LICENSING OPPORTUNITIES

Cancer Research UK has over 200 oncology-focused projects under development and potentially available for licensing or collaboration. All are involved in the fight against cancer and include novel chemotherapeutic and biological agents, diagnostic methodologies and enabling technologies. The projects range from new targets to therapies in pre-clinical development to those in Phase I/II clinical studies.

View our opportunities using the navigation below.

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- Antibody Enhancing Technology
SMALL MOLECULES

Chk2 Inhibitor Programme

**Lead Optimisation**
A potent and selective compound series with low nM activity against the Chk2 cell-cycle checkpoint kinase has been developed. Chk2 is a cancer target involved in cell cycle arrest and homologous recombination DNA repair. This programme currently comprises novel patented compounds, established biological assays and co-crystallographic methods to support and inform ongoing medicinal chemistry. The compound series demonstrates inhibition of Chk2 in cellular assays and in vivo xenografts, as well as good ADMET and physicochemical properties. Cancer Research UK is now seeking a commercial partner interested in pursuing a co-development or direct licensing arrangement.

Contact: Angus Lauder, Angus.Lauder@cancer.org.uk

Novel dual inhibitors of FLT3 and Aurora Kinases

**Clinic Ready**
Potent, orally bioavailable dual inhibitors of FLT3 (including clinically relevant FLT3-ITD-TKD mutant forms) and Aurora kinases have been developed. The strategy of dual FLT3/Aurora inhibition in a single agent has the potential to overcome the need for combination therapies in AML, and is predicted to have improved efficacy in FLT3-ITD+ AML and reduced susceptibility to resistance. Dual FLT3/Aurora kinase inhibitors also have potential for the treatment of other cancers. The Clinical Development Candidate demonstrates single agent growth inhibition in FLT3-ITD+ human AML xenografts in vivo, and overcomes mutation-driven resistance to selective FLT3 inhibition in AML xenograft in vivo. The project is ready to progress to the clinic, with pre-clinical toxicology studies completed, bulk API manufactured and a clinical protocol prepared. Cancer Research UK is seeking a co-development or licensing partner to take the Clinical Development Candidate into Phase I clinical studies.

Contact: Tanya Moore, Tanya.Moore@cancer.org.uk
SMALL MOLECULES

First in Class IKK Alpha Selective Inhibitors

Lead Optimisation
Inhibition of NF-κB signalling is an attractive approach in inflammation and cancer and the I kappa B kinases (IKK’s) are tractable targets within this pathway. However, emerging evidence suggests that inhibition of IKKβ may have clinical side effects and as such selective IKKα inhibitors may be attractive candidates. IKKα has been linked to a number of cancers and our unpublished data has identified a stratified population of prostate cancer patients where inhibition of IKKα could be applied. Our programme has also identified the first reported potent and selective IKKα inhibitors and the compounds are well placed to deliver a clinical candidate. Cancer Research UK is seeking a co-development or licensing partner to drive candidate selection and entry into formal pre-clinical studies.

Contact: Angus Lauder, Angus.Lauder@cancer.org.uk

Novel CDC7 Selective Inhibitors

Pre Clinical
Cdc7 is a highly conserved serine/threonine protein kinase and a core component of the licensing machinery required for origin unwinding of the DNA and recruitment of DNA polymerases required for DNA synthesis. Emerging evidence also suggests a link between Cdc7 and the DNA damage response.

Depletion of Cdc7 in cancer cell lines has been demonstrated to cause an abortive S phase and apoptotic cell death or aberrant mitosis. In contrast, in untransformed cells Cdc7 depletion results in a reversible arrest in G1 or a prolongation of S-phase and cells remain in a viable nonproliferative state. Cancer Research UK’s Cdc7 inhibitors show antiproliferative and tumour selective pro-apoptotic activity, consistent with this proposed mechanism of action.

