MSI AUTOMATION, Inc. *MAY 28, 2026*
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PREVENTING FOOT AMPUTATION

MAGNETIC HYPERTHERMIA Can Stop Diabetic Infections and Prevent Foot Amputation

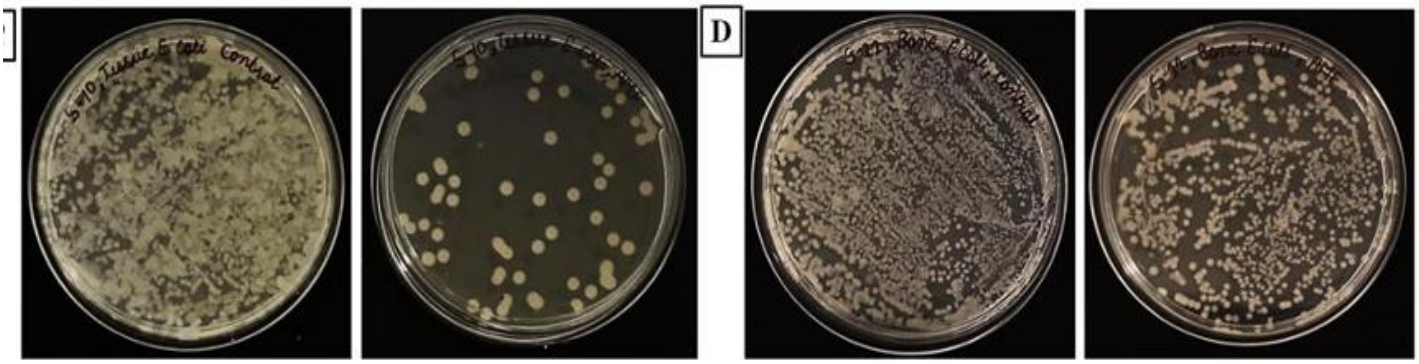
1. February 2026: The **FDA** has recently approved and for the first time at the **Mayo Clinic** the use of **Magnetic Hyperthermia** for Cancer Treatment. The Reasons are Obvious: Other forms of Cancer Treatment: Chemo, Radiation and Surgery: are not always successful.

2. Magnetic Hyperthermia's use for cancer treatment is still limited by several factors: **(1)** Magnetic Heating Power must be regulated within safe limits for magnetic energy applied to human tissue, **(2)** Size of the nanoparticles, **(3)** The Difficulty and Precise location to inject the nanoparticles into a tumor, **(4)** Nanoparticle metallurgy, **(5)** Nanoparticle concentration, and **(6)** Toxicity of the administered nanoparticles to other organs.

New Magnetic Hyperthermia Discovery: 2025-2026: Dr. Deepa Ghosh of the ***Institute of NanoScience and Technology*** has discovered a more practical use of Magnetic Hyperthermia as a medical treatment. Many of the 6 problems mentioned above for treating cancer do not apply to Magnetic Hyperthermia when it is used to treat **Bacterial Infections.**

LIVE HUMAN TISSUE **LIVE HUMAN BONE**

E-Coli Infection **E-Coli Infection**



BEFORE **AMF** **BEFORE** **AMF**

Magnetic Hyperthermia (AMF) was used here to demonstrate how live and infected tissue and bone samples can have their bacterial populations dramatically reduced with just one 5-15 minute treatment session. Healthy tissue, that lacks the iron nanoparticles inherent in bacterial cells, will not heat even when subjected to the same magnetic field. The treatment here is remarkable because all these samples were taken from patients that had undergone extensive antibiotic treatment for their infections but without success. To save the patient's life, **amputation** of the bone and tissue was necessary. Magnetic Heating Power: A-***B Limit*** **Data: 347 kHz / 32 kA/M = 13 (10)9**

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Dr. Deepa's Description of the Treatment of tissue and bone from live patients:
"Longer exposure results in higher death rate for the bacteria. Scanning electron microscope images revealed the destruction of the bacterial cell wall. **AMF** treatment also resulted in excess reactive oxygen species formation, which might contribute to bacteria cell death." (**Journal of the Royal Society of Chemistry 2022: *NanoScale*,14. 1713…)**

How Bacteria Responds When Heated by Magnetic Hyperthermia: Bacteria naturally acquire iron oxide for its own nutrition and growth. The bacteria ***biosynthesize*** the iron oxide into iron nanoparticles. Iron nanoparticles are ***paramagnetic*** and will easily heat by magnetic hyperthermia. Iron nanoparticles are inside the bacterial cell membrane. When exposed to this magnetic heating, the iron nanoparticles will heat. There is no blood flow in bacteria to remove the heat. The cell membrane over-heats, denatures and the bacteria cell dies.

