
Exploring Cancer
Exploring the Role of Biology, Race, Class, and Socioeconomics
Live Lecture
Welcome to the
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10:55
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11:00
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Exploring the Role of Biology, Race, Class, and Socioeconomics
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A collaboration between
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UNC Lineberger Comprehensive Cancer Center
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Exploring the Role of Biology, Race, Class, and Socioeconomics

exploringcancer.org/courses

Fridays
11:00 - 11:50 AM EST/EDT

August 30 Welcome to Cancer(s) and Health Disparities 101 - The Introduction	**September 6** Reassessing Tumor Biology through the Lens of African Ancestry and Health Equity	**September 13** Global Cancer Health
September 27 ACCURE: A Systemic Approach to Eliminating Racial Disparities in Cancer Care and Beyond	**October 4** Breast Cancer health disparities	**November 1** Lung Cancer/Clinical Trial Enrollment
November 8 Precision medicine	**November 15** International Collaborations to Improve Pharmacy-Driven Initiatives	**November 22** Using Structural Biology to Guide the Development of Cancer Therapies

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Exploring Cancer

Exploring the Role of Biology, Race, Class, and Socioeconomics

November 22, 2024

Using Structural Biology to Guide the Development of Cancer Therapies

Chrystal Starbird, PhD

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Chrystal Starbird, PhD

Chrystal Starbird grew up in Brookline, Massachusetts. Her early interest in science grew out of her love of nature, which prompted her to start a nature club in second grade. She completed her undergraduate work at the University of North Carolina (UNC) at Chapel Hill, where she worked in multiple labs before graduating with a B.S. in biology. Dr. Starbird spent a few years working in academic and industry labs before returning to UNC-Chapel Hill to complete a year-long postbaccalaureate research education program. Then she completed her graduate work in chemical and physical biology at Vanderbilt University and her postdoctoral work at Yale University in the Cancer Biology Institute. She recently returned to UNC as an assistant professor, where research in her lab focuses on the structural basis for activation of TAM receptor tyrosine kinases.

As a nontraditional student in many ways, Dr. Starbird is an advocate for diversity, equity, and inclusion. Her efforts in promoting diversity include co-founding of the Yale Black Postdoctoral Association and Intersections Science Fellows Symposium.

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Professional Highlights

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Professional Highlights

5. Chrystal Starbird, PhD received the first Cell Rising Black Scientist Award

8

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4. She is a MOISAIC K99/R00 Scholar

9

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Professional Highlights

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Professional Highlights

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3. She was on the ACD Working Group on Re-envisioning NIH-Supported Postdoctoral Training
2. She was was recently appointed Chair of the Board of Directors for the Life Science Editors Foundation
1. She has been a guest on 4 science podcasts, all on her lab website

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Structural Biology and Cancer: How structural biology aids in the development of Immunotherapy

Presented by:
Chrystal Starbird
Assistant Professor

THE STARBIRD LAB

UNC: Department of Biochemistry and Biophysics

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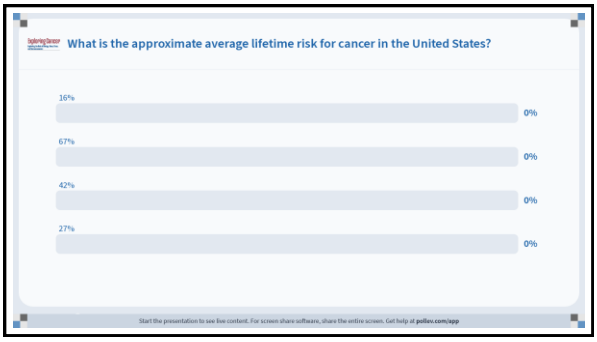

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Learning Objectives

- Define "immunotherapy" and understand how immune checkpoint inhibitors generally work
- Understand broadly what structural biology is and what some of the basic structural biology techniques are
- See examples of how structural biology has aided in the development of immune checkpoint inhibitors
- Discuss why basis research remains important in the work to fight cancer

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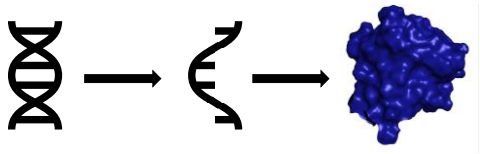
Why did I become a Structural Biologist?

Structural biology is the study of the molecular structures of biological molecules-primarily proteins, nucleic acids, and RNA.