Two chemical series have been optimised to deliver orally bioavailable, potent and selective inhibitors of CDC7. Positive POC has been achieved in a colorectal mouse xenograft model demonstrating target engagement and anti-tumour effect. Cancer Research UK’s lead series’ are differentiated from the clinical candidates of the competition by being both highly selective and of distinct chemical structure. Selectivity is likely to be critical to limiting the toxicity of cell cycle kinase inhibitors. A pharmacodynamic marker for clinical studies has been defined, and disease positioning and genetic patient selection strategy for CDC7 inhibitors is under continued investigation.

Contact: Tassos Konstantinou, Tassos.Konstantinou@cancer.org.uk
BIOLOGICAL THERAPEUTICS

CEA Antibodies

**Pre Clinical**
MFE-23 is a single chain Fv antibody that has high affinity for the tumour specific antigen CEA. Successful preclinical and clinical studies support its potential for use in a number of applications. These include Phase I studies conducted with radiolabelled MFE-23 for use as an imaging agent, for radioimmuno-guided surgery, and as the tumour-targeting moiety of an antibody-directed enzyme prodrug therapy. Humanised MFE-23 and higher affinity variants are also available. Cancer Research UK is seeking to secure a commercial partner(s) to develop these antibodies for therapeutic, imaging and/or diagnostic purposes. Collaborations and/or field-exclusive and non-exclusive licences are available.

Contact: Jesse Toe, Jesse.Toe@cancer.org.uk

αvß6-binding Peptides for Tumour Targeting

**In Vivo Proof-of-Principle**
Peptides which selectively bind to the integrin αvß6 with high affinity have been developed. The structural motif required for binding has been elucidated, and the consensus sequence is protected by a patent application. The peptides target tumours (including oral, pancreatic, ovarian, lung, colorectal and breast) and fibrotic lesions in which the integrin is over-expressed. The peptides have utility as imaging agents as well as for cancer therapy via targeting of payloads and functional inhibition of αvß6. αvß6 plays multiple regulatory functions in tumours including TGFß activation, cell proliferation, MMP production, cell invasion and survival. The ability of radiolabelled versions of the peptide to selectively localise to αvß6-expressing xenografts in vivo, including breast and pancreatic, has been demonstrated by PET and SPECT. Cancer Research UK is seeking to secure a commercial partner(s) to develop these peptides for therapeutic, imaging and/or diagnostic purposes. Collaborations and/or field-exclusive and non-exclusive licences are available.

Contact: Jesse Toe, Jesse.Toe@cancer.org.uk

MUC1 Antibodies

**In Vivo Proof-of-Principle**
MUC1, a transmembrane mucin family protein, is highly expressed in an underglycosylated form in multiple tumour types of epithelial origin, including over 90% of breast cancers. The glycosylation changes expose new peptide epitopes and oligosaccharides, making MUC1 an attractive target for antibody approaches that exploit the tumourspecific epitopes created. Several antibodies were raised against MUC1 and have been commercialised. We are seeking licensees for a package of patents, materials and know-how for development of these antibodies.

Contact: Irene Patzak, Irene.Patzak@cancer.org.uk

IGF2-Trap Therapy

**In Vivo Proof-of-Principle**
A novel IGF pathway therapeutic for treatment of a range of tumours that are associated with gain of function of IGF2 including hepatocellular carcinoma, sarcomas, adrenocortical carcinomas, breast, lung, prostate and colorectal cancers. The lead high affinity (sub 1nM Kd) Insulin-like Growth Factor 2 specific Ligand Trap (IGF2-Trap) comes with an extensive data package including protein sequence optimisation, Fc fusion constructs, in vitro assays, and demonstration of anti-IGF2 activity in vivo (hypoglycaemic model) recently published in PNAS PMID: 27140600. Cancer Research UK is seeking a partner to take the therapeutic forward into clinical development.

