

# ICAP GRAND ROUNDS WEBINAR

THE NEW WHO GUIDELINES FOR INTENSIFIED  
CASE-FINDING AND ISONIAZID PREVENTIVE  
THERAPY FOR PEOPLE LIVING WITH HIV IN  
RESOURCE CONSTRAINED SETTINGS

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January 20<sup>th</sup>, 2011



## TB AND HIV

- Once infected with M. Tuberculosis, people living with HIV have a 20 – 37 fold increased risk of developing active TB compared to HIV uninfected persons<sup>1</sup>
- TB is the most common OI in people living with HIV in Africa: 79% of TB-HIV cases occur in SSA out of 1.4 million global cases of TB-HIV reported in 2007
- TB responsible for >25% of deaths in PLWH<sup>2</sup>

1. WHO. Global TB control: a short update to the 2010 report. December 2009.  
2. Getahun H et al. Clinical Infectious Diseases; 2010, 50: S201-207



## WHO GUIDELINES

New guidelines are an update of WHO/UNAIDS recommendations from 1998

They include a comprehensive review of available scientific evidence that was conducted to formulate recommendations

Evidence was evaluated using **GRADE methodology** (evidence level categorized between high and very low)

Recommendations were made as either **Strong or Conditional**

**Strong Recommendations** – desirable effects of adherence to recommendations outweigh undesirable effects

**Conditional Recommendations** – desirable effects of adherence probably outweigh undesirable effects



## WHO GUIDELINES

### Key questions addressed:

- What is the best combination of signs, symptoms, diagnostic procedures to identify those eligible for IPT or requiring further work-up?
- What is the optimal duration and drug regimen for treating latent TB infection (LTBI)?
- Should secondary prophylaxis with IPT be provided for PLWH previously treated for TB?
- Does treating LTBI in PLWH lead to drug resistance?

12 key recommendations

## RECOMMENDATIONS

WHO recommendations	1998	2010
TB screening	Cough > 3 weeks +/- further evaluation	4 symptom screening questionnaire
IPT – eligibility?	All PLWHA with: <ol style="list-style-type: none"> <li>1. Positive TST</li> <li>2. Contact with TB case</li> <li>3. Living in TB prevalent area &gt;30%</li> </ol>	All PLWHA – including: <ol style="list-style-type: none"> <li>1. Children &gt; 12 mo</li> <li>2. Pregnant women</li> <li>3. Those completing TB treatment</li> </ol>
IPT - assessment?	CXR before initiating IPT	If symptom screen negative CXR not required
IPT - how long?	6 months	At least 6 months

## WHO GUIDELINES SCREENING ADULTS

- Adults & adolescents with HIV should be screened for TB with clinical algorithm. Those without any of current cough, fever, weight loss or night sweats are unlikely to have TB and should be offered IPT

**STRONG recommendation,**  
**Moderate quality of evidence**
- Adults & adolescents with HIV who report any one of the symptoms of current cough, fever, weight loss or night sweats may have active TB and should be evaluated for TB

**STRONG recommendation,**  
**Moderate quality of evidence**

## SCREENING ADULTS FOR TB

Meta-analysis of primary patient data from 12 TB screening studies, including 8000 pts

Any of current cough, fever, night sweats, weight loss as best combination for screening		
Value (and 95% CIs)	# participants (studies)	Quality of evidence
<b>Negative Predictive Value</b>		
0.98 (95% CI: 0.97-0.98)	8148 (9 Studies)	Moderate
<b>Sensitivity</b>		
0.79 (95% CI: 0.75-0.82)	8148 (9 Studies)	Moderate
<b>Specificity</b>		
0.50 (95% CI: 0.29-0.70)	8148 (9 Studies)	Moderate



## SCREENING ADULTS FOR TB

Meta-analysis of primary patient data from 12 TB screening studies, including 8000 pts

Any of current cough, fever, night sweats, weight loss as best combination for

**Take Home (1):** Presence of any of **current cough**, night sweats, fever or weight loss has a Sensitivity of 79%, Specificity 50%.

**Take Home (2):** At TB prevalence of 5% this screening rule has a NPV of 98%. Those that screen negative are very unlikely to have TB and can start IPT

