

Two Decades of Cancer Research Progress

Major Advances in Medical Oncology and Our
Path Forward

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American Society of Clinical Oncology



Summary

**Cancer Care:
1990s**

**A
Transformative
20 Years**

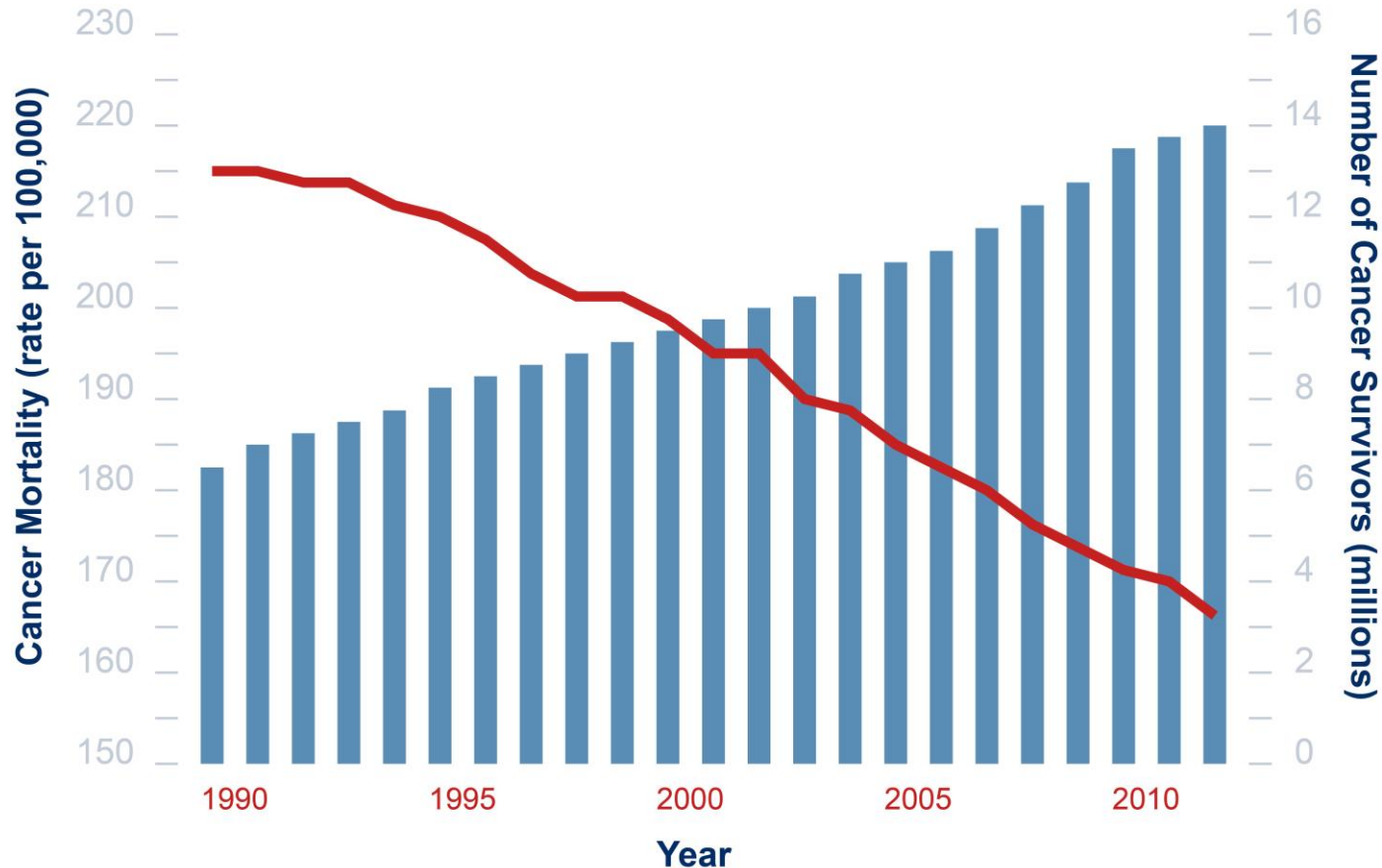
**Our Path
Forward**

Snapshot: Cancer Care 20 Years Ago

- Cancer treated primarily based on **histology**, **location** and **size**; few biomarkers
- Roughly **200 fewer treatment options than today**
- Three **basic treatment modalities**
- **Limited supportive care options**

Since the 1990s: Mortality Down, Survivorship Up

In the United States...



Sources: US Mortality Files, National Center for Health Statistics, CDC. DeSantis C, Chunchieh L, Mariotto AB, et al. (2014). Cancer Treatment and Survivorship Statistics, 2014. CA: A Cancer Journal for Clinicians.

Since the 1990s: Progress by Many Measures

Treatment

- New therapies
- Imaging, radiation oncology and surgery advances
- Precision medicine
- Immunotherapy

Prevention

- Interventions for infection-related cancers
- Cancer susceptibility genes
- Drug and surgical risk reduction strategies

Quality of Life

- Better toxicity management
- Less intensive therapies
- Palliative care integration

Survivorship

- Growing research area
- Late effects identified
- Surveillance strategies established

Top 5 Advances in Modern Oncology*

- 1965: Chemotherapy Cures Advanced Hodgkin Lymphoma
- **2006: Vaccine Approved to Prevent Cervical Cancer**
- **2001: Targeted Drug Transforms Treatment of CML**
- 1977: Chemotherapy Cures Advanced Testicular Cancer
- **1991 Powerful Anti-Nausea Drugs Control Major Side Effect of Cancer Treatment**

A Transformative 20 Years

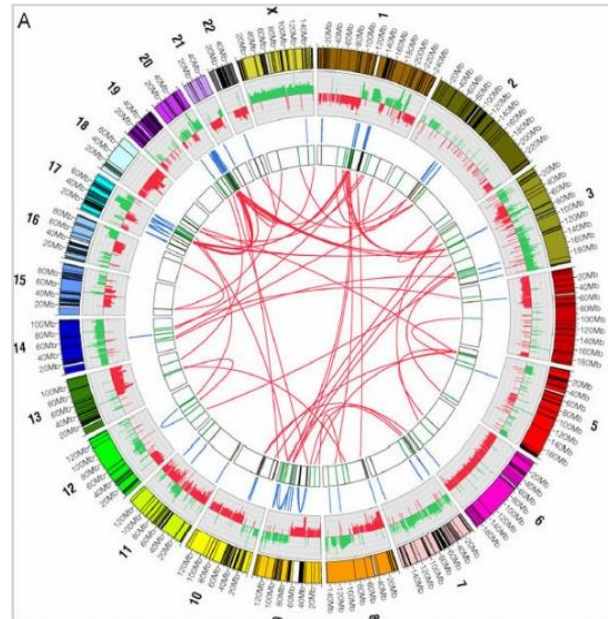




Precision Medicine: Science Serving Patients



Germline
Variation



Somatic
Mutation



Personalized
Care



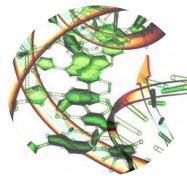
Cancer Genomics

- Advent of the “precision medicine” era
- But cancer’s biology is far more complex than we had imagined



