



VIRTUAL

CANCER ACTION DAY

MAY 14, 2020 ONLINE & BY PHONE





49 MALE
NOBEL LAUREATES.
0 FEMALE.
LET'S CHANGE THAT.

Present and Future Innovations in Radiation Oncology

Jessica Fleming, PhD

The James



THE OHIO STATE UNIVERSITY
WEXNER MEDICAL CENTER



Creating a cancer-free world. One person, one discovery at a time.



Outline

- Personal Path to Cancer Research
- The James Cancer Hospital at Ohio State University
- Department of Radiation Oncology
- Translational Cancer Research Efforts
 - Precision Biomarkers
 - Proton Therapy
 - FLASH Radiation Therapy
- Cancer Research Funding

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Personal Path to Cancer Research



Jessica Fleming, PhD
Radiobiologist



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The Ohio State University

- One of the largest universities in USA
- 62K students; 40K faculty & staff
- 14 colleges
- Most comprehensive health sciences campus in USA

Comprehensive Cancer Center

- NCI “Comprehensive” status since 1976
- 270+ member investigators
 - OSU, Nationwide Children’s & Cincinnati Children’s
- Five (5) scientific programs
- Twenty (20) Shared Resources
- **The James Cancer Hospital**





The James Cancer Hospital and Solove Research Institute

21st century hospital

- 3rd largest cancer hospital in the US
- Sub-specialized, multidisciplinary clinical care model
- 21 floors
- 14 Cancer-Related Operating Rooms

James Interactive Cancer Research Programs:

- Cancer Control
- Leukemia
- Molecular Biology and Cancer Genetics
- Molecular Carcinogenesis and Chemoprevention
- Translational Therapeutics

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**The Ohio State
University**

**Department of
Radiation Oncology**

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James Radiation Oncology Team



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World-Class Radiation Oncology



World-Class Radiation Oncology



Translational Cancer Research

Primary Goal:

Development of novel, more effective personalized care strategies for cancer patients.

Key Strategies:

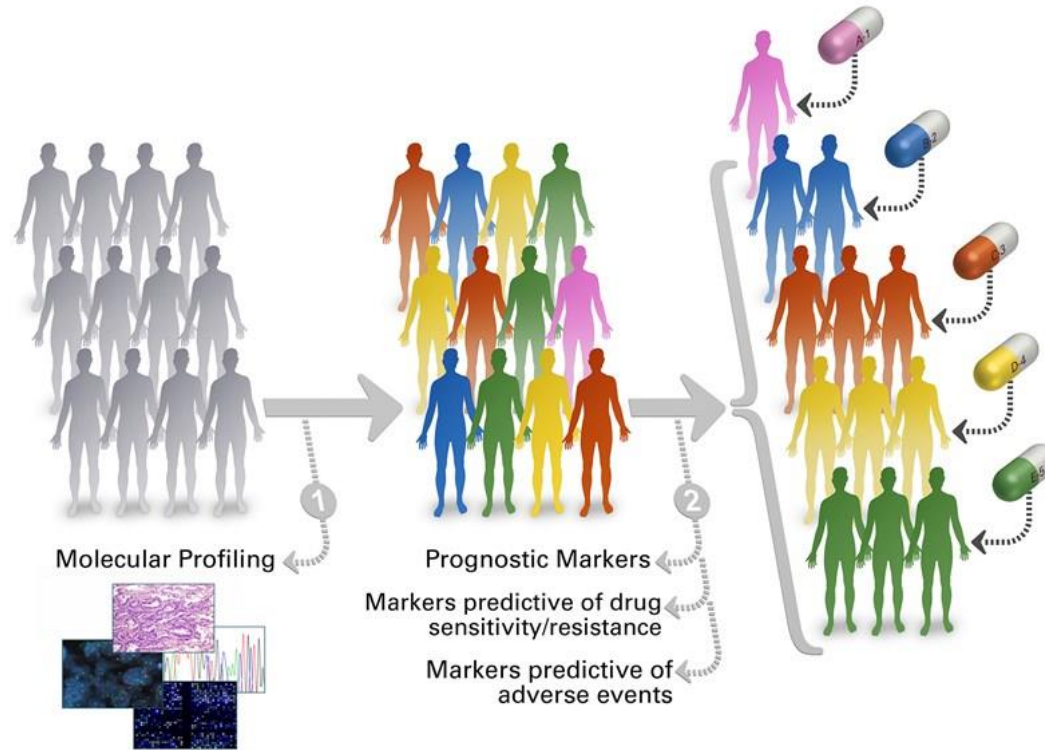
- Identification of molecular biomarkers in cancer patients that can aid in diagnosis, prognosis, and treatment planning.
- Identification of pathways driving cancer progression and developing personalized targeted treatment options that increase survival and quality of life.