**ABSENCE OF 4 SYMPTOMS - VERY UNLIKELY TO HAVE TB – CAN START IPT**

**PRESENCE OF ANY ONE OF 4 SYMPTOMS –EVALUATE FOR ACTIVE TB**

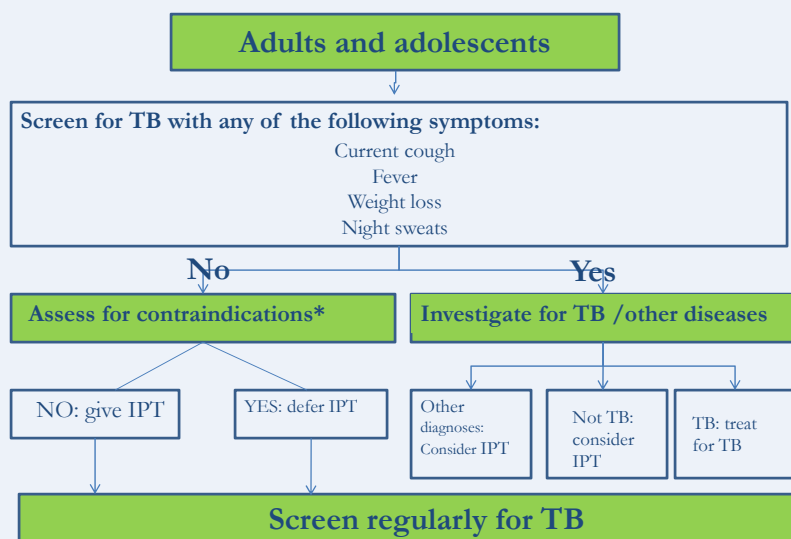


## SCREENING ADULTS – THE ROLE OF CXR

Any of <b>ABNORMAL CXR</b> , current cough, fever, night sweats, weight loss or as best combination for screening		
Value (and 95% CIs)	# participants (studies)	Quality of evidence
<b>Negative Predictive Value</b>		
0.98 (95% CI: 0.97-0.99)	2805 (4 Studies)	Moderate
<b>Sensitivity</b>		
0.90 (95% CI: 0.66-0.97)	2805 (4 Studies)	Moderate
<b>Specificity</b>		
0.38 (95% CI: 0.12-0.73)	2805 (4 Studies)	Moderate

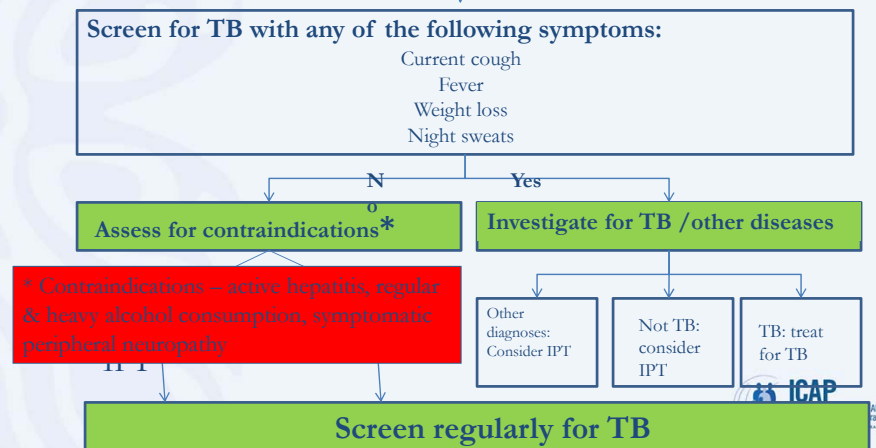
**Take home:** CXR is no longer a mandatory investigation before starting IPT. At higher TB prevalence CXR does increase sensitivity and NPV, but increased cost, workload, staff, etc.

## TB SCREENING ALGORITHM FOR ADULTS AND ADOLESCENTS LIVING WITH HIV



## TB SCREENING ALGORITHM FOR ADULTS AND ADOLESCENTS LIVING WITH HIV

**NOTE: CXR is not required before initiating IPT, unless patient screens**



## HOW FREQUENTLY SHOULD PEOPLE LIVING WITH HIV BE SCREENED FOR TB?

- New WHO guidelines:  
*‘At every visit to a health facility or contact with a health care worker.... Regardless of whether they have received IPT or ART.’*
- Implications:
  - Increased workload for HCWs
  - Earlier detection of TB
  - Reduced TB transmission

## 3

## WHO GUIDELINES

- All adults and adolescents living with HIV with unknown or positive TST who are unlikely to have active TB should receive at least 6 months of IPT as part of a comprehensive package of HIV care. IPT should be administered:
  - a. Irrespective of CD4 count
  - b. To those on ART
  - c. To pregnant women
  - d. To those previously treated for TB

**STRONG recommendation,  
High quality of evidence**



## EFFICACY OF IPT IN PLWH

- For those with confirmed, probable or possible TB disease IPT, reduced the risk of active TB by **33%\*** (RR 0.67 CI 0.51-0.87) <sup>1</sup>
- IPT in PLWH who are TST+ reduces risk by **64%\*** (RR 0.36, 95% CI 0.22-0.61) <sup>1</sup>
- IPT in PLWH who are TST – reduces risk by 14% (RR 0.86, 95% CI 0.59-1.26) <sup>1</sup>
- IPT in PLWH with unknown TST – reduces risk by 14% (95% RR 0.86, CI 0.48-1.58)

\*Statistically significant

1. Akolo, C et al. Cochrane Review, 2010



## 3

## IPT FOR THOSE ON ART

- Antiretroviral therapy reduces TB incidence by 50%<sup>1</sup>
- However, TB rate 2-7% per annum in PLWH on ART in TB endemic areas<sup>2</sup>
- Until recently, ART and IPT combined impact had not been studied

1. Golub J E et al. AIDS; 2009. 2. Lawn S D et al. AIDS; 2008



## ART & IPT REDUCE TB INCIDENCE<sup>1</sup>

Cohort study from SA: 2778 PLWH were followed for 4287 person years - primary exposure was receipt of IPT and /or ART. Primary outcome was incident TB

