



# Oncology Technologies at The University of Chicago

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# Oncology Therapeutics: Immunotherapy

# Oncology Therapeutics: Immunotherapy

## [Gajewski UCHI 2381](#)

### Beta-Catenin inhibitors in cancer immunotherapy

- While cancer therapies are being revolutionized by the development of effective immunotherapeutic approaches, only a subset of patients respond to such treatments.
- [Dr. Thomas Gajewski](#) has identified an association between active  $\beta$ -catenin signaling in human melanoma and the absence of a host immune response indicating that inhibition of the  $\beta$ -catenin pathway could re-establish host immune response to immunotherapies such as anti-PD1.
- Pharmacologic strategies to block  $\beta$ -catenin can restore immune recognition and enhance responsiveness to immunotherapeutics.
- The mechanism by which active  $\beta$ -catenin signaling results in T-cell exclusion and resistance to anti-PD-L1/anti-CTLA-4 mAb therapy was demonstrated in a genetic mouse model.
- A PCT application is pending on compositions and methods for the treatment of cancer using  $\beta$ -catenin or  $\beta$ -catenin pathway inhibitors and is available for licensing.
- The investigators seek collaborations to test the efficacy of specific molecules directed at targets identified through this work in mouse models of cancer.

## [Gajewski UCHI 2184](#)

### Synergistic combination of immunologic Inhibitors for the treatment of cancer

- Therapies that engage just one immune inhibitory pathway demonstrate limited success, but combination therapies that rely on immunologic synergy and target multiple pathways can produce more comprehensive anti-tumor activity.
- [Dr. Thomas Gajewski](#) has determined that immunologic modulators that address different aspects of immune dysregulation in tumor cells have synergistic anti-cancer effects.
- Pairs of inhibitors of indoleamine-2,3-dioxygenase (IDO), the PD-L1/PD-1 pathway, or CTLA-4 have shown to be substantially more effective than any one inhibitor alone.
- Blocking CTLA-4, PD-L1, or IDO pathways in various combinations resulted in improved tumor control in vivo likely through the observed surge in CD8+ T cell response that jumpstarts native IL-2 activity.
- Patent applications are pending US, Europe and Canada directed towards methods of using combinations of inhibitors of IDO, the PD-L1/PD-1 pathway, and CTLA-4 for the treatment of cancer and are available for licensing.
- The investigators are interested in pursuing clinical or pre-clinical collaborations to identify and characterize optimal combinations of immunologic modulators.

# Oncology Therapeutics: Immunotherapy

## [Gajewski UCHI 1184](#)

### Immune response regulation for the treatment of cancer and autoimmune disorders

- Despite the presence of tumor-associated antigen-specific T cells, the human immune system can be prevented from mounting a normal immune response against tumors via a mechanism known as T-cell anergy.
- [Dr. Thomas Gajewski](#) has determined that down-regulation of diacylglycerol kinase (DGK) can alleviate anergy, allowing the immune system to mount a defense against cancer cells.
- Small molecule inhibitors of DGK could reverse T-cell anergy and induce an immune response for cancer therapy. Conversely, activators of DGK could down-regulate the overactive immune system in autoimmune patients.
- T cells from anergic mice demonstrated substantial recovery (2.4 - 4.8 fold) of IL-2 production when treated with a DGK inhibitor.
- A US patent has been issued on methods of boosting an immune response by alleviating T cell anergy with a DGK inhibitor and is available for licensing.
- Dr. Gajewski is seeking collaboration to identify additional DGK inhibitors to test in tumors and DGK activators in autoimmune disease.

## [Gajewski UCHI 2232](#)

### Treatment of cancer through targeting the EGR2 transcriptome

- Overcoming the immune system's tolerance of cancer cells through ablation of T-cell anergy can increase the efficacy of immunotherapy for cancer.
- [Dr. Thomas Gajewski](#) has identified an EGR2-based gene signature that differentiates between immune-responsive and non-responsive tumors.
- The EGR2 transcriptome of anergic T-cells identifies numerous potential drug targets.
- Validated studies from three independent genome-wide expression and ChIP-sequencing analyses identified a key set of genes involved in the immune response to cancer.
- National applications have been filed in the U.S. and EPO on methods for diagnosis and treatment of cancer through identification and suppression of T-cell anergy by way of the EGR2 transcriptome and are available for licensing.
- The gene expression signature offers opportunities for development of powerful new therapeutics.