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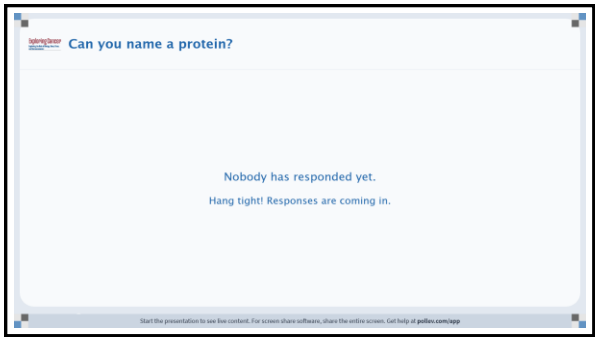

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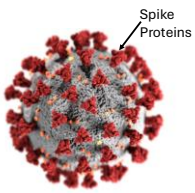
- Proteins are the functional units in the cell
- DNA contains information that is primarily translated into protein
- The DNA-RNA code is translated into a language of 20 amino acids, which make up the protein chains



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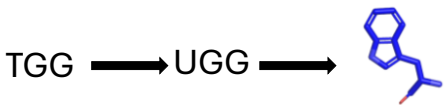
The Central Dogma of Molecular Biology



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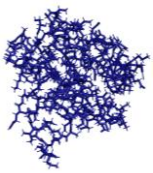
Structural Biology Provides Atomic-Level Information



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Structural Biology Provides Atomic-Level Information

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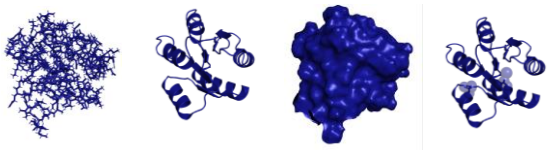
Structural Biology Provides Atomic-Level Information



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Why did I become a Structural Biologist?

I definitely did not start out that way:

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Ranger Rick image: https://blog.nature.org/2020/12/14/ranger-

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Always one More Question

Environmental Science

Microbiology

Cystic Fibrosis

Epigenetics

Pfizer: vaccine development

Structural Biology

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I was a PREP Scholar: the very first cohort

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I started a Family…

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My Trajectory through Science Seems Straight

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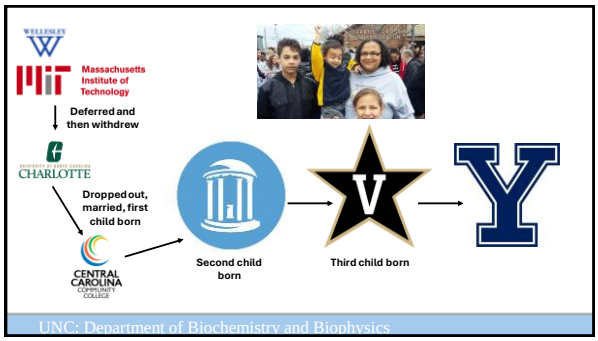
Massachusetts Institute of Technology
Deferred and then withdrew
CHARLOTTE
Dropped out, married, first child born
CENTRAL CAROLINA COMMUNITY COLLEGE
Second child born
Third child born
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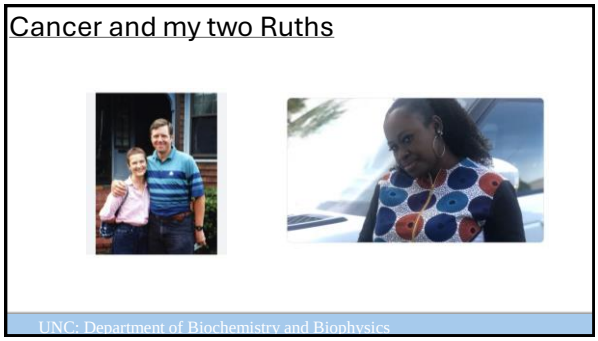
Cancer and my two Ruths
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THE STARBIRD LAB
Opened in February 2023

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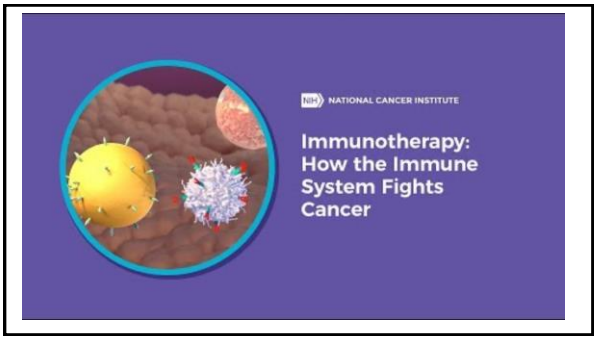

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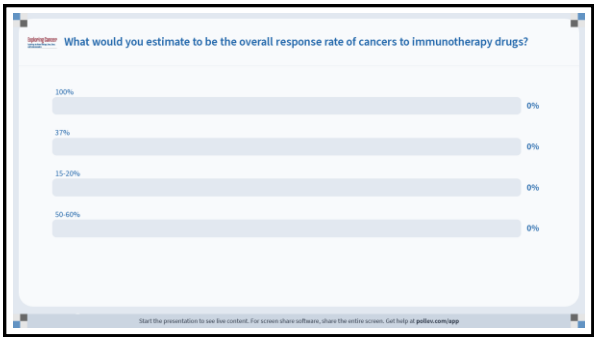

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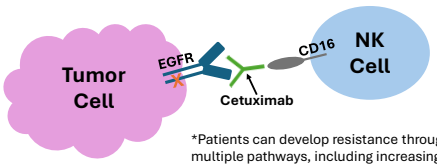
Basic Science Research and Immunotherapy

Many Immunotherapy drugs target cell surface receptors



*Patients can develop resistance through multiple pathways, including increasing EGFR expression, so TKIs can be used in combination

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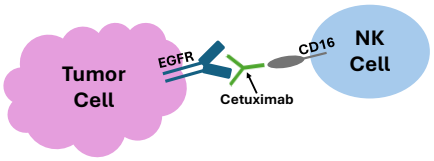
Basic Science Research and Immunotherapy

Many Immunotherapy drugs target cell surface receptors



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Basic Science Research and Immunotherapy

Currently, none of these methods are enough.