	IRR (per 100 PYs)	95% CIs
No IPT, no ART	7.1	6.2-8.2
ART alone	4.6	3.4-6.2
IPT before ART	5.2	3.4-7.8
ART and IPT	1.1	0.02-7.60

Take Home Message

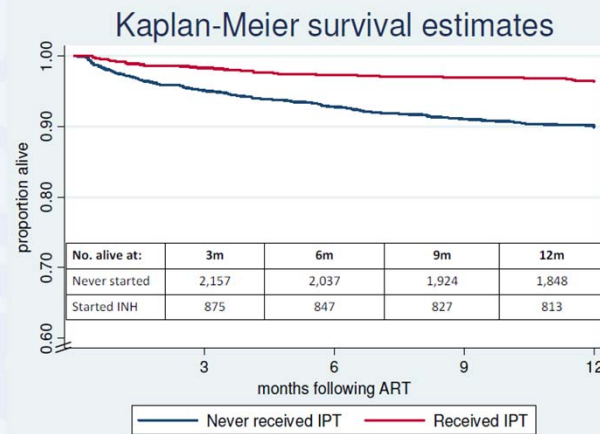
**50%** Reduction with ART alone  
**80%** Reduction with ART and IPT

1. Golub et al, 2009



## IPT & ART REDUCES MORTALITY<sup>1</sup>

**Observational Cohort Workplace study** (South Africa): Followed 3270 patients from ART initiation of ART until death / 12 months. IPT given just prior to or concurrent with ART initiation.



1 –Chalambous,  
AIDS, 2010

**ICAP**  
International Center for AIDS  
Care and Treatment Programs  
WORLD LEADER IN HIV/AIDS CARE AND TREATMENT PROGRAMS

3

## IPT & PREGNANCY

Pregnant women with HIV – At risk for TB, which can impact both maternal and peri-natal outcomes

IPT in pregnant women:

- x - ↑risk of hepatitis shown in one study<sup>1</sup>
- x- IPT never an emergency –can wait
- ✓ - Introducing TB screening at maternal services will lead to enhanced diagnosis, treatment and prevention of TB
- ✓ - IPT regarded as safe in pregnant woman
- ✓ - Any risk of TB on the mother and child outweigh the small risk of hepatitis in patients with LTBI...

Research<sup>2</sup> is ongoing, watch this space...

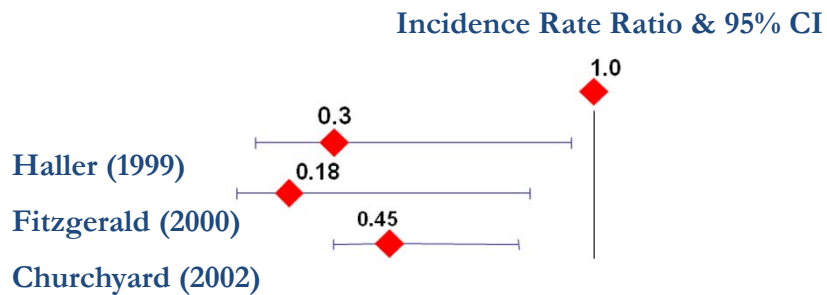
1 Franks. Public Health Rep, 1999. 2 TB APRISE Study

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## 3

## IPT AS SECONDARY PROPHYLAXIS

Three studies show benefit of IPT following treatment of active TB in HIV+ patients



**Take Home Message:** IPT prevents TB in those who complete TB treatment

Woldehanna and Volmink, Cochrane, 2006

## 4

## WHO GUIDELINES

- Adults and adolescents living with HIV with unknown or positive TST status and who are unlikely to have active TB should receive at least 36 months of IPT preventive therapy as part of a comprehensive package of HIV care.

**Conditional recommendation,  
Moderate quality of evidence**

## IPT -DURATION OF THERAPY

- 6 months IPT in TST + Uganda and Zambian PLWH showed a 67-77% benefit <sup>1</sup>
- However, studies have found no difference between 6 and 12 months <sup>2</sup>
- Protective effect decreases with time and ranges for up to 5 years

Is continuous (36 months) IPT better preventing TB than 6 months short course?



1 – Bucher et al. AIDS, 1999. 2 – Akolo, C et al, Cochrane, 2010

## IPT -DURATION OF THERAPY BOTUSA IPT STUDY <sup>1</sup>

**RCT (double blind):**

Median CD4= 300  
23% TST positive  
50% on ART at end

6 months of INH

30 months of INH, n=989

30 months of Placebo, n=1006



1- Samandari, CROI, 2010

## BOTUSA IPT STUDY:<sup>1</sup> TB INCIDENCE

		# Patients	TB rate / 100py	Hazard Ratio (p value)
<b>Intention To Treat (ITT)</b>	6m + placebo	989	1.26	1
	36 m	1006	0.72	<b>0.57</b> (P= 0.047)
<b>Per Protocol (PP)</b>	6m + placebo	665	1.18	1
	36 m	653	0.51	<b>0.43</b> (P=0.045)

**Take Home Message:** Patients receiving 36 months of INH (surrogate for lifelong INH) were much less likely to develop TB disease than those receiving 6 months of INH. 36 months of INH was not associated with a significant increase in INH-resistant TB.