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Personalized Care Strategies



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Cancer Types of Interest

- **Brain (Primary and Metastatic)**
- **Prostate**
- **Head & Neck**
- **Cervical**
- **Gastrointestinal**
- **Pediatric**
- **Lung**
- **Kidney**
- **Bladder**
- **Sarcoma**
- **Melanoma**

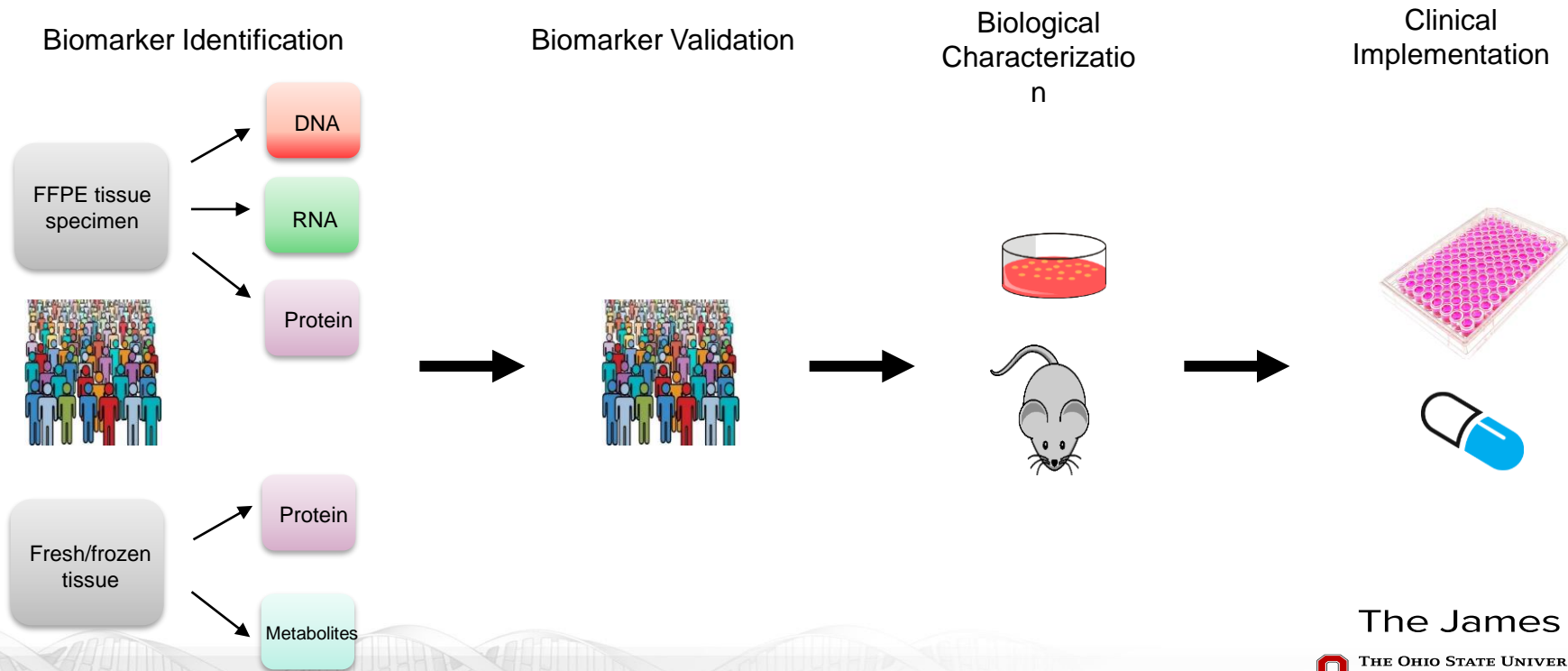
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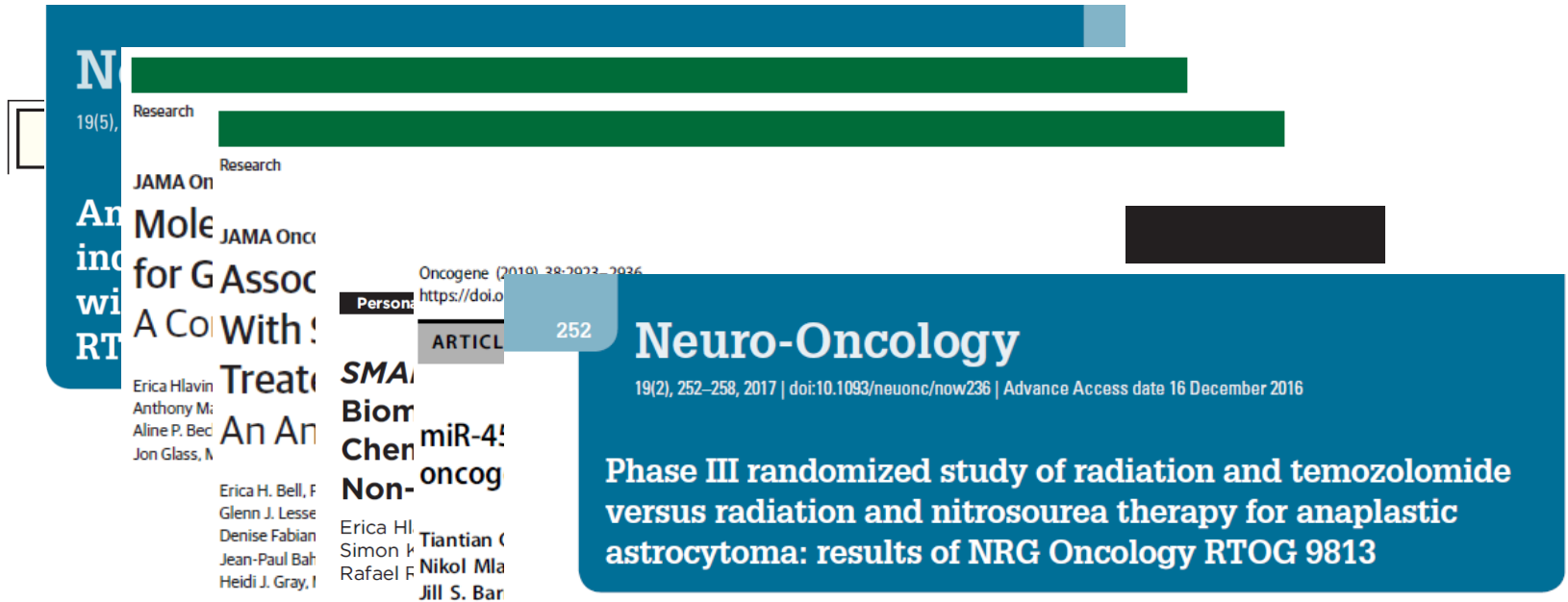
Biomarker Identification Pipeline

Biomarker: A biological molecule found in blood or tissues that is a sign of a normal or abnormal process, or of a condition or disease.



