Session – New Advancements and Initiatives in the Treatment of Cancer

Roxana Dronca, M.D., Medical Oncologist

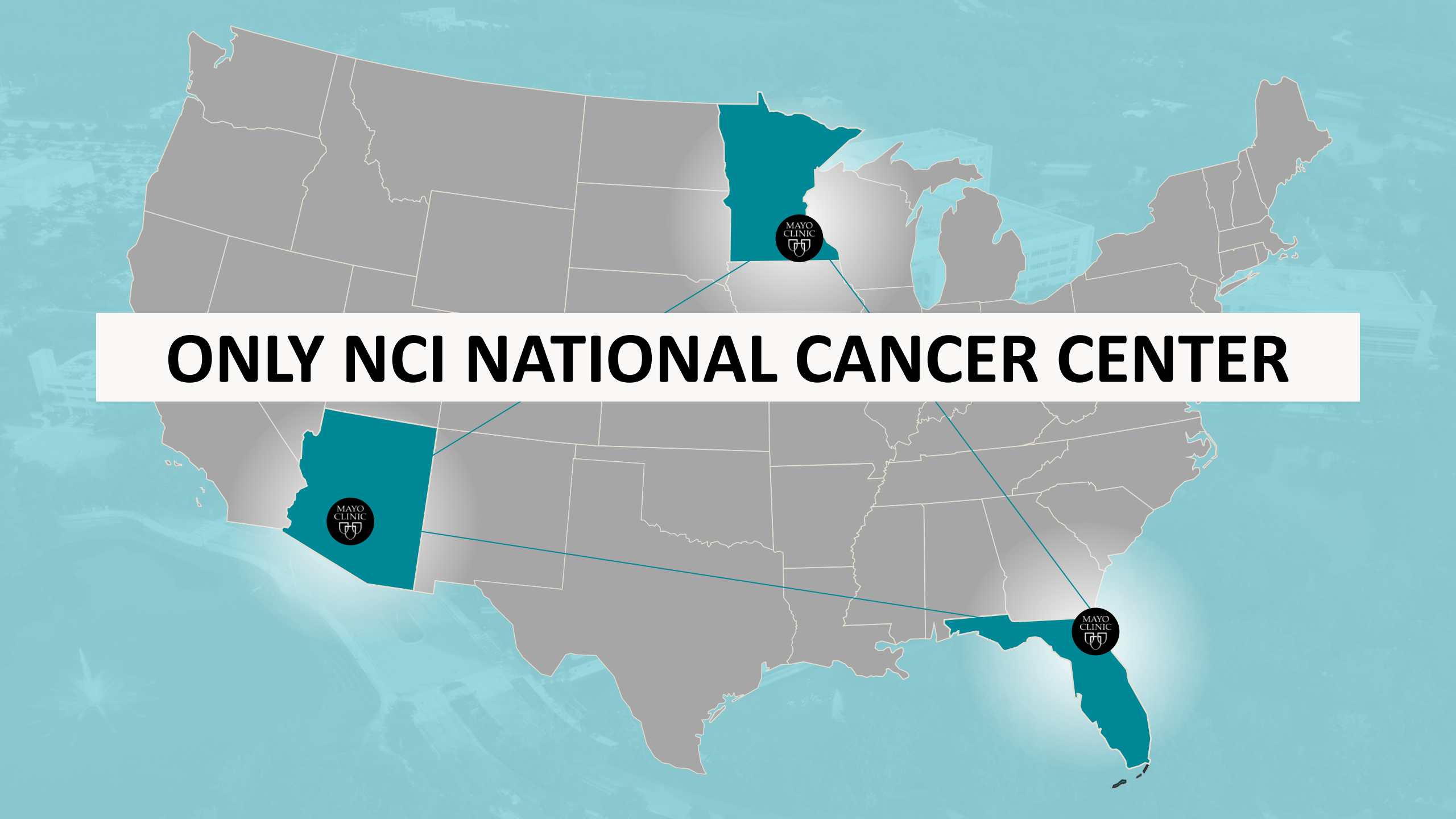
Mayo Clinic

MAYO CLINIC
Comprehensive Cancer Center

TRANSFORMING CANCER CARE:

Innovation, Access, and the Future of Treatment

Roxana S. Dronca, M.D
Site Director, Mayo Clinic Comprehensive Cancer Center in Florida
Director, Mayo Clinic Cancer CARE Beyond Walls Program
Professor of Oncology


MAYO CLINIC
MAYO CLINIC
MAYO CLINIC
ONLY NCI NATIONAL CANCER CENTER

MAYO CLINIC / COMPREHENSIVE CANCER CENTER

#1 Health System in U.S. & World
#1 Cancer Hospital-MN / #3 USNWR
Highest Volume Proton Beam and Radiopharmaceutical Practice in U.S.
1.3 M Patients Annually (System)
83,000 Faculty & Staff (System)

Mayo Clinic in Minnesota (MCR)
Rochester (Two Campuses)

Mayo Clinic in Arizona (MCA)
Phoenix and Scottsdale

#1 Hospital; #1 Cancer Hospital in Arizona
Highest Volume Solid Organ Transplant in U.S.
Cancer Focus: Early Detection; Cellular Engineering; Novel Therapeutics; Disparities; ASU Partnership

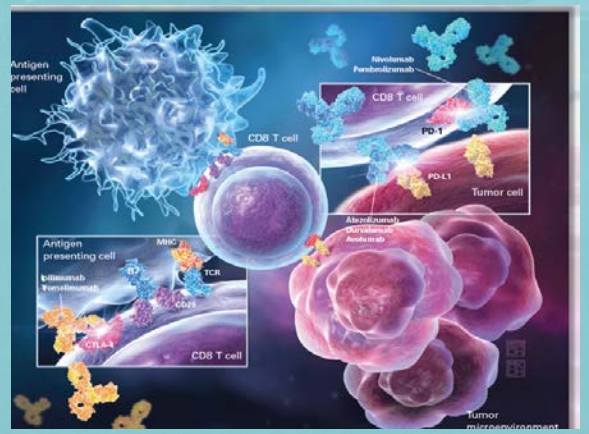
Mayo Clinic in Florida (MCF)
Jacksonville

