Who is Doing What
Academic Research in the UK in:

Urological Devices & Materials

Directory 2005 – Version 1.1

Corrections: If any of the details contained in this document are inaccurate or out of date, please contact BITECIC at the address below or via e-mail (**bridget.matthews@bitecic.com**) and the information will be regularly updated.

Acknowledgements: Dr Nora Sabbuba, Cardiff School of Biosciences, Cardiff University and BioMed HTC Bristol, for expert advice in the creation of this activity list.

BITECIC
3320 Century Way
Thorpe Park
Leeds LS15 8ZB

T +44 (0)113 284 0225
F +44 (0)113 284 0211

Medical Devices Faraday Partnership

BioMed Health Technology Co-operative

BITECIC

Institute/ Department	**Research Director/Key personnel**	**Material/ Technology**	**Clinical Application**	**Approach** (Key words in **bold**)
*The University of Bristol, School of Veterinary Science, **Department of Anatomy** ***and*** **The University of Strathclyde, **Department of Pure and Applied Chemistry**	Prof I.A. Silver* ***and*** Prof N.B. Graham**	Biodegradable materials with properties similar to polyethylene oxide hydrogels	Biodegradable prostatic stents, potential alternatives to trans-urethral prostatectomy.	The aim is to develop a **resorbing biomaterial** for use in **prostatic stents,** in order to overcome the inherent problems with current surgical approaches to prostatectomy**.** Such a material would have to have suitable **water absorption** and **swelling properties**, and avoid the risks to the prostate of ischaemic damage. The response of the biomaterial to urine exposure is being assessed.

Institute/ Department	**Research Director/Key personnel**	**Material/ Technology**	**Clinical Application**	**Approach** (Key words in **bold**)
Brunel University, Uxbridge. *School of Engineering and Design ***and*** **The University of the West of England, Bristol. School of Human and Analytical Sciences ***and*** +Bristol Urological Institute, Southmead Hospital, Bristol.	Prof B. Ralph* ***and*** Dr A.G.W. Hodson** Dr D. Patton** Dr L. Fisher** ***and*** Prof R.C.L. Feneley+	Silicone and modified silicone surfaces	Silicone catheters resistant to bacterial adhesion and biofilm encrustation.	**Quantitative surface analysis** and **electron microscopy** techniques are used to determine, in detail, the **kinetics of nucleation of inorganic** matter during **biofilm** accumulation on **catheter surfaces**. In particular**, silicone** and **chemically modified silicone** surfaces are being studied, with a major aim of developing catheters resistant to bacterial colonisation and blockage. In collaboration with the **Stryker Europe CASA Group**, Limerick, Eire.

Institute/ Department	**Research Director/Key personnel**	**Material/ Technology**	**Clinical Application**	**Approach** (Key words in **bold**)
The University of Cambridge, **Department of Applied Mathematics and Theoretical Physics**.	Prof T.J. Pedley Prof D.G. Crighton	Computational analysis of viscous flow in collapsible tubes	Fundamental information relating to urine flow.	The approach is based upon a **new method for calculating large non-axisymmetric deformation** in a **tube wall**. In combination with computation of slow viscous flow in three dimensions, it permits **investigations of tube collapse and reopening**, plus aspects of **peristaltic pumping** under different conditions.
Cardiff University, **School of Biosciences**	Dr D.J. Stickler Dr N.S. Morris	Polyurethane materials Hydrophilic coating materials	Novel urinary catheter design	Proprietary **polyurethane technology** has enabled development of an **improved catheter design**. A larger drainage lumen and other novel features restrict bacterial colonisation and encrustation and extend blockage times by three-fold, when compared with conventional designs in a laboratory model of the catheterised bladder. In collaboration with **Ranier Technology Ltd**., Cambridge.
*Cardiff University, **School of Biosciences** ***and*** **The University of Durham, **Department of Chemistry**	Dr D.J. Stickler* ***and*** Prof W.J. Feast**	New polymeric coating materials	Bioactive coating materials for urological appliances.	**Bacteriological** and **microscopical assessment** of **new polymers,** using established laboratory models of bacterial colonisation. This work is primarily to develop materials which **inhibit bacterial urease enzyme production**, **inhibit bacterial migration** (ie. Migration of *Proteus mirabilis* by swarming), or which undergo **controlled ablation** in response to **urine at pH8.0**.

Institute/ Department	**Research Director/Key personnel**	**Material/ Technology**	**Clinical Application**	**Approach** (Key words in **bold**)
*Cardiff University, **School of Biosciences** ***and*** **Bristol Urological Institute**, Southmead Hospital, Bristol. The BUI works in close collaboration with both the University of Bristol and the University of the West of England.	Dr D.J. Stickler* ***and*** Prof R.C.L. Feneley**	Not specific	A simple method to prevent encrustation and blockage of catheters used in urinary incontinence.	The group are investigating how the **antibacterial** solution of **triclosan**, can be used to inflate **catheter balloons** so that it subsequently, diffuses into the urine of the bladder and **inhibits** the **encrustation** process of catheters. The current project aims to conduct a **clinical trial** to determine whether this form of **treatment** is safe and effective in the prevention of catheter encrustation in people with urinary incontinence.
Cardiff University, School of Dentistry, **Matrix Biology and Tissue Repair Unit**	Prof M. Waters	Functional silanes chemisorbed on to polymeric surfaces	Surfaces that are more resistant to bacterial attachment.	Work has been conducted to modify the **surface chemistry of polymeric materials** so as to make them more **resistant to bacterial attachment**. Hope to apply this to **urinary catheters** in an attempt to reduce bacterial attachment and biofilm formation.