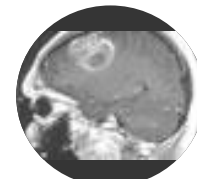
2000

*Hallmarks of
Cancer* published



2005

The Cancer Genome
Atlas (TCGA)
launches



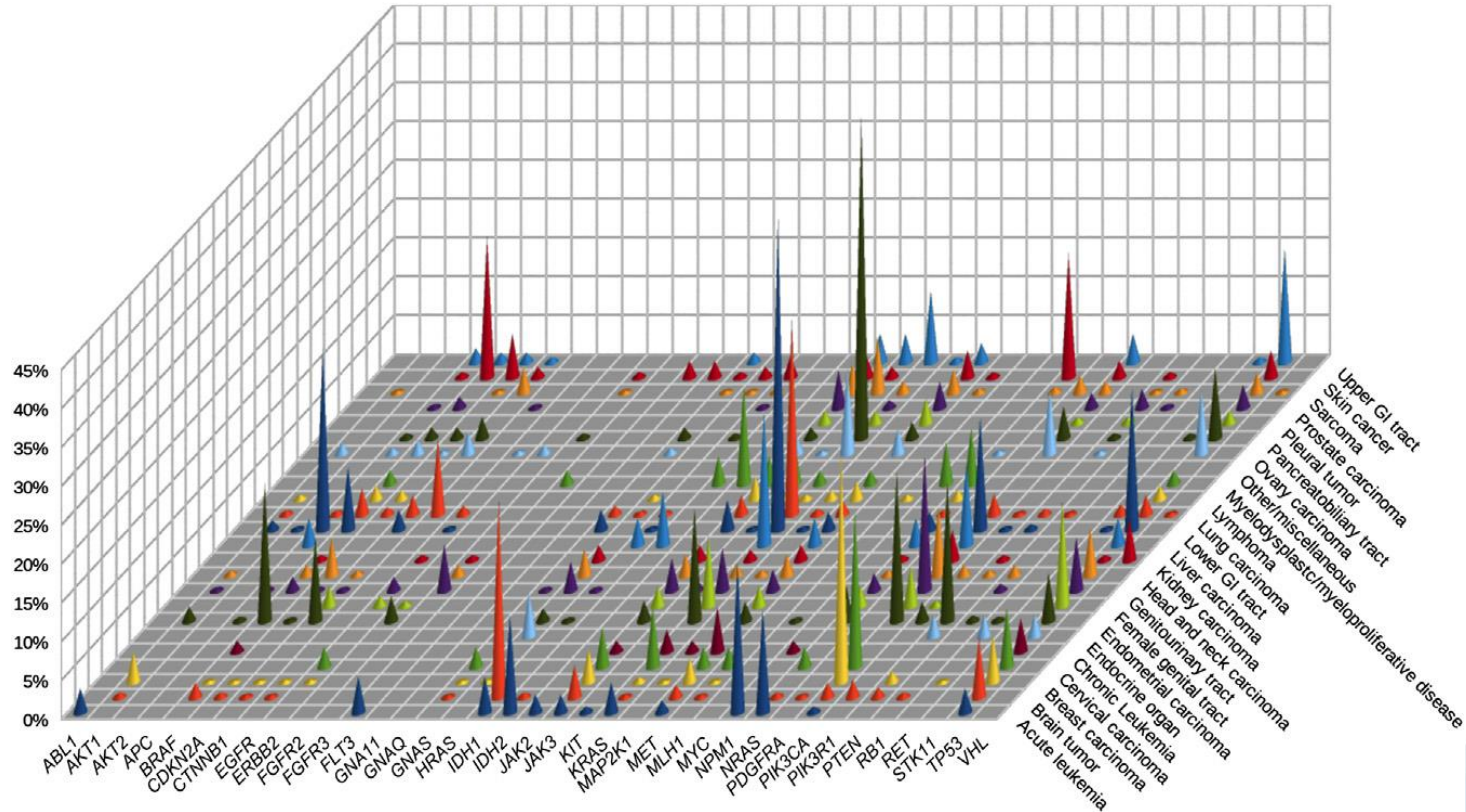
2010-2014

Genetic subtypes of
glioblastoma, gastric
and other cancers
identified via TCGA
research