Conclusion: All the bacteria share these iron nanoparticles. They are dispersed uniformly within the infected tissue. The average amount of magnetic hyperthermia heating energy delivered to each bacteria cell is small but is effective at killing the bacteria. The surrounding healthy tissue has no iron nanoparticles, so that healthy tissue is unharmed during the magnetic hyperthermia treatment. (See below)

Comparative Research: *To Study of the Safety of Magnetic Hyperthermia on Healthy Tissue:* The research included tests with live animals exposed to the **A-B Limit** over extended treatment sessions. The results are shown below. There is no evidence of tissue damage when exposed to this level of magnetic heating. (Read Below)

Exploratory Study to evaluate the efficacy of alternate magnetic field (AMF) to reduce bacterial load

Safety Check on Living Tissue: To confirm the safety of continuous/pulsed **AMF,** we exposed cohorts of female SD rats to AMF of **225 kHz, 325** Oe / **5.3 10(9)*** and 375 kHz, 320 Oe / **9.3 10(9)****, respectively.

l of 25 female rats, inclusive of one acting as the control, underwent diverse treatment regimens employing **AMF.** The Pulsed treatment involved subjecting 4 rats AMF treatment in precise intervals of 5 minutes of treatment, 5 minutes of rest, followed by an additional 5 minutes of treatment. Subsequently, two rats were sacrificed on the same day, while the remaining two underwent sacrifice the following day. Similarly, 4 rats were similarly analyzed after continuous treatment of 10 minutes. Note: Oe x 0.08 = kA/M / NIH ***Atkinson-Brezovich Limit*: 9.59 x (10)9.** Conversion: *225,000 x 26,000 kA/M = **5.85** 10(9) / ** 375 (10)3 x 25.6 (10)3 =**9.6 (10)9**

Note: Two separate cohorts, each comprising four rats, underwent repeated continuous treatments at 7-day intervals, culminating in their sacrifice after an aggregate period of 21 days. Analysis of the exposed skin to **AMF**, showed no significant changes on visualization after treatment

The absence of observable signs of paw swelling or edema across the experimental conditions implied an overall lack of significant edematous responses to **AMF** (Fig.7). This was confirmed with the consistent measurements of paw size that suggested an absence of inflammation in the paws on exposure to **AMF** (Fig. 8).

Histological Examinations of skin and muscle tissues from rats exposed to **AMF** showcased no notable changes in comparison to control groups. Microscopic analyses: (1) intact tissue architecture, (2) the absence of necrotic foci, (3) inflammatory responses, or (4) other discernible alterations in both skin and muscle sections (Fig. 10). These findings suggest a lack of substantial tissue damage or inflammatory reactions elicited by the applied AMF.

Conclusion:

Test conducted by Dr. Deepa have shown that positive results have been achieved within the **NIH** safe limit.

NIH Safety Limits: Is is imperative for the **NIH** to establish safety limits on Magnetic Hyperthermia. It has been widely accepted that the **Atkinson-Brezovich Limit of 9.59 x (10)9** is the standard. This value is the product of the Frequency (f) and the Magnetic Amplitude (H) in kA/M. ***Proposal of New Safety Limits for In Vivo Experiments of Magnetic Hyperthermia Antitumor Therapy: Cancers 2022, 14(13), 3084; https://doi.org/10.3390/cancers14133084***