1- Samandari, CROI, 2010

## WHO GUIDELINES

- TST is not a requirement for initiating IPT in people living with HIV.

5

**STRONG recommendation**  
Moderate quality of evidence

- People living with HIV who have a positive TST benefit more from IPT; TST can be used where feasible to identify such individuals.

6

**STRONG recommendation**  
High quality of evidence



## EFFICACY OF IPT-INFLUENCE OF TST

	# Studies	TB cases / IPT exposed patients (%)	TB cases / control patients (%)	Relative Risk (95% CI)
TST Positive	4	18/693 (2.6%)	46/618 (7.4%)	<b>0.36</b> (0.22-0.61)
TST negative	7	49/1297 (3.8%)	54/1193 (4.5%)	<b>0.86</b> (0.59-1.26)
TST unknown	2	18/162 (11.1%)	23/173 (13.3%)	<b>0.86</b> (0.48-1.52)

**Take Home Message:** The real benefit of IPT is in PLWH who are TST+, although there is a non-significant ↓ in TST- persons too. However, TST challenges are significant: cost of test, staff training, cold chain requirements, 2 visits per patient, ↑ energy with ↓CD4

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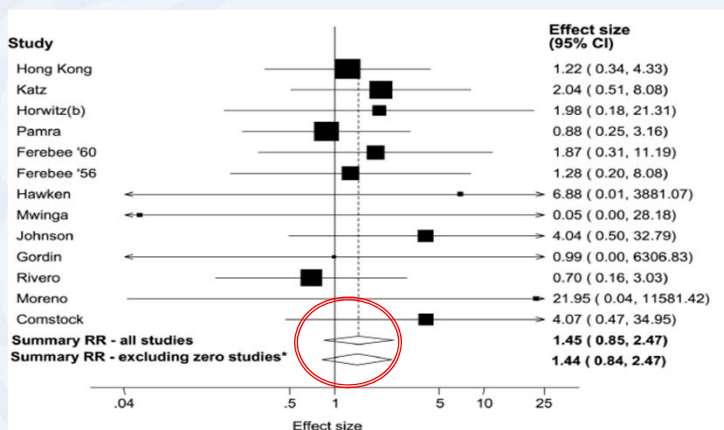
## WHO GUIDELINES

- Providing IPT to people living with HIV does not increase the risk of developing INH resistant TB. Therefore concerns regarding the development of INH resistance should not be a barrier to providing IPT.

**STRONG recommendation,  
Moderate quality of evidence**

WHO reviewed 8 studies, a large observational cohort analysis and a meta-analysis of 13 IPT trials. All demonstrated that INH resistance is not significantly associated with provision of IPT.

## META-ANALYSIS, INCIDENCE OF INH RESISTANCE, IPT VS. NO IPT<sup>1</sup>



1 -Bacells, Emerg Infect Dis, 2006



## WHO GUIDELINES SCREENING CHILDREN & INFANTS

- 8** Children with HIV who do not have poor weight gain\* fever or current cough are unlikely to have active TB  
**Strong recommendation**  
**Low quality of evidence**
- 9** Children with HIV who have any one of the following symptoms –current cough, poor weight gain\*, fever, or contact with a TB case –may have TB and should be evaluated for TB. If the evaluation shows no TB, they should be offered IPT regardless of their age  
**Strong recommendation**  
**Low Quality of evidence**

\*Poor weight gain: reported weight loss or very low weight (weight for age less than -3 z-score) or underweight (weight for age less than -2 z score) or confirmed weight loss (>5%) since last visit or growth flattening

## TB SCREENING IN CHILDREN WITH HIV

Any of cough  $\geq 2$  weeks, fever or failure to thrive as best combination for screening<sup>1</sup>

Value	Type of study (# of participants)	Quality of evidence
<b>Negative Predictive Value</b>		
0.99	Observational study (303)	Low *
<b>Sensitivity</b>		
0.90	Observational study (303)	Low *
<b>Specificity</b>		
0.65	Observational study (303)	Low *

**Take Home (1):** Absence of cough > 2 weeks and failure to thrive and fever is a reliable means of assessing eligibility for IPT in children with HIV.

**Take Home (2):** WHO recommend *CURRENT COUGH*, fever and poor weight gain as screening questions in children. Any child without all should be offered IPT

\*Limitations: observational study and did not have a well-defined gold standard

1. Song et al. 2009.



10

## WHO guidelines

- Children with HIV over 12 months of age who are unlikely to have TB on symptom-based screening should receive 6 months of IPT (10mg/kg/day) as part of a comprehensive package of HIV prevention care services.

