

BIORESOURCE PAPER

The Wales Cancer Bank (WCB)

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The Wales Cancer Bank (WCB) was established in 2004 and consents patients in Wales, UK with a known or suspected cancer diagnosis to donate biosamples for future research. The resource is open access to all researchers working in cancer research, regardless of geographic location or employment sector. To December 2017, just over 13,500 patients have donated samples across a variety of tumour types. Tumour and adjacent normal tissue and blood samples are routinely collected, stored and processed to standardised protocols. Bespoke collections for unique samples such as urine or ascites are also available. Pathology data, clinical data including treatment and outcome data and selected molecular data is also available.

Keywords: biobank; cancer; biosamples; bioresource; clinical data; research

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(1) Bioresource Overview

Project description

Give a general aim and description of the project that led to the bioresource creation (200–300 words with a maximum of 10 key references).

The aim of the Wales Cancer Bank (WCB) has always been to be a disease orientated resource to help inform health strategy, cancer treatment and facilitate the movement towards personalised medicine for the Welsh population and beyond.

The mandate to collect tumour and other samples from cancer patients in Wales, for future, unspecified research, was envisaged to give a solid infrastructure to facilitate research leading to the identification, validation, and use of new targets for cancer therapies, as well as better selection of existing therapies. The move towards targeted treatment relies on robust models and tests carried out on human tissue to replicate disease initiation, progression and outcome as closely as possible to the *in vivo* reality and the provision of high quality, well annotated biosamples is the key to achieving such goals.

WCB collects samples from cancer patients at multiple sites across Wales [1]. Patients undergoing surgical procedures are consented and tumour tissue surplus to diagnostic requirements is banked as snap frozen tissue and/or formalin-fixed and paraffin-embedded (FFPE). Tissue samples are provided with highly detailed histopathological data and sample processing times and storage conditions are recorded and available upon request.

Additional blood samples are also taken, and processed into various derivatives (whole blood, serum, plasma and

cell fraction). Collections now include longitudinal blood sampling from patients that are undergoing chemotherapy and radiotherapy. Serum and plasma samples are processed at multiple time points throughout the patient's treatment of the disease. Blood samples are also collected from patients that have disease progression or relapse. In some cases, if surgical intervention is required, tissue samples are also banked from these patients.

Linkage with the all Wales Cancer Clinical database (CaNISC) enables collection of clinical data. Confidentiality is paramount, and all data is stored securely and only anonymised samples are issued to researchers.

Classification (1)

Human.

Species

Homo sapiens.

Classification (2)

Biological samples and associated data.

Context

Spatial coverage

The biobank is managed centrally from Cardiff University and sample collection takes place in the National Health Service (NHS) hospitals around Wales.

Samples have been collected in several hospitals around Wales:

University Hospital of Wales (Cardiff)

Llandough Hospital (Cardiff)
 Velindre Cancer Centre (Cardiff)
 Royal Gwent Hospital (Newport)
 Nevill Hall Hospital (Abergavenny)
 Singleton Hospital (Swansea)
 Morriston Hospital (Swansea)
 Princess of Wales Hospital (Bridgend)
 Prince Charles Hospital (Merthyr Tydfil)
 Prince Philip Hospital (Llanelli)
 West Wales General Hospital (Carmarthen)
 Withybush General Hospital (Haverfordwest)
 Ysbyty Gwynedd Hospital (Bangor)
 Glan Clwyd Hospital (Rhyl)

Description: Pan Wales collection
 Northern boundary: +53.34/-3.77
 Southern boundary: +51.39/-3.45
 Eastern boundary: +52.54/-3.01
 Western boundary: +51.86/-5.26

Temporal coverage

The start date of the collection was 2005 and is ongoing with no current end date.

Temporal coverage for accessibility

n/a

(2) Methods

Describe the methods used to collect the bioresource (ca. 100–200 words) using the following sub-headings:

Steps

Patients are consented to donate tissue and blood samples. Donated tissue is surplus to diagnostic requirement that has been removed during a routine clinical procedure. Additional blood samples are taken during routine diagnostic or clinical appointments. Informed consent is required and consent forms are managed and retained by WCB. Standard operating procedures (SOPs) are in place to cover the consent and withdrawal process.

Patients are assigned a linked anonymised WCB number and any samples related to that donation have a uniquely derived 2D barcode. This number is used to track the samples on the WCB sample management database.