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Radiation Oncology Key Publications



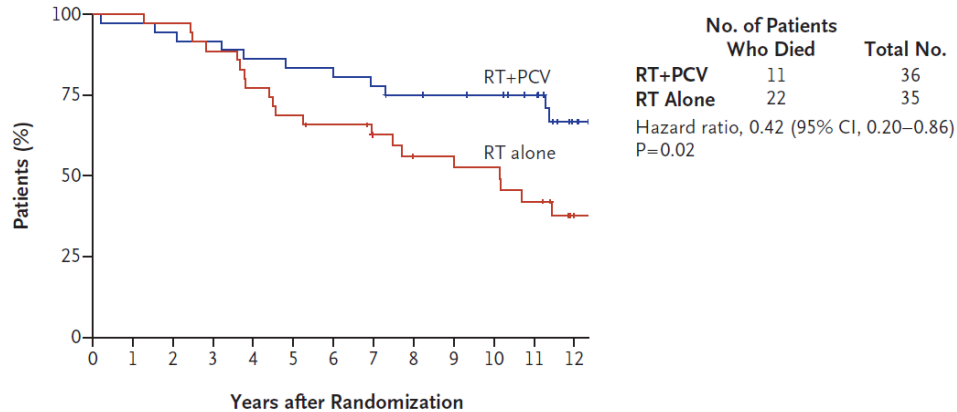
Susan Chang, Peixin Zhang, J. Gregory Cairncross, Mark R. Gilbert, Jean-Paul Bahary, Carol A. Dolinkas, Arnab Chakravarti, Kenneth D. Aldape, Erica H. Bell, David Schiff, Kurt Jaeckle, Paul D. Brown, Geoffrey R. Barger, Maria Werner-Wasik, Helen Shih, David Brachman, Marta Penas-Prado, H. Ian Robins, Karl Belanger, Christopher Schultz, Grant Hunter, and Minesh Mehta

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ORIGINAL ARTICLE

Radiation plus Procarbazine, CCNU, and Vincristine in Low-Grade Glioma

Overall Survival among Patients with *IDH1* R132H Mutation



No. at Risk	0	1	2	3	4	5	6	7	8	9	10	11	12
RT+PCV	36	35	34	33	31	30	29	28	26	25	24	21	12
RT alone	35	35	34	31	27	24	22	19	16	15	15	12	5

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Ohio State Partnered with Nationwide Children's Hospital To Bring Proton Therapy To Central Ohio!

Health Care

Ohio State, Nationwide Children's to team up on \$100 million proton therapy cancer center

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Ohio State News

Home

November 20, 2018

Region's first proton therapy facility to treat cancer patients

[The Ohio State University Wexner Medical Center](#) and the [Arthur G. James Cancer Hospital and Richard J. Solove Research Institute](#) are collaborating with [Nationwide Children's Hospital](#) to bring the first proton therapy treatment facility to central Ohio. This will offer state-of-the-art radiation oncology treatment for adult and pediatric cancer patients in one place.

The proton center will be located at the new 340,000 square-foot outpatient facility planned for Ohio State's west campus. The proton therapy portion is expected to utilize 55,000 square feet and cost approximately \$100 million. Nationwide Children's has committed to up to 50 percent of the expected proton center project cost.

"This is a significant advancement for our patients and their families," said Ohio State President [Michael V. Drake](#). "As part of our nationally renowned Wexner Medical Center, comprehensive cancer center and health sciences campus, this facility will spark leading-edge research, inspire new academic partnerships and drive innovative solutions to combat this ubiquitous and devastating disease."