**Strong Recommendation,  
Moderate quality of evidence**



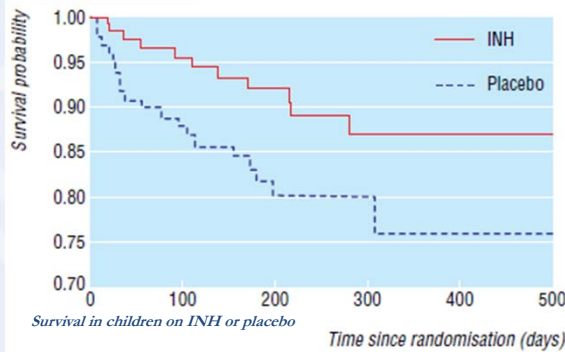
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# IPT in Children<sup>1</sup>

Prospective double blind placebo controlled trial in South Africa evaluating IPT in children living with HIV

**Results:** 263 HIV-infected children, median age 2 years, > 90% not on ART

1. Reduction in mortality, HR= **0.46**, p=0.015
2. Reduction in incidence of TB, HR = **0.28**, p=0.005



**Results:**

**Mortality**

8% in IPT

16% Placebo

**TB Incidence was**

4% in IPT

10% Placebo



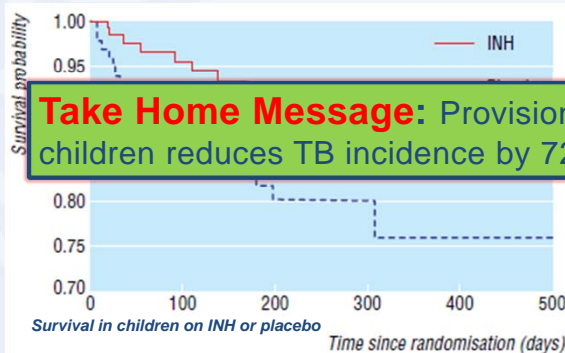
<sup>1</sup>- Zar et al. BMJ, 2007

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**Results:**

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**Take Home Message:** Provision of IPT in HIV-infected children reduces TB incidence by 72% and mortality by 54%

**TB Incidence was**

4% in IPT

10% Placebo



<sup>1</sup>- Zar et al. BMJ, 2007

# INH DOSING IN CHILDREN<sup>1</sup>

Study demonstrated that children frequently under-dosed for INH

Isoniazid dose stratum, mg/kg	No. of children	Isoniazid dose, mg/kg	Age at enrollment, years	C <sub>max</sub> , mg/L	AUC <sub>0-6h</sub> , mg·h/L <sup>a</sup>
<4	7	3.55 (3.25–3.82)	1.27 (0.41–5.10)	0.76 (0.69–2.24)	2.93 (1.56–7.20)
4–6	30	4.77 (4.37–5.08)	3.58 (1.97–5.51)	2.39 (1.59–3.40)	5.97 (4.00–9.39)
>6 to <8	2	7.00 (6.66–7.33)	7.01 (2.04–11.97)	5.85 (5.70–6.00)	11.72 (11.09–12.35)
8–12	15	9.72 (9.27–10.81)	4.07 (1.91–6.43)	5.71 (4.74–7.62)	14.13 (9.40–28.42)
>12	2	14.39 (13.19–15.58)	0.81 (0.61–1.01)	6.46 (5.92–6.99)	19.74

**NOTE.** Data are median (interquartile range), unless otherwise indicated. AUC<sub>0-6h</sub>, area under the curve until the 6-h time point; C<sub>max</sub>, peak concentration.

The recommended dose of isoniazid for preventive therapy in HIV co-infection is **10 mg/kg/daily** for 6 months (maximum 300mg/day).