Institute/ Department	**Research Director/Key personnel**	**Material/ Technology**	**Clinical Application**	**Approach** (Key words in **bold**)
The University of Dundee, **Department of Mechanical Engineering and Mechatronics**	Dr Q. Zhao	Coating materials combining silver, PTFE and surfactant	Anti-microbial composite for catheter surfaces.	**Experimental and theoretical modelling** to **optimise** surfactant type and concentration of **silver, PTFE and surfactant** in **coating composites** for catheters with evaluation by radiometric assay and scanning electron microscopy. Special attention to efficacy as **anti-bacterials** and in terms of leaching of components from the coatings.
The University of Durham, *__School of Engineering__ ***and*** **__Department of Chemistry__ ***and*** +Cardiff University, __School of Biosciences__. ***and*** ++__Bristol Urological Institute__, Southmead Hospital, Bristol.	Prof A. Unsworth* ***and*** Prof W.J. Feast** ***and*** Dr D.J. Stickler+ ***and*** Prof R.C.L. Feneley++	1. Coating materials 2. Nano-pressure die and pH sensor	1. Surface coatings for urinary catheters to inhibit bacterial colonisation. 2. An intelligent catheter with precision control of the bladder fill/empty cycle.	1. Testing of **new polymer materials** in an ***in vitro*** laboratory model of the catheterised bladder to identify suitable **coating formulations** for urinary catheters, which **prevent** colonisation, encrustation and blockage by **crystalline biofilms**, especially those formed by **Proteus mirabilis**, a major bacterial pathogen of the urinary tract. 2. Using **nanotechnology** to develop a <5mm diameter **microvalve**, incorporating a sensitive **pressure die** and **pH sensor** for monitoring bladder pressure and urine pH. This would facilitate advanced control of urine collection and release. In collaboration with **Ellis Developments Ltd**., Nottingham, and **ETB Ltd.**, Codicote.

Institute/ Department	**Research Director/Key personnel**	**Material/ Technology**	**Clinical Application**	**Approach** (Key words in **bold**)
*The University of Durham, **Department of Chemistry** ***and*** **The University of York, Department of Biology **Jack Birch Unit of Molecular Carcinogenesis**	Dr. N.R. Cameron* ***and*** Prof J. Southgate**	Polymerised high internal phase emulsions with tunable physical and biological properties	Tunable biomaterials for soft tissue engineering	This project hopes to develop a **synthetic biodegradable scaffold** for **soft tissue engineering**. Tissue development on scaffolds will be examined using *in vitro* models of bladder regeneration.
*Heriot-Watt University, Edinburgh, **Department of Mechanical and Chemical Engineering** ***and*** The University of Edinburgh, Department of Urology,	Prof R.L. Reuben* ***and*** Mr S.A. McNeill** Mr L.H. Stewart** ***and*** Dr F.K. Habib+ Mr T.B. Hargreave+ ***and*** Dr R. Stevens++	Micro-engineered tactile probe	Cystoscope- or catheter-delivered probe to measure prostatic compliance.	**UROCATH project** - the project aims to design and build a **microprobe** to permit *in situ* **measurement of compliance** of the prostate, in order to **relate histology to prostatic compliance** in benign **prostatic hyperplasia**. This will be a tactile medical device for measuring the mechanical properties of prostate tissues in situ. A more focused and effective therapeutic strategy could then replace the current "treatment cascade" approach.

Institute/ Department	**Research Director/Key personnel**	**Material/ Technology**	**Clinical Application**	**Approach** (Key words in **bold**)
Cont. **Western General Hospital *and* +School of Molecular and Clinical Medicine ***and*** ++Council for the Central Laboratory of the Research Councils (CCLRC), Didcot Rutherford Appleton laboratory,	***See above***	***See above***	***See above***	***See above***
The University of London, Imperial College of Science, Technology andMedicine, Department of Materials	Prof L.L. Hench	Bioactive gel glasses.	Prosthesis coatings for controlled release of anti-microbials.	Determination of the **concentration** and **rate of release** of **Ag^+ from gel-glass matrix**, to provide 'parts per million' doses, which are **inhibitory to the growth** of both gram (+) and gram (-) bacteria.