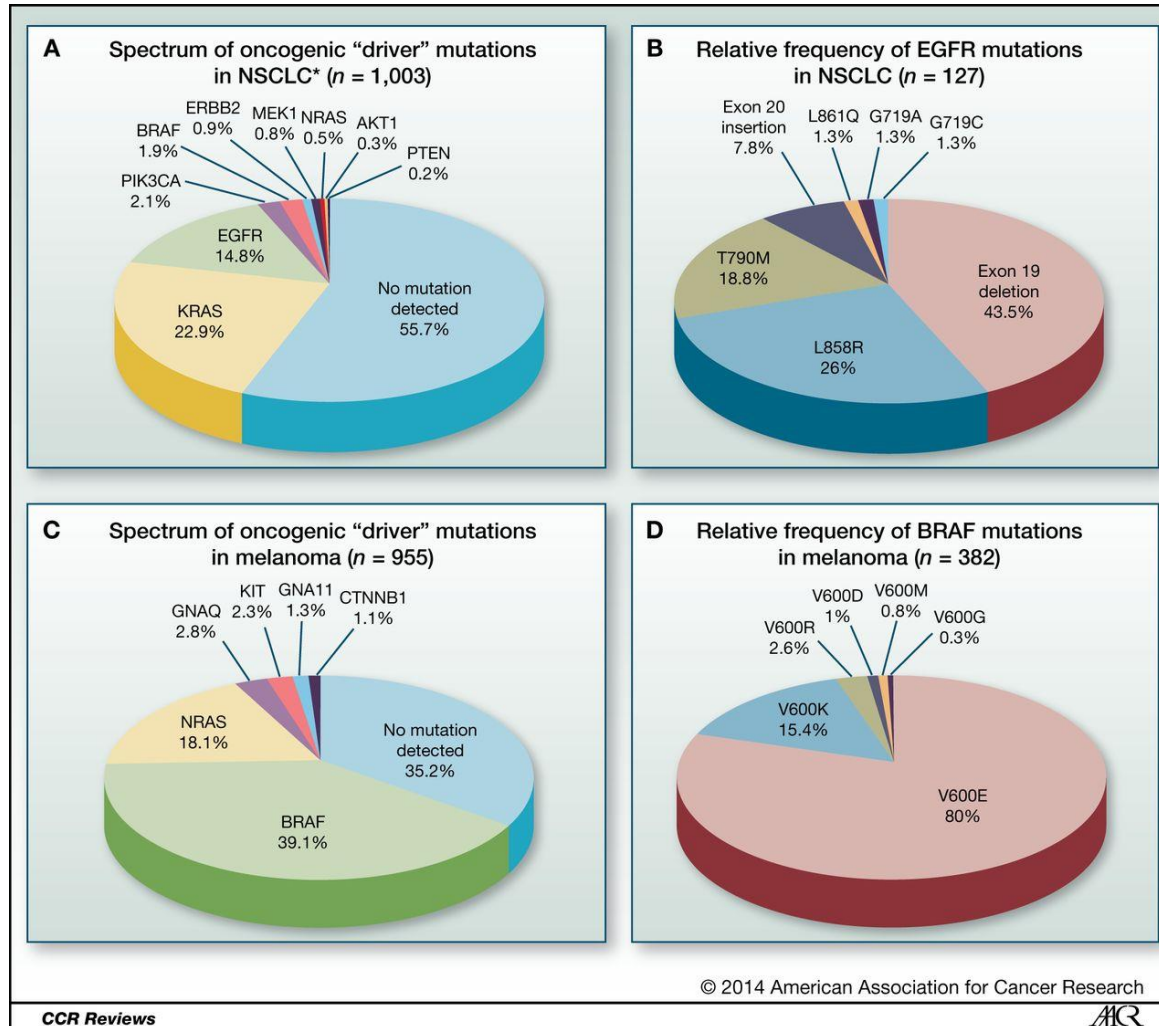
Cancer Genomics

Genomic Landscape of 5,000 Human Cancers



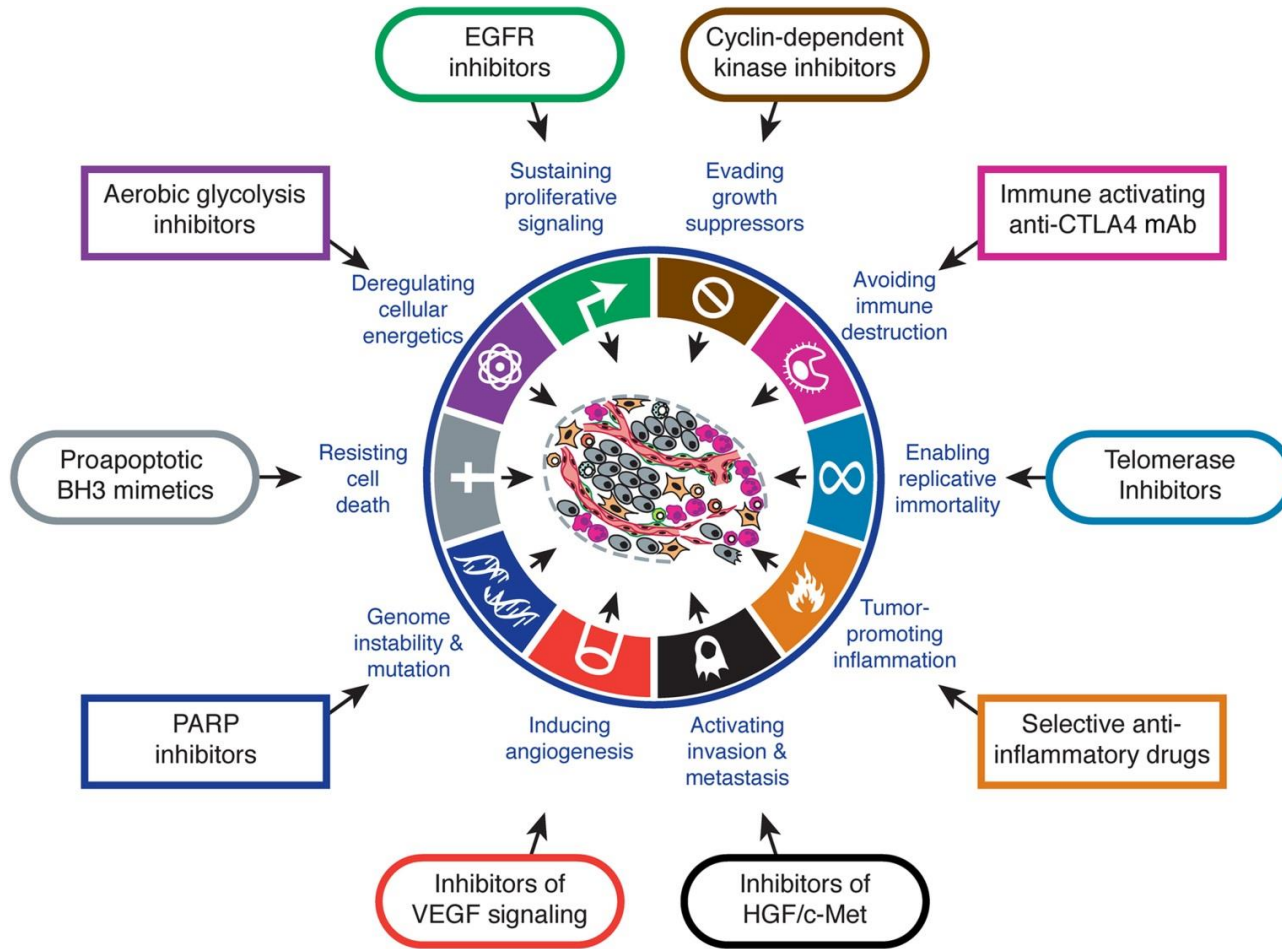


Common Cancers Now Collections of Rare Cancers



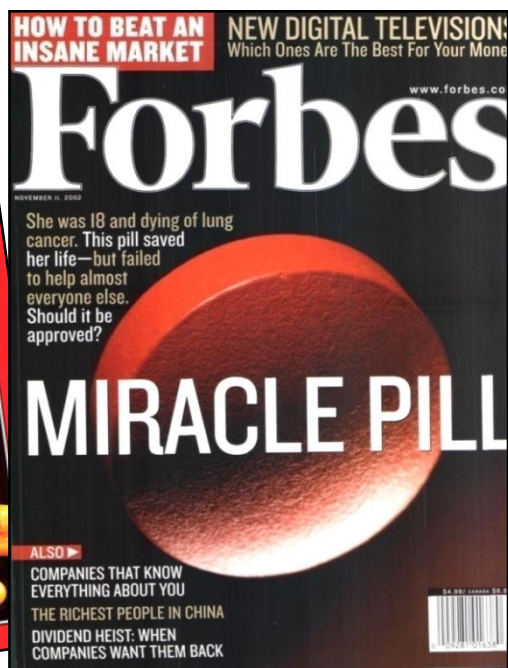


Hallmarks of Cancer: Therapeutic Implications





The Rise of Targeted Therapy





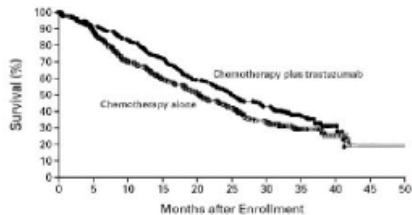
Precision Medicine

- Cancers classified by molecular abnormalities and site of origin
- Exceptional success when treatment is matched to a driver mutation