1. McIlleron H et al. CID 2009

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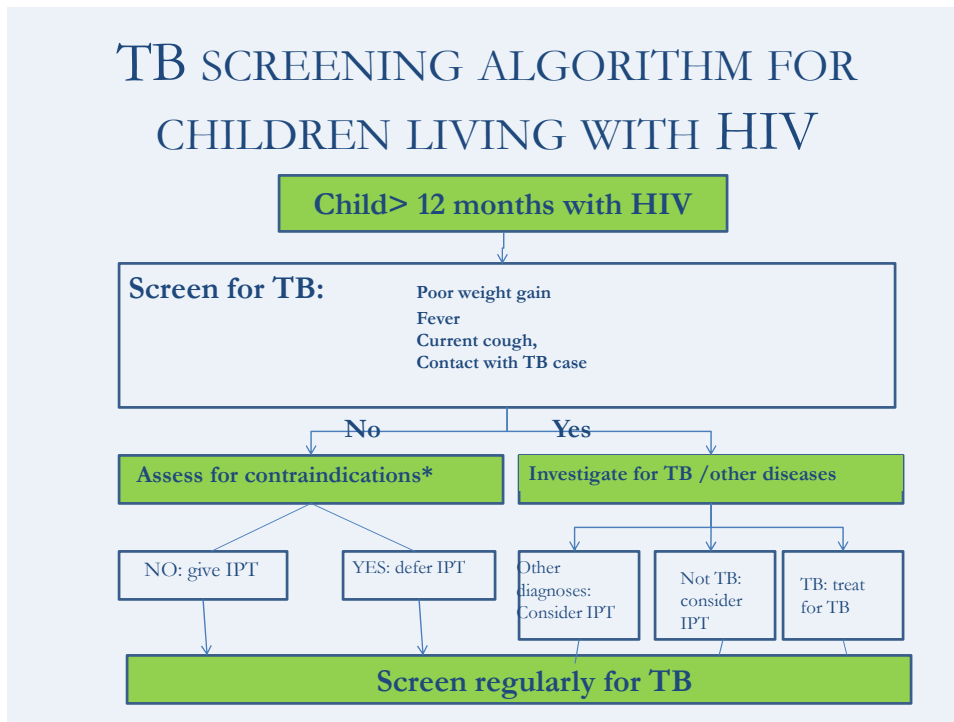
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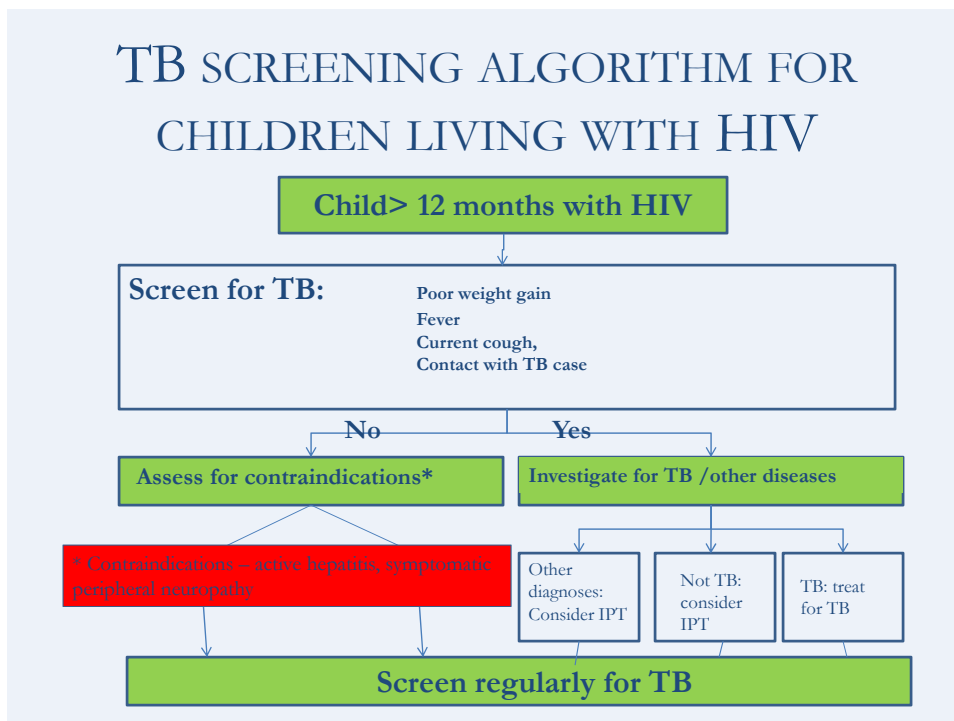
1. McIlleron H et al. CID 2009

**70% of children given INH at 4-6 mg/kg have peak INH concentration below the recommended reference range**

## TB SCREENING ALGORITHM FOR CHILDREN LIVING WITH HIV



## TB SCREENING ALGORITHM FOR CHILDREN LIVING WITH HIV



11

## WHO guidelines

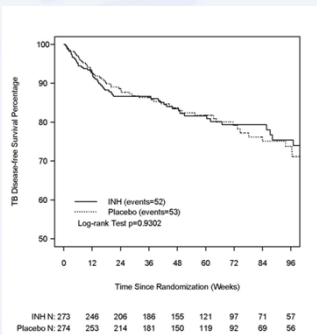
- In children living with HIV who are < 12 months, only those who have contact with a TB case and who are evaluated for TB (using investigations) should receive 6 months of IPT if the evaluation shows no TB disease.

**Strong Recommendation,  
Low quality of evidence**



37

## NO BENEFIT OF IPT IN HIV- INFECTED INFANTS ON ART



**HR 0.98, 95% CI  
0.67-1.44**

### SA trial<sup>1</sup>:

548 HIV infected infants living in high TB prevalence, 99% receiving ART  
Randomized at age 4 months to INH or placebo

### Results:

No significant difference in mortality

**(10% INH, 6% Placebo)**

No significant difference in TB incidence

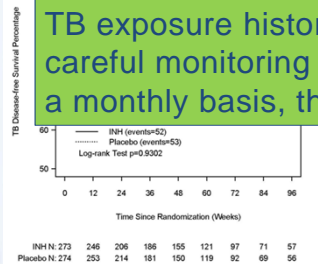
**(11% INH, 14% Placebo)**



1. Mitchell C et al. 16<sup>th</sup> CROI Feb 2009 Abs 907

## NO BENEFIT OF IPT IN HIV-INFECTED INFANTS ON ART

**Take Home Message:** In HIV-infected infants with no TB exposure history, with rapid access to ART and careful monitoring for new TB exposure or disease on a monthly basis, there is no benefit from IPT