Tissue samples are processed by NHS trained and certified staff through the hospital histology departments and only surplus material is passed to the biobank.

Blood samples are taken by a suitably trained person and other fluids (eg. urine, ascites) may also be collected. SOPs are in place to cover sampling, processing, labelling, transportation and storage of each type of sample collected.

Patient information, clinical and pathology data is sourced from hospital records and is stored alongside the sample information within the sample database. No patient identifiable material is included and all data is stored under the assigned unique WCB number.

SOPs cover all processes including biobank management, data management, equipment and audit. All staff are trained to the SOPs at induction and audited annually

to ensure compliance. Process and data audits are also carried out to ensure adherence to SOPs.

Stabilization/preservation

Blood is collected in both EDTA tubes and in clot-activator tubes.

Tissue samples are either placed in formalin prior to embedding in paraffin or transported on ice prior to freezing with dry-ice cooled isopentane. If fresh tissue is required, tissue is placed in culture medium and shipped immediately to the researcher.

Type of long-term preservation

FFPE tissue

Frozen tissue

Frozen serum, plasma, whole blood, DNA, RNA

Samples are labelled with a unique barcode that includes the WCB number. No patient identifiable data is included.

All storage containers (cabinets/drawers/freezers) are locked and located in a keypad or swipe-card entry-controlled laboratory. Access to laboratories and the WCB database is restricted to current WCB staff.

Storage temperature

–80°C: snap-frozen tissue, whole EDTA blood, processed blood products, nucleic acids.

Ambient (18–25°C): FFPE tissue blocks and slides, TMA blocks and slides.

Shipping temperature from patient/source to preservation or research use

0–4°C (on ice): tissue to freeze or fresh tissue to culture.

Ambient (18–25°C): tissue in formalin, blood samples.

Shipping temperature from storage to research use

–80°C (on dry ice): frozen tissue, frozen blood or blood products.

Ambient (18–25°C): FFPE tissue.

Quality assurance measures

Tissue samples are examined by a pathologist to assess:

- presence of tumour tissue
- percentage tumour epithelium
- necrosis
- marked lymphoid infiltrate

A new H&E section is taken after supply of sections to a project to ensure current QA details are available and entered on the tracking database.

Nucleic Acids:

DNA samples: Quantity and quality (260/280 and 260/230 ratios) are assessed using nanodrop, Qubit and agarose gel Electrophoresis. Data is available upon request.

RNA samples: Quantity and RNA integrity is assessed using the Agilent Bioanalyser.

Source of associated data

Associated data is manually collected from hospital medical records, both paper and/or electronic (all NHS managed resources). A family questionnaire was also implemented, and the associated data is available for some patients. Data is audited by cross-referencing and regular manual checks.

Ethics Statement

The Wales Cancer Bank has ethics approval as a Research Tissue Bank from the Wales Research Ethics Committee 3, reference 16/WA/0256 (previous approval references – 06/MRE09/26 and 11/WA/0279). This approval covers the collection of samples (including consent), processing and storing samples across multiple collection and storage sites. The approval also allows release of anonymised samples to researchers carrying out cancer related activity, following successful application approval from the WCB External Review panel. The reviewers are an international group of experts, currently comprising of five members, who score applications and make recommendations to WCB. Researchers worldwide and working in any sector (academia, biotech, pharma etc) can apply to WCB to access samples and/or data.

The WCB is licensed by the Human Tissue Authority under the UK Human Tissue Act (2004) to store human tissue, taken from the living, for research (licence 12107).

Patients consent to unspecified future research on their donated sample, allowing genetic analyses to be performed. Additional consent for xenografting is obtained for specific studies.

Constraints

Activity is limited to patients attending hospitals in Wales with a known or suspected malignancy, and by available staff to consent patients. Patient samples will only be collected during routine clinical procedures performed during their standard of care treatment. WCB is a not-for-profit resource and is heavily reliant on research grants and cost recovery income.

(3) Bioresource description**Object name**

Cancer.

Bioresource name

The Wales Cancer Bank.
Acronym: WCB.

