



Diagnosis – An overview

- Role of the laboratory in antiretroviral treatment programs
- Laboratory tests in HIV diagnosis and ART
- Overview of HIV Diagnosis Technologies
- Tests for treatment eligibility and efficacy
- Treatment safety (toxicity) monitoring
- Lab requirements in order to provide quality services



Session Objectives

At the end of the session participants should be able to:

- List down key roles of laboratory services in ART
- Describe various laboratory tests done for diagnosis and management of HIV/AIDS
- Explain the key requirement for laboratories to provide quality services



Functions of Laboratory in ART

- Identifying infected individuals
- Staging infected individuals for eligibility to treatment
- Diagnosing opportunistic infections
- Monitoring patients on treatment or follow up

Laboratory Tests in HIV diagnosis and Therapy

- HIV diagnosis
 - Antibody detection using rapid tests or ELISA
 - DNA/RNA PCR assay (children <18 months)
 - p24 antigen detection using ELISA (children <18 months)
 - Virus isolation (gold standard)
- Treatment eligibility for all HIV+ and monitoring for all on therapy
 - CD4 cell count or percentage
 - Viral Load
- Safety Assays for drug toxicity for all patients on treatment
 - Chemistry and Haematology

Laboratory Tests in HIV Diagnosis and Therapy



- Other tests:
 - Drug resistance for drug choice decisions in situations of treatment failure

- Standard of care tests in routine clinical practice
 - Tests for STIs
 - Tests for Opportunistic infections
 - Stool examination for parasites
 - Blood slides for Malaria and other haemo-parasites

Overview of HIV Diagnosis Technologies



- Antibody detection (EIA, Rapid tests, Western blot)
- Antigen detection, p24 Antigen (EIA)
- Viral nucleic acid detection (PCR)
- Virus isolation (viral culture)

HIV Diagnosis in Adults and children >18 months

- Antibody detection
 - ELISA
 - Rapid Tests
 - Western blot; for confirmation
 - Not commonly used; very expensive
 - Difficult to interpret; produce many indeterminate results

- Alternative confirmatory strategy uses sequential testing by two rapid or more assays or ELISA
 - Adopted WHO confirmatory strategy II with some modification
 - Eliminates the use of Western Blot

National HIV Test algorithm – Rapid Test

Bioline-based

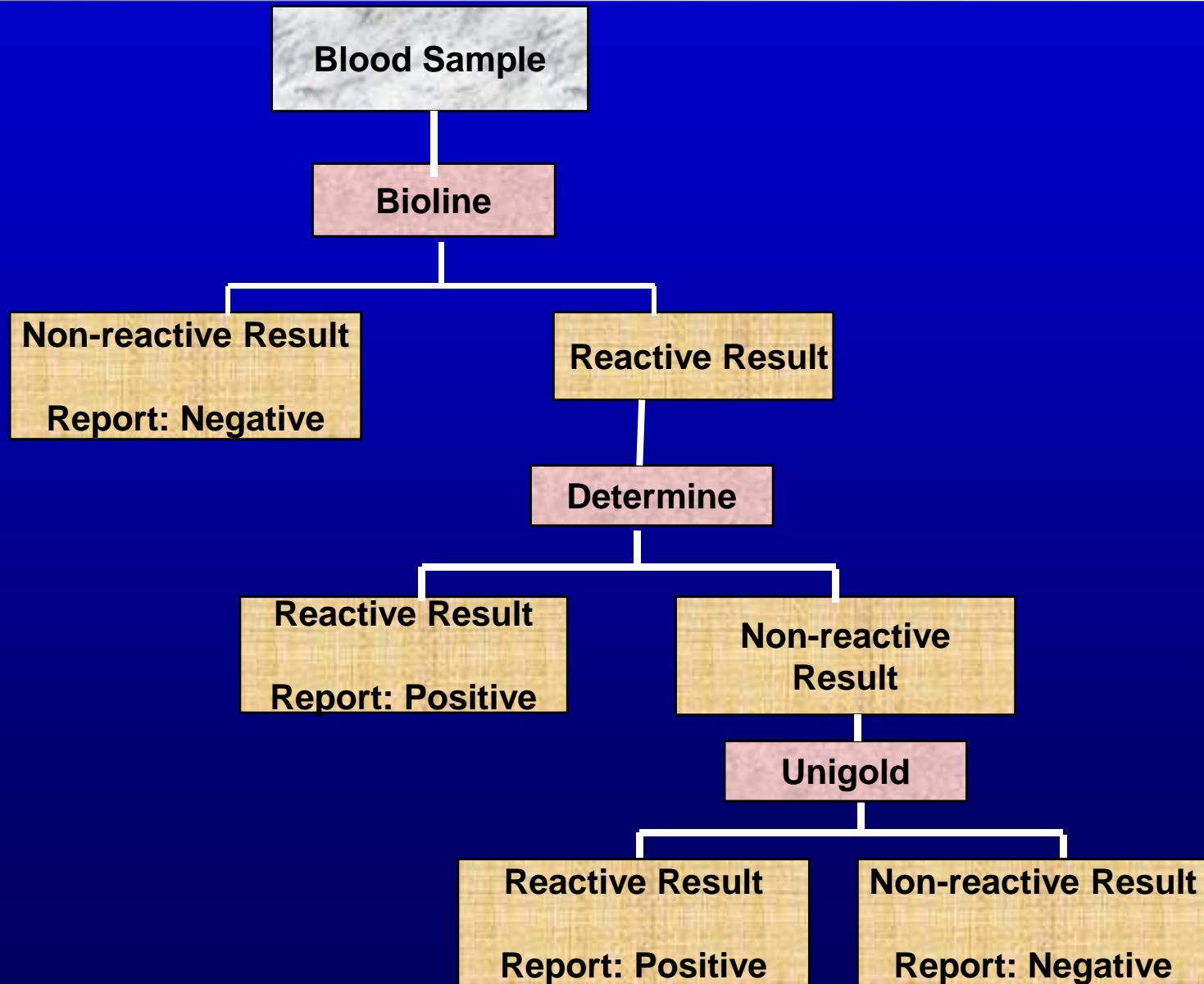
- Test 1: Bioline HIV1/2
- Test 2: Determine HIV1/2
- Discordant specimens; Test 3: Unigold HIV (tie-breaker)