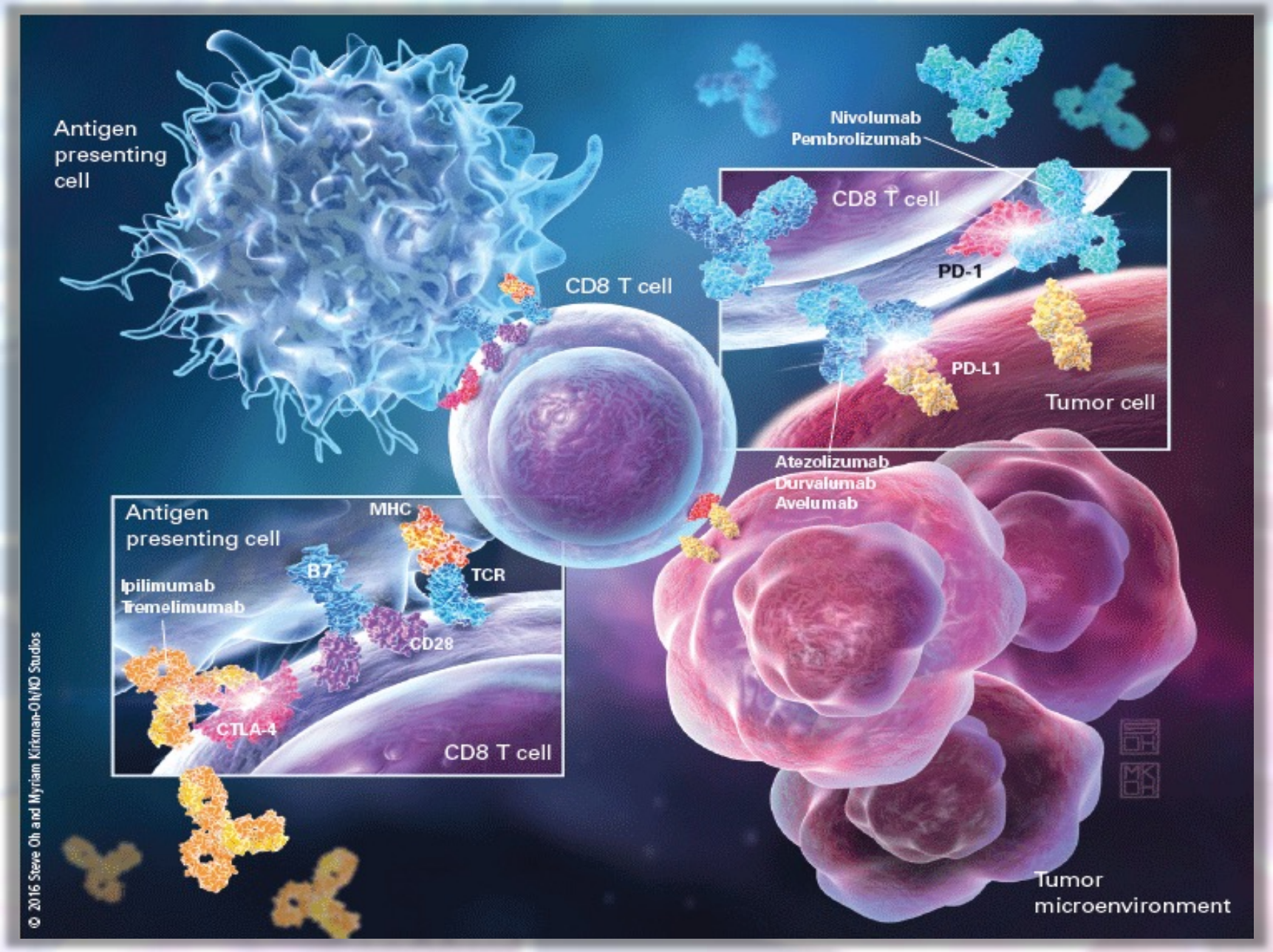
#1 Hospital; #1 Cancer Hospital in Florida
Cancer Focus: First Carbon Ion Site in Americas, Heavy Particle Therapies, Cancer Vaccines/mRNA Therapeutics, Advanced Care@Home; Disparities

OVER A CENTURY OF HEALING AND DISCOVERY

"The glory of medicine is that it is constantly moving forward, that there is always more to learn. The ills of today do not cloud the horizon of tomorrow, but act as a spur to greater effort.."
William J. Mayo, M.D.

Haidong Dong, PhD
Professor of Immunology
Co-discoverer of PD-L1 protein




Antigen presenting cell
CD8 T cell
Nivolumab
Pembrolizumab
CD8 T cell
PD-1
PD-L1
Tumor cell
Atezolizumab
Durvalumab
Avelumab
Antigen presenting cell
MHC
B7
TCR
Ipilimumab
Tremelimumab
CD28
CTLA-4
CD8 T cell
Tumor microenvironment
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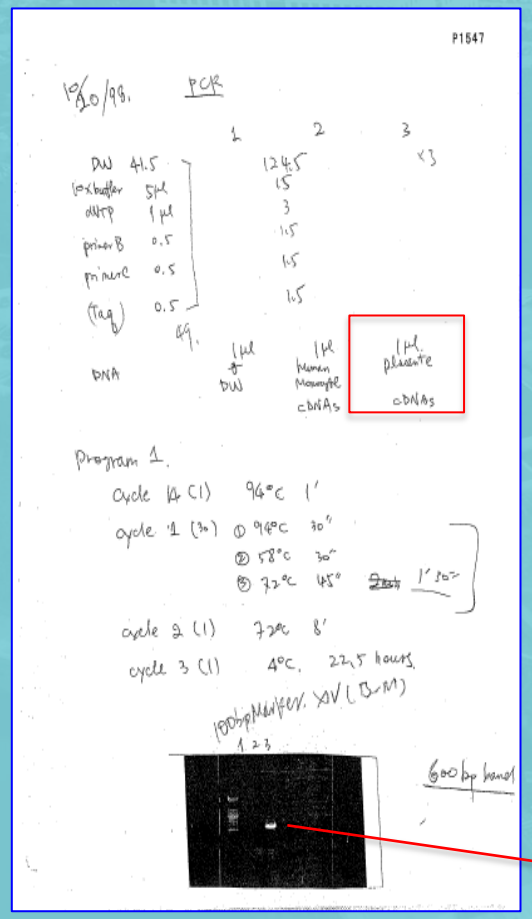
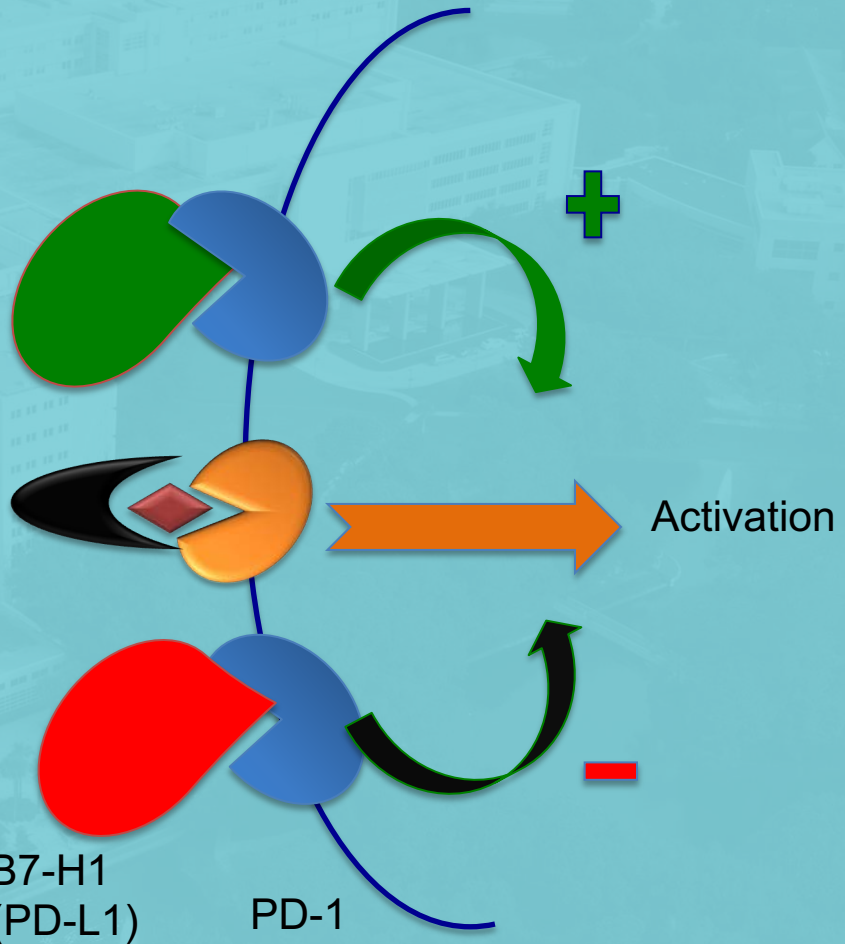
PD-L1 WAS DISCOVERED AT MAYO CLINIC IN 1998