Bioresource location

The resource is managed centrally within Cardiff University:

The Wales Cancer Bank
Cardiff University
A2, 2nd floor
University Hospital of Wales
Heath Park
Cardiff, CF14 4XN, UK

Patients are (or have been) consented in several hospitals around Wales:

University Hospital of Wales (Cardiff)
Llandough Hospital (Cardiff)
Velindre Cancer Centre (Cardiff)
Royal Gwent Hospital (Newport)
Nevill Hall Hospital (Abergavenny)
Singleton Hospital (Swansea)
Morrison Hospital (Swansea)
Princess of Wales Hospital (Bridgend)
Prince Charles Hospital (Merthyr Tydfil)
Prince Philip Hospital (Llanelli)
West Wales General Hospital (Carmarthen)
Withybush General Hospital (Haverfordwest)
Ysbyty Gwynedd Hospital (Bangor)
Glan Clwyd Hospital (Rhyl)

Bioresource contact

wcbresearchapplications@cardiff.ac.uk

Bioresource URL

<http://walescancerbank.com/>

Identifier used

n/a

Bioresource type

Cancer.

Type of sampling

Disease based.

Anatomical site

All cancer, with recent focus on breast, lung, colorectal and prostate see **Figures 1** and **2**.

Disease status of patients/source

Malignant disease.

Clinical characteristics of patients/source

Adults (>16 years).

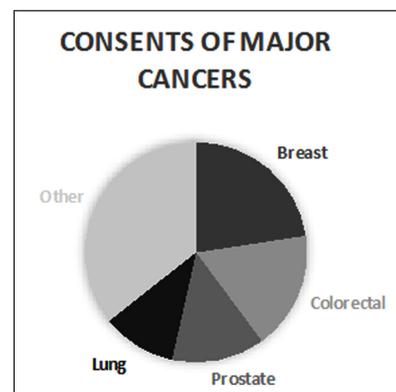


Figure 1: Proportion of consents within the bank that fall into the major cancers, breast, colorectal, prostate and lung. Consents from these four cancer types account for 67% of the collection.

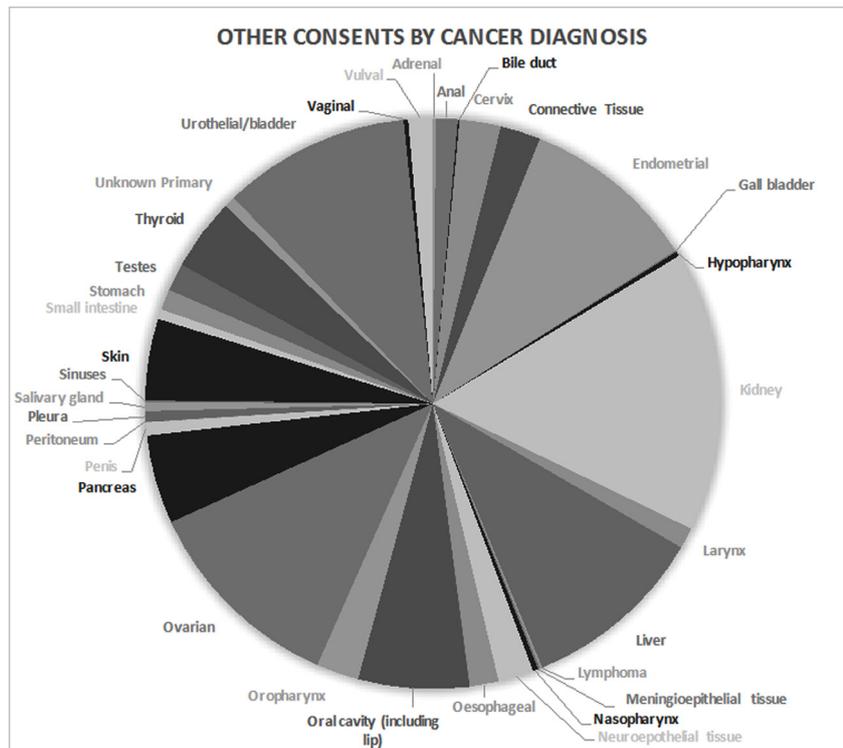


Figure 2: Proportion of consents within the bank that fall into the 'other' cancers. Consents from these cancer types account for 33% of the collection and include head and neck, renal, gynecological and bladder cancers.

Male and female.

Known or suspected malignant disease.

Tissue samples collected at biopsy, resection and metastasis (majority collected at resection).

Blood samples collected at time of biopsy, resection, metastasis and a small cohort of longitudinal sampling throughout treatment.