Share

Region's first proton therapy facility to treat cancer patients



Get the latest Ohio State News

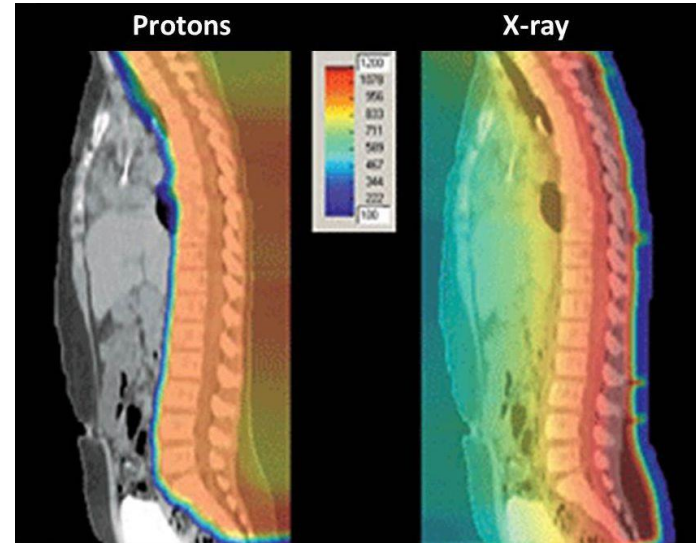
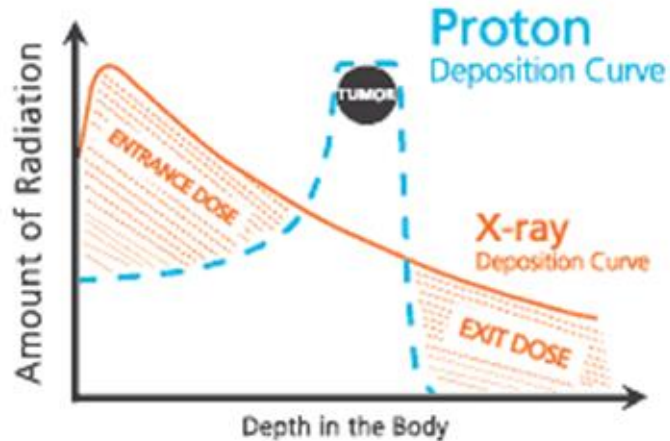
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Treatment Benefits of Proton Therapy



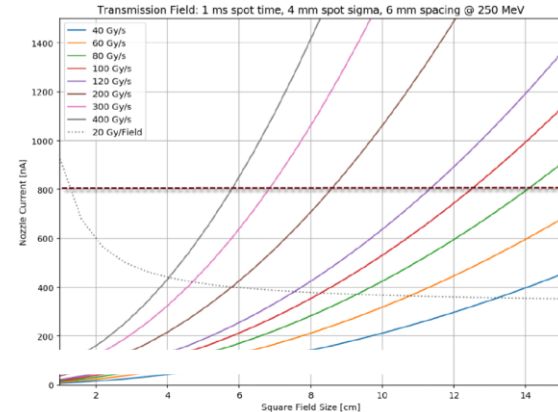
- Targets tumors and cancer cells with precision
- Reduces short- and long-term side effects on surrounding healthy tissues /organs
- Can be used to treat recurrent tumors and patients previously treated with radiation
- Improves quality of life during and after treatment
- Increases the long-term survival rates

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OSU Will Be One Of The First Centers Capable Of Delivering Proton And Electron FLASH Radiotherapy



FlashForward™ + RapidScan will Boost Dose Rates



**FlashForward™
RapidScan
20 Gy dose/field**

**6 X 6 cm field =
200 Gy/s**

**12 X 12 cm field =
50 Gy/s**

3 VARIAN CONFIDENTIAL/ PROPRIETARY. DISCLOSED SOLELY FOR IMMEDIATE RECIPIENT ONLY

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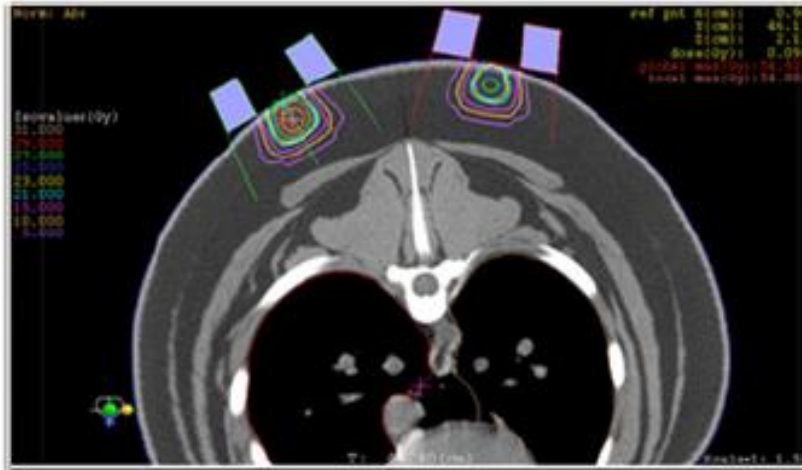
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FLASH Radiotherapy

Ultrahigh dose-rate radiation delivered in a very short period of time that produces a damaging effect in tumor tissue while sparing surrounding normal tissues.

Dose distribution in mini pig

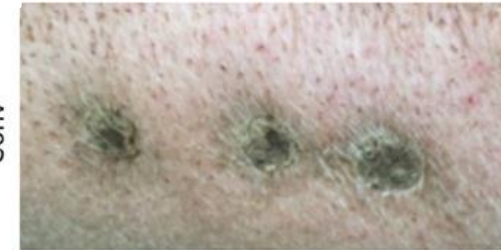


34 Gy*

31 Gy*

28 Gy*

Conv



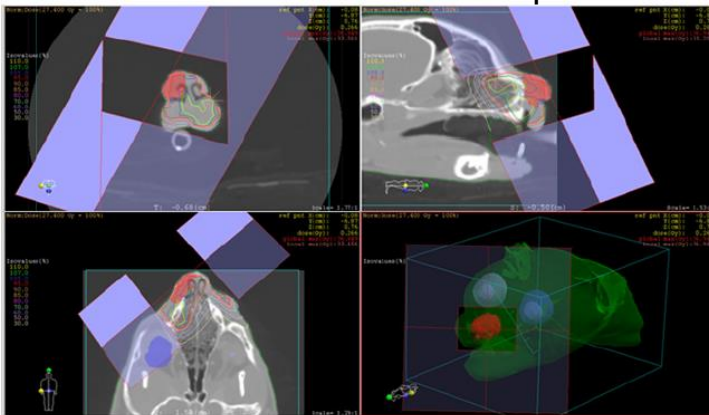
FLASH



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A Single FLASH Radiotherapy Demonstrates Excellent Tumor Control In Small Animals