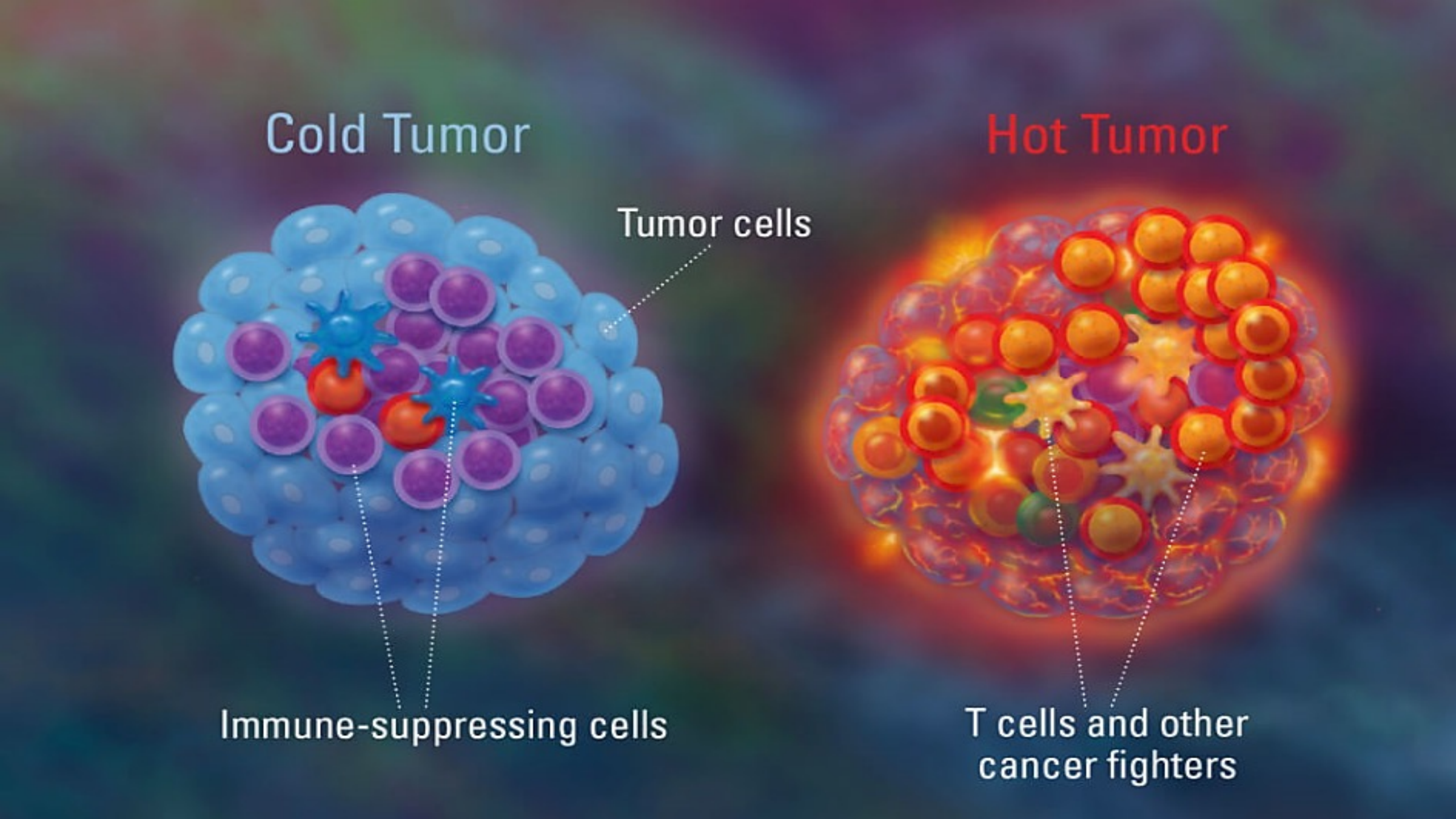
Co-stimulation signals (Accelerator)

Antigen/MHC (Engine switch)

Checkpoint signals (Brakes)

