

# Co-operating with industry in biomarker studies

**Tim Bowen**

**Department of Nephrology  
Wales Kidney Research Unit  
Cardiff University**



# Diabetic nephropathy (DN): A major UK health problem with no effective prognostic biomarkers

**BBC** News Sport Weather iPlayer TV R

## NEWS HEALTH

Home World UK England N. Ireland Scotland Wales Business Politics Health Education Sci/E

25 April 2012 Last updated at 01:27

Share f t e d

### Diabetes: Most NHS costs wasteful, says Diabetic Medicine

The majority of NHS spending on diabetes is avoidable, says a report in the journal *Diabetic Medicine*.

It suggests that 80% of the NHS's £9.8bn annual UK diabetes bill goes on the cost of treating complications.

Experts say much of this is preventable with health checks and better education - something the Department of Health says it is tackling.



Type 2 diabetes is linked to obesity

**BBC** News Sport Weather iPlayer TV Rad

## NEWS HEALTH

Home World UK England N. Ireland Scotland Wales Business Politics Health Education Sci/Env

29 June 2011 Last updated at 08:39

Share f t e d

### NHS faces 'diabetes time bomb'

The health service could face a "diabetes time bomb" according to an audit of patients in England and Wales.

The [report](#) says 800,000 Type 1 and Type 2 patients have elevated blood sugar levels which could lead to kidney failure, limb amputation and stroke.

It warned that many of the patients were young or middle aged and could require "substantial hospital care in a matter of years".



High blood sugar levels can damage the body

**BBC** News Sport Weather iPlayer TV Ra

## NEWS HEALTH

Home World UK England N. Ireland Scotland Wales Business Politics Health Education Sci/Env

6 August 2012 Last updated at 03:11

656 Share f t e d

### Kidney care 'needs to improve'

By Adam Brimelow  
Health Correspondent, BBC News

An NHS report has called for better detection and earlier treatment to help tackle chronic kidney disease.

The study commissioned by NHS Kidney Care says it causes up to 45,000 premature deaths each year, more than lung and breast cancer combined.

An improved approach could help many people to lead better lives and save the NHS money, it adds.

