The Burden of Cancer in Immunosuppressed People in the U.S.

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Background

- Immunosuppressed people have increased risk of cancer.
  - Loss of control of oncogenic viruses
  - Chronic inflammation

- HIV infection and AIDS
  - Onset of epidemic in 1980
  - Since 1996, use of highly active antiretroviral therapy (HAART) has prolonged life.
  - 1.1 million people in the U.S. living with HIV

- Solid organ transplantation
  - Life-saving therapy for end-stage organ disease
  - 27,000 transplants per year in U.S.
  - Recipients take immunosuppressive medications to prevent graft rejection.
Cancer in HIV and transplant

Immunosuppression
Inflammation
Transplanted organ

Cofactors
- Infectious agents
- Tobacco, alcohol

Medications
Cancer risk in HIV and transplant

Grulich, Lancet 2007
NCI’s HIV/AIDS Cancer Match Study

- Computerized linkage of HIV/AIDS and cancer registries in 14 U.S. areas

- 780,000 HIV-infected people 1980-2009
  - 630,000 AIDS cases (57% of U.S. total)

- Examine epidemiology of specific cancers
  - Compare risk with general population
  - Risk factors for cancer

http://www.hivmatch.cancer.gov
Clues to etiology: two examples

- Merkel cell carcinoma
  - Rare skin cancer
  - Elevated incidence in HIV, transplant
  - SIR=13 in people with AIDS
  - Discovery of Merkel cell polyomavirus in MCC tumors

- Lung cancer
  - Most common non-AIDS-defining cancer in HIV-infected people
  - High prevalence of smoking in HIV population (50-90%)
  - SIR=3.8 among people with AIDS
  - Risk higher than could be explained by smoking.
  - Findings suggest HIV infection amplifies effects of tobacco.

Evolving patterns of cancer in HIV

- Due to HAART, HIV-infected people are living longer, but immune system is not normal.

- With prolonged survival, HIV population is growing and ageing.

- Public health and research priorities informed by population-based estimates of cancer risk.
We evaluated trends in the number of cancer cases in the U.S. AIDS population (cancer burden).

We calculated the number of cancer cases by applying cancer rates to AIDS population at risk.

Cancer burden = $\sum$ rate x person-years

HIV/AIDS Cancer Match Study

CDC surveillance

Shiels et al., International AIDS Society Meeting 2010
U.S. AIDS Population by Year and Age Group

Number of People

1991: 100,000
1992: 150,000
1993: 200,000
1994: 250,000
1995: 300,000
1996: 350,000
1997: 400,000
1998: 450,000
1999: 500,000
2000: 550,000
2001: 600,000
2002: 650,000
2003: 700,000
2004: 750,000
2005: 800,000

CDC data

- 0-12 years
- 13-19 years
- 20-29 years
- 30-39 years
- 40-49 years
- 50-59 years
- 60+ years
Incidence of AIDS-defining Cancers

Incidence rate, per 100,000

Incidence of non-AIDS-defining Cancers

Incidence rate, per 100,000
KS cases in U.S. general population

![KS cases chart]

- Number of Cases: 0, 1000, 2000, 3000, 4000, 5000, 6000, 7000
KS cases in U.S. general population

Number of Cases

Year

Cases with AIDS
Cases without AIDS
Shifting HIV cancer burden

- The burden of AIDS-defining cancers has decreased over time.

- The burden of other cancers is rising sharply.
  - Parity with AIDS-defining cancers
  - With ageing, these cancers will represent increasing burden in the future.

- Understand role of HIV in pathogenesis of non-AIDS-defining cancers

Shiels et al., International AIDS Society Meeting 2010
Implications for prevention

- Smoking cessation
- Prevention and treatment of HBV and HCV
- Evaluation of anal Pap smear screening
NCI’s Transplant Cancer Match Study

- Computerized linkage of U.S. transplant registry with 13 cancer registries
- 38% of all U.S. transplants 1987-2010
- Close partnership between NCI and Health Resources and Services Administration (HRSA), which oversees U.S. transplantation
Preliminary results

- 175,822 transplants
- 10,603 cancers
- Overall SIR = 2.08
- Analyses of specific cancers is ongoing.
Transplant Cancer Match Study

- Describe spectrum of cancer risk

- Risk factors for cancer
  - Demographic factors
  - Characteristics of transplanted organ
  - Medical conditions
  - Viral infections
  - Immunosuppressive medications

- Risk of transmission of cancer from donors
Cancer in HIV and transplant

- Immunosuppression
- Inflammation
- Transplanted organ
- Cofactors
  - Infectious agents
  - Tobacco, alcohol
- Medications
NCI’s studies of HIV and transplant

- Complementary studies allow comparison of cancer patterns between populations.

- Collaborations between NCI, other federal agencies (CDC, HRSA), and state public health authorities

- Address questions of public health and scientific importance
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- Transplant Cancer Match Study
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  - Scientific Registry of Transplant Recipients
  - Cancer registries