Efforts to improve the use of immunotherapy to treat cancer are ongoing

Strategies include:

Identifying new immunotherapy targets

Combining immunotherapies

Designing new ways to treat existing targets

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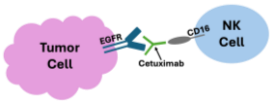
Having Atomic Level Detail Allows for Better Drug Design



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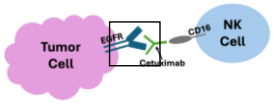

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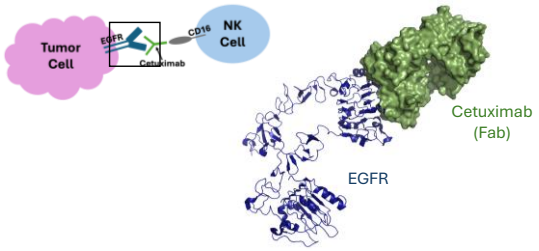

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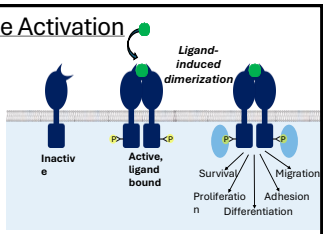
Receptor Tyrosine Kinase Activation

**Central model for RTK activation proceeds by ligand-induced dimerization followed by phosphorylation of the intracellular tyrosine kinase domain*



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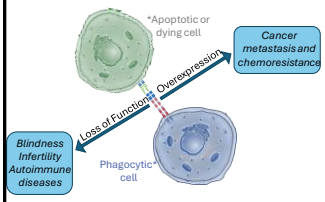
TAM Receptor Tyrosine Kinases: Apoptotic Clearance



Roles in:
- Hemostasis
- Inflammation
- Cell proliferation, survival, adhesion and migration

Potential therapeutic targets in:
- Thromboembolic disease
- Atherosclerosis
- Sepsis
- Autoimmune disease
- Cancer

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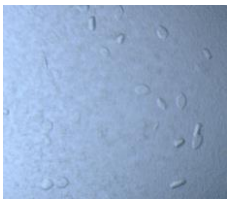
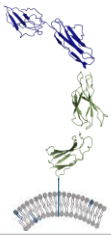
Crystallography

Using crystallography to determine structures of receptors





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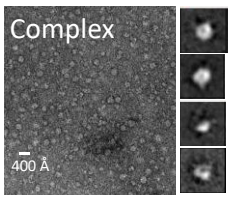
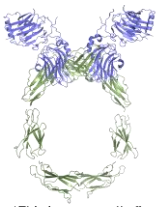
Cryo-Electron Microscopy



Negative Stain of Axl:Gas6 Complex



*This is a manually fit **MODEL**

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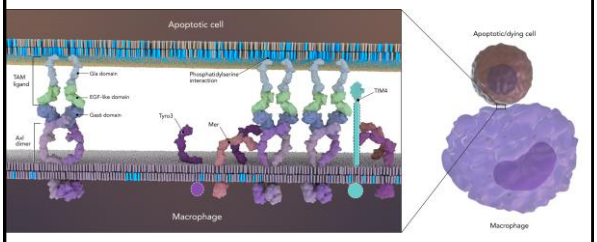
Investigating the Structural Basis of TAM Receptor Activation



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Acknowledgements

Starbird Lab
Chrystal Starbird
Skylar Grimsley
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Johnna Bingham

Ferguson Lab
Kathryn Ferguson
Jerry Madukwe
Kahlil Walker
Yuhong Zuo

UNC cryo-EM Core

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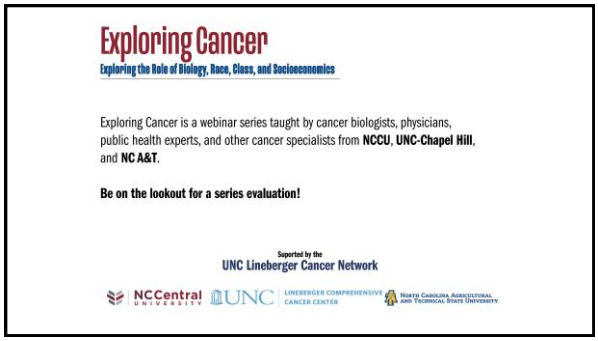
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