES EASE OF OPERATION

The BSD-500 System is a so-called roll-around, plug-in unit. As with an ultrasound unit, it can be moved to any room and operated without shielding. With the aid of an additional module, the system is also suitable for administering interstitial hyperthermia in conjunction with brachytherapy.

## APPLICATORS

To provide the best hyperthermia treatment for every tumor size and shape, three different applicators are available for superficial hyperthermia therapy.

### ► THE 24-ANTENNA APPLICATOR

was developed specifically for treatment of chest wall recurrence. 24 spiral antennas are mounted on a rectangular, flexible silicone carrier and are connected to an 8-channel microwave generator. This allows the applicator not only to be adjusted to fit the specific body and tumor contour – specifically, the chest wall tumor size and shape – but also permits the 24 spiral antennas to be activated selectively in order to achieve a tumor-specific temperature distribution.

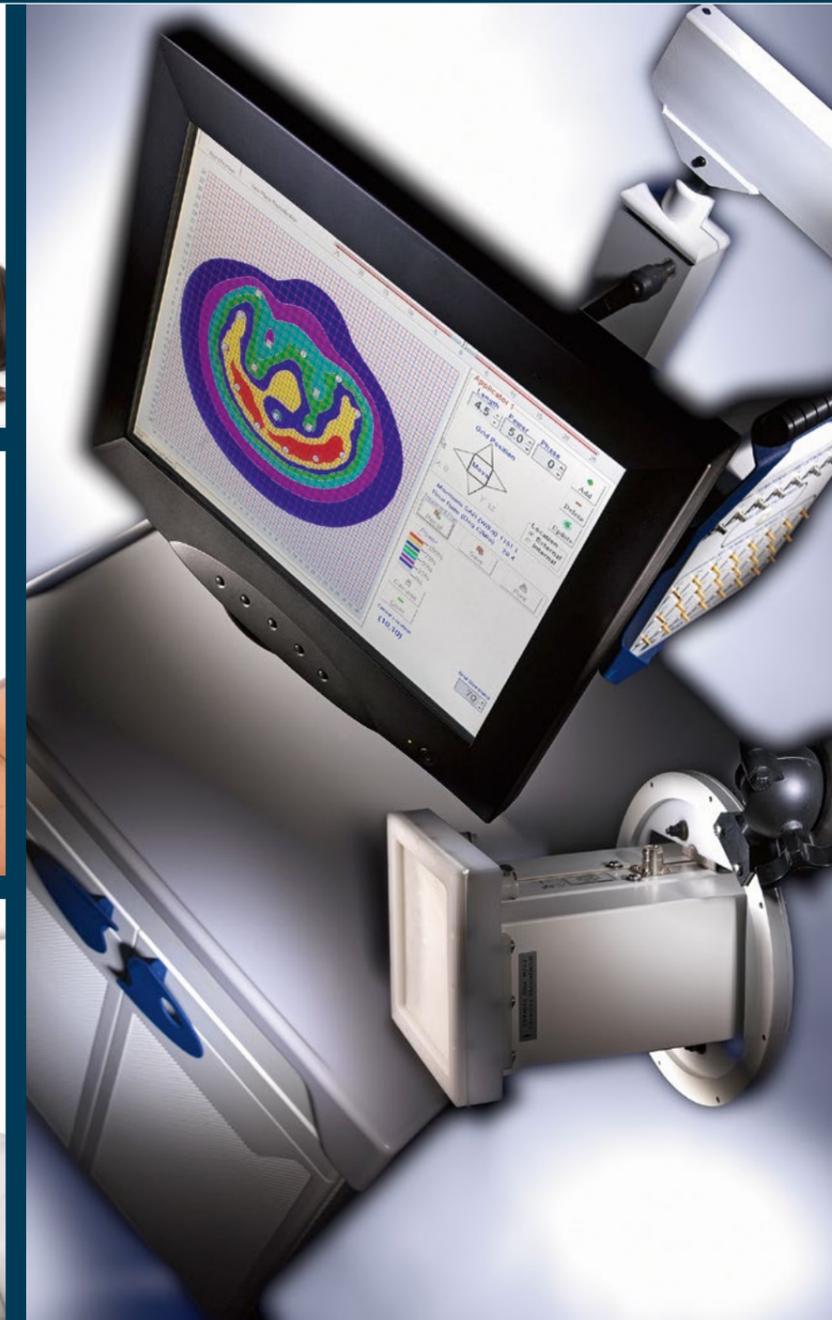
### ► THE MA-151 WAVEGUIDE APPLICATOR

is used for hyperthermia treatment of small lesions in the head/neck area. The slim shape of this applicator enables it to reach poorly accessible tumors.