**HR 0.98, 95% CI  
0.67-1.44**

or placebo

**Results:**

No significant difference in mortality

**(10% INH, 6% Placebo)**

No significant difference in TB incidence

**(11% INH, 14% Placebo)**



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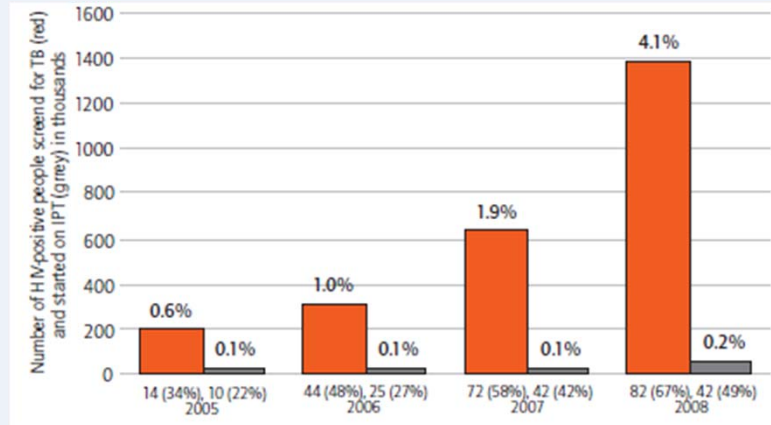
## WHO guidelines

- All children living with HIV who have successfully completed treatment for TB disease should receive INH for an additional 6 months

**Conditional Recommendation,  
Low quality of evidence**

**Risk of re-infection and recurrence of TB:** No studies have evaluated the role of IPT in secondary prophylaxis in children. However, it follows from research in adults that IPT after TB treatment will reduce risk of TB re-infection and recurrence in children.

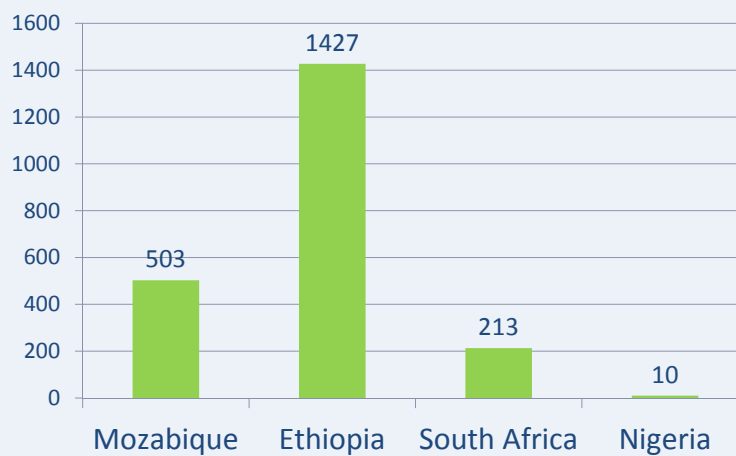
## DESPITE ALL THE EVIDENCE....



Intensified case finding and IPT provision among HIV-infected people. Grey bars show the extent of IPT as a proportion of total estimated HIV infected people

WHO, 2009

## NUMBER OF ELIGIBLE PERSONS STARTED ON IPT AT ICAP SITES (JULY-SEPT, 2010)



42

## WHY IS IPT NOT MORE WIDELY IMPLEMENTED?



## LACK OF KNOWLEDGE & EXPERIENCE

Qualitative study from SA<sup>1</sup> -

Key reasons why health care workers do not prescribe IPT:

- Health care providers unaware of IPT's efficacy
- Health care providers inexperienced prescribing INH
- Community groups and patients unaware of IPT
- Perceived operational barriers:

Increased resistance

Anticipated poor adherence



1. Lester, R et al. AIDS, 2010

## CONCERNS ABOUT ADHERENCE

**Adherence (<80%) is lousy:** in adults 34-98%

However, no studies have shown poor adherence assoc with ↑ resistance

**ICAP Mozambique:** If patient came back for first follow up visit, very likely to complete 6 months<sup>1</sup>

**Better adherence:**

Proximity to clinic<sup>2</sup>

Family/friend with TB<sup>2</sup>

Age<sup>3</sup>

Multiple other factors: housing, nutrition, supportive staff



1. Scardigli, 2010. 2. Munseri IJTBLD 2008 12 (9) 1037. 3. Le Roux BMC Medicine 2009 7:67

## CONCERNS ABOUT ADHERENCE

**Adherence (<80%) is lousy:** in adults 34-98%

However, no studies have shown poor adherence assoc with ↑ resistance

**ICAP Mozambique:** If patient came back for first follow up visit,

What are the lessons already learned from ART adherence? How can those lessons be applied to IPT in adults & children?