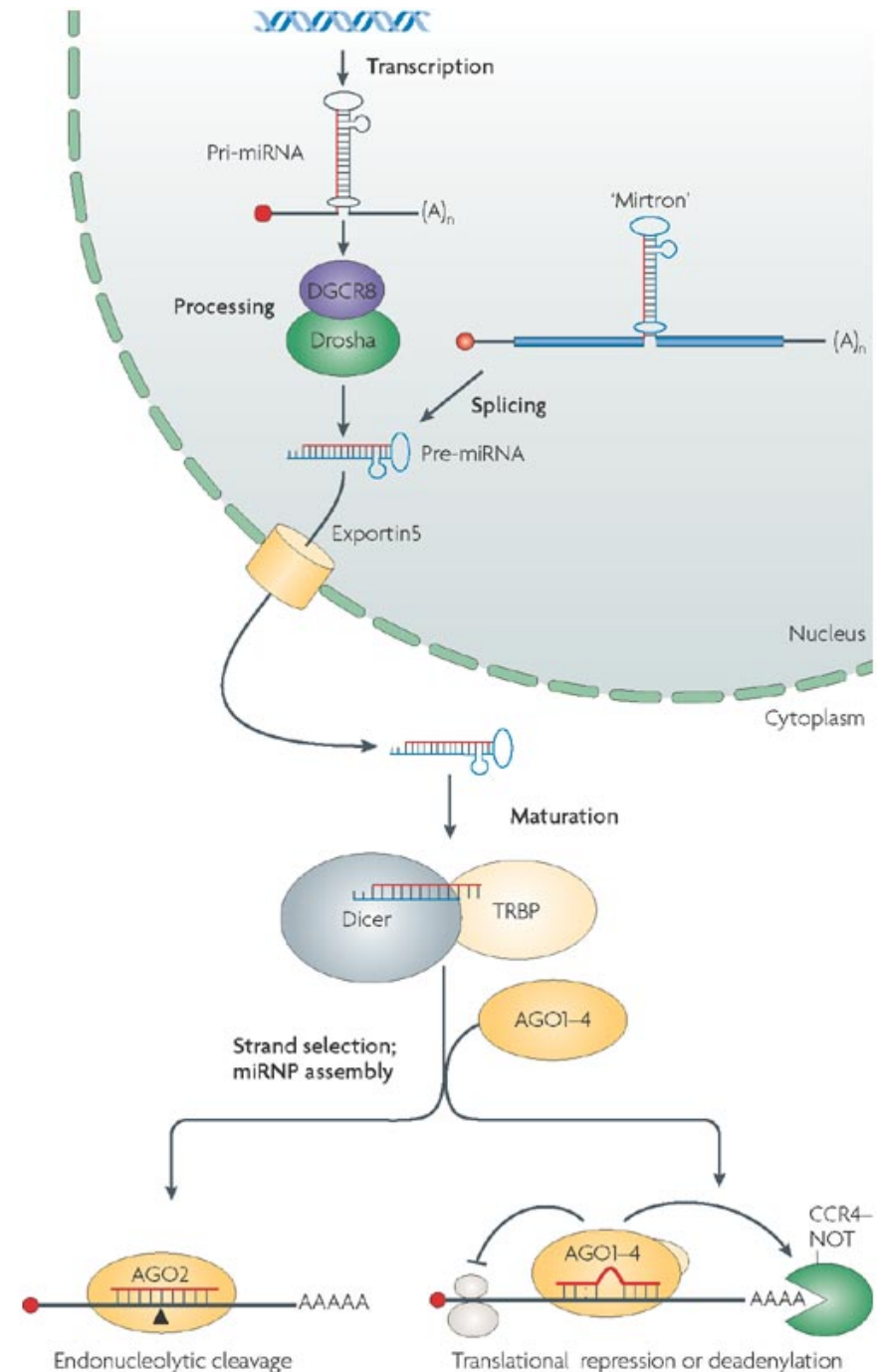


Half of NHS spending on the disease funds dialysis

**Investigating the utility of urinary microRNAs  
as diabetic nephropathy biomarkers**

## microRNAs bind to specific mRNA targets and inhibit protein synthesis

- 22-25 nucleotide RNA regulators of gene expression
- Imperfect base pairing to target sites in the 3'-untranslated region (UTR)
  - repress translation
  - enhance mRNA degradation
- Sequence-specific target recognition
  - seed region
  - multiple binding sites in 3'-UTR



# Urinary microRNA biomarker development

Knowledge Economy Skills Scholarship (KESS)  
**European Social Fund & BBI Group**



Invention for Innovation (i4i)  
early-stage product development grant  
**NISCHR & BBI Group**



Industrial CASE 4-year PhD studentship  
**BBSRC & Gwent Group**

**MicroRNAs: global regulators of gene expression with conserved function**



- Accessible, non-invasive sample type
- Alternative to renal biopsy
- Analysis by RT-qPCR

**Evaluate feasibility of miRNA test for diabetic kidney disease**

# Urinary microRNA biomarker development

Knowledge Economy Skills Scholarship (KESS)  
European Social Fund & BBI Group



Invention for Innovation (i4i)  
early-stage product development grant  
**NISCHR & BBI Group**




Industrial CASE 4-year PhD studentship  
BBSRC & Gwent Group

**Innovation for Invention (i4i)**  
**early-stage product development grant**  
**NISCHR & BBI Group**

---

*Development of urinary  
microRNAs as biomarkers  
for diabetic kidney disease*

**RT-qPCR validation and development of test platform**

- 
- Evaluate microRNA utility across disease stages
  - Evaluate microRNA detection in independent patient cohorts
  - Optimise sample preparation / develop test

**Prototype microRNA biomarker test / Intellectual property**



# Urinary microRNA biomarker development

Knowledge Economy Skills Scholarship (KESS)  
European Social Fund & BBI Group



Invention for Innovation (i4i)  
early-stage product development grant  
NISCHR & BBI Group