Capillus-based

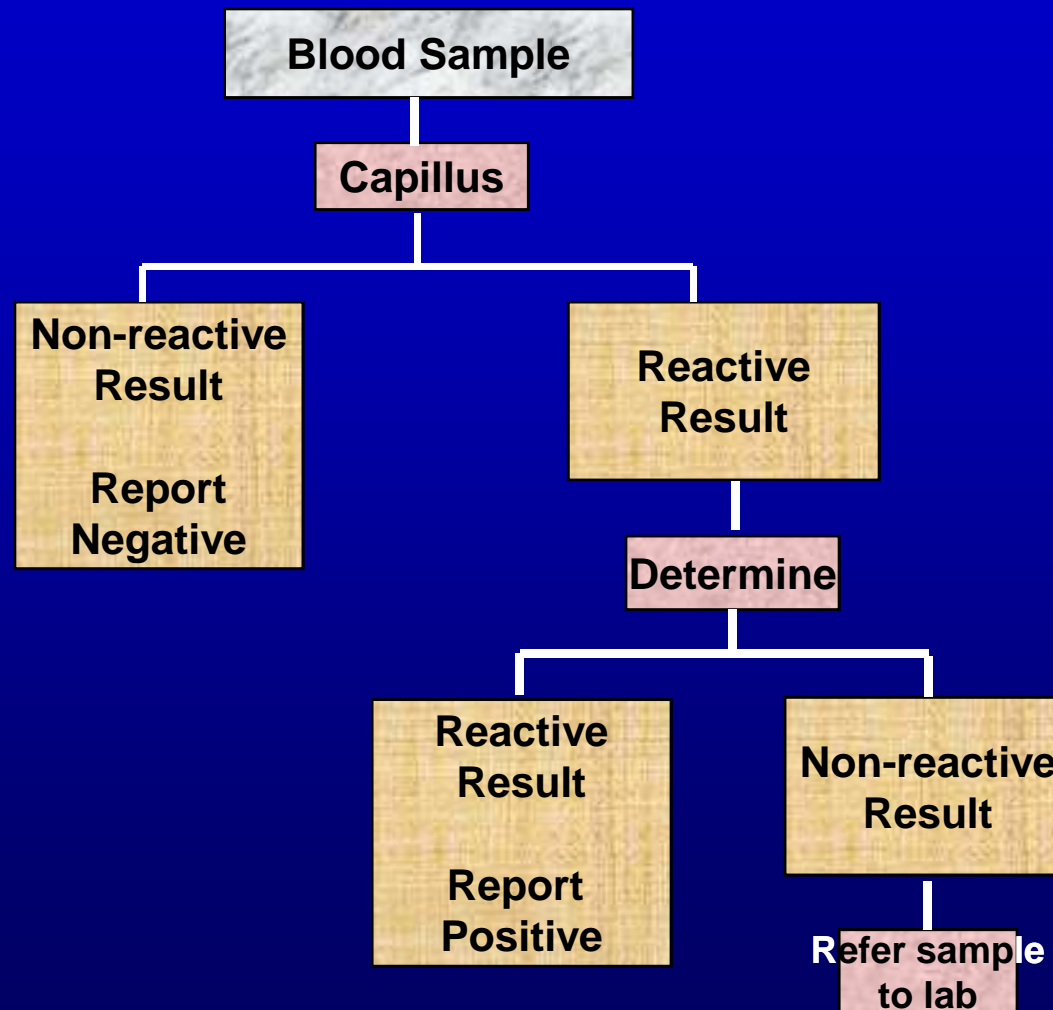
- Test 1: Capillus HIV1/HIV2
- Test 2: Determine HIV1/2
- Discordant specimens are sent to laboratory for confirmation

The roll out of Bioline-based algorithm is being scaled up while the Capillus-based being phased out

Bioline-based National HIV Rapid Testing Algorithm



Capillus-based National HIV Rapid Testing Algorithm



National HIV test algorithm - ELISA

- Currently there is no national algorithm for ELISA
- Evaluation of the most current generation of ELISA kits is underway
- Some laboratories use Vironostika Uniform Ag/Ab **OR** Wellcozyme Ag/Ab followed by Enzygnost HIV1/2 Plus