# Oncology Therapeutics: Immunotherapy

## [Lengyel UCHI 2415](#)

### Novel targets for T-cell-based immunotherapies and vaccines against ovarian cancer

- Immuno-oncology is widely considered the future of cancer treatment, and immunotherapies are more effective when they can be targeted effectively towards the tumor cells.
- [Dr. Ernst Lengyel](#) and his colleagues have discovered that abnormal expression of novel peptides in advanced ovarian cancer can serve as new targets for T-cell-based immunotherapies and cancer vaccines.
- Novel peptide fragments of an abnormally expressed protein are displayed on the surface of ovarian cancer cells in a HLA-dependent manner, and can elicit robust immune responses in vitro.
- Complementary liquid chromatography-mass spectrometry-based peptidomics analyses identified a set of peptides of this protein, which were then tested across different ovarian cancer cell lines for their ability to induce T-cell stimulation and proliferation.
- A provisional application is pending for 1) methods of treating patients using immunotherapies that target the novel peptides and 2) an associated biomarker for predicting responsiveness.
- Investigators are conducting further experiments to validate the targets for use in immunotherapies.

## [Weichselbaum UCHI 2259](#)

### Methods for anti-tumor therapy based on the pathways of cytoplasmic RNA and DNA sensing

- There is a need for new approaches to cancer therapy as standard treatments become less effective against radioresistant and chemoresistant tumors.
- [Dr. Ralph Weichselbaum](#) has meticulously characterized the key effectors in the DNA/RNA-sensing pathway (cGAS and LGP2) that when modulated correctly, can promote enhanced irradiation effects by increasing IFN- $\beta$  – an immune cytokine known to have tumor-suppressing and apoptotic effects.
- Modulators of cGAS, LGP2, or RIG-I would sensitize resistant tumors to chemotherapeutics and radiation therapy for effective cancer treatment.
- In chemo- and radio-resistant cancer cell lines and xenograft mouse models, siRNA depletion of LGP2 enhanced cell death when combined with 5 Gy radiation whereas increasing cGAS levels provided a similar potent effect when combined with radiation.
- Nationalized applications in the US and EU are pending for methods and compositions for treating cancer by targeting these effectors. A US application is pending on compositions of oligonucleotide modulators of RIG-I.
- Dr. Weichselbaum is seeking commercial partnerships to further develop cancer therapeutics against these novel pathway targets.

# Oncology Therapeutics: Small Molecules



# Oncology Therapeutics: Small Molecules

## [Connell UCHI 2516](#)

### Rad51 inhibitors for cancer therapy

- Upregulated expression of Rad51, a recombination-based DNA repair protein, is correlated with aggressive tumor pathology, making Rad51 inhibition a potential therapeutic approach.
- Inhibitors of Rad51 are applicable for oncology, and [Dr. Philip Connell](#) and colleagues have developed a suite of technologies involving small-molecule inhibitors of Rad51.
- Two classes of Rad51 inhibitors have been developed which exploit two different activities of the protein. Class I blocks Rad51 from binding to ssDNA, while Class II blocks Rad51 D-loop formation.
- The Rad51 D-loop formation inhibitors preserve the beneficial function of Rad51 protein in protecting stalled replication forks from degradation. This has been demonstrated to inhibit outgrowth of tumor cell lines after exposure to ionizing radiation.
- The university holds both an issued patent and pending applications on composition and methods of use of Rad51 inhibitors.
- Investigators are currently collaborating with chemists to optimize Rad51-inhibiting compounds and investigate the next generation of D-loop inhibitors.