Contact: Elisabeth Parker, Elisabeth.Parker@cancer.org.uk
αvß6 Antagonistic Antibodies

**Lead Optimisation**
αvß6 integrin is a promising target for cancer therapy. It plays an active role in tumour progression and its high expression is linked to poor prognosis in many tumour types. Humanised single chain Fv and full IgG antibodies have been developed by inserting a proprietary short αvß6 binding peptide into a proprietary scaffold. The antibodies show remarkable binding selectivity for αvß6. *In vitro* studies support their potential utility to block αvß6-mediated cancer cell invasion or to deliver and internalise toxins specifically to αvß6-expressing tumours. Cancer Research UK is seeking a collaborative or licensing partner for the further development of anti-αvß6 antibodies.

Contact: Jesse Toe, Jesse.Toe@cancer.org.uk

TACE Antibody

**Pre Clinical Candidate**
TACE (ADAM17) is a membrane metalloprotease that cleaves and releases a number of substrates including EGF family growth factors, receptors such as the IL6 receptor and natural killer cell regulators like MICA. Many of these substrates have been linked to the growth and therapeutic response of tumours and their levels are controlled by TACE making this an interesting target. A package of data exists showing *in-vivo* modulation of TACE substrates and initial *in vivo* activity using our lead human antibody D1(A12) an antagonistic antibody that potently inhibits TACE activity. D1(A12) is selective for TACE and binds the human TACE protein (but not murine version). Cancer Research UK is seeking a commercial partner to take the lead antibody into formal pre-clinical studies and a package of data and US/EU patents are available for licensing.

Contact: Angus Lauder, Angus.Lauder@cancer.org.uk

Jagged1 Monoclonal Antibody

**In Vivo Proof-of-Principle**
The lead anti-Jagged1 monoclonal antibodies (mAbs) come with a strong data package demonstrating high specificity and low nM affinity binding, as well as having been humanised and deimmunised by Lonza. There is clear *in vitro* inhibitory action against Jagged1 and its downstream targets. Efficacy has been demonstrated *in vitro* in 3D spheroids to a similar degree as the pan-Notch γ-secretase inhibitors and *in vivo* in breast cancer and ovarian cancer xenograft models. They bind to a novel Jagged1 epitope that distinguishes them from others in the field as outlined further in our patent application WO 2014111704. Cancer Research UK is seeking a co-development partner or a licensee to take the mAbs forward into clinical development.

Contact: Elisabeth Parker, Elisabeth.Parker@cancer.org.uk

Anti-CD55 Antibodies

**Discovery**
CD55 is a complement regulatory protein overexpressed on a number of tumours and protects the tumour cells from complement-dependent cytotoxicity (CDC). A chimeric antibody has been developed from a mouse anti-CD55 antibody that has been extensively used in the clinic as an imaging agent with no observed antibody-associated toxicity. Blocking CD55 using Cancer Research UK’s chimeric anti-CD55 antibody has the potential to elicit both CDC and antibody-dependent cell-mediated cytotoxicity (ADCC) offering new therapeutic avenues both alone and in combination with other agents. The project comes with granted patents with the potential to generate novel IP through further development. Both the chimeric and mouse antibodies are available for licensing and/or collaboration.

Contact: Fiona Middleton, Fiona.Middleton@cancer.org.uk
LICENSING OPPORTUNITIES
Updated July 2017

BIOLOGICAL THERAPEUTICS

LMP2-T Cell Receptor

Pre Clinical
Researchers from the University of Birmingham have developed a novel T-cell receptor (TCR) targeting the viral protein LMP2 in Epstein Barr Virus (EBV)-associated nasopharyngeal carcinoma (NPC). EBV is detected in almost all NPC patients and is strongly associated with NPC pathogenesis through HLA-restricted alleles. NPC is unusually common in Southeast Asia and China, where it accounts for 63% of the 87,000 cases of NPC worldwide. Consequently, an HLA A*1101 restricted TCR was selected for development since this allele is found in a significant proportion of people of Chinese and Southeast Asian origin. The gene transfer approach of the LMP2-TCR enables significantly faster (48h) preparation of patient-derived T-cells compared to the 9 weeks for alternative co-culture methods for autologous cell therapies. We have demonstrated excellent in vivo efficacy with no observed toxicities. This technology is also suitable for other EBV cancers expressing LMP2 including, NK/T-cell lymphoma and around 10% of gastric cancers. A patent covering the technology and the relevant sequences is in PCT phase. Cancer Research UK is seeking a partner experienced in the field of cell therapy development and in the Chinese regulatory environment to take this technology through to first in man trials in China via a licence or collaborative route.