Industrial CASE 4-year PhD studentship  
BBSRC & Gwent Group

**Industrial CASE**  
**4-year PhD studentship**  
**BBSRC & Gwent Group**

---

*Electrochemical detection of microRNAs*

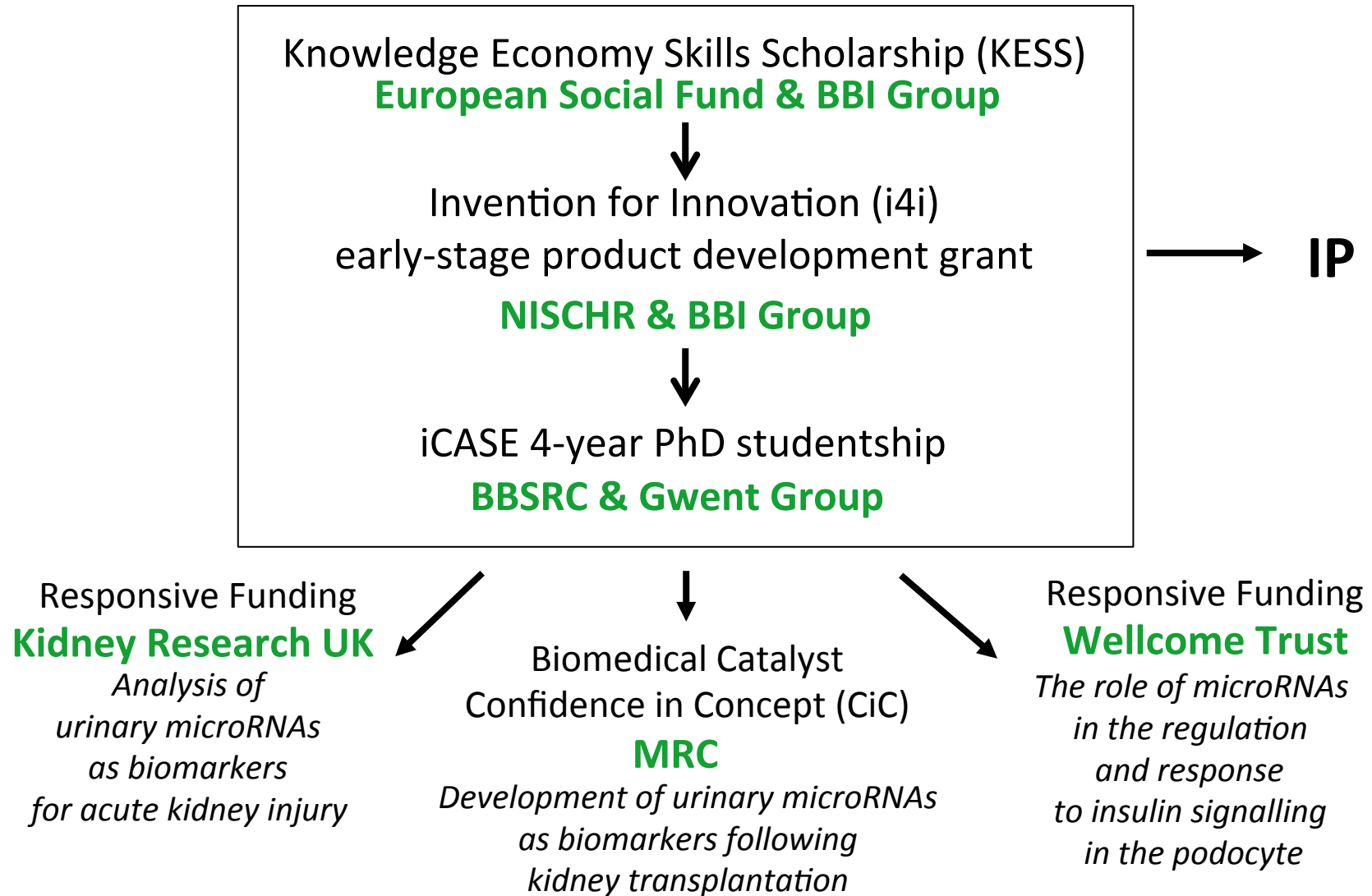
**Probe development for electrochemical miRNA detection**



- Synthesis of electrode-tethered microRNA probe
- Preliminary data from synthetic urine analysis promising
- Aim to develop a microRNA “dipstick” probe