## [Connell UCHI 1524](#)

### Rad51 stimulators for cancer therapy

- RAD51, an enzyme involved in DNA double-stranded break repair, can protect cells from death caused by DNA damage. The protein is overexpressed in multiple malignancies including subsets of breast, lung, and prostate cancers.
- [Dr. Philip Connell](#) and his team have used high-throughput screening methods to identify a suite of Rad51 stimulators that can be used either as a) protective agents for healthy tissue in patients undergoing DNA damaging therapies or b) cytotoxic therapeutics for cancers overexpressing Rad51.
- These stimulators enhance the DNA binding activity of RAD51, leading either to protection of healthy cells or to accumulation of RAD51-DNA complexes and subsequent cell death in Rad51-overexpressing cancer cells.
- A stimulator compound has been demonstrated to have anti-tumor effects in *in vivo* mouse models of prostate cancer. Inhibition of tumors was also demonstrated in similar experiments using HEK-293 xenograft models
- A US patent was issued on the composition and methods of using Rad51 stimulators to protect healthy cells from radiotherapy and chemotherapy damage.
- Investigators are conducting structure-based optimization of compounds.

# Oncology Therapeutics: Small Molecules

## [Lengyel UCHI 2006](#)

### **Inhibition of Fatty Acid Binding Protein (FABP) for the treatment of ovarian and other cancers**

- It is unclear why ovarian tumors have a strong preference to metastasize to the omentum, a fatty pad-like organ made of adipocytes.
- [Dr. Ernst Lengyel](#)'s group identified through a protein array analysis that FABP4 was upregulated in omental metastases as compared to primary ovarian cancers.
- FABP4 inhibitors were found to reduce the accumulation of adipocytes in ovarian cancer cells, as well as suppress adipocyte-mediated homing, migration, and invasion of these cancer cells.
- FABP4 knockout mice showed improved survival after intraperitoneal injection with mouse ovarian cancer cells, as compared to wild-type mice.
- A patent has been issued on methods for treating ovarian cancer by inhibiting fatty acid binding proteins.
- We are seeking partners to develop small molecule inhibitors of FABP4 to treat ovarian cancer.

## [Weichselbaum UCHI 2165](#)

### **Methods for anti-tumor therapy through targeting JAK2 kinase effectors in treatment-resistant tumors**

- Radio- and chemo-resistant cancers present a challenge for conventional and emerging cancer therapies.
- [Dr. Ralph Weichselbaum](#) systematically assessed the effects of each gene downstream of the JAK/STAT pathway to identify new therapeutic cancer targets that are effective on resistant cancer lines and potentially exhibit fewer side effects than current JAK/STAT-only therapies.
- Combination radiation therapy and JAK/STAT effector inhibitors provide superior efficacy for radio- and chemo-resistant cancers.
- In chemo- and radio-resistant cancer cell lines and xenograft mouse models, siRNA depletion of PSMB9 and PSMB10 in combination with 5 Gy radiation enhanced cell death.
- A US application is pending for methods and compositions for treating cancer by targeting these effectors.
- Dr. Weichselbaum is seeking commercial partnerships to further develop cancer therapeutics against these novel pathway targets.

# Oncology Therapeutics: Biologics

# Oncology Therapeutics: Biologics

## [Balyasnikova UCHI 2354](#)

### Single-chain antibody fragment against human IL13R $\alpha$ 2 and uses thereof

- IL13R $\alpha$ 2 is overexpressed in multiple cancers, and current therapeutic approaches target IL13, which is also expressed in healthy tissues.
- Dr. Irina Balyasnikova and colleagues have developed a highly specific monoclonal antibody towards IL13R $\alpha$ 2.
- The monoclonal antibody has a single-chain variable fragment with demonstrated high specificity and affinity towards only recombinant human IL13R $\alpha$ 2, and not to IL13R $\alpha$ 1 or IL13R $\alpha$ 2 from other species.
- In a mouse model of orthotopic human glioma xenograft, treatment with IL13R $\alpha$ 2 monoclonal antibody improved survival when compared to control mice treated with IgG control.
- A PCT application has been filed for single-chain antibody fragments against human IL13R $\alpha$ 2 and is available for licensing.
- The investigators are currently planning clinical trials to test efficacy against glioma.