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S100A4 Neutralising Antibody

In Vivo Proof-of-Principle
S100A4 is a calcium binding protein which interacts with and regulates multiple cancer-relevant cell signalling pathways, such as apoptosis, proliferation, motility, invasion and angiogenesis. S100A4 has a well-validated role in metastasis and tumour progression and has been associated with poor prognosis in a number of solid tumours. A mouse monoclonal anti-S100A4 antibody has been developed that has high affinity and specificity for the metastasis-associated protein, is highly selective against other S100 proteins and comes with a strong package of in vivo proof of concept data as an anti-metastatic therapy. In addition, data suggest the antibody may have an immunomodulatory effect by reversing the Th2:Th1 phenotype in T-cells and delays primary tumour growth. A patent has been filed to protect the lead antibody and novel epitope. Cancer Research UK is seeking a partner for collaboration or licensing to further develop this antibody.

Contact: Fiona Middleton, Fiona.Middleton@cancer.org.uk

CCR4

In Vivo Proof-of-Principle
Fully human IgG1 anti-CCR4 antibodies are available for licensing and/or collaborative development. Due to its expression on tumour infiltrating immune cells, including regulatory T-cells and pro-tumour M2 macrophages, chemokine receptor CCR4 represents an exciting target for cancer immunotherapy. Although CCR4 is known to be highly expressed in haematological cancers of T-cell origin, recent data from Professor Fran Balkwill (Queen Mary University of London) also suggest a therapeutic potential for anti-CCR4 antibodies in solid cancer indications, including renal cell carcinoma (RCC). In vivo efficacy of our antibodies has been demonstrated in both an adult T cell lymphoma xenograft model and an orthotopic syngeneic model of RCC. Mechanism of action studies carried out in collaboration with Professor Balkwill demonstrate that the antibodies function (at least in part) by repolarising the tumour microenvironment, through promoting an increase in Th1 type versus Th2 type cytokines and inducing a pro-tumour M2 to anti-tumour M1 macrophage switch, suggesting that treatment with our antibodies would be advantageous in highly immunosuppressive microenvironments. The dual ‘function-blocking’ and ‘ADCC’ properties of the antibodies suggest an advantage over competitor programmes.

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LICENSING OPPORTUNITIES
Updated July 2017

BIOLOGICAL THERAPEUTICS

p53 TCR Mimic

In Vivo Proof-of-Principle
This opportunity has produced a lead T-Cell Receptor mimic (TCRm) monoclonal antibody (mAb) against an HLA-A*0201 presented peptide derived from the cancer target p53, that is mutated in 50% of human tumours and deregulated in many more. Currently we have selectivity and specificity data on the lead mAb, with positive preliminary data for Antibody Dependent Cell-mediated Cytotoxicity (ADCC), Complement Dependent Cytotoxicity (CDC), Antibody Dependent Cellular Phagocytosis (ADCP), as well as in vivo efficacy data in a mouse xenograft model. In addition the antibody is shown to internalise making it suitable for use in an Antibody Drug Conjugate (ADC) approach. Cancer Research UK is seeking a co-development/licensing partner to take the antibody forward into clinical development, and would be happy to provide more data under CDA as our PCT patent application is currently unpublished.

