Best strategies for global HCV eradication

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Since 2007, more Americans die from HCV than HIV infection (Similar in Europe)

- National multiple-cause mortality data

By 2007 hepatitis C-associated deaths had overtaken HIV as a cause of mortality in the United States.

- Co-morbidities associated with increased odds ratio of mortality
  - Alcohol related (4.6; HCV and 3.7; HBV)
  - HIV co-infection (1.8; HCV and 4.0; HBV)

Ly et al. Annals of Internal Medicine 2012
HCV Related Illness

Expected to Increase Significantly in the Coming Years

*In the absence of novel treatments it’s going to be a tsunami of HCV related liver failure, transplant, death & increased financial burden*

![Bar chart showing estimated % increase from 2000 - 2020 for HCC, Cirrhosis, Decompensation, and Liver-related deaths.]

- HCC: 81%
- Cirrhosis: 82%
- Decompensation: 106%
- Liver-related deaths: 181%

A New Analysis of Dx and Rx of HCV Infections

Source: UBS research, Milliman 2009 report
HCV Therapies: Changing Landscape
Advances for Unmet Medical Needs

“The times, they are a-changin”

Bob Dylan
Market Will See An Influx of New Drugs Over the Next Few Years

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VRTX’s Incivek & MRK’s Victrelis approved

Following GS-7977 data, “Patients warehousing themselves”

GILD’s sofosbuvir (GS-7977) likely approved for all genotypes

BMY’s dadatasvir, JNJ’s TMC-435 likely approved

GILD’s single-pill combo (GS-7977+5885) likely approved

ABT’s all-oral DAA combination likely approved

Bristol’s all-oral DAA triple combination likely approved

Other all-oral possible approvals: ACHN (PI/NS5a) VRTX (VX-135) IDIX (nuc/NS5a)

Source: UBS research
VRTX’s Incivek & MRK’s Victrelis approved

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Source: UBS research
The Game is not over

- Assuming Sofosbuvir (PSI/GS-7977) is approved by Q4 2013; new IND are behind by 3 years.

- Gilead may be able to treat at most half a million people per year. With only 1.5 – 2 MM people treated over 3 yrs, there is still majority of the world and US market available.

- > 60 MM people who can pay will be available for treatment
There is still another opportunity:
Shift in focus to difficult to treat persons

Several unmet needs remain:
• Cirrhosis
• DAA/PR failures
• co-infected with HIV or HBV
  • non-GT1
• IFN intolerant or contraindicated
• bleeding disorders
• pediatrics
• opiate substitution therapy
• null-responders

Too few Tx persons to come to any conclusion

Adapted from A. Kwang
Three Waves of Treatment with Leading Drug Sofosbuvir Leading to Cure Tsunamis

- Sofosbuvir as a single DAA plus Riba
- Sofosbuvir/NS5a or PI for genotype 1
- Final regimen, short in duration, one size fits all that is pangenotypic and SVR rates > 90% in the real world (nuc as backbone + PI/NS5a or two nucs)
The US and EU are Only ~5% of the Total Worldwide HCV Population

170MM People HCV Infected Worldwide

Source: Pharmasset AASLD Investor Relations Slide Deck November, 6, 2011.
The HCV response will create islands of sufficiency in a swamp of insufficiency.
Health systems in Africa

Risk pooling is very scarce
Africans lack protection against medical costs; solidarity is limited

Social security and private prepaid health care spending

Only 4% of total health expenditure in Africa is financed through health insurance

Source: WHO 2008
TIME

Africa Rising

Inside This Week: Technology Quarterly

President Newt? Brace yourselves
Britain's coming recession
Why India needs Walmart
France tries to stay AAA
The science of ethical foie gras

Africa rising
Growing Pains
Sub-Saharan Africa has the second fastest growing regional economy in the world, after Asia. But huge challenges remain, even in countries that are experiencing boom times.

Powerhouse
Kenya
Kick-starting Africa’s mobile-banking boom, Kenya’s M-PESA service has grown by an average of 3.5 million customers per year since it started in 2007, reaching 34% of Kenyans in 2011.

But the capital, Nairobi, is home to one of the largest slums in the world.

New Star
Ghana
GDP grew by an impressive 14.4% in 2011.
Primary-school enrollment jumped 20% in four years, reaching 100% in 2007.

But currently half of university graduates leave the country.

Quiet Achievers
These island countries boast solid economic growth and high scores in health and education.

Although classified as an upper-middle-income country by the World Bank, South Africa has one of the most unequal societies in the world.
Lessons from HIV:
Reasons not to introduce HAART in resource-poor settings in 1996

• Too expensive

• Too complex

• Prevention more important than treatment
Positive developments ("milestones") by 2012-13 bringing HAART to resource poor settings

- **Price reduction of antiretroviral agents** (Accelerating Access Initiative, etc) (2000)
- **Declaration of Commitment of the United Nations General Assembly Special Session on HIV/AIDS (UNGASS) (2001)**
- **Establishment of funding mechanisms:**
  - World Bank Multicountry AIDS Program (MAP, 2000)
  - Global Fund to fight AIDS, TB and malaria (GFATM, 2002)
- **WHO Treatment Guidelines + uptake of antiretroviral agents in WHO Model List of Essential Medicines (2002)**
- **WHO’s “3by5” initiative:** “3 million people in resource-poor settings on antiretroviral therapy by the end of 2005”
Number of people receiving antiretroviral therapy in low- and middle-income countries, by region, 2002–2011

HCV shows no visible scars like HIV that inspire the public to advocate solutions
Global Eradication Solutions

We must meet the silence of HCV’s forward march with resonant opposition

Keys to successful eradication:
- Public awareness
- Government action (local, state, national, international)
- Emphasize that new drugs can cure

Increase awareness through:
- Universal screening to unmask “silent” infections
- Education that empowers
- Care for prisoners, drug addicts, children & the poor
Global Eradication Solutions

Translate education to advocacy

- Confront government with the ethical and moral responsibility to screen and treat
- Intensify government, UN & WHO action to become proportional to burden of HCV
- Governments must cultivate financial and political will to step up to the opportunity to eradicate another global plague (e.g., smallpox, polio)
HCV ERADICATION WORLDWIDE IS POSSIBLE

A pessimist sees the difficulty in every opportunity;
An optimist sees the opportunity in every difficulty

Winston Churchill
“The ultimate benefit of cures for HCV will be measured by the costs they avoid, but by the lives they save”

Thank You

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COI: I am a founder & shareholder of Idenix & RFS Pharma LLC