## [Thirman UCHI 1460](#)

### TAT-MLL for the treatment of acute leukemia

- Resistance to conventional cytotoxic chemotherapeutic agents remain a major obstacle to improving remission rates and achieving prolonged disease-free survival in patients with hematological malignant diseases.
- [Dr. Michael Thirman](#) has engineered a cell permeable peptide, TAT-MLL, which interrupts a key interaction between the proto-oncogenic gene product, mixed lineage leukemia (MLL) and its downstream partner, menin, a key transcriptional regulator of cell differentiation.
- The TAT-MLL peptide is a potential universal approach to treating hematopoietic malignancies by disrupting menin activity.
- In in vitro murine and human leukemia cell lines, treatment with TAT-MLL increased apoptosis.
- US patents are issued for therapeutic compositions and methods of inducing cell death using TAT-MLL, and are available for licensing.
- Dr. Thirman is seeking collaboration opportunities to optimize the binding affinity and stability of the TAT-MLL peptide.

# Oncology Therapeutics: Biologics

## [Toback UCHI 1435](#)

### Methods and compositions related to mucositis

- Oral mucositis is one of the most common adverse reactions to chemotherapy and radiation therapy, yet no effective agents currently exist to treat this serious side effect.
- Dr. F. Gary Toback has identified a unique peptide that reduces the intensity and delays the onset of oral mucositis.
- The therapy is a 21-mer peptide derived from the 18-kDa Antrum Mucosal Protein (AMP18 aka GKN1) that exhibits robust cytoprotective, mitogenic, and motogenic effects, and supports maintenance of mucosal integrity.
- In mouse and hamster models of radiation-induced oral mucositis, topical administration of the peptide slowed development and reduced the extent of erythema, prevented ulcer formation, and accelerated recovery. Peptide treatment did not diminish the antitumor effects of concomitant radiation in a lung xenograft model, but was additive with radiation to inhibit tumor growth.
- Patents directed towards therapeutic compositions and methods of use are issued in the US, Europe, Mexico, Japan, and Australia.
- The investigators are interested in collaborating to develop and test an AMP-18 therapeutic for the treatment of oral mucositis.

# Oncology Diagnostics: Gene Signatures and Biomarkers

# Oncology Diagnostics: Gene Signatures and Biomarkers

## [Conzen UCHI 2280](#)

**Glucocorticoid and androgen receptor expression predicts response to Hsp90 inhibitors in TNBC**

- Hsp90 inhibitors have been proposed as potential therapeutics for triple negative breast cancer (TNBC) but require better biomarkers to predict treatment efficacy.
- [Dr. Suzanne Conzen](#) has documented that treatment with Hsp90 inhibitors is likely to be most effective in glucocorticoid receptor (GR) and/or androgen receptor (AR) overexpressing TNBC because the activity of these nuclear receptors, which can drive tumor growth, is targeted by Hsp90 inhibition.
- The technology provides a predictive diagnostic where the GR/AR status of the tumor informs patient response to Hsp90 inhibitors.
- Data from TNBC cell lines and mouse models have demonstrated that inhibition of Hsp90 leads to rapid loss of GR/AR activity in tumors, accompanied by tumor cell death.
- A US application has been filed on treating breast cancer patients that have been tested for GR/AR status with Hsp90 inhibitors.
- Clinical trials are underway to further evaluate the predictive validity of GR/AR status in the use of Hsp90 inhibitors for breast cancer.

## [Gajewski UCHI 2232](#)

**Diagnosis of cancer through the EGR2 transcriptome**

- Overcoming the immune system's tolerance of cancer cells through ablation of T-cell anergy can increase the efficacy of immunotherapy for cancer.
- [Dr. Thomas Gajewski](#) has identified an EGR2-based gene signature that differentiates between immune-responsive and non-responsive tumors.
- The EGR2 transcriptome of anergic T-cells identifies numerous biomarker opportunities.
- Validated studies from three independent genome-wide expression and ChIP-sequencing analyses identified a key set of genes involved in the immune response to cancer.
- National applications have been filed in the U.S. and EPO on methods for diagnosis and treatment of cancer through identification and suppression of T-cell anergy by way of the EGR2 transcriptome, and are available for licensing.
- The gene expression signature offers opportunities for development of powerful new treatment-enabling diagnostics.