Dose distribution in cat SCC patient



Before FLASH-RT



14 months post FLASH-RT



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OSU Received IntraOp Mobetron Spring 2020 To Begin Pre-Clinical FLASH Electron Studies



Modifications made to
achieve FLASH effect



- Pre-clinical research studies:
 - Mice
 - Zebrafish
- Vet School Clinical Trials

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OSU FLASH Team



Arnab Chakravarti, MD
Chair, Radiation Oncology



Dukagjin Blakaj, MD, PhD
Radiation Oncologist



John Grecula, MD
Radiation Oncologist



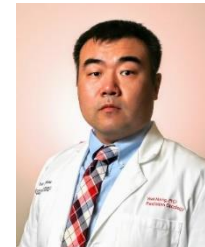
Nilendu Gupta, PhD
Chief, Medical Physics



Ahmet Ayan, PhD
Medical Physicist



Jessica Fleming, PhD
Radiobiologist



Wei Meng, PhD
Radiobiologist



Cecilia Cuitino, DVM, PhD
Veterinary Pathologist

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Research Funding

- OSUMC received \$100 million dollars from the Health and Human Services Grant
- OSUMC also received a 2nd very generous donation of \$100 million dollars.
- OSU has received >\$25 million dollars in research funding for Federal/NIH-related projects and grants over the past five years.
- OSU is ranked 7th in NIH funding amongst Radiation Oncology.



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PELTONIA 15

RIDE AS ONE → RAISE AS ONE

→ → Huntington → → PERRY & KILMER SANTULLI → →



Main Takeaways

- Advancements in molecular techniques have launched the cancer field into the era of personalized medicine.
- Proton and FLASH radiotherapy have the potential to revolutionize the way we treat cancer patients!
- Work of American Cancer Society Cancer Action Network is critical to further advancements in cancer research!



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Thank You!

To learn more about Ohio State's cancer program, please visit cancer.osu.edu or follow us in social media:



And please visit the Department of Radiation Oncology at radiationoncology.osu.edu

Jessica.Fleming@osumc.edu

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AMERICAN CANCER SOCIETY
PAN OHIO HOPE RIDE

American
Cancer
Society®

American
Cancer
Society®



WALKING
CLUB

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#OHIOFIGHTSCANCER

Coach Chris Holtmann,
The Ohio State University



National Cancer Information Center



American Cancer Society Cancer Action Network



Judy's Story

Road To Recovery

<https://www.youtube.com/watch?v=rmfR5f3DXMA>



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Delmar's Story

The Hope Lodge



<https://www.youtube.com/watch?v=B5VEnvAk0U>



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Relay For Life



FIGHT LIKE THE HERO YOU

Braydon

Making Strides Against Breast Cancer





IMPACT AND IMPORTANCE OF BIOMEDICAL RESEARCH FUNDING

Scott M Langevin, PhD, MHA, CT(ASCP)

Associate Professor of Epidemiology

Co-Director, Clinical & Translational Research Graduate Education Program

Department of Environmental & Public Health Sciences

University of Cincinnati College of Medicine

About Me...



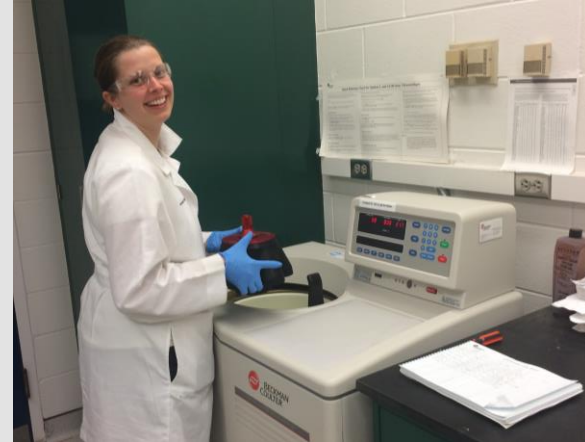
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- PhD (Epidemiology) from University of Pittsburgh Graduate School of Public Health (2010)
- Postdoctoral Fellowship in Cancer Epidemiology and Environmental Pathology at Brown University (2010-2013)
- Faculty member with UC College of Medicine Department of Environmental & Public Health Sciences (2013-Present)
 - Currently tenured Associate Professor of Epidemiology

My Research...

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- ❑ Molecular Epidemiology / Pathobiology of Respiratory Tract Cancers
 - ❑ Cancer epigenetics
 - ❑ Biomarker discovery and development
 - ❑ Etiology (cancer causes and risk factors)



