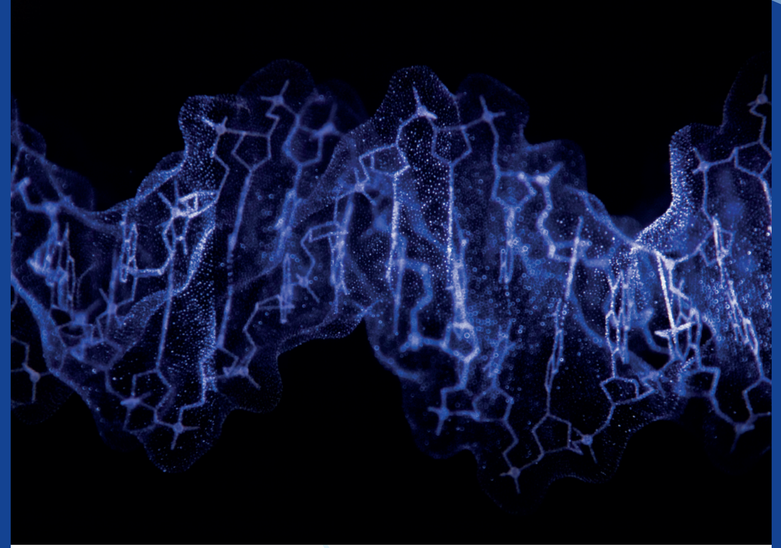


The new Bangor Group

Future Projects

Other clinical applications have been identified that will benefit from the delivery of extremely focussed heat into tissue, these include:

- Cervical and ovarian cancer treatment
- Removal of nerve plexus for pain relief and palliative care
- Brain tumours

The use of high frequency microwave and millimetre wave energy to deliver focussed heat into various biological structures has seemingly endless possibilities.

Low power mm wave energy

The medical microwave research group at Bangor is also working on more "blue sky" research. The use of non-thermal millimetre wave energy for medical applications is still a very new idea and as such there is a great deal of scope for research and development. The group are conducting research into the possible uses of non-thermal millimetre wave energy to stimulate cell re-growth, increase the production of cells and produce other clinical effects. In this work, bioeffects of millimetre waves are produced without heating the biological tissue. Non-thermal millimetre wave systems operate at a much higher frequency and much lower power density. It has been reported that cells could have this energy applied to them in order to stimulate cell renewal and growth.

The group has identified a number of areas where this technology could be applied, which include; increased cell production for use in stem cell applications, reduction in the rate of generation of cells for cancer treatment applications and the release of opiods for pain relief and sedation.

Current projects:

Members of the group are developing instrumentation and experimental techniques to enable increased and decreased production of various types of cells. This work is exploring ways of controlling the production of various important cells to assist with stem cell work and cancer treatment.

Future work:

The group intends to extend its activities in order to look at how the production of certain cells can be used in stem cell work required for treating Parkinson's disease, and for bone/skin regrowth. Another area of future activity is nerve stimulation to regenerate damaged nerves.

Collaborators

The group is currently working with a number of other academic institutions and commercial partners.

MicroOncology Limited

Creo Medical Limited

Poietics Limited

University College London (UCL) – Electrical and Electronic Engineering Department

University College Hospitals Foundation Trust - Windeyer Institute of Medical Sciences

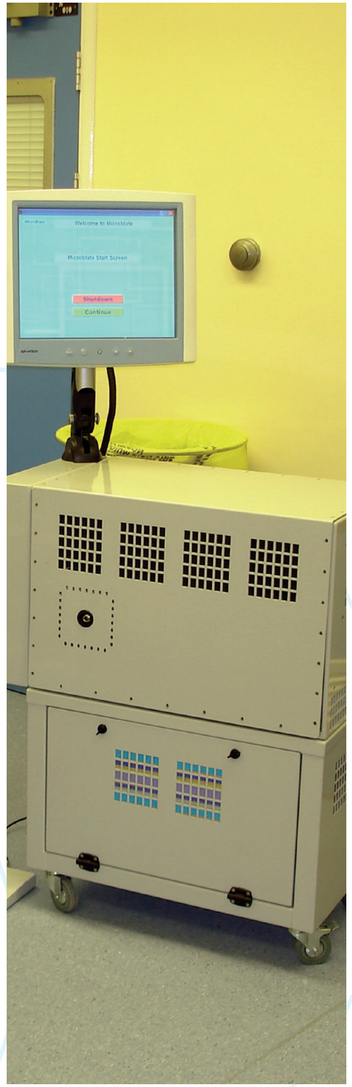
Royal Liverpool University Hospitals - Radiology Department

