



a new chapter in the history of medicine



magforce®

NANOTECHNOLOGIES AG



Cancer Thermotherapy Using Magnetic Nanoparticles

MagForce® Nano-Cancer-Therapy

Dr.rer.nat. Andreas Jordan
MagForce Nanotechnologies AG

18 Years Research & Development



The Center of Biomedical Nanotechnology (CBN)
Managing Director: Dr. A. Jordan

1988-1994

Research, financed by...

- the „Deutsche Krebshilfe e.V.“ (German registered Association for the Support of Cancer Patients)
- university research support (Charité)
- private foundations, donations



1994-2001

Special Field of Research 273, financed by...

- the „Deutsche Forschungsgemeinschaft (DFG)“ (German Group of Research)



Im Auftrag und mit Unterstützung des



Bundesministerium
für Bildung
und Forschung

2002-2007

Joint Projects under the Direction of MagForce

- German Federal Ministry of Education and Research (BMB+F) support program „Nanobiotechnology“, project executing organization Jülich/PTJ/VDI-TZ

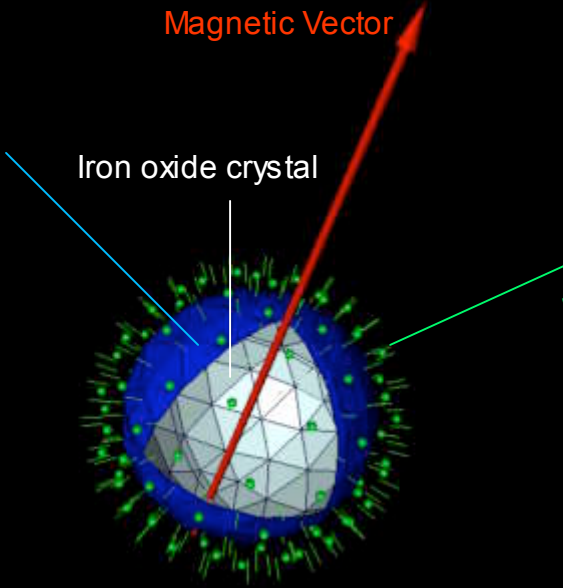


Technologiezentrum



Projektträger des BMBF und BMBW
Forschungszentrum Jülich GmbH

MagForce® Nanoparticles



The diagram illustrates a spherical nanoparticle with a central core and multiple layers. The core is a white, faceted 'Iron oxide crystal'. This is surrounded by a blue 'Primary coating'. The outermost layer consists of 'Secondary coatings' represented by green, hair-like structures. A red arrow labeled 'Magnetic Vector' points from the center towards the top right.

MagForce® nanoparticles 1. generation
(advanced clinical testing since 2003)

Primary coating:
Guarantees optimal particle load of the tumor tissue
-> It is necessary to inject the particles directly into the tumor.

MagForce® nanoparticles 2. generation
(laboratory testing since 2002)

Secondary coatings: Targeting molecules; single tumor cell detection and destruction.
Intravascular application.



The MagForce®-Technology operates only in the world of **Nano**.

- Only **Nano**particles absorb high energy from the activating magnetic field
- Only **Nano**particles are able to carry a great number of binding sites for cancer cells / target molecules due to their enormous surface
- Only **Nano**particles are able to infiltrate deeply into the tumor tissue
- Only **Nano**particles with corresponding coating
 - are detected late by the immune system, so that they reach their target
 - can be absorbed by tumor cells in great quantities
 - form a homogenous liquid of low viscosity in water



Thermotherapy using magnetic nanoparticles *General Application Procedure*

Options (free eligible):

43-45°C

Hyperthermia

Adjuvant therapy to increase efficacy or decrease dosage (side effects) of radio- and chemotherapy; **curative**
6 sessions 1 hour each (2 times a week)

> 46°C

Thermoablation

Monotherapy, **palliative**; advanced stage curative option
6 sessions 1 hour each (2 times a week)

Clinical brain tumor application is shown here.
 Similar procedures are clinically used for most other solid tumors.



NanoTherm® MFL

NanoPlan®

MFH®300F

MagForce is a system provider for a new cancer therapy.

Step 1

Step 2

Step 3

Step 4

Step 5



Select MagForce nanoparticle formulation
 NanoTherm® MFL: certified quality, tested for clinical application

3-d treatment planning: advise to physician for nanoparticle treatment volume, number and position of depots overall dosage

Minimally invasive injection of nanoparticles into tumor acc. 3-d treatment planning system (image guided control)

Non-invasive thermal treatment with therapy system MagForce MFH® 300F under online temperature control (tumor and reference points)

1-2 thermotherapy treatments per week up to 6 weeks. Additional nanoparticle application is possible.



Thermotherapy using magnetic nanoparticles: convincing arguments for a new method.

- Selectively alters tumor tissue; normal tissue is spared to the optimum.
- Nearly free of side-effects, a cancer therapy partly even sensed as comfortable.
- Minimally-invasive instillation of the nanoparticles, all further therapy steps are effected contact-less from the outside.
- Can be repeated over several weeks.
- 3-d plannable down to millimeter precision before treatment and precisely assessable.
- Application of the nanoparticles does not cause alteration of healthy tissue.
- Can be combined with conventional therapies (like surgery, radio- and chemotherapy) and increases their efficacy (with temperatures of 41-45°C).
- Can be applied as sole treatment (with temperatures of $\geq 46^\circ\text{C}$).



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Thank you for your attention !