# Oncology Diagnostics: Gene Signatures and Biomarkers

## [Lengyel UCHI 2415](#)

### **A novel predictive factor and immunogenic target for high-grade serous ovarian cancer**

- Clinicians, patients, and families value the ability to predict whether a patient will respond to chemotherapies, such as platinum-based cytotoxins with potentially harmful side-effects, and emerging immunotherapies.
- [Dr. Ernst Lengyel](#) has discovered that overexpression of a certain protein in high-grade ovarian cancers predicts heightened sensitivity to platinum-based therapies, and that novel antigens from the protein are expressed by ovarian cancer cells and represent a new target for T-cell- based immunotherapy.
- Overexpression of the protein enables clinicians to accurately predict whether the patient will respond to a platinum-based therapy, and/or whether an immunotherapy targeting the novel antigen protein will be effective.
- Retrospective clinical study and state-of-the-art proteomic profiling approach identified protein and antigen expression in human high-grade, serous ovarian tissue; mechanistic studies confirmed role in DNA repair and as an HLA-type specific-antigen.
- A provisional patent application has been filed on methods of treating ovarian cancer based on expression of the protein in tissue.
- The investigators are seeking partners for clinical development of these diagnostics.

## [Rosner UCHI 2323](#)

### **Triple-negative breast cancer prognostic gene expression signature for metastasis**

- Identifying the patient subset most at-risk is helpful in finding patients most appropriate for novel therapeutic trials and for determining probable treatment outcome.
- [Dr. Marsha Rosner](#) has determined a panel of ~30 genes for identifying patients with the most lethal metastatic forms of triple-negative breast cancer.
- The gene expression signature, named BACH1 Pathway Metastasis Signature or BPMS, works in complement with Mammaprint and Oncotype to identify patients who are most likely to experience metastasis.
- The prognostic power of the thirty-gene signature was validated in a retrospective study of 3600 human breast cancer patients.
- A US application has been filed on methods for determining prognosis for breast cancer patients.
- The investigators are working on determining additional tests for which BPMS provides complementary information.



# Oncology Diagnostics: Gene Signatures and Biomarkers

## [Rosner UCHI 2383](#)

### Methods for determining prognosis for breast cancer patients

- Information about tumor-stromal crosstalk can offer insights into the progression of Triple-Negative Breast Cancers (TNBC), which is often refractory to treatment.
- [Dr. Marsha Rosner](#) has identified a group of genes from both tumor and stroma whose collective expression is prognostic for metastasis-free survival in TNBC patients.
- The gene expression signature can be used to identify patients who are likely to have poor treatment outcomes.
- In retrospective studies of four independent human breast tumor gene expression datasets, the gene signature stratified high-risk patients with TNBC.
- A PCT application has been filed for using the signature to determine prognosis for breast cancer patients.
- Several of the genes in the signature are potential therapeutic targets in the early stages of testing; the investigators plan to further probe these relationships to determine whether the signature can predict therapeutic outcomes for these drugs.

## [Salgia UCHI 1944](#)

### Mutations in c-CBL which predict tumor sensitivity to MET-targeting therapies

- Some types of cancers are resistant to c-MET- or EGFR-targeted therapies, making it hard to design appropriate treatment regimens.
- Dr. Ravi Salgia has identified key mutations in c-CBL (Casitas B-lineage lymphoma), which correlate positively with lung cancer cells' response to c-MET inhibitors.
- Mutations in and expression level of c-CBL can function as a biomarker to provide clinically valuable information in designing treatment plans.
- 14 mutations were identified in human lung cancer cells which successfully predicted response to c-MET inhibition therapy.
- A US utility application has been filed on uses of c-CBL mutations for identifying patients who are likely to respond to a given therapy.
- Validating proof-of-concept studies have been completed using mouse xenograft models and archived clinical trial samples.