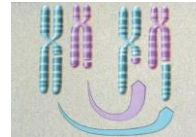
1997

First targeted drug: rituximab



1998

Trastuzumab introduced for HER2+ breast cancer



2001

Imatinib introduced

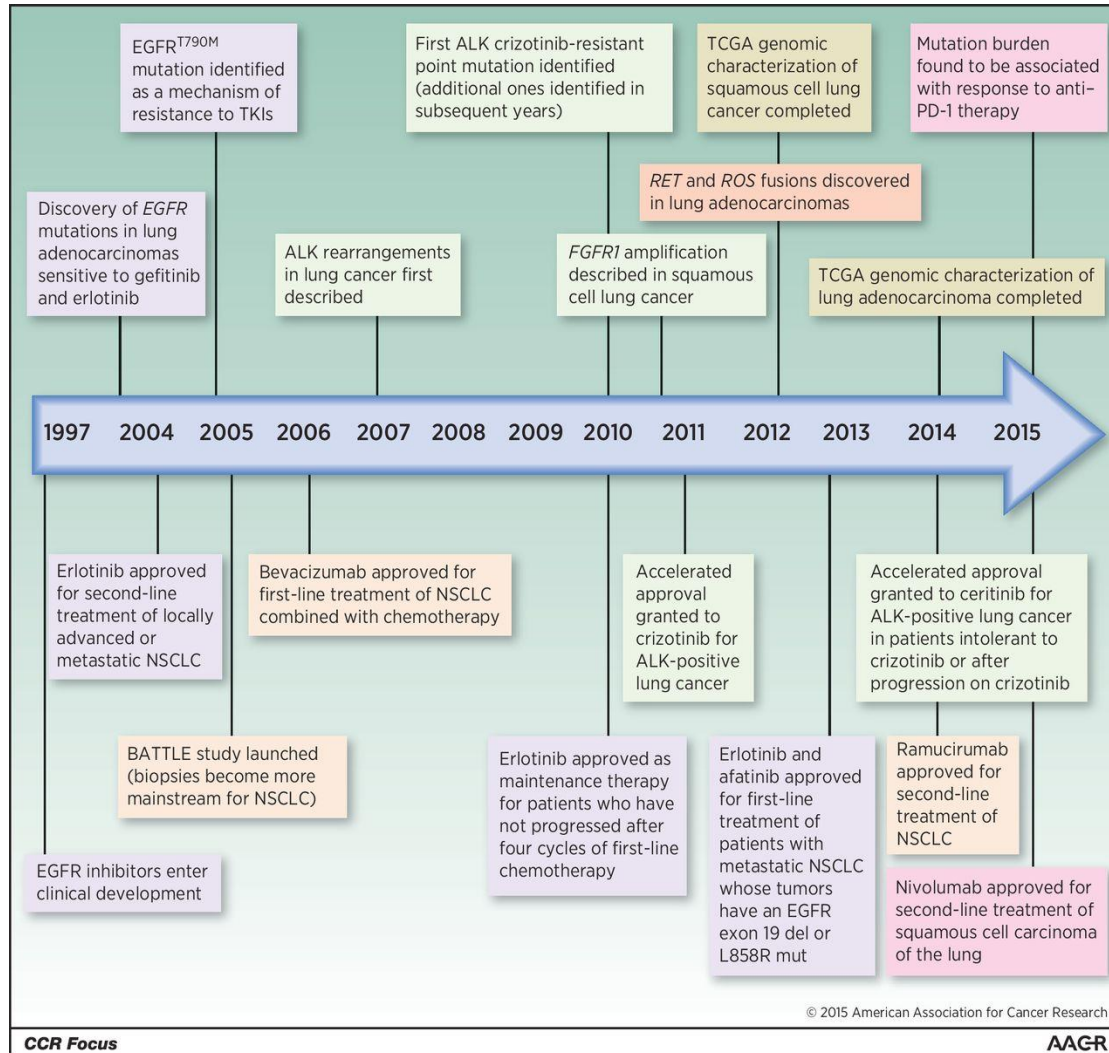


1997-2016

100+ FDA-approved targeted cancer drug indications



Timeline of Selected Major Discoveries in Lung Cancer Treatment





Precision Medicine

But precision medicine has brought new complexity – and challenges

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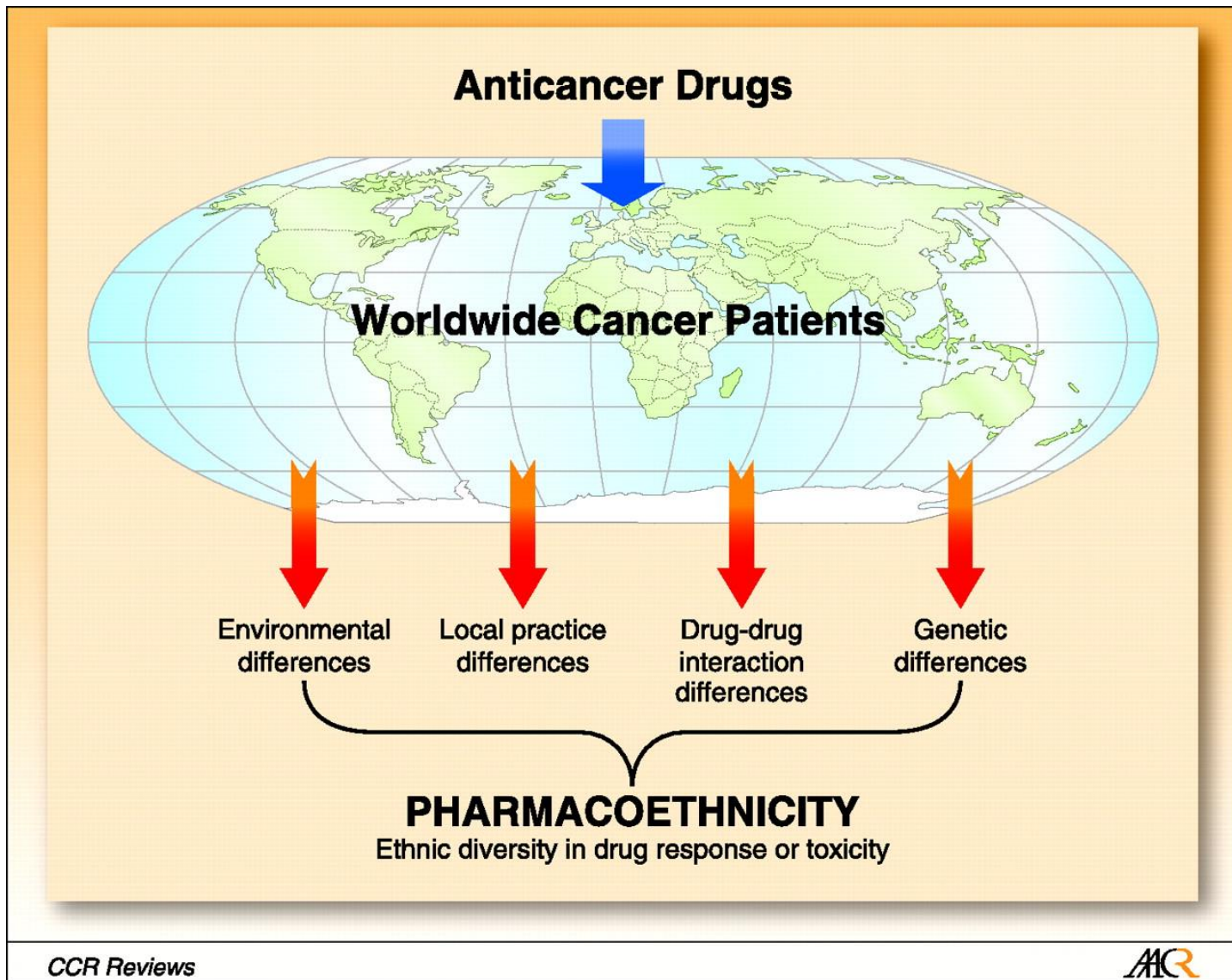
Photographs were taken:

- A.** Before initiation of vemurafenib
- B.** After 15 weeks of therapy with vemurafenib
- C.** At relapse, after 23 weeks of therapy.