Institute/ Department	**Research Director/Key personnel**	**Material/ Technology**	**Clinical Application**	**Approach** (Key words in **bold**)
The University of London, University College London, **Department of Medical Physics and Bioengineering/ *Continence Technology Group***	Dr A.M. Cottenden	Not specific	Urinary incontinence	Conducts **clinical evaluation** of incontinence products. Laboratory tests are carried out on the interaction between **fluids** and **absorbent materials**.
The University of London, University College London, **Dept of Medical Physics and Bioengineering/ *Continence Technology Group***	Dr A.M. Cottenden Dr I. Eames	Existing inhomogeneous sheet fabrics	New incontinence bedpan design.	**Predictive modelling** using **non-linear advection-diffusion equations** to analyse time-dependent distribution of applied fluid driven by external and capillary forces in a two-dimensional sheet of material. **Bedpans** will be built to **new designs** optimising available materials.
The University of London, University College London, **Institute of Urology and Nephrology**	Prof C.H. Fry Mr H. Whitfield Mr S. Graham	Material inhibitors/promoters of calcium and magnesium deposition	Management of urinary tract stones.	The work revolves around the need to understand **the nature of physico-chemical conditions which,** in some patients, **predispose towards crystallisation of magnesium and calcium salts as stones** (in the renal pelvis, ureter and bladder), or as **encrustations on indwelling catheters**. Materials with inhibitory potential, are tested *in vitro* by their effects on Ca2+ and Mg2+ solubility in urine samples of defined composition and pH.

Institute/ Department	**Research Director/Key personnel**	**Material/ Technology**	**Clinical Application**	**Approach** (Key words in **bold**)
The University of London, University College London, **Institute of Urology and Nephrology**	Prof M.D. Craggs Dr S. Knight	Hydraulically-controlled, pressure-regulated artificial sphincter	Prosthetic implant for urinary incontinence.	An **improved artificial sphincter** is being developed, to overcome the shortcomings of the single available alternative. The design will include: a **broad-range, pressure-regulating silicone balloon**, serving an **occluder cuff**, a **self-sealing, transcutaneous, filling port,** and a **stress relief reservoir**. The long-term aim is to prepare the device as a single, sterile unit for convenient implantation. In collaboration with **Bibby Sterilin Ltd.**, Stone, and **Isotron plc.**, Swindon.
The University of Lancaster, **Department of Engineering**	Dr M.J. Joyce	Application of Quartz Crystal Microbalance	Fundamental information on bacterial adhesion relating to urinary tract infections.	The physical mechanisms of bacterial adhesion to surfaces, as an **initial stage in biofilm formation**, are investigated by studying fluid at the surface of **a shear oscillator**. Study of **mass trapping, viscous coupling, fluid viscosity** and **fluid density** may provide important insights into the initial attachment and colonisation of bacteria on different surfaces.
*The University of Southampton, **School of Engineering Sciences** ***and***	Dr J.P. Scanlan* Dr H. Godfrey**	New application for existing biocompatible materials	Suprapubic port for bladder management.	A **device providing suprapubic** entry to the bladder for **urine collection, endoscopy** and **stone treatment** is being developed, as an alternative system for long-term catheterised patients. The design includes a **cutaneous flange** and **indwelling portal tube**. **By Computer simulation** and **prototype testing** on **anatomical models**, are used in the design and evaluation of the device before clinical trials.

Institute/ Department	**Research Director/Key personnel**	**Material/ Technology**	**Clinical Application**	**Approach** (Key words in **bold**)
Cont. **The University of the West of England, Bristol **Faculty of Health and Social Care** (Centre for Research in Applied Social Care and Health)	***See above***	***See above***	***See above***	***See above***
The University of the West of England, Bristol, Faculty of Computing, Engineering and Mathematical Sciences, **Engineering and Medicine Elastomers Research Centre**	Dr V.A. Coveney	Elastomers	Elastomers as components of catheters and other urological devices.	Major interests include the **engineering of elastomers** for urological applications. Performance of elastomer catheters, and interactions of these devices with the patient are evaluated. **Physical** and **mathematical models** of the human bladder have been developed to study **force-deformation events**, **stress-relaxation** and behaviour of the indwelling catheter.

Institute/ Department	**Research Director/Key personnel**	**Material/ Technology**	**Clinical Application**	**Approach** (Key words in **bold**)
Queen's University Belfast, School of Pharmacy, **Drug Delivery and Biomaterials** ***and*** **Clinical and Professional Practice**	Prof S.P. Gorman Prof D.S. Jones Prof A.D. Woolfson ***and*** Dr M. Tunney	Solvent-cast films of PCL +/- PVP Novel silicone-based materials	New coatings with anti-bacterial properties for urological devices, especially catheters.	The work is directed towards developing **bio-compatible** and **biomimetic biomaterials,** which **resist bacterial colonisation** for use in prostheses in various medical disciplines**. Polyvinyl pyrollidone** (**PVP**) coated as a hydrophilic layer on polyurethane has been shown to **impair bacterial adhesion** and exhibit useful **lubricity**. Films of **polyepsilon-caprolactone** (**PCL**) mixtures, with or without PVP-iodine, are being assessed by bacteriological and mechanical testing, including: **tensile analysis, dynamic thermal analysis** and **dynamic contact angle analysis.** Surface properties are being assessed by **scanning electron microscopy**. Bacterial encrustation is studied using an ***in vitro*** **model** system. In collaboration with Xiomateria Ltd., School of Pharmacy, Queen's University Belfast.