**In collaboration with Dr James Redman, CU School of Chemistry**

# Urinary microRNA biomarker development



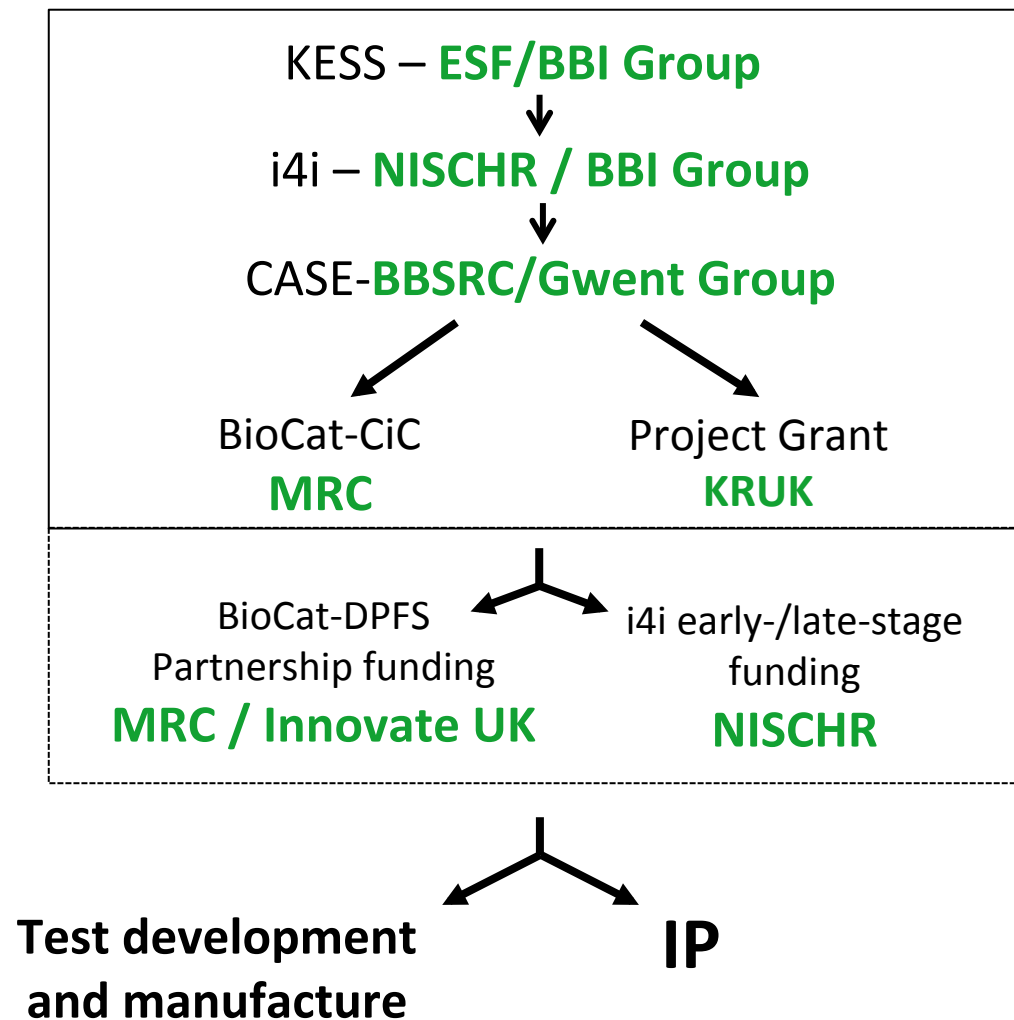
**MiRNA data from human kidney transplant patient urine samples**



- Urine samples from post-transplant patients
- Comparison with IRI/IPC rat models
- Analysis of perfusate solution underway

**Biomarker miRNAs to predict transplantation outcomes**

# Urinary microRNA biomarker development



# Acknowledgements

WKRU, Cardiff University

**Cristina Beltrami**

**Kate Simpson**

**Usman Khalid**

Robert Jenkins

Chris Carrington

**Donald Fraser**

Cardiff University

Aled Clayton

**James Redman**

**Ian Weeks**

**BBi Group Pete Corish**

**The Gwent Group Guido Drago**

**Dept Renal Medicine, QEH, Birmingham**

**Paul Cockwell** et al.

**Academic Renal Unit, Bristol University**

**Simon Satchell**, Richard Coward et al.

**All Wales Kidney Research Network**



## Contact details

Tim Bowen PhD

Senior Lecturer in Matrix and Molecular Biology

Department of Nephrology

School of Medicine

College of Biomedical and Life Sciences

Cardiff University

Heath Park

Cardiff CF14 4XN UK

Tel direct: +44-(0)29-2074-8389

Tel office: +44-(0)29-2074-8467

Fax office: +44-(0)29-2074-8470

Web home: <http://medicine.cf.ac.uk/person/dr-timothy-bowen/>