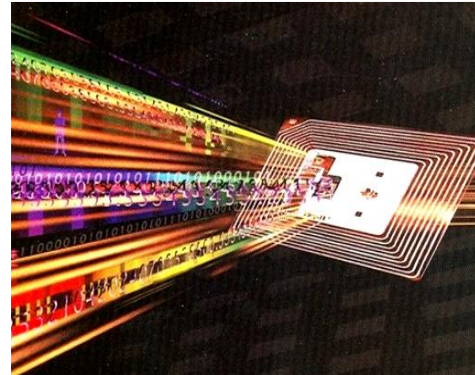
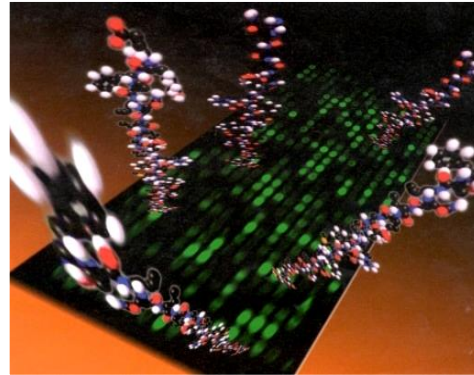
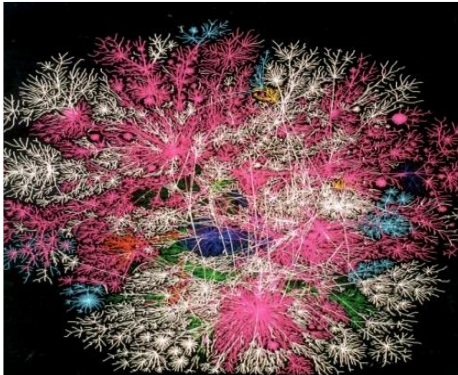
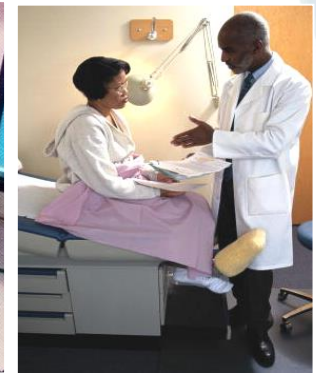
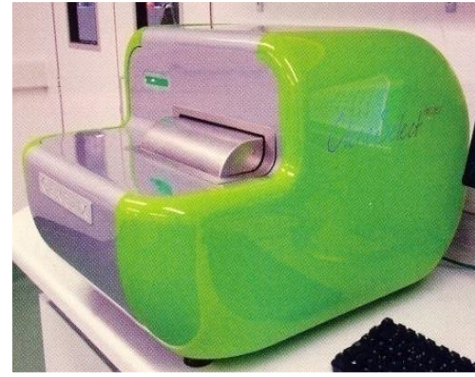
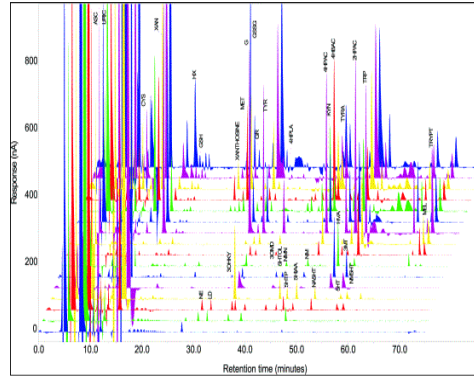
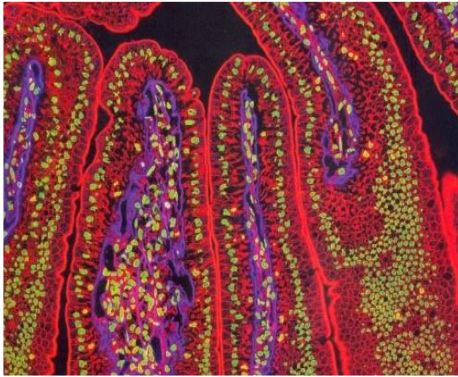


Ethnic Diversity in Drug Effects





Precision Medicine: Implementing Personalized Cancer Care



Biospecimens
and
Molecular Pathway
Analysis

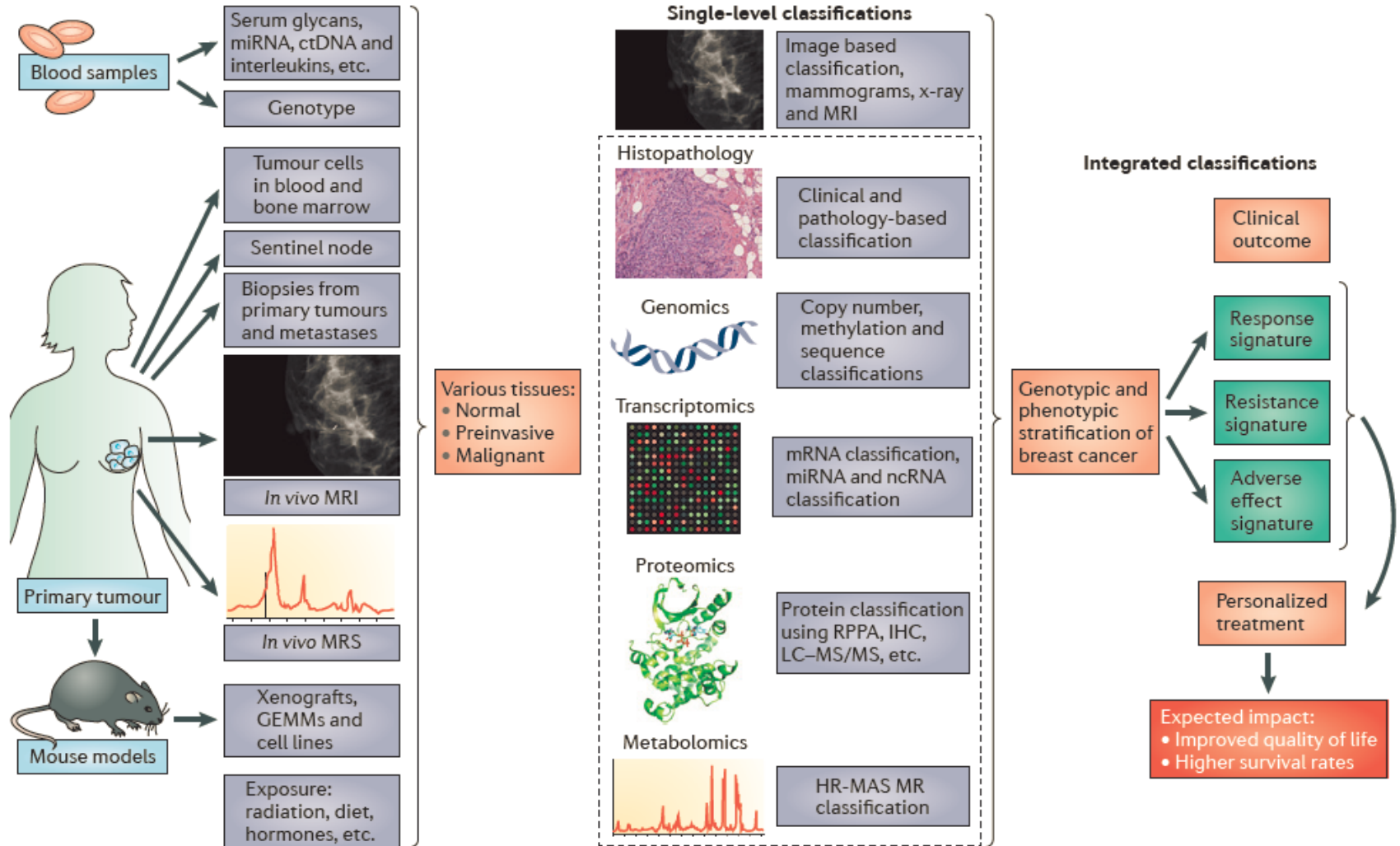
Biomarker Validation
and
Multiplex Assays

Instrumentation
and
Informatics

Clinical Decision
Support
and Patient
Monitoring



Precision Medicine: Systems Biology of Cancer





Chemotherapy Advances

- Advances in both common and rare cancers
- Smarter, more refined approaches
- Increasing and decreasing treatment aggressiveness to maximize benefit