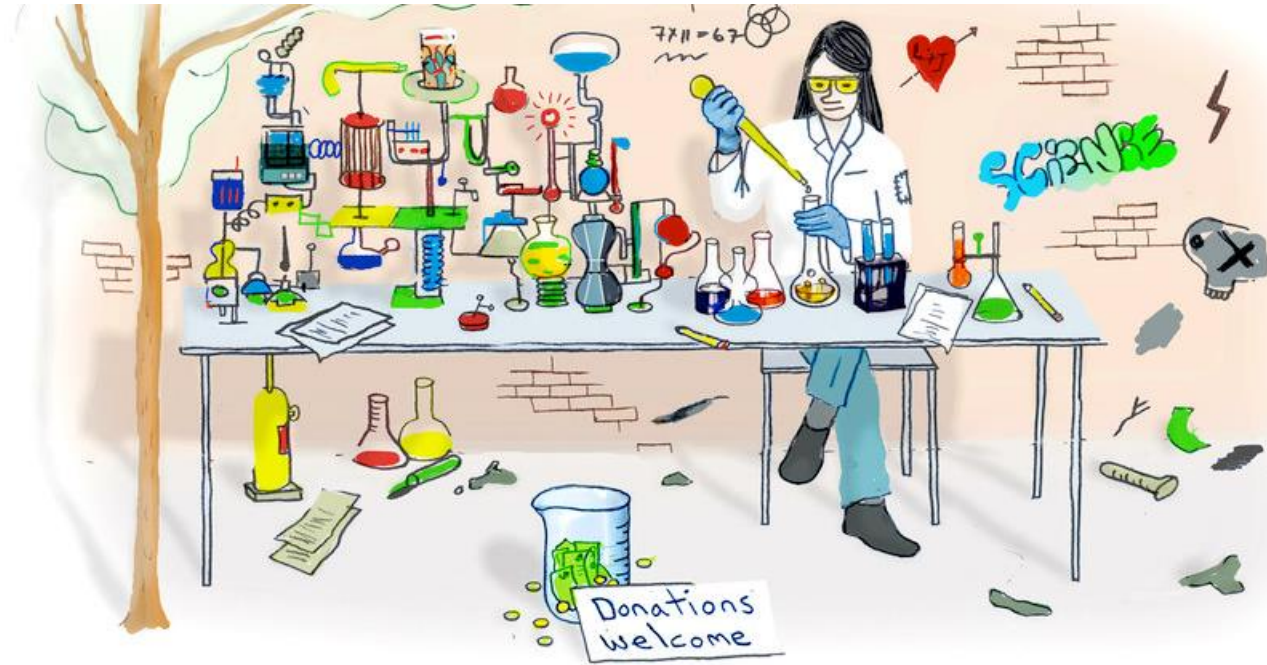
ACS Grant Funding



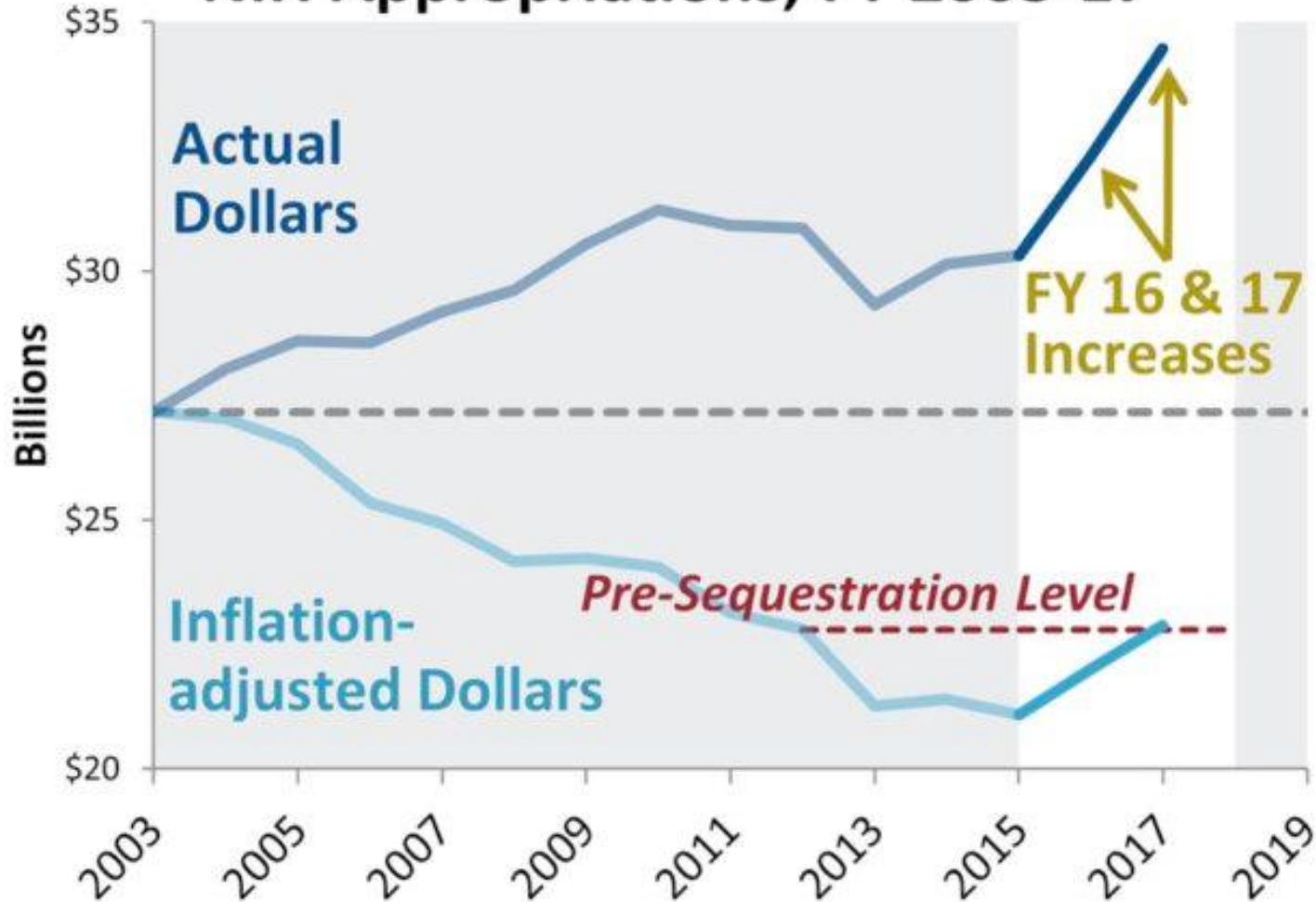
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- Received ACS Research Scholar (Jan 2019 – 2022)
 - ▣ Head and neck cancers have among the highest recurrence rates of all cancers
 - ~50% will recur within 2-years of treatment
 - ▣ Earlier detection of recurrent cancer is associated with better outcomes
 - ▣ Applying our patented biomarker panel in oral rinse (mouthwash) for early detection of recurrence following oral cancer treatment