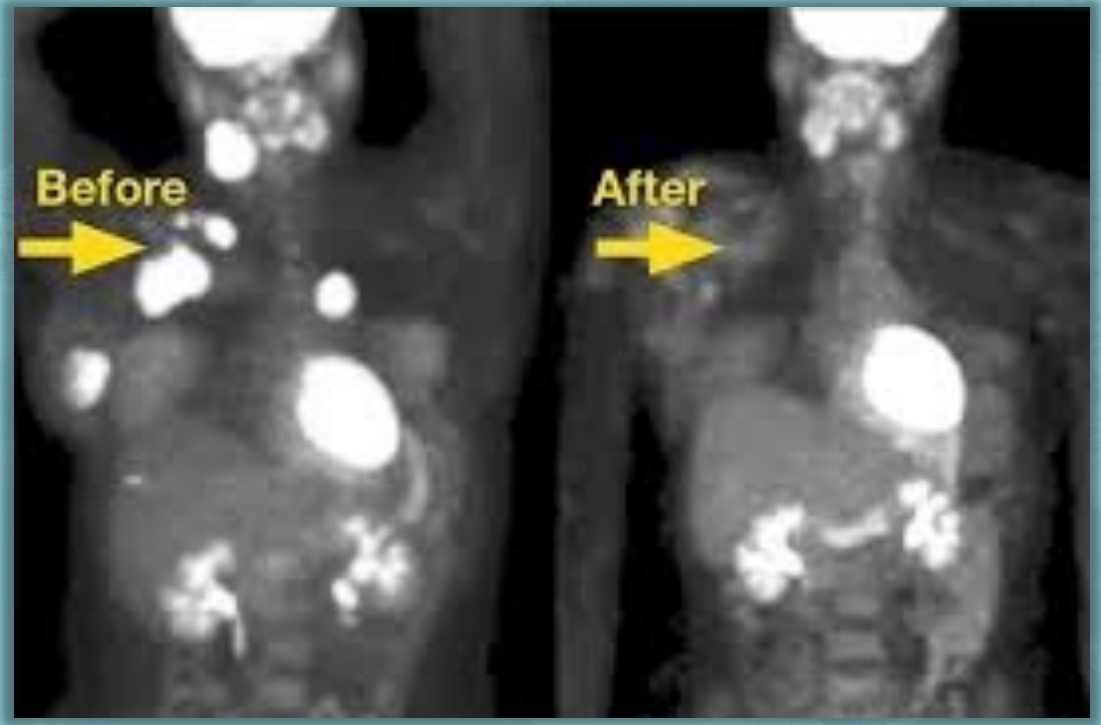


Courtesy of Dr. Haidong Dong

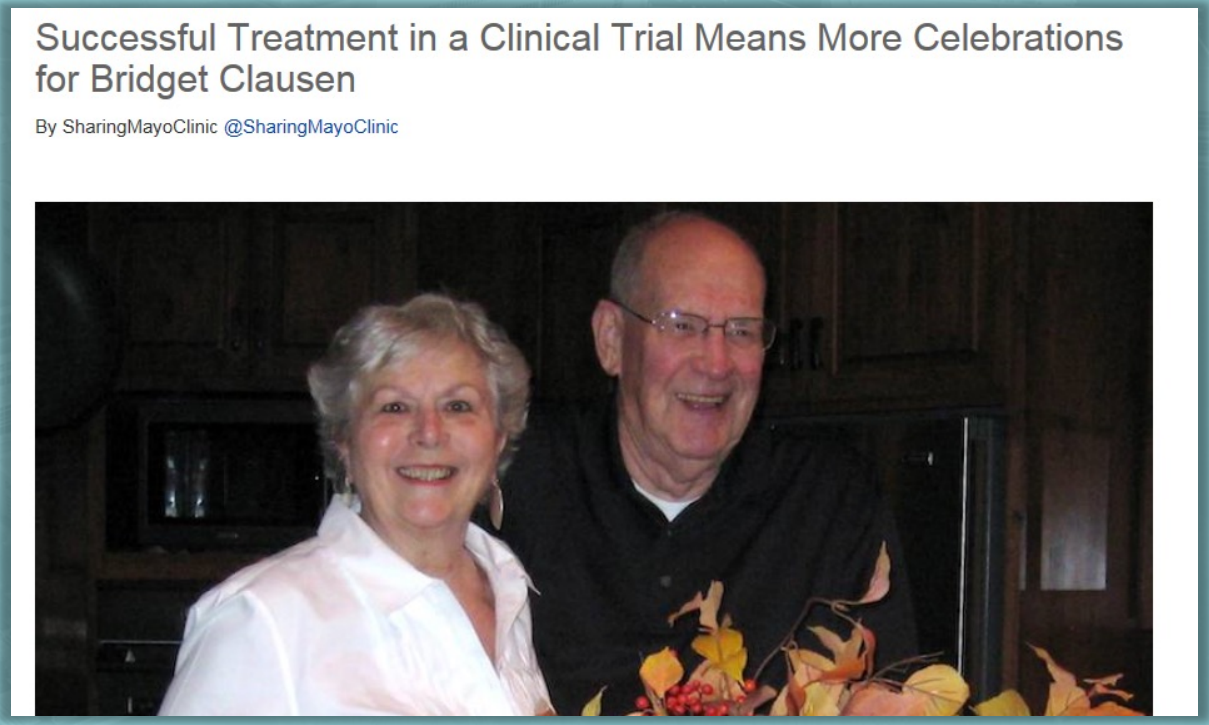

Cold Tumor
Tumor cells
Immune-suppressing cells
Hot Tumor
T cells and other
cancer fighters