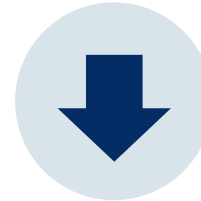
1998



2004-2005



2004



2007



2015

AVBD replaces MOPP for pediatric Hodgkin lymphoma

Adjuvant CT for lung, pancreatic cancers

Biomarker tests identify patients for adjuvant CT

Chemo dosing halved for low-risk neuroblastoma

Long-term mortality halved for pediatric cancer survivors



Imaging Advances

Cancer Detection and Staging

- Diagnosis at earlier stage
- Clearer picture of disease spread
- Helps patients get optimal treatment
- Permits more limited, minimally invasive surgical techniques



Response Assessment

- Informs treatment continuation or discontinuation

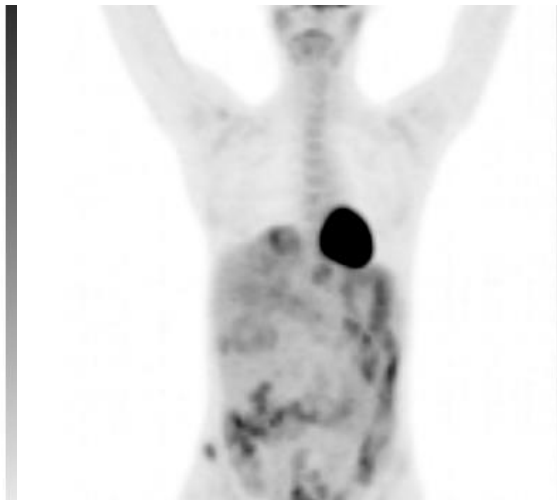
- Digital mammograms
- PET scanning
- Low-dose CT
- Enhanced MRI technologies