Size of the bioresource

13,600 patients currently consented with collection ongoing.

Vital state of patients/source

Alive.

Clinical diagnosis of patients/source

Cancer (Malignant disease).

Pathology diagnosis

Malignant disease – various.

Control samples

Small number of blood samples and/or genomic DNA from a control group. The control group were non-blood relations living in same environment (eg. spouse, partner) of the cancer patient. These samples are archived and collection for the control group is no longer ongoing.

Adjacent cancer-associated normal tissue is collected from cancer patients (patient –matched control).

Biospecimen type

Frozen tissue: tumour and adjacent normal – approx. 5 mm, 1 tumour and 1 normal per patient. Frozen tissue available for approximately 15% of collection.

Paraffin embedded tissue (FFPE) – tumour and normal adjacent, 1–2 blocks per patient. FFPE tissue available for approximately 50% of collection.

Whole Blood: 4 ml EDTA blood tubes.

Serum: 0.5 ml aliquots.

Plasma: 1 ml aliquots.

DNA (tissue): 3ug in 50ul aliquots.

RNA (tissue): 5ug in 20ul aliquots.

DNA (blood): 1ug.

Tissue Microarrays (TMA): Breast Invasive Ductal Carcinoma, Prostate and Renal Cancer.

Concentrations and volumes stated are the standard aliquot size stored and available to access from WCB. The number and type of biospecimens available per patient will vary depending upon the initial amount/volume of tissue or blood sample sourced.

Size of the bioresource

To date 13,600 patients have been consented with collection ongoing.

Release date

Open for applications.

Access criteria

Researchers worldwide and working in any sector can apply to WCB to access samples and/or data. The research must be cancer related. The WCB's access policy and procedures are approved by the Wales Research Ethics Committee 3 and anonymised samples and data can be issued to researchers without further ethical committee review on successful completion of the WCB application process.

An online search facility (<http://walescancerbank.com/online-search.htm>) allows researchers to perform a preliminary availability search on the samples in the biobank. Researchers requiring further information or assistance or wishing to initiate bespoke collections (eg. fresh tissue or tumour/sample types not in the archive), should contact the WCB via email (wcbresearchapplications@cardiff.ac.uk) to ascertain feasibility and timescales.

Application is via a request form (online or via email), which includes a Material Transfer agreement. Applications are reviewed by an external (virtual) panel to ascertain scientific merit, appropriate use of samples and potential outcome from the study. The review takes 2–4 weeks, depending upon whether further information is required. Following approval, time to sample supply is dependent upon the number, type and availability of samples. A contribution to cost recovery fee is charged. This fee is dependent upon the number and type of samples requested, the level of required processing or data and any input from the requesting researcher. Acknowledgement in papers and return of raw data is also specified.

A requirement for publication of the paper is that the bioresource is guaranteed to be made available should these conditions be met.

(4) Reuse potential

(ca. 50–200 words) Please describe the ways in which the data/samples could be reused by other researchers.

Terms of supply stipulate that only the research approved in the application may be carried out on the samples and any subsequent activity or sample sharing between the researcher and their collaborators must be formally requested via an application amendment request. WCB does not require unused samples to be

returned and therefore will supply only the appropriate amount of sample to complete the research stated. Nucleic acids will be extracted by WCB and aliquot(s) supplied to researchers. Sections will be cut by WCB and supplied to researchers. Only in exceptional circumstances will an entire frozen or FFPE tissue block be issued. Due to this non-exclusive approach, samples from a patient may therefore be supplied to several research projects. WCB requests raw data back from researchers post publication or IP exploitation and strives to make this data available for bioinformatics mining or use by others.

Acknowledgements

Clinical Director – Prof R Adams; Scientific Director – Dr Richard Clarkson; Previous Director and Founder – Prof M Mason.

Patients who have kindly consented to WCB for collection of tissue, blood and clinical data for use in medical research.

Competing Interests

The authors have no competing interests to declare.

Author Roles

Alison Parry-Jones is the Bioresource Manager.

Lisa Spary is the Scientific Liaison Officer.

Reference

1. **Parry-Jones, A.** 2014. 'Assessing the Financial, Operational, and Social Sustainability of a Biobank: The Wales Cancer Bank Case'. *Biopreservation and Biobanking*, 12(6): 381–388 DOI: <https://doi.org/10.1089/bio.2014.0044>

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