FIGHTING CANCER WITH IMMUNOTHERAPY

BRIDGET'S STORY

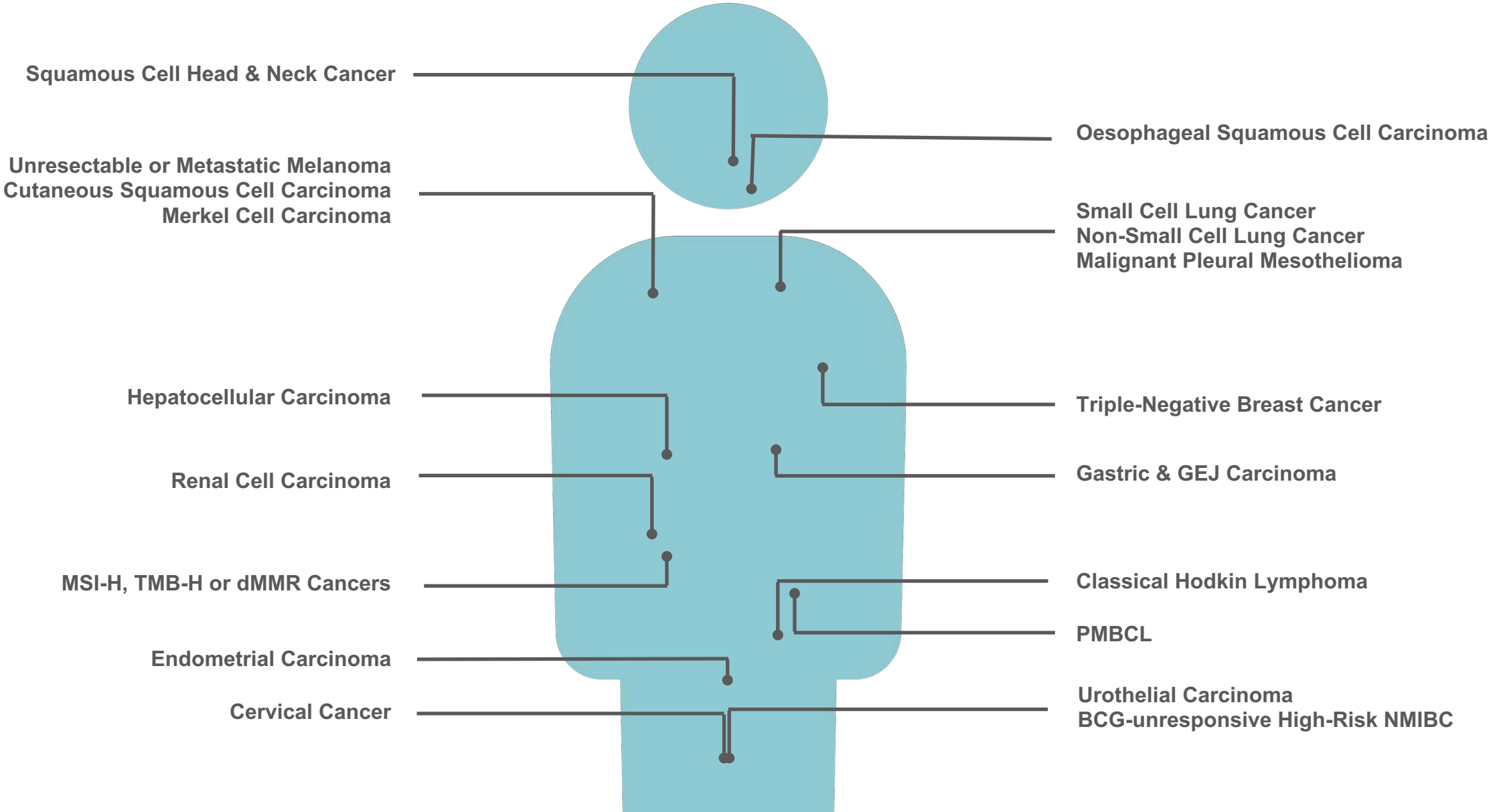


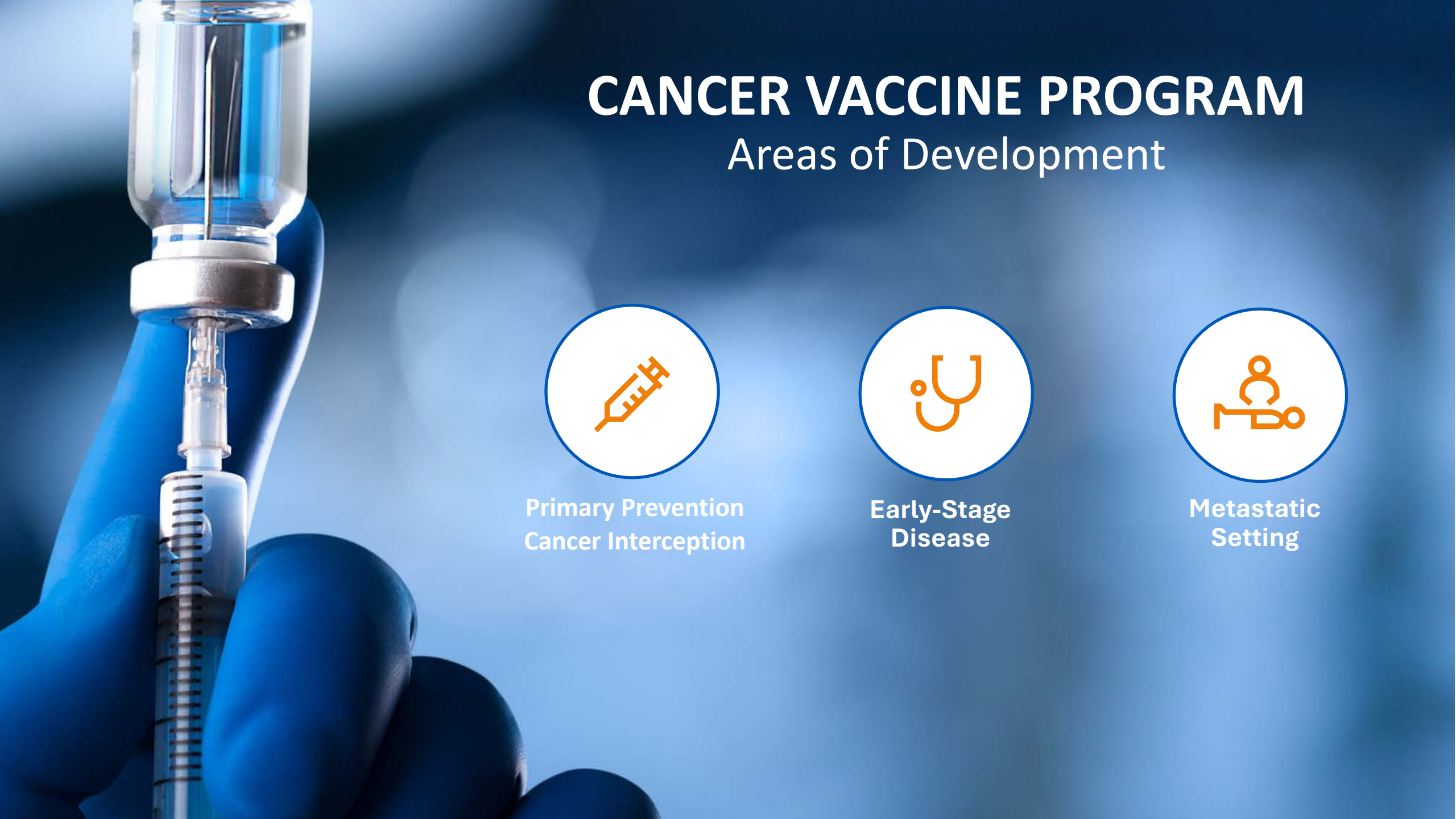
2011 2012



2018: Cancer Free

U.S. FDA APPROVED IMMUNE-CHECKPOINT INHIBITORS





CANCER VACCINE PROGRAM

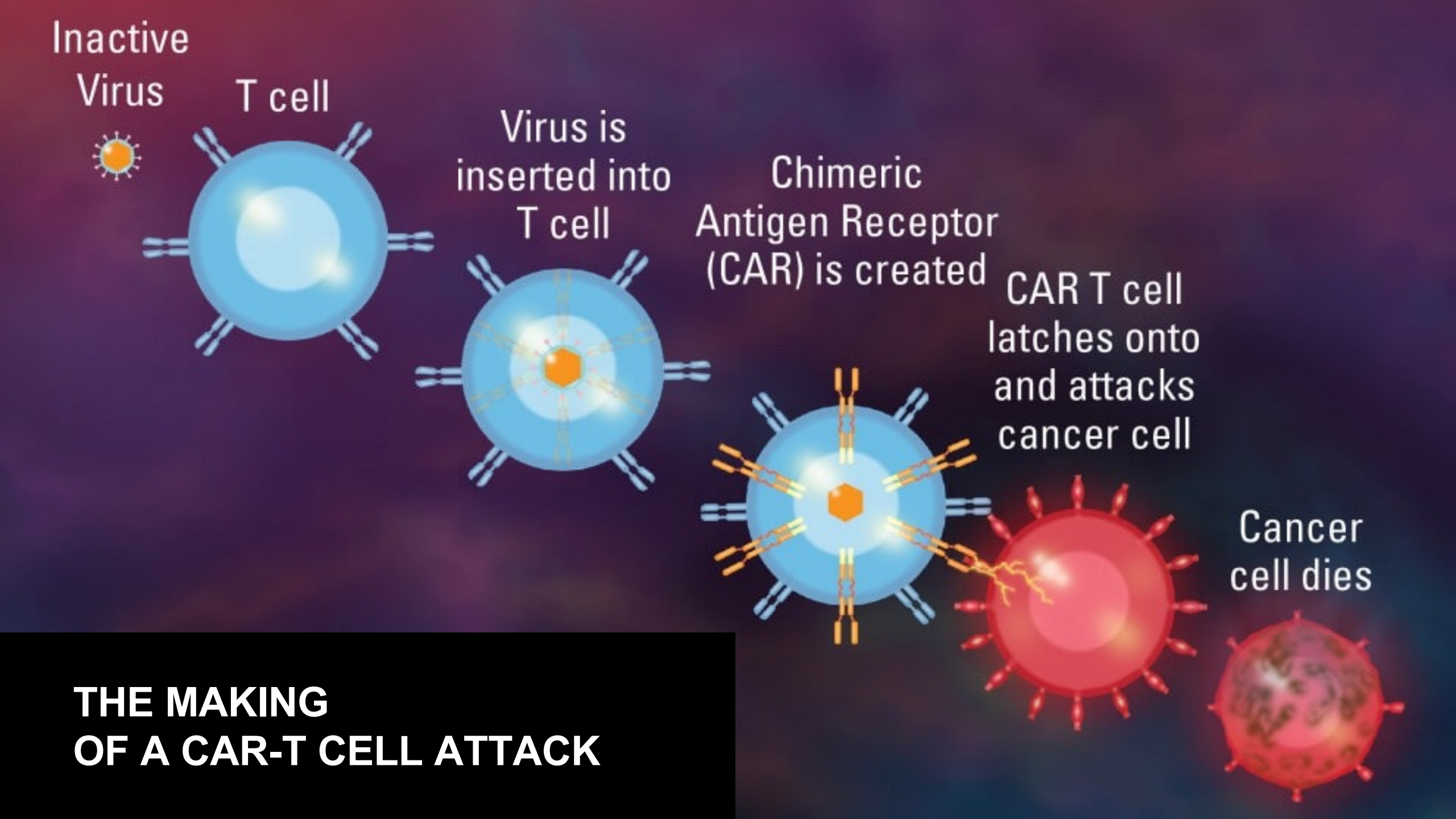
Areas of Development

Primary Prevention
Cancer Interception

Early-Stage
Disease

Metastatic
Setting


CAR-T THERAPY: A LIVING THERAPY



THE MAKING OF A CAR-T CELL ATTACK

CAR-T THERAPY AT MAYO CLINIC