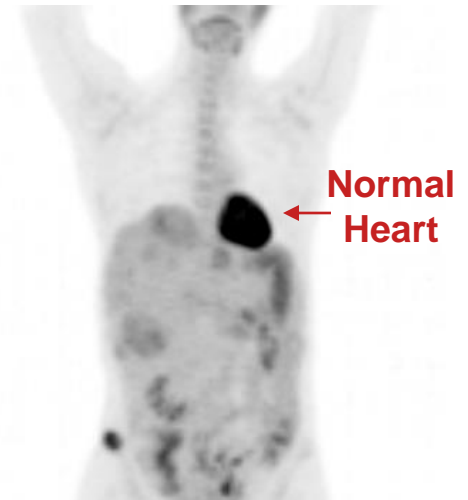
Raid Response Assessment



Baseline:
GIST resistant
to Imatinib



After 1 week
of Sunitinib
Therapy

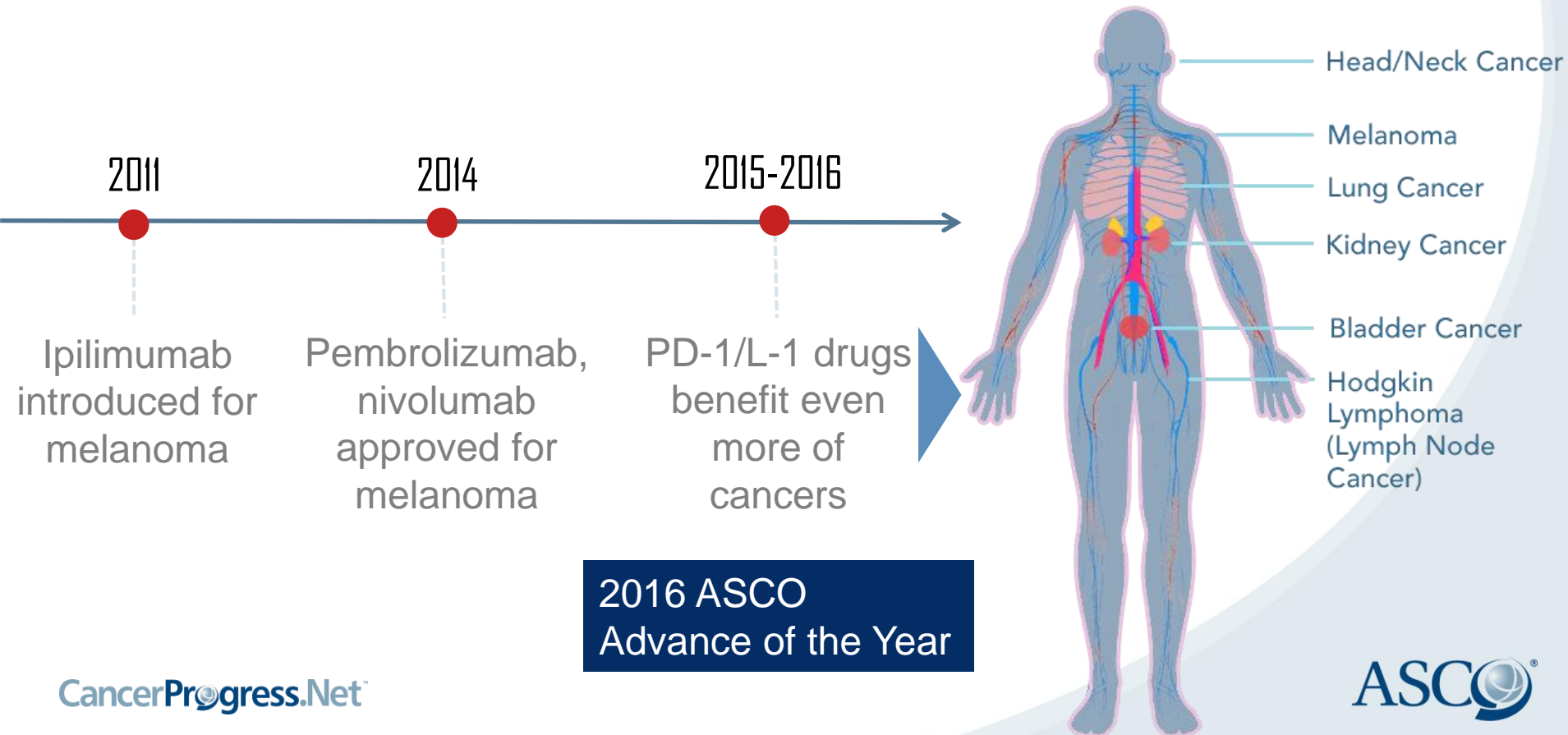


After 2 months
of Sunitinib
Therapy



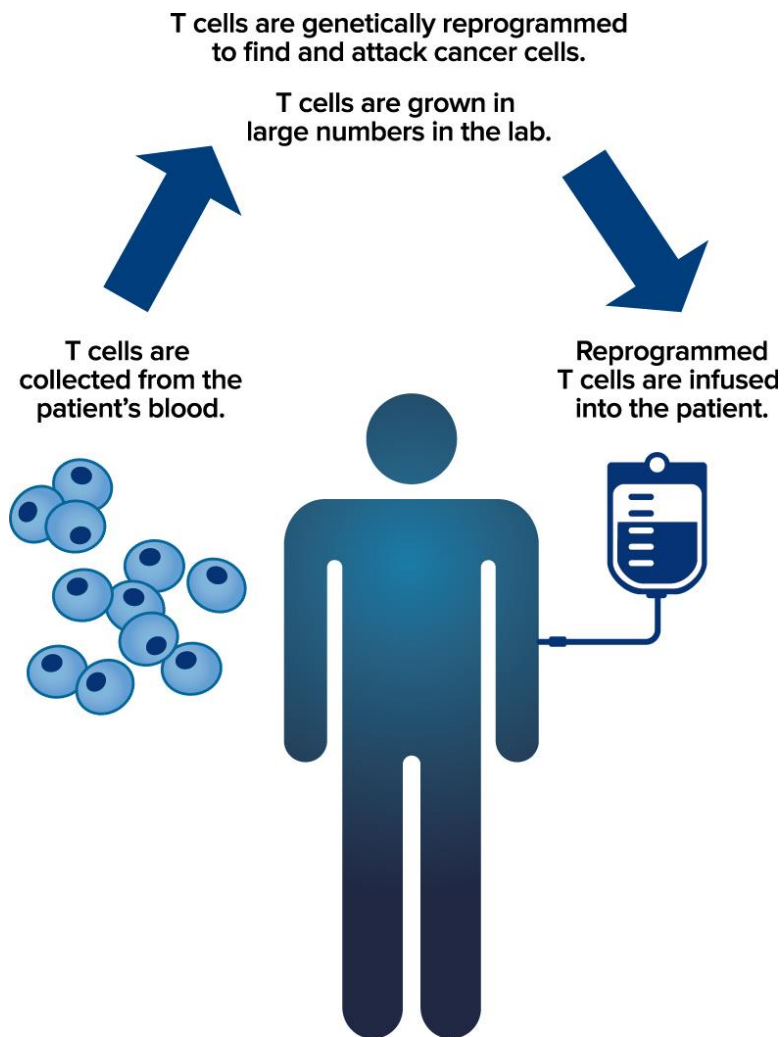
Rise of Immunotherapy

- Long-term disease control against recalcitrant cancers
- Game-changing discoveries – more coming





Rise of Immunotherapy



On the Horizon:

- CART-cell therapy
- Customized vaccines



Infection-Related Cancers

% of Cancers Caused By Infectious Diseases

4%

7%

16%

33%

North
America



Europe



Global



Sub-Saharan
Africa





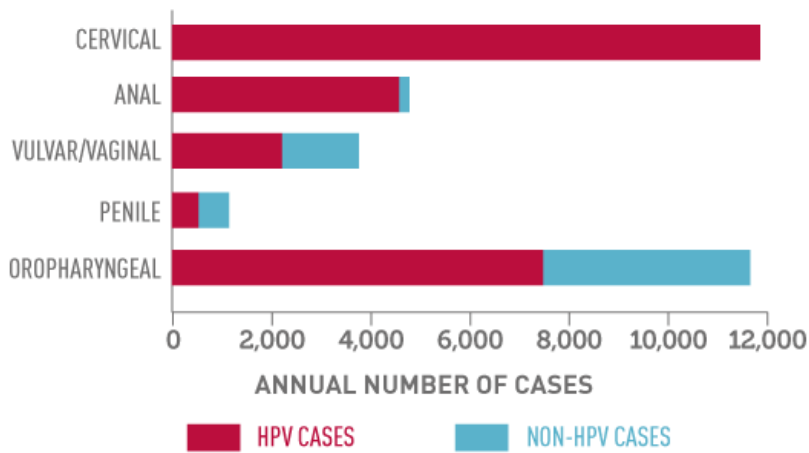
Infection-Related Cancers: HPV

New innovations hold major potential

- Screening tools for high- and low-resource settings
- Tailored treatments
- Vaccines

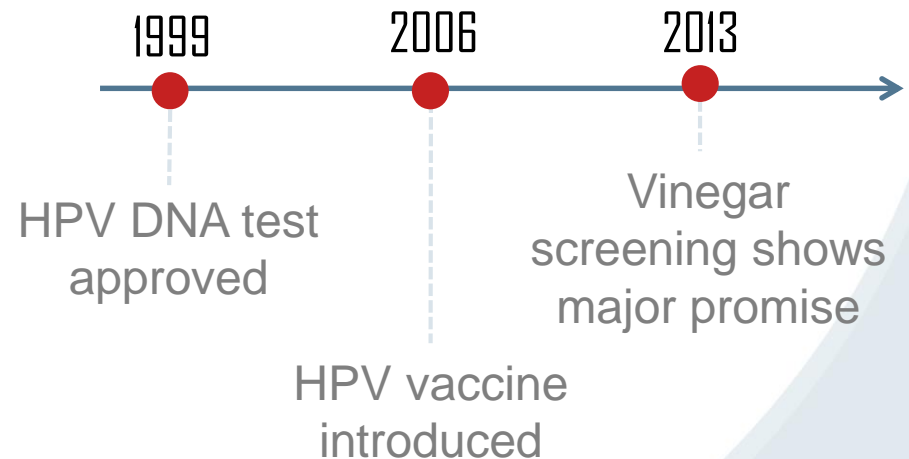
PROPORTION OF CANCERS CAUSED BY HPV IN THE UNITED STATES

HPV infection causes virtually all cases of cervical cancer and a substantial proportion of several other cancers.



www.cancer.gov

Source: Schiller JT and Lowy DR. Understanding and learning from the success of prophylactic human papillomavirus vaccines. *Nat Rev Microbiol* 2012; 10(10): 681-692.





Infection-Related Cancers: Hepatitis



+80%
vaccine
coverage

Hepatitis B

Climbing global vaccination rates
are reducing liver cancers



Hepatitis C

Recent breakthrough curative
therapies will further reduce
liver cancers



Supportive and Palliative Care

- New therapies greatly reduce treatment side effects
- Shift in approach and philosophy - QOL is a central focus of oncologists' work



1999

Filgrastim approved



QOPI Certification Program
Quality Cancer Care: Recognizing Excellence

2002

Pain management as a core quality measure



2010

Early palliation helps NSCLC patients live better and longer



**32.6
million**

**5-Year Cancer Survivors
Worldwide**



Expanding Field of Survivorship

- New field of research and care
- Survivors face persistent, diverse challenges

Cardiac Health

Psycho-social
Needs

Obesity

Sexual Health

Surveillance

Long-term
Healthcare
Costs

Disparities

Oncologist-
PCP
Coordination

The Path Forward

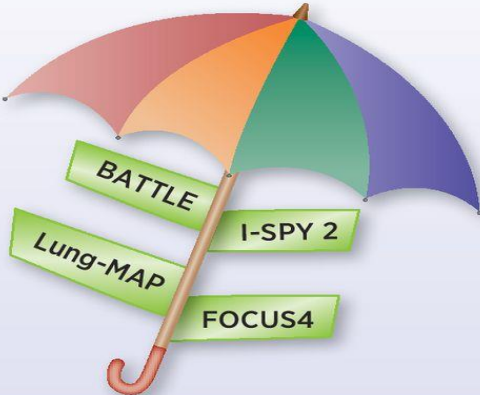
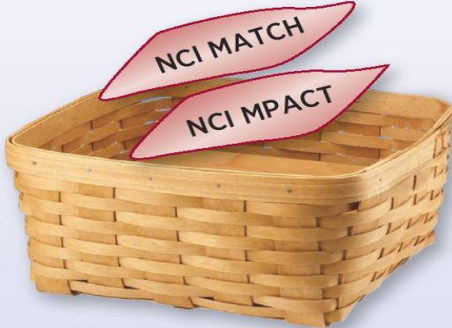




**Tackle complexity
of cancer head on,
in smarter ways**

- More basic research
- Smarter clinical trials
- Increase population diversity in research
- More efficient biomarker validation

New Clinical Trial Designs

Umbrella	Basket
Test the impact of different drugs on different mutations in a single type of cancer	Test the effect of one or more drugs on one or more single mutations in a variety of cancer types
	
Clinical Cancer Research	© 2015 American Association for Cancer Research
CCR Perspectives in Drug Approval	AAGR

Herbst et al. Clin Cancer Res 2015;21:1514-1524

2.