Family/friend with TB

Age<sup>3</sup>

Multiple other factors: housing, nutrition, supportive staff



1. Scardigli, 2010. 2. Munseri IJTBLD 2008 12 (9) 1037. 3. Le Roux BMC Medicine 2009 7:67

## CONCERNS ABOUT TOXICITY

- **In adults** –7 RCTs (INH vs placebo) reviewed  
All demonstrated that INH was safe  
(non significant increase in adverse reactions of 1.66 (95% CI 1.09-2.51))  
  
1 large observational cohort study (SA) involving 24221 participants:<sup>1</sup>
  - 130 adverse events (0.54%)
  - 4 events (2 hepatotoxicity, 1 fatal) were serious
  - Clinical toxicity was associated with ↑ alcohol consumption
- **In children** - no evidence of Grade 3/4 toxicity in children > 12 month. Zar et al found no statistical diff in liver problems (4% on INH vs 6% on Placebo)<sup>2</sup>



1. Grant et al, AIDS, 2010. 2. Zar et al, 2008

## CONCERNS ABOUT TOXICITY

- **In adults** –7 RCTs (INH vs placebo) reviewed  
All demonstrated that INH was safe  
(non significant increase in adverse reactions of 1.66 (95% CI 1.09-2.51))

**Take home message:** Eligibility for IPT needs to be carefully assessed at the outset. But INH is safe and well tolerated in most children and adults living with HIV.

- **In children** - no evidence of Grade 3/4 toxicity in children > 12 month. Zar et al found no statistical diff in liver problems (4% on INH vs 6% on Placebo)<sup>2</sup>



1. Grant et al, AIDS, 2010. 2. Zar et al, 2008

## HEALTH SYSTEM BARRIERS<sup>1</sup>

- **Leadership & Governance**

Lack of leadership, weak TB/HIV links, no guidelines

- **Service delivery**

Lack of screening algorithm, centralized HIV care

- **Supplies and products**

Ineffective TB/HIV supply mgmt, shortage of INH

- **Health information systems**

Lack of M&E indicators or standardized indicators

- **Finance related**

Competing financial priorities

1. Getahun, H, et al. AIDS, 2010



## CONCLUSIONS

- ICF/IPT should be seen as one joint policy
- Symptom based screening should be routine component of care for all PLWH
- CXR is not a mandatory investigation before starting IPT
- IPT should be part of a comprehensive TB prevention package offered by HIV care & treatment programs.



# THANK YOU



## IPT AND MDR TB<sup>1</sup>

Study evaluating TB outcomes and drug susceptibility in individuals exposed to IPT. Look at 71 TB cases in cohort of 23000 patients exposed to IPT and compared DST results to comparison group, in a control cluster.

	Active TB in patients exposed to IPT (n=71)		Active TB in comparison group (n=275)	
	First episode, n= 58 % (95% CI)	Retreatment, n=13 % (95% CI)	First episode, n=200, % (95% CI)	Retreatment n=75 % (95% CI)
<b>Any INH resistance</b>	7 <b>12.1%</b> (5.5-23.3)	1 <b>7.7%</b> (0.2-36.0)	12 <b>6.0%</b> (3.6-10.2)	14 <b>18.7%</b> (10.5-9.3)
<b>MDR</b>	1, <b>1.9%</b> (0.0-9.2)	1, <b>7.7%</b> (0.2-36.0)	3, <b>3.1%</b> (1.1-6.4)	10, <b>13.3%</b> (6.6-3.2)

**Take Home Message:** Rates of MDR were no higher in those who got TB on IPT

1-Van Halsema, AIDS 2010

## IPT & ART REDUCES MORTALITY<sup>1</sup>

**Results:** (\*Adjusted for age, CD4 count, ART, Hemoglobin)

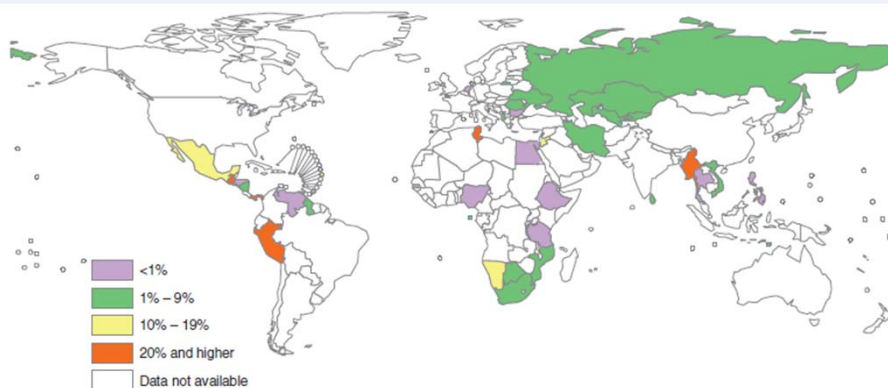
Adjusted Analysis*		N=3094	
Variable	Parameter	Hazard Ratio	P value (95% CI)
IPT	No	1	P>0.002 (0.32-0.80)
	Yes	<b>0.51</b>	

**Sensitivity Analysis:** Excluding those with symptoms possibly associated with TB

	IPT	# deaths/PY	Unadjusted HR (95% CI)
No TB symptoms (N= 1923)	No	66/1011	1 (p=0.008)
	Yes	15/683	<b>0.37</b> (0.24-0.96)

**Take Home Message:** IPT saves lives, but significantly more in those who definitely do not have TB at initial screening

## IPT IMPLEMENTATION IS VERY LOW



Map showing % of PLWHA who screened negative for TB and received IPT, 2009 (denominator = estimated number of PLWHA screened for TB)