Tanis Milicevic's Story

MAYO CLINIC

Carbon Ion Therapy

A First in the Americas and a Bold Step Forward for Cancer Care

THE NEED FOR NEW OPTIONS

50%

of cancer patients require radiotherapy during some point of their care.

20+

cancer types for which carbon ion therapy has promise for improving outcomes.

~60k

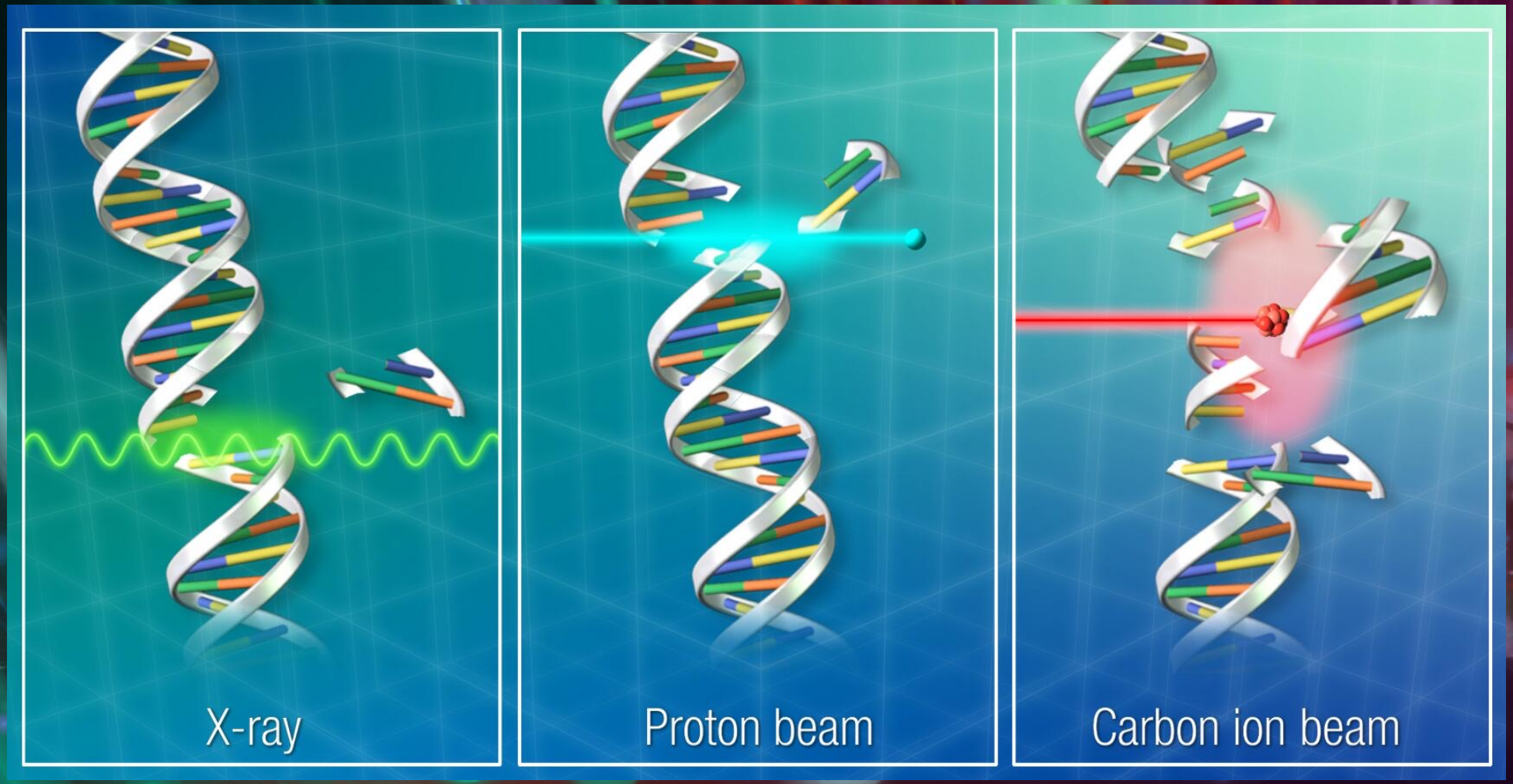
patients in the United States who can benefit right now from carbon ion therapy.

WHAT IS CARBON ION THERAPY?