# Oncology Diagnostics: Gene Signatures and Biomarkers

## [Weichselbaum UCHI 1374](#)

### **IRDS: Predictive seven-gene signature for breast cancer therapy**

- In order to avoid unnecessary treatments, it is important to be able to predict whether continued adjuvant therapy would be effective for breast cancer patients.
- [Dr. Ralph Weichselbaum](#)'s team has performed retrospective studies to demonstrate the ability of seven genes – IFIT3, STAT1, IFIT1, OAS1, IF144, MX1, and G1P2 – to identify responders to adjuvant chemotherapy or radiation.
- The signature – termed the Interferon-Related DNA-damage-resistance Signature (IRDS) – can be used to identify patients who will likely benefit from adjuvant therapy.
- Combined clinical and laboratory data show that the IRDS signature can successfully predict the efficacy of continued adjuvant chemotherapy and local-regional control after radiation.
- A US patent has been issued on predictive markers for assessing risk of local-regional failure, survival, and metastasis in cancer patients.
- The gene signature is compatible with conventional commercial platforms and has been tested on clinically-relevant sample types.

# Oncology Imaging Technologies

# Oncology Imaging Technologies

## [Aldogan UCHI 1849](#)

**Novel imaging agent improves targeting radiation therapy and aids diagnosis and research**

- Current imaging technology does not easily or cheaply provide both anatomical and functional analysis for cancer diagnosis and treatment.
- [Dr. Bulent Aldogan](#) has developed a deoxyglucose-labeled gold nanoparticle (AuNP-DG) which provides X-ray contrast to glycolytic cancer cells.
- The AuNP-DG imaging agent enables a standalone CT system to acquire both anatomical and functional information, traditionally acquired by a PET/CT hybrid.
- The internalization of AuNP-DG has been proven in both the A-549 lung cancer cell line as well as a grafted mouse tumor.
- A US Utility application has been issued on methods and compositions for imaging cancer cells
- The imaging agent is being validated in other tumor models.

## [Lengyel UCHI 1418](#)

**Targeted MRI imaging agent for ovarian cancer**

- Effective early diagnosis of ovarian cancer – typically diagnosed at late stages of metastases to omentum and peritoneum – is critical for its treatment.
- Drs. [Ernst Lengyel](#) and [Joseph Picirilli](#) have developed an MRI imaging agent molecularly targeted to the prolactin receptor for ovarian cancer diagnosis and monitoring; such an agent would prevent costly, invasive and unnecessary biopsies.
- The targeted imaging agent comprises engineered human placental lectogen (hPL) conjugated to gadolinium; the specificity is increased by the robust expression of the prolactin receptor in 98% of ovarian cancers.
- The first-generation hPL-gadolinium conjugate has been validated both *in vitro* and in mouse models.
- A US patent has been issued on the method of identifying ovarian cancer using the imaging agent.
- Investigators are developing a second-generation conjugate for enhanced detection.

# Oncology Imaging Technologies

## [Wiersma UCHI 2295](#)

### A combined therapy and imaging beam dose algorithm for optimal image-guided radiation therapy

- The safety and efficacy of image-guided radiation therapy is limited by clinical concerns of off-target radiation.
- [Dr. Rodney Wiersma](#) has developed a radiation treatment planning algorithm that optimizes the imaging radiation dose (kV) and treatment radiation dose (MV) together, reducing unwanted, excess off-target radiation.
- The algorithm treats the kV dose as an additional source of therapeutic radiation to deliver both imaging information and an effective treatment dosage.
- In real patient imaging data, application of the algorithm reduced excess radiation to surrounding tissue by up to 50%.
- A US patent application is pending for systems and methods for radiation treatment planning.
- Dr. Wiersma is continuing to optimize the algorithm and is interested in collaborating with instrument manufacturers to implement the approach.