The University of Manchester - Faculty of Medical and Human Sciences

The University of Manchester – Electrical and Electronic Engineering Department

Northwick Park Institute of Medical Research (NPIMR) - Department of Surgical Research

St. Mark's Hospital - Endoscopy Unit



For further information or to get involved at any level please contact:

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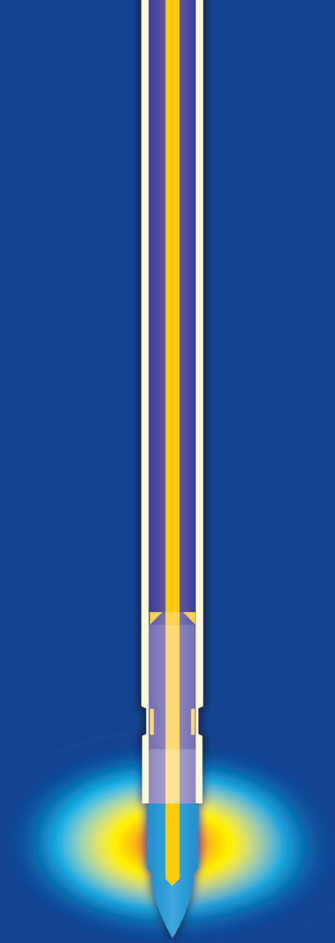
PRIFYSGOL BANGOR UNIVERSITY



Medical Microwave Systems Research Group Bangor University

Overview

New High-Tech Medical Systems based on microwave and millimetre wave engineering techniques are being developed at Bangor University in the Medical Microwave Systems Group.

High frequency microwave and millimetre wave technology has been used for many years in military applications, for the detection of enemy craft or concealed weapons. Recent advances in semiconductor power device technology developed for the communications industry, has substantially reduced the cost of microwave and millimetre wave devices and made it possible for researchers in the medical field to explore the potential of using energy at frequencies that would otherwise have been inaccessible for medical device applications.

It is predicted that new high tech medical solutions using devices developed for these other technologies will become the next big growth industry with the Bangor group trailblazing research into as yet uncharted territory.

The main activity of the group is to develop new systems that make use of focussed thermal and non-thermal high frequency microwave and millimetre (mm) wave energy that can be directed into biological tissue in a controlled manner to produce a range of beneficial tissue affects. These effects range from the denaturing of proteins to destroy cancerous tissue, to the generation of cells that have the potential to be used in stem cell research.

The new group offers a unique opportunity for undergraduates and post graduate researchers to work on interesting and challenging projects that will have a major impact on healthcare services in the UK and throughout the world, as well as to research into areas that have a life changing impact. Study in the area of new medical device technology also offers a lucrative career path for graduates leaving university and entering into the growing healthcare and high tech medical sector.

Systems developed by members of the group

Researchers within the group have discovered that focussed high frequency microwave energy can give the medical practitioner the ability to selectively destroy cancerous tissue in otherwise hard to reach areas of the body, thereby negating the need for invasive surgery. This exciting new alternative to conventional surgery means that many procedures can be carried out laparoscopically or percutaneously and in an outpatient environment; saving health organisations time and money.

A number of clinically superior systems using focussed high frequency microwave energy have already been developed by members of the group, some of which have been through full clinical trails and others are now in the pre-clinical and pilot clinical phase.