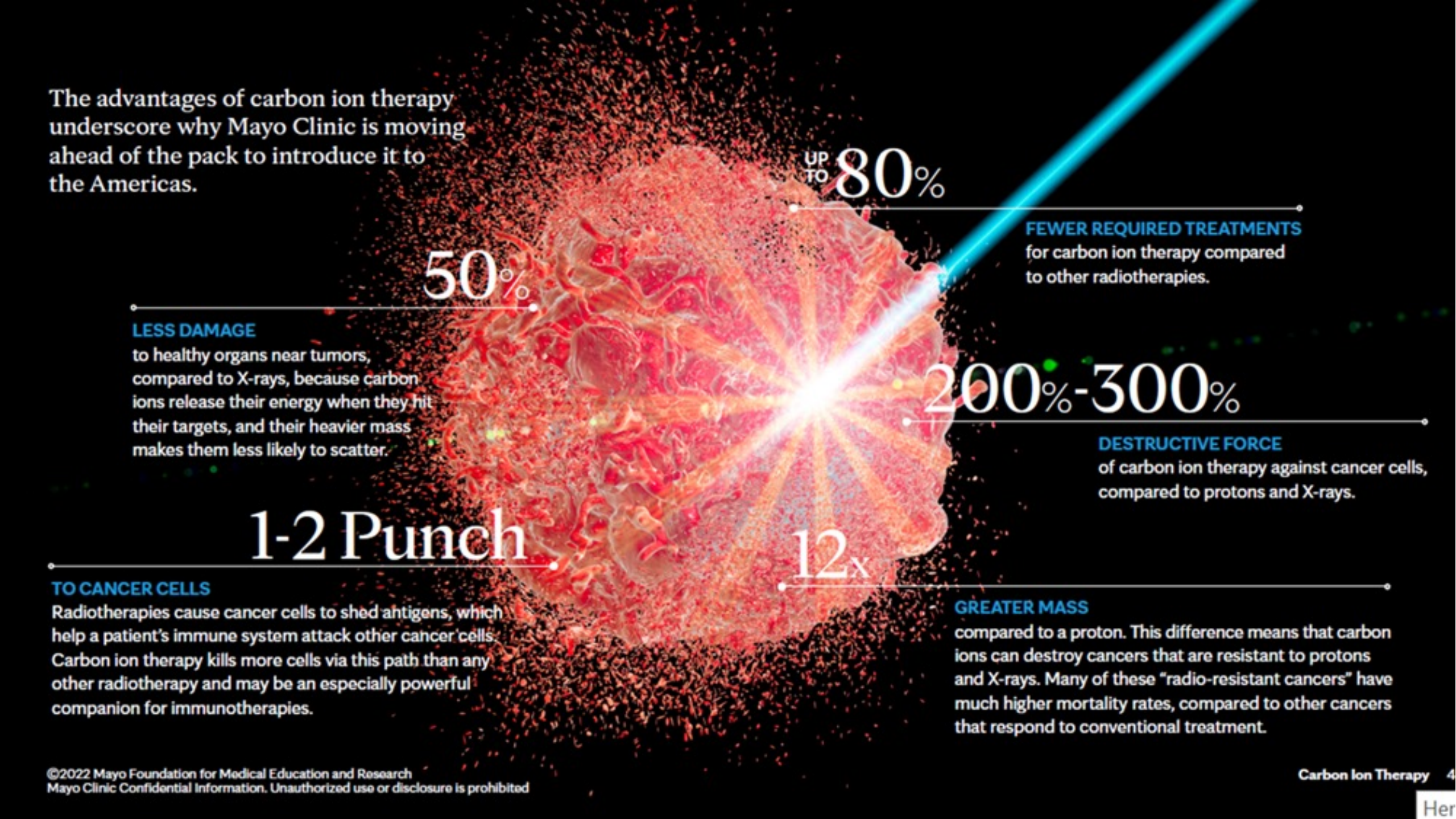
Carbon ion therapy uses a process similar to proton therapy.

It sends charged particles to cancer cells, and the particles release their energy when they hit their target, which destroys cancer cells with minimal damage to surrounding tissue.

RADIATION PHYSICS 101



The advantages of carbon ion therapy underscore why Mayo Clinic is moving ahead of the pack to introduce it to the Americas.



UP TO 80%

FEWER REQUIRED TREATMENTS
for carbon ion therapy compared to other radiotherapies.

50%

LESS DAMAGE
to healthy organs near tumors, compared to X-rays, because carbon ions release their energy when they hit their targets, and their heavier mass makes them less likely to scatter.

200%-300%

DESTRUCTIVE FORCE
of carbon ion therapy against cancer cells, compared to protons and X-rays.

1-2 Punch

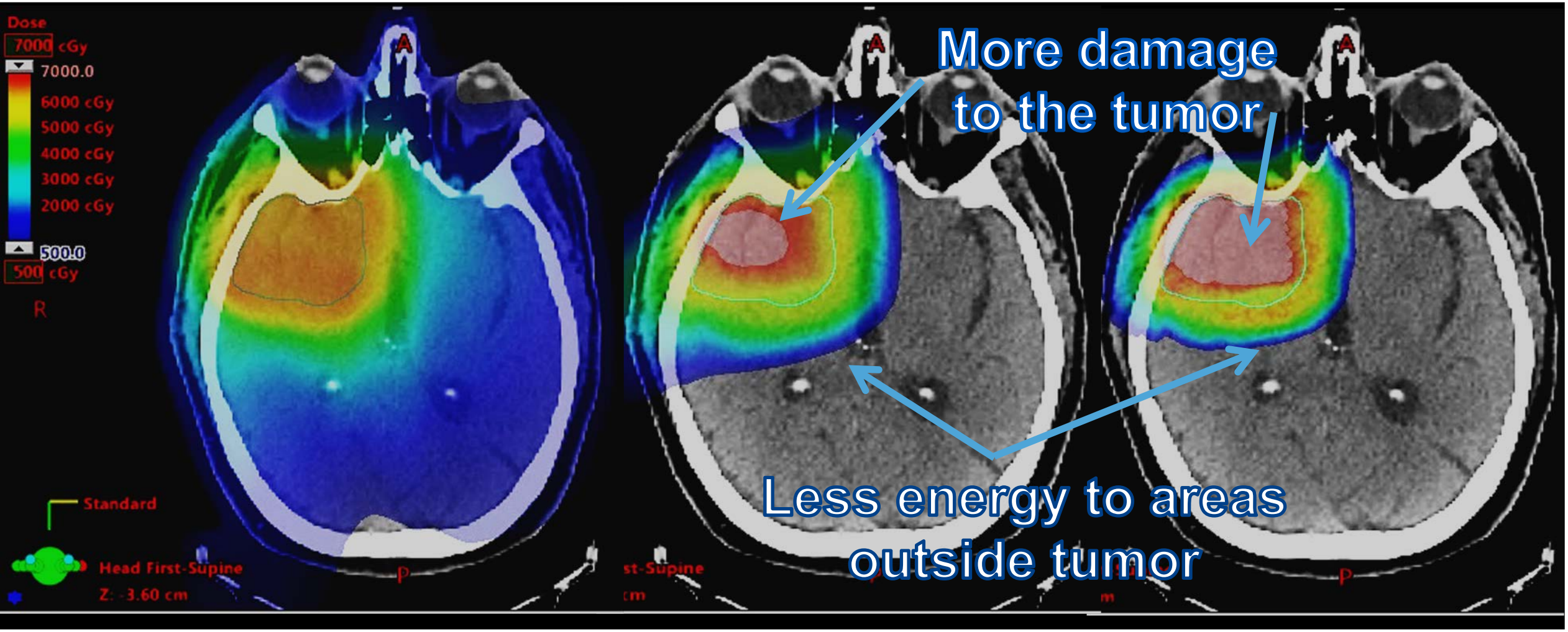
TO CANCER CELLS
Radiotherapies cause cancer cells to shed antigens, which help a patient's immune system attack other cancer cells. Carbon ion therapy kills more cells via this path than any other radiotherapy and may be an especially powerful companion for immunotherapies.