# Oncology Platform Technologies

# Oncology Platform Technologies

## [Koide UCHI 2225](#)

### Affinity Clamps: A platform for developing high-affinity synthetic binding proteins

- Affinity clamp technology could pave the way to understand complex physiological and pathological protein signaling networks and provide unique diagnostic and therapeutic agents.
- [Dr. Shohei Koide](#) has created a novel protein engineering platform for developing renewable, high affinity and high specificity antibody-like proteins to diverse and difficult targets in unstructured region of proteins, such as post-translational modifications.
- Current affinity clamps are targeted against phospho-tyrosines and can function as biosensors for the diagnosis of chronic myelogenous leukemia and Noonan syndrome.
- The level of affinity achieved with the clamp technology is three-four orders of magnitude greater than that of FLAG/antibody, c-myc/antibody, and 6xHis-tag/immobilized metal systems.
- Pending US patent application on platform technology and issued US patent on specific clamps.
- The affinity clamps have been optimized to bind a variety of small epitopes. Dr. Koide has also developed a novel protein capture system with a unique peptide fusion tag and its corresponding affinity clamp.

## [Koide UCHI 2089](#)

### Recombinant antibodies to histone post-translational modifications for chromatin-based diagnostics

- High-quality, reliable antibodies of high specificity are needed for chromatin-based diagnostics.
- [Dr. Shohei Koide](#) has created high-quality recombinant antibodies to histone post-translational modifications using tailored phage-display libraries.
- A series of recombinant antibodies have been generated against tri-methylated residues on histones 3 and 4 that may be useful for the diagnosis of breast cancer, renal cell carcinoma, and other cancers, or as companion diagnostics for histone-modifying drugs.
- Lead antibodies were identified from two libraries and validated against commercially available antibodies; the recombinant antibodies showed greater specificity and reproducibility than their commercial counterparts.
- A US patent application is pending on compositions and methods of diagnosis and drug screening.
- Histone antibodies to additional post-translational modifications are in development.

# Oncology Platform Technologies

## [Kossiakoff UCHI 2340](#)

### Engineered Protein G for creating multivalent, bispecific recombinant affinity reagents

- Protein G is widely used for the purification of antibodies, but current reagents lack specificity to Fabs and subject the antibodies to harsh conditions that may affect product quality.
- [Dr. Anthony Kossiakoff](#) has engineered Protein G (eProtein G) to bind to Fabs with higher affinity and specificity compared to native Protein G or Protein A.
- eProtein G can be used to purify recombinantly produced Fabs in a pH sensitive fashion or covalently tethered together to create multivalent recombinant affinity reagents to desired targets.
- In in vitro binding assays, use of eProtein G tethering of Fabs against a target antigen enhanced binding compared to the same concentration of Fabs alone.
- A PCT application is pending for compositions and methods of use of Protein G variants.
- Dr. Anthony Kossiakoff is expanding the use of the Protein G platform to diagnostic and therapeutic applications.

## [Kron UCHI 2037](#)

### TrueQ microspheres for flow cytometry surfaced with oligonucleotides for calculation of antibody binding capacity (ABC) for any antibody

- Despite advances in instrumentation, progress in methodology has lagged, offering no simple and efficient method for antibody labeling or quantifying antibody binding per cell.
- [Dr. Stephen Kron](#) has developed a DNA-directed assembly approach to fluorescent labeling that (i) obviates the need for time-consuming antibody: microsphere conjugation, (ii) outperforms standard, commercially available solutions, and (iii) can be used quantify antibody binding per cell.
- Multiparametric flow cytometry offers a powerful approach to single cell analysis with broad applications in research and diagnostics.
- The oligosphere approach to quantitative flow cytometry was compared to commercial quantitative fluorescent microspheres to quantify CD4 from murine splenocytes and demonstrated enhanced efficiency, added flexibility and improved quantitation.
- A US patent has been issued and one is pending on methods for quantitative immunoassays using flow cytometry.
- The method is ready for use in systems biology and clinical diagnostics.