The group prides itself on its collaboration with leading medical clinicians and practitioners to inform the development of the new medical devices being developed. Members of the group are named inventors on over 100 patents and patent applications based on the use of microwave and mm-wave energy for therapeutic applications. The group is currently publishing the results of this work in bioengineering, microwave and clinical journals.

Members of the team have successfully patented and commercialised14 of their medical device ideas, and have received recognition from a number of internationally renowned clinicians and the Department of Health.

MicroBlate™
Controlled focussed ablation system for locating and treating breast tumours.

The MicroBlate system is a new advanced electrosurgical system which delivers focussed microwave energy into tissue to detect and then controllably remove the tumour, leaving a well defined margin of healthy tissue. This system offers clear advantages over any other treatment and measurement systems currently available.

"…. I am tremendously excited by the prospects of this new technology and I do believe it will have a major impact on care pathways in Breast Surgery." ***Leading UK breast surgeon***

"…. from the pre-clinical results obtained so far, this system should enable the treatment of breast tumours of up to 2cm in diameter to be moved from operating theatres to outpatient centres…..this is extremely exciting and will offer a significant advantage to the NHS"
Programme Manager NHS HTD meeting

GastroBlate™
Device for treating acid indigestion or gastro esophageal reflux disorder.

This system is particularly useful for treating oesophageal reflux disorder where it is necessary to produce controlled thermal damage to the inner lining of the oesophagus. Novel travelling wave antennae structures fabricated on low loss flexible microwave substrate material were developed and integrated into a standard surgical balloon.

PortaBlate™
A portable ablation system for treating thread veins and small skin lesions.

This technology uses high frequency microwave energy at power levels of less than 5W to deliver focussed heat into thread veins or small lesions on the surface of the skin.

The new Bangor Group

Building on the success of initial research and development, the group at Bangor has been created to bring research and development into the academic environment. Bangor has put together a research team which engages clinicians, researchers, engineers and SMEs in a non-commercial environment where all parties contribute to the research at the same level.

The group is also able to gain access to grant funding, which would not be available outside the academic environment.

Cancer treatment and medical device development is not only costly but time consuming, and the group in Bangor is aiming to tackle these problems head on by providing the perfect environment for the pre-commercial development of new clinically-useful medical devices and systems.

Current projects

The core activities are split into two broad areas, thermal and non-thermal microwave and millimetre wave systems. In certain applications both types of energy could be used to achieve a positive clinical outcome.

Focussed thermal energy

Skin treatment system
Based on the development of energy systems and applicators using new millimetre wave devices to deliver energy into the skin with a uniform distribution. The ability to deliver energy to very limited depths of penetration provides the potential to treat a number of skin related conditions, including:

Skin cancer:
- Benign tumours: skin tag, cutaneous horn, seborrheic keratosis, general warts and actinic keratosis
- Malignant tumours: melanoma

Cosmetic:
- Collagen shrinkage for wrinkle removal

"Your treatment system has the potential to treat a number of skin-related conditions where the current treatment is either inadequate or no solution is available."
Dr Kenichiro Ogoshi – Japanese Dermatologist

Pancreatic Cancer Treatment System
Pancreatic cancer is extremely difficult to treat due to the close proximity of the pancreas to other vital organs. The medical microwaves research group is working closely with clinicians at the Royal Liverpool Hospital to produce a surgical antenna that can be introduced into the tumour through the instrument channel of a surgical endoscope.

This new solution will result in faster treatment times and quicker patient recovery, with no external scarring and a significantly reduced risk of infection. The use of focussed microwave energy offers significant advantages over all other existing treatment solutions. Consultant clinicians at Royal Liverpool Hospital are helping the group take the research to the first pre-clinical study.

Bone cancer
Impedance matched focussed heat produced by high frequency microwave energy is introduced either directly into the bone or coupled through the bone using bespoke surgical antenna structures. This system may also be used in conjunction with non-thermal millimetre wave systems to repair damaged or lost bone.

Brain tumours
The group is collaborating with colleagues conducting research in the area of visualisation in order to create a treatment system for brain tumours.