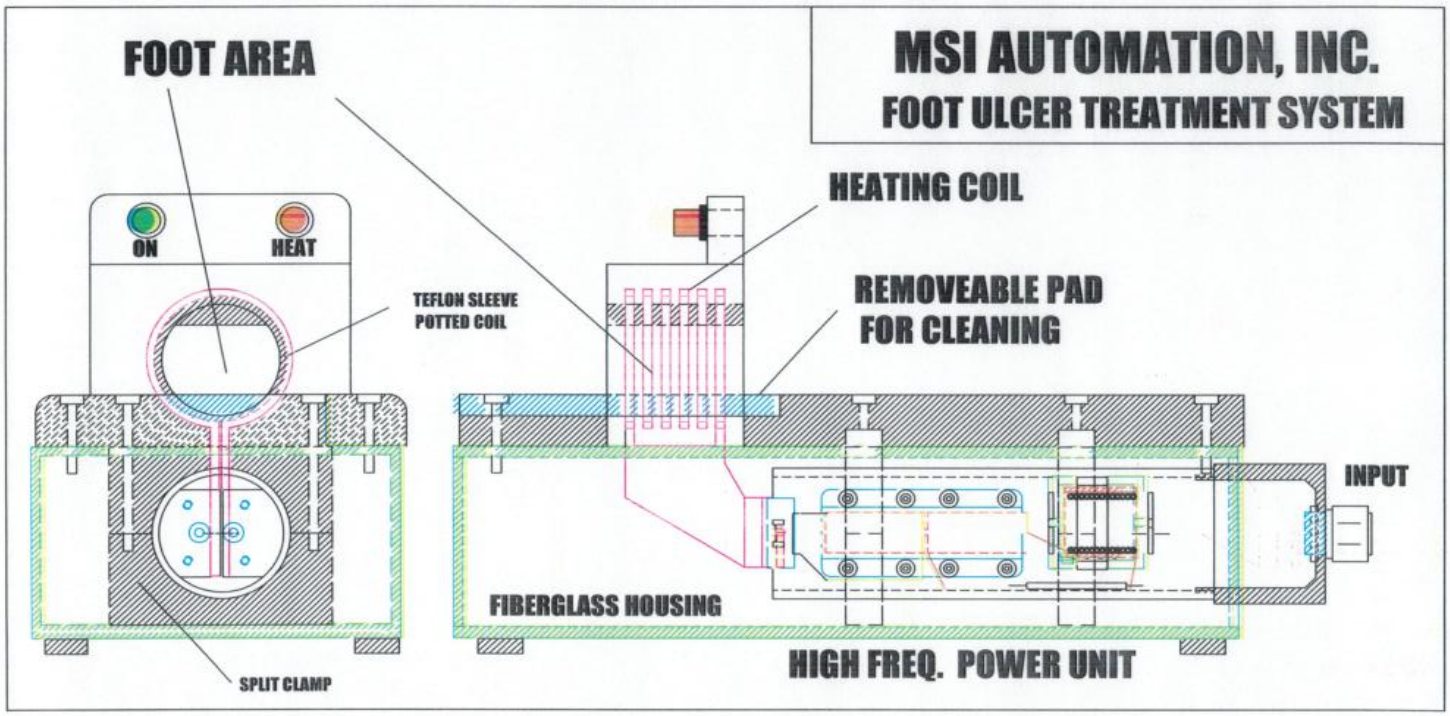
Computer Control: the ***MSI Automation Magnetic Hyperthermia System*** uses the computer to control the heating power at the **NIH** limit. The computer measures the **Frequency (f)** and **Magnetic Field (H)** automatically operates an algorithm that controls the heating such that it does not exceed the **A-B Limit**. The heating performance will be certified and registered for each treatment machine. Parameters as Frequency and Magnetic energy will by locked from any unauthorized adjustment.

Magnetic Hyperthermia Treatment System for Bacterial Infections.

Shown is the Magnetic Hyperthemia System to be used to treat infections of the foot. There is no physical contact between the foot and the ***Induction Tunnel***. Treatment sessions would, be 15-30 minutes. Multiple session over a week might be necessary to completely kill the bacterial infection. Electrical cost for a 15 minute treatment is about **½ USD**.

Important: The Computer is critical to the use of Magnetic Hyperthermia. It controls the safe heating level up to the **NIH** limit: **A-B : LIMIT: 9.59 (10)9**

Treating the Foot Infection Immediately



to Avoid Amputation

Without rapid and effective treatment and a means to penetrate treatment into the infection of the foot and bone, the condition will worsen. Magnetic Hyperthermia **(AMF)** treatment is immediate, taking not days or weeks. **AMF** passes through the drug-resistant bacterial biofilm to stop the infection.

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