# Oncology Platform Technologies

[Greene UCHI 2258](#)

## Simplified chromosome conformation capture (S3C)

- Chromatin Conformation Capture (3C) – a traditional technique to study chromosomal and genetic interactions – is time-consuming and limited by stringent experimental conditions and can yield irreproducible results.
- [Dr. Geoffrey Greene](#) and his colleagues have developed a streamlined version of 3C, called CATCH (Capture of Associated Targets on Chromatin), which addresses the problems encountered with 3C.
- S3C uses unbiased fragmentation of DNA through shearing, and is a faster, more reproducible technique to investigate genomic interactions.
- The investigators used CATCH to identify four estradiol-positive chromatin interactions around SIAH2, an E3 ubiquitin ligase whose upregulation correlates with poor prognosis in breast cancer.
- A US patent application is pending for methods of capturing chromosomal and genetic interactions, and is available for licensing.
- The investigators are interested in developing kits to commercialize CATCH, and encourage adoption of the CATCH technology to identify new therapeutic targets.

# The University of Chicago Medicine Comprehensive Cancer Center (UCCCC)

*To address the complexity of cancer, we use cooperative, multidisciplinary initiatives to support innovative research.*

## Clinical Trials Capabilities

- Over 330 active therapeutic clinical trials, spanning preclinical to investigator-initiated phase I trials, to phase II trials in regional network, to phase III studies within Alliance
- Leader and participant in regional and national clinical trial networks
- Areas of expertise include:
  - First-in-human studies (phase I trials)
  - Combination and drug-drug interaction studies
  - Food-effect studies
  - Organ dysfunction studies
  - Population pharmacology and pharmacogenetics
  - Innovative trial designs
  - Pharmacodynamic biomarker studies

## Core Facilities

- Biostatistics
- Cancer Clinical Trials Office
- Cytometry and Antibody Technology
- Genomics
- Human Immunologic Monitoring-cGMP
- Human Tissue Resource Center
- Image Computing, Analysis, and Repository
- Integrated Microscopy
- Integrated Small Animal Imaging Research
- Pharmacology
- Transgenic Mouse and Embryonic Stem Cell Facility
- Center for Research Informatics (CRI) Bioinformatics
- Epidemiology and Research Recruitment

## UCCCC Specialized Programs

The UCCCC scientific community integrates 210 members across 20 academic departments in three University Divisions (Biological, Physical, and Social Sciences). Our members specialize in fields that span the continuum of cancer research in a highly interactive environment. Research is organized in six established scientific programs that emphasize translational and interdisciplinary research, and promote collaboration among a diverse and dedicated team of outstanding scientists and physicians. **UCCCC Centers include:**

- Molecular Mechanisms of Cancer
- Hematopoiesis and Hematological Malignancies
- Immunology and Cancer
- Pharmacogenomics and Experimental Therapeutics
- Advanced Imaging
- Cancer Prevention and Control

# The University of Chicago Cancer Research

Our programs emphasize interdisciplinary research through collaborations among a diverse and dedicated team of outstanding basic, translational, clinical, and population researchers, caregivers, and trainees.

**We aim to answer cancer's most challenging questions through inquiry, creativity and collaboration.**

- *How do we prevent cancer, especially in the most vulnerable populations?*
- *How can we match individual patients with the most appropriate treatments?*
- *How can we harness the immune system to destroy cancer more effectively?*
- *How do we stop cancer from spreading?*
- *How can we best improve survivorship for cancer patients after diagnosis and treatment?*

**Though daunting in breadth, these questions are the foundation for great invention.** Our researchers have embraced the ambitious scope of each challenge, as evidenced by the groundbreaking discoveries born from such pursuit.

## University of Chicago Cancer Research Innovation Highlights



[Big Data](#)  
[Cancer Disparities](#)  
[Risk and Prevention](#)  
[Epigenetics](#)  
[Imaging](#)  
[Immunotherapy](#)  
[Personalized Medicine](#)  
[Pharmacogenomics](#)  
[Metastasis](#)  
[Survivorship](#)



**POLSKY**

# How to Partner with the University of Chicago

Contact the Polsky Center for Entrepreneurship and Innovation Technology Commercialization and Licensing team and speak to anyone on the project management team.



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**Oncology Innovation &**  
**Commercialization Lead**

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