12x

GREATER MASS
compared to a proton. This difference means that carbon ions can destroy cancers that are resistant to protons and X-rays. Many of these "radio-resistant cancers" have much higher mortality rates, compared to other cancers that respond to conventional treatment.

ADVANTAGES OF CARBON ION THERAPY?

IMRT Protons Carbon



Courtesy of Chris Beltran

CARBON THERAPY FACILITIES

*PTCOG website:https://www.ptcog.ch/

MAYO CLINIC IN FLORIDA

First Carbon Ion/Proton Radiation Treatment Center in the Americas

Built for the Future

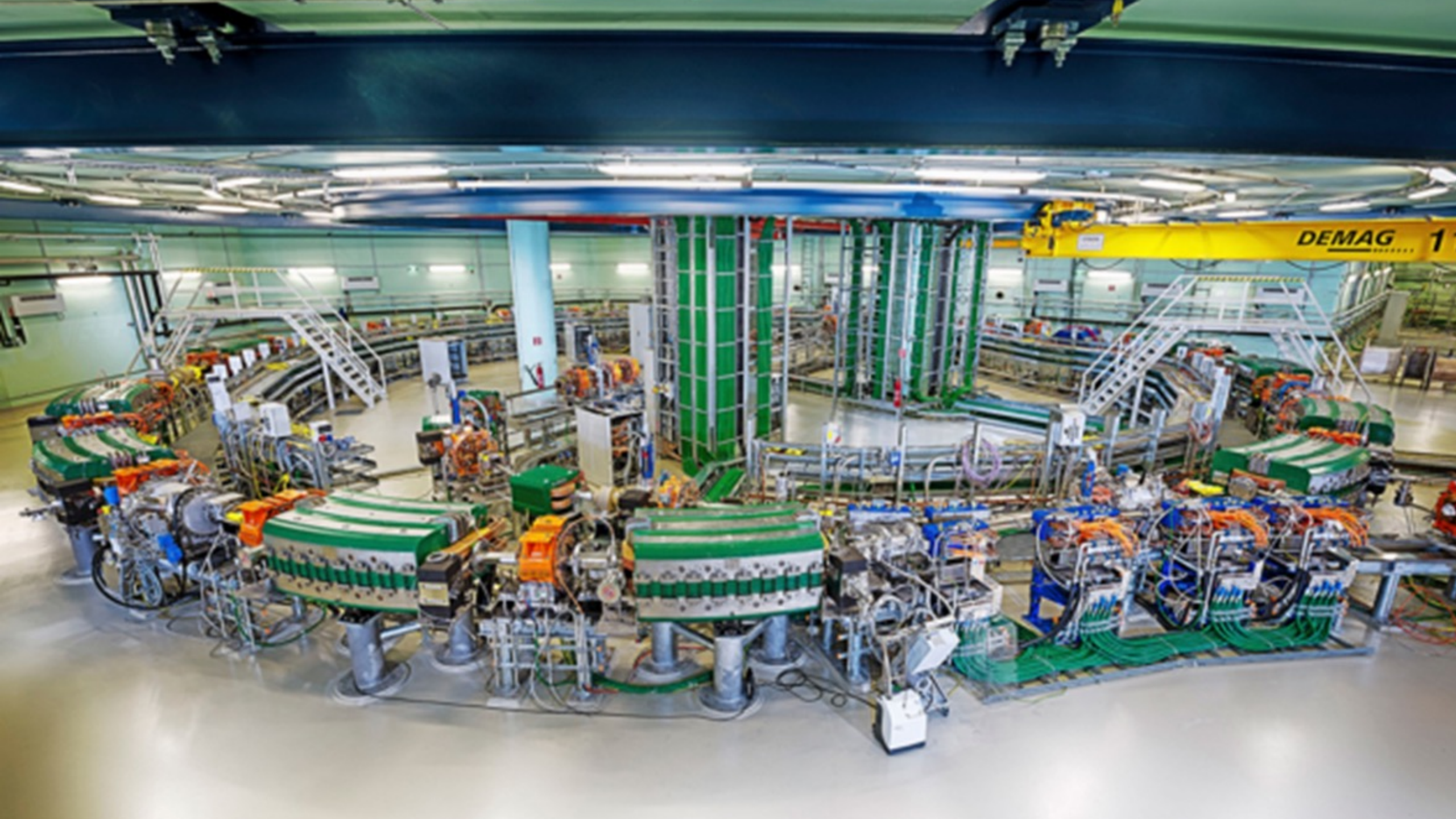
The design of the Integrated Oncology Building can support future advancements. For example:

01 The building can **grow to twelve stories** to meet future demand for Mayo Clinic's care.

02 The building has **a beam line that can seamlessly deliver protons or carbon ions** and is ideal for research to identify new protocols that use both treatments.

03 The building can **support future innovations and expansion in carbon ion therapy.** Mayo Clinic has designed the building to accommodate an addition that can hold two carbon ion gantries. The gantry design also includes real-time imaging, which will improve the precision of the treatment.

04 The building's technology can **accommodate other heavy ions,** which are now in research studies, should those ions prove beneficial for cancer care.


DEMAG

INTEGRATED ONCOLOGY BUILDING (IOB)

Radiation Oncology Practice Expansion Timeline

November 2024

Equipment delivery begins

January 2025

Facility readiness

Summer 2025

First Photon Patient

(2 Linacs, 1 Leo Chair, 1 CT, 1 MR)

Q1 2027

First Proton Patient

(2 Proton Gantries)

Q1 2028

First Carbon Patient

(1 Fixed Beam)

PARTNERING TO ACOMPLISH OUR GOALS

Graduate School of Medicine
Faculty of Medicine, Osaka University

GSI Helmholtzzentrum für Schwerionenforschung GmbH

National Cancer Centre Singapore
SingHealth

HEIDELBERG UNIVERSITY HOSPITAL

MedAustron

YONSEI UNIVERSITY

UNIVERSITY OF VIENNA

FLORIDA STATE UNIVERSITY
COLLEGE OF MEDICINE

臺北榮民總醫院
Taipei Veterans General Hospital

National Institutes for Quantum Science and Technology
QST Hospital (former NIRS Hospital)

CNAO
Centro Nazionale di Adroterapia Oncologica

群馬大学
GUNMA UNIVERSITY

UFHealth
UNIVERSITY OF FLORIDA HEALTH

Thank You.

Roxana Dronca, M.D., Medical Oncologist

Mayo Clinic