Contact: Elisabeth Parker, Elisabeth.Parker@cancer.org.uk

CLEC14a

In Vivo Proof-of-Principle
CLEC14A is a novel target of high interest for anti-angiogenesis therapies. This is mainly due to its specific expression in tumour endothelial cells. Cancer Research UK has generated murine monoclonal antibodies recognising both human and mouse CLEC14A and is currently evaluating them in vivo as naked Abs and ADCs. Both approaches have demonstrated the ability of CLEC14A inhibition to substantially reduce the tumour burden as well as inhibit cell migration and invasion. Cancer Research UK is seeking to exclusively license the patent application and related know how / materials for development of anti-CLEC14A antibody based therapy.

Contact: Tassos Konstantinou, Tassos.Konstantinou@cancer.org.uk
αvß6 Binding Peptides for Imaging

**In Vivo Proof-of-Principle**

Peptides which selectively bind to the integrin αvß6 with high affinity have been developed. The structural motif required for binding has been elucidated, and the consensus sequence is protected by a patent application. The peptides have utility for targeting tumours (including oral, pancreatic, ovarian, lung, colorectal and breast) and fibrotic lesions in which the integrin is over-expressed. The peptides have applications in tumour imaging as well as in cancer therapy via targeting of payloads and functional inhibition of αvß6. αvß6 plays multiple regulatory functions in tumours including TGFß activation, cell proliferation, MMP production, cell invasion and survival. The ability of radiolabelled versions of the peptide to selectively localise to αvß6-expressing xenografts in vivo, including breast and pancreatic, has been demonstrated by PET and SPECT. Collaborations and/or field-exclusive and non-exclusive licences are available.

Contact: Jesse Toe, Jesse.Toe@cancer.org.uk

MCM Lung

**Diagnostic**

Over 1.3 million people worldwide are diagnosed with lung cancer each year. Cancer Research UK’s technology offers a rapid and cost effective approach for the diagnosis of lung cancer based on MCM detection in sputum. A study of 597 patients has revealed that combining sputum MCM immunocytochemistry testing with chest X-rays offers equivalent sensitivity and specificity values as the standard diagnostic approach of sputum cytology and X-rays. The MCM/X-rays combination test provides the advantage of being a simpler and more rapid procedure. In addition, the method has the potential to significantly decrease the number of patients requiring follow-on diagnostic testing and removes the requirement for a highly skilled cytopathologist at initial diagnosis, resulting in a substantial cost saving. Cancer Research UK is looking for a partner to develop a MCM sputum-based diagnostic test under a licence to a granted multiple-territory portfolio of patents on the target antigen and MCM specific antibodies.

Contact: Julie Little, Julie.Little@cancer.org.uk
ENABLING TECHNOLOGY

Optimam Mammography Image Database and Viewing Software

Software
The database has been created to support research involving medical imaging aimed at optimising the use of existing and adoption of new X-ray imaging technologies, including digital breast tomosynthesis (DBT), for detecting breast cancers and improving early detection in the NHS Screening Programme. This very valuable database is constantly being added to and currently contains over 80,000 processed and unprocessed digital images, typically for women who have had screen detected breast cancer. The images are annotated with the location and appearance of cancers, and where applicable, expert determined ground truths describing features of interest are added. MedXViewer is a separate bespoke software application designed to allow workstation independent, PACS-less viewing and interaction with mammography images. Regions of interest can be identified by a user and any associated information about a mark, an image or a study can be added. The flexible software design allows the application to be easily extended to support other imaging modalities. Images and software are available for licensing. Cancer Research UK is also seeking collaborative partners interested in using and helping to develop the available tools.

Contact: Julie Little, Julie.Little@cancer.org.uk

Imaging Agent for Prostate and Glioma Tumour Detection

In Vivo Proof-of-Principle
Our tracer 18F-FDMP is based on a pivalic acid structure and is designed for imaging the first steps of lipid metabolism. We have tested this tracer in the indications of breast, prostate and brain tumours, where it performed better than the gold standard 18F-FDG. We anticipate utility in a greater range of indications, including inflammatory disorders and brain lesions. Due to its composition, the imaging agent can be labelled to be used in PET, SPECT and DNP imaging. Cancer Research UK is seeking licensees for the patent and know-how for development of this imaging agent.