### ► THE PLATE-SHAPED SPIRAL APPLICATORS

are suitable for treatment of tumor lesions close to the skin's surface. Each spiral antenna can be activated individually. This permits the temperature distribution to be targeted precisely to the individual tumor characteristics.

Three applicator versions ensure optimal matching to the tumor contour and region of the body: The SA-812 has a diameter of 12 cm and is equipped with eight spiral antennas. Within its diameter of 10 cm, the SA-510 contains five spiral antennas. The SA-308, with its three spiral antennas and a diameter of 8 cm, is appropriate for small lesions. All spiral applicators are characterized by their low inherent weight and are manufactured from a transparent material, allowing simple positioning.



## FULL COMPLIANCE

### QUALITY ASSURANCE

In keeping with the quality assurance requirements for optimized treatment, all of the Pyrexar hyperthermia systems not only have CE approval, but also comply with the guidelines of the German Society for Radiation Oncology (DEGRO) and the European Society for Hyperthermic Oncology (ESHO).

### DR. OLIVER OTT, RADIATION THERAPY CLINIC, UNIVERSITY OF ERLANGEN

“Only the tumor cells actually heated can respond more sensitively to the radiation treatment or chemotherapy. For this reason, quality assurance, especially measurement of the temperatures in the tumor region and in normal tissue, is an indispensable aspect of hyperthermia treatment.”

## AT A GLANCE

### PYREXAR BSD-500

- ▶ 8 channels, each 60 watts
- ▶ Up to 24 channels by a 3-way power splitter, e.g. for interstitial hyperthermia
- ▶ Large range of applicators
- ▶ Individual temperature distribution and continuous monitoring (Bowmann sensors)
- ▶ Leading supplier of hyperthermia systems for over 30 years
- ▶ As used in clinical studies (cervix, bladder, rectum, head & neck)
- ▶ Experienced service team

### NEW AND IN THE PIPELINE

- ▶ Improved calibration of temperature probes (dry well)
- ▶ Operating noise reduced to below 65 dB (A)
- ▶ DICOM integration and connection to PACS
- ▶ 61 cm medical-grade touchscreen
- ▶ New GUI with user administration and more secure user log-in based on Windows 10

## DR. SENNEWALD MEDIZINTECHNIK GMBH

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Dr. Sennewald Medizintechnik was founded with the aim of discovering innovative and beneficial cancer therapies and we have since amassed over 30 years of experience in regional and superficial hyperthermia. Our aim is to help improve the range of products on offer, to support the growth of this proven technology and so increase the survival rate among cancer patients.

To help us achieve this goal, we have entered into a long-term partnership with the pioneers and world leaders, Pyrexar Medical, to further develop the manufacture of hyperthermia systems. These high-quality medical devices are designed for maximum efficacy combined with minimum risk for greater patient comfort and are installed in oncology departments, research organizations and leading universities throughout Europe.

Our unrivaled links to the scientific community have led to the acceptance of hyperthermia, the development of dedicated software, reimbursement of hyperthermia and its use in the treatment of children. Strategic partnerships with medical centers have resulted in phase III clinical studies demonstrating that Pyrexar systems offer a significant increase in cancer response rates, and are the only ones to have received FDA approval.

The success of Dr. Sennewald Medizintechnik GmbH is a result of continuity. We are able to draw on our many years of experience for our in-depth knowledge of customers' clinical requirements and of the precise technical specifications for all the hyperthermia systems we offer. In addition, our teams of engineers, technicians and software developers remain as close to customers as possible, offering support in the planning, installation and set-up of the systems, as well as after-sales service.

One example of this is Ludwig-Maximilians University (LMU) of Munich, Germany, which has installed a new image-guided hyperthermia system at Großhadern University Hospital. A pioneer in cancer treatment with hyperthermia, the hospital has carried out over 15,000 patient treatments using this method, many of whom had soft tissue sarcoma tumors.

The facility has been leading a phase III clinical study which illuminated the long-term survival benefits of adding hyperthermia to chemotherapy and LMU is also at the center of the HEAT (Hyperthermia European Adjuvant Trial) study, a randomized, dual-arm trial for pancreatic cancer using chemotherapy plus hyperthermia.



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