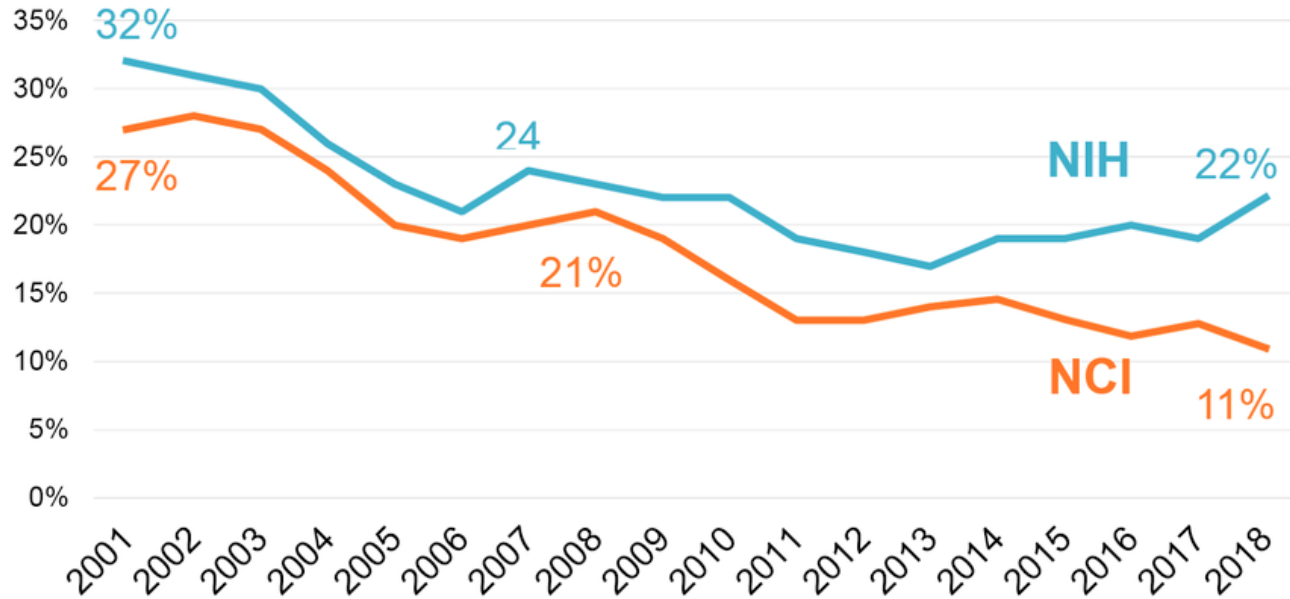
Need for Outside Support



NIH Appropriations, FY 2003-17



Success Rates for NIH & NCI Grant Applications

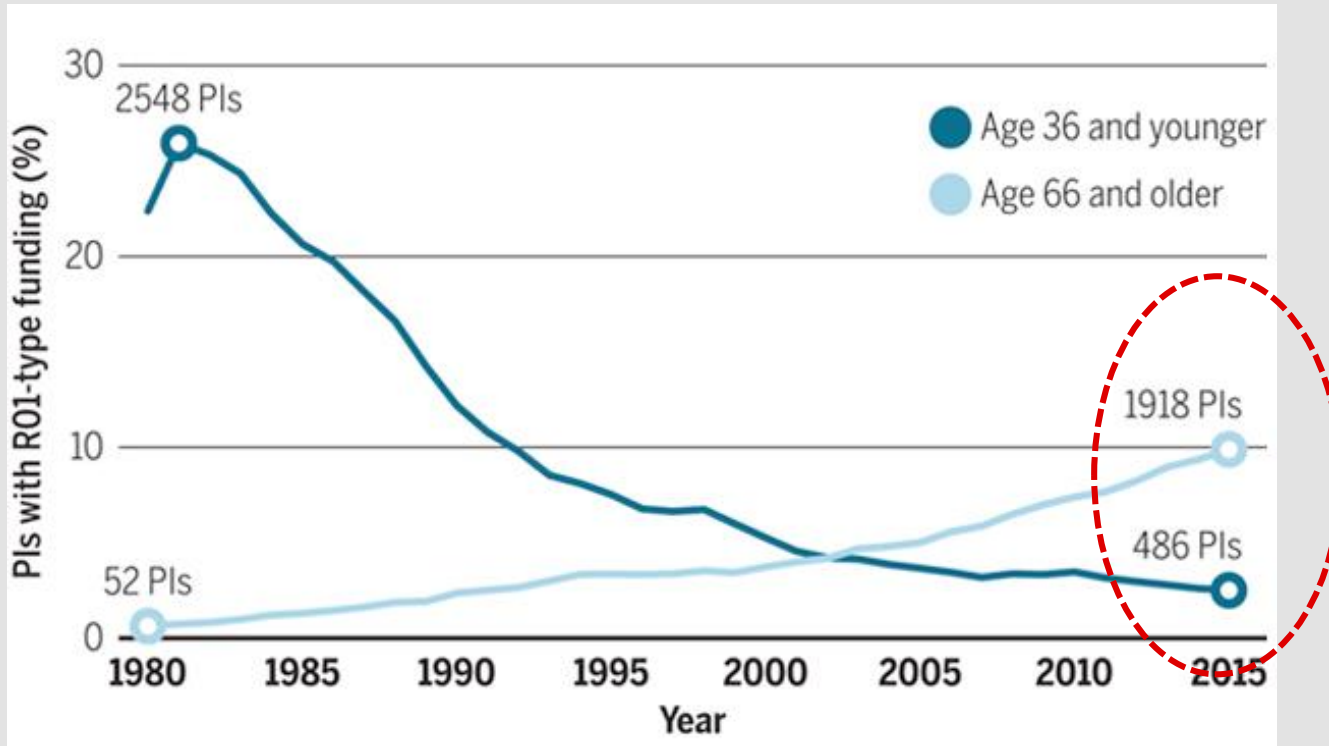


Data include all RPGs, including SBIR/STTR.

Sources: NIH Data Book (<http://report.nih.gov/nihdatabook/index.aspx>) and supplemental tables available in RePORT, and NCI DEA.

Increasing Age of NIH-Funded Principal Investigators

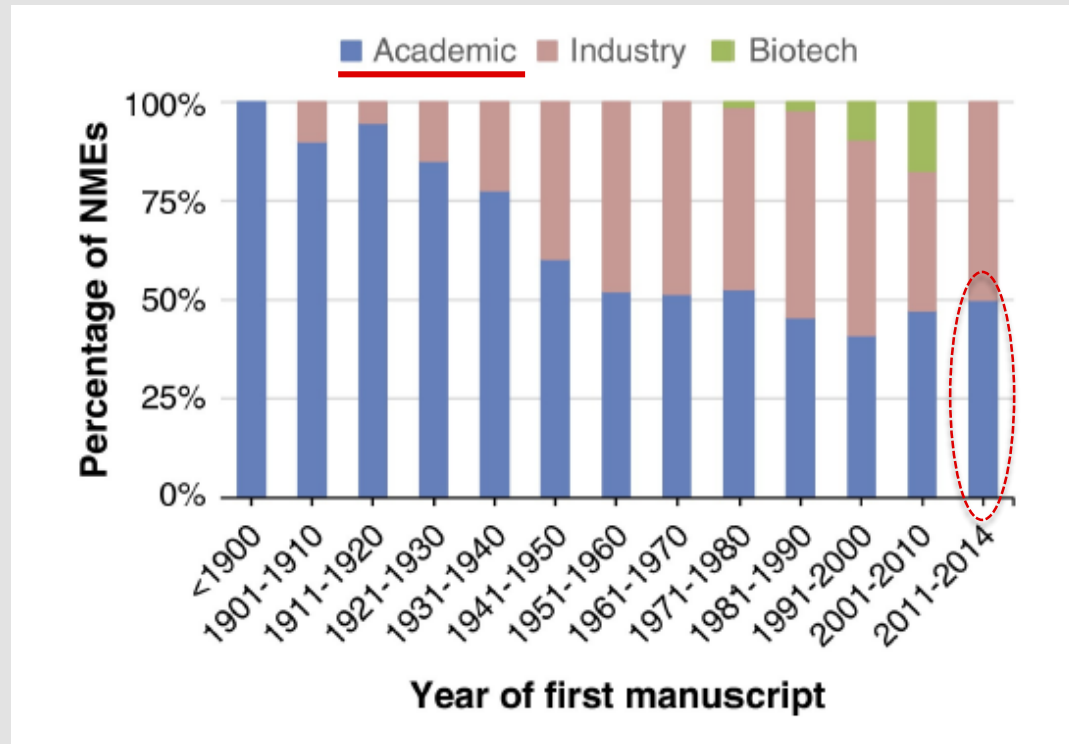
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Source: Alberts et al. *Science*. 2018; 360(6390):716-8.

Source of New FDA-Approved Drugs

47



Source: Patridge et al. *Drug Discov Today*. 2015;20(10):1182-7.

Don't Forget About Us!...

48

- Institute for Health Metrics and Evaluation (IHME) predicts 137,184 COVID-19 deaths through Aug 2020
- American Cancer Society (ACS): 1,806,590 new cancer cases and **606,520** cancer deaths in US in 2020
 - ▣ Siegel et al. *CA Cancer J Clin.* 2020;70(1):7-30
- **Underscores the critical importance of sustained funding for cancer research!**

THANK YOU!



ACS Research Program



Road to Recovery



Real Men Wear Pink



REAL
MEN
WEAR
PINK

Lights of Hope



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#OHIOFIGHTSCANCER

A word cloud where the words 'THANK YOU' are the largest and most prominent. Surrounding them are various translations of 'thank you' in different languages, including Spanish (GRACIAS, ARIGATO), Arabic (SHUKRIA, BIYAN, SHUKRIA), Indonesian (TERIMA KASIH), and others. The words are arranged in a roughly rectangular shape, with 'THANK YOU' being the central focus.



acscan.org