Leverage health IT to realize unseen opportunities

- Enormous possibilities with advanced health information technology
- Learn from every patient – not just clinical trials patients
- Support oncologists' decision-making
- Quality improvement and assessment

Aggregating Information

Scientists

Clinical Researchers

Physicians

Patients

CollabRx search or start a discussion. MyLab check for matching trials for you.

My Updates

- Discussion: Toremisen vs Toremisen: 3/20 PM Update
- Discussion: 3/20 PM Update
- Discussion: 3/20 PM Update

Hypotheses Evidence

- Melphalan: [Drug Card]
- Toremisen: [Drug Card]
- Interferon alpha-2b (Intron A): [Drug Card]

ARCC: 2007-05-08

Abstract: Regional therapy with toremisen was more effective when combined with melphalan for the treatment of metastatic melanoma.

CollabRx search or start a discussion. MyLab check for matching trials for you.

Primary Origin

- Skin/Other
- Eye
- Acral/Mucosal

Metastatic Sites

- Lymph Nodes
- Brain/CNS
- Other

Mutational Information

- BRCA1: Unknown
- BRCA2: Unknown
- GNAQ: Unknown
- GNA11: Unknown

Find drugs and trials

Provide Melanoma Information

Melanoma Stage

- Early (Stage I & II)
- Stage III
- Stage IV (Advanced Stage)

Primary Origin

- Skin/Other
- Eye
- Acral/Mucosal

Metastatic Sites

- Lymph Nodes
- Brain/CNS
- Other

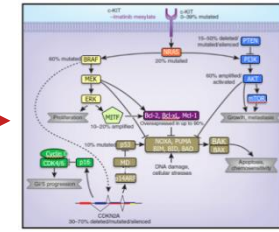
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Find drugs and trials



Data



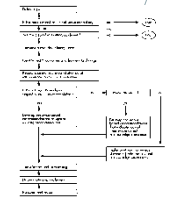
Molecular Disease Models



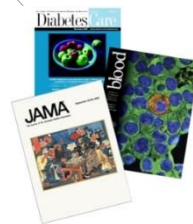
Trials



Treatments



Guidelines



Literature



Tests



Cases



ASCO 
CANCER LINQ™
Learning Intelligence Network for Quality

3.

Expand both knowledge and means to access high-quality care

- Huge variations in developed countries
- Basic tools often out of reach in developing countries
- Major gaps in oncologist workforce
- Cost – an issue everywhere



4.

**Keep focus on
needs
of whole patient**

- Patient-reported outcomes
- Palliative care
- Survivorship

Keep pressing forward...

Imagine, where will we be
in another 20 years?

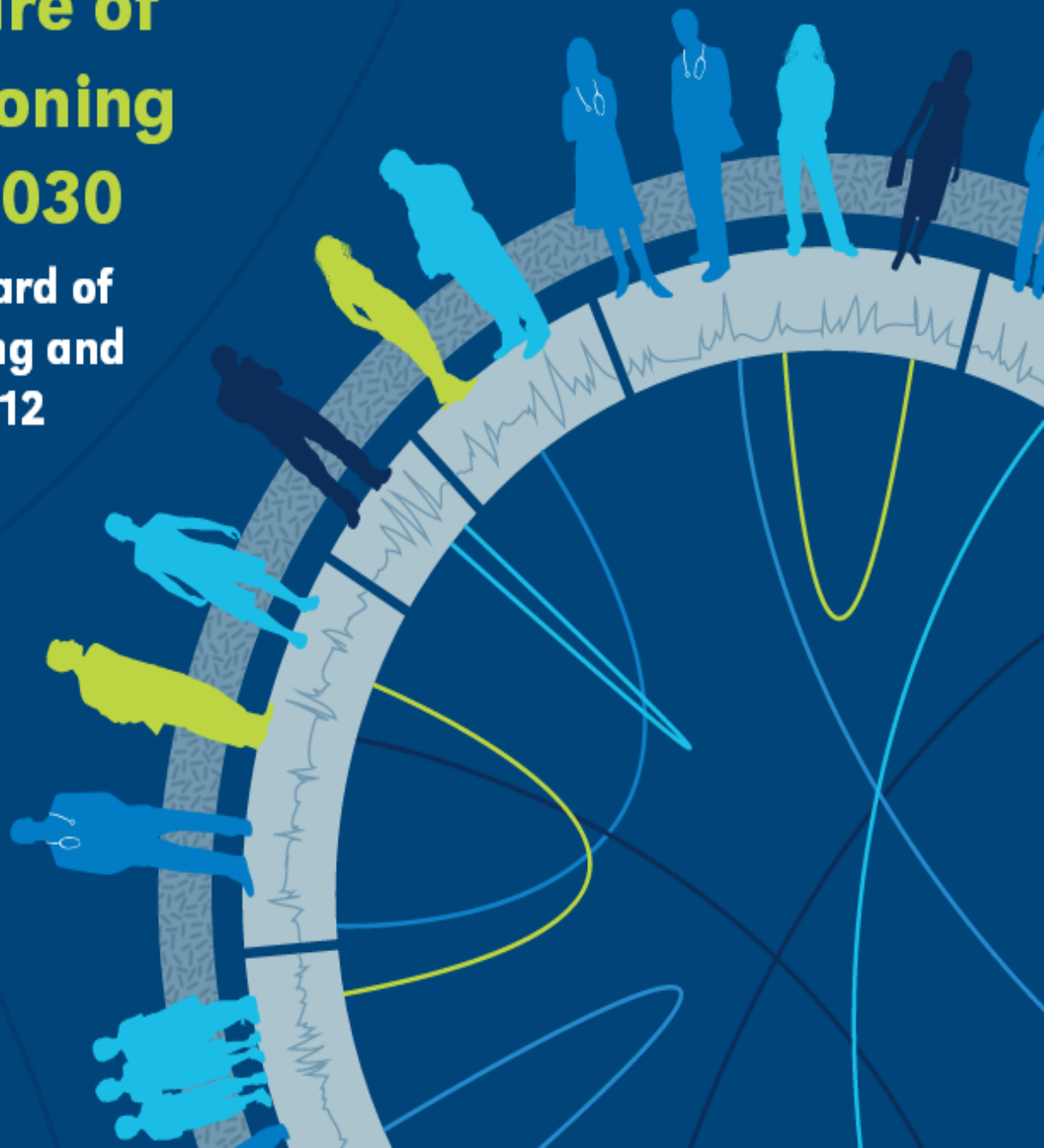
Shaping the Future of Oncology: Envisioning Cancer Care in 2030

Outcomes of the ASCO Board of
Directors Strategic Planning and
Visioning Process, 2011-2012



American Society of Clinical Oncology

Making a world of difference in cancer care



The Three Revolutions



Cancer
Panomics

Big data

Payment
reform/Value

There is Likely a Fourth

Cancer
Panomics

Big data

Payment
reform/Value

Patient
engagement

Progress Depends on Collaboration



Progress Depends on Collaboration

**“To go fast,
go alone.**

**To go far,
go together.”**

--African Proverb