Contact: Irene Patzak, Irene.Patzak@cancer.org.uk

RALA

In Vivo Proof-of-Principle
RALA is a novel cell penetrating peptide for delivering biologic cargoes inside cells. Compared to other technologies in the field, RALA is characterised by low immunogenicity, minimal toxicity and high transfection efficiency. The RALA peptide has been evaluated in several in vivo proof-of-concept studies, and is best exemplified by the therapeutic delivery of the inducible nitric oxide synthase gene in highly aggressive models of metastatic breast and prostate cancer. In addition to DNA, RALA has demonstrated the ability to deliver small molecules, RNAi and mRNA in vitro and in vivo. Cancer Research UK is currently seeking partners for licensing and/or collaborative development of the RALA peptide, and welcomes interest in exploring alternative applications and payloads.

Contact: Tassos Konstantinou, Tassos.Konstantinou@cancer.org.uk
MEDICAL DEVICES

Biological Fluid Filtration Device

Clinical testing
Most patients with blood in the urine will undergo cystoscopy to rule out bladder cancer. Cystoscopy is the gold standard for bladder cancer diagnosis due to its high sensitivity and specificity. However, only ~10% of patients who undergo a cystoscopy have bladder cancer with many patients needlessly undergoing this invasive and expensive test. Inventors at the Danish Cancer Society have developed a diagnostic-compatible device for the concentration and isolation of tumour cells found in urine. The device improves the sensitivity and specificity of molecular diagnostics based test performed on isolated tumour cells. Cancer Research UK is now working with a commercial investors to bring the device to the market and is seeking partners with in vitro diagnostic test in the uro-oncology space.

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NEW AND OTHER OPPORTUNITIES

IBIS Software (Tyrer-Cuzick Model)

Risk/Predisposition
The Tyrer-Cuzick model is a breast cancer risk assessment tool incorporating family history, endogenous hormonal factors, benign disease, risk factors such as age and body mass index, as well as genetic factors (including BRCA) into a single statistical model. The Tyrer-Cuzick model has been shown in independent studies to be the most consistently accurate when compared with other available risk assessment models. The model has been incorporated into a computer programme, the IBIS software that gives a personalised risk estimate. IBIS is available for non-exclusive licensing for stand-alone use or for incorporation into broader software platforms.

Contact: Jesse Toe, Jesse.Toe@cancer.org.uk

S100A4 Neutralising Antibody for Inflammatory Diseases

In Vivo Proof-of-Principle
S100A4 is a calcium binding protein which has been associated with a number of inflammatory diseases such as rheumatoid arthritis, psoriasis and seasonal allergic rhinitis. Cancer Research UK’s monoclonal mouse anti-S100A4 antibody has a high affinity for the target and is selective for S100A4 over other S100 family members. The antibody comes with in vivo proof of principle data generated in a mouse model of allergic dermatitis showing that it reverses some of the hallmarks of allergy. This potential first in class therapy for inflammatory diseases is available for further development through licensing or collaboration.

Contact: Fiona Middleton, Fiona.Middleton@cancer.org.uk

Antibody Enhancing Technology

In Vivo Proof-of-Principle
The technology shows that isotype-dependent, FcγR-independent mechanisms are very important determinants of monoclonal antibody (mAb) activity and may have profound implication for the development of agonistic (or super agonistic) mAb-based therapeutics.

Through a combination of in vitro and in vivo approaches the inventors show that IgG2 hinge and CH1 domains (h2 regions) delivers unique FcγR-independent super agonistic activity to anti-CD40 antibodies and to antibodies specific to other immunostimulatory receptors, including 4-1BB and CD28.

This patented technology may allow to manipulate the disulfide bond configuration of the h2 regions to control the action of mAbs directed against a range of immune receptors, thereby permitting the fine-tuning of biological function with defined therapeutic activity regardless of FcγR expression levels in the local microenvironment. Cancer Research UK is seeking to license the technology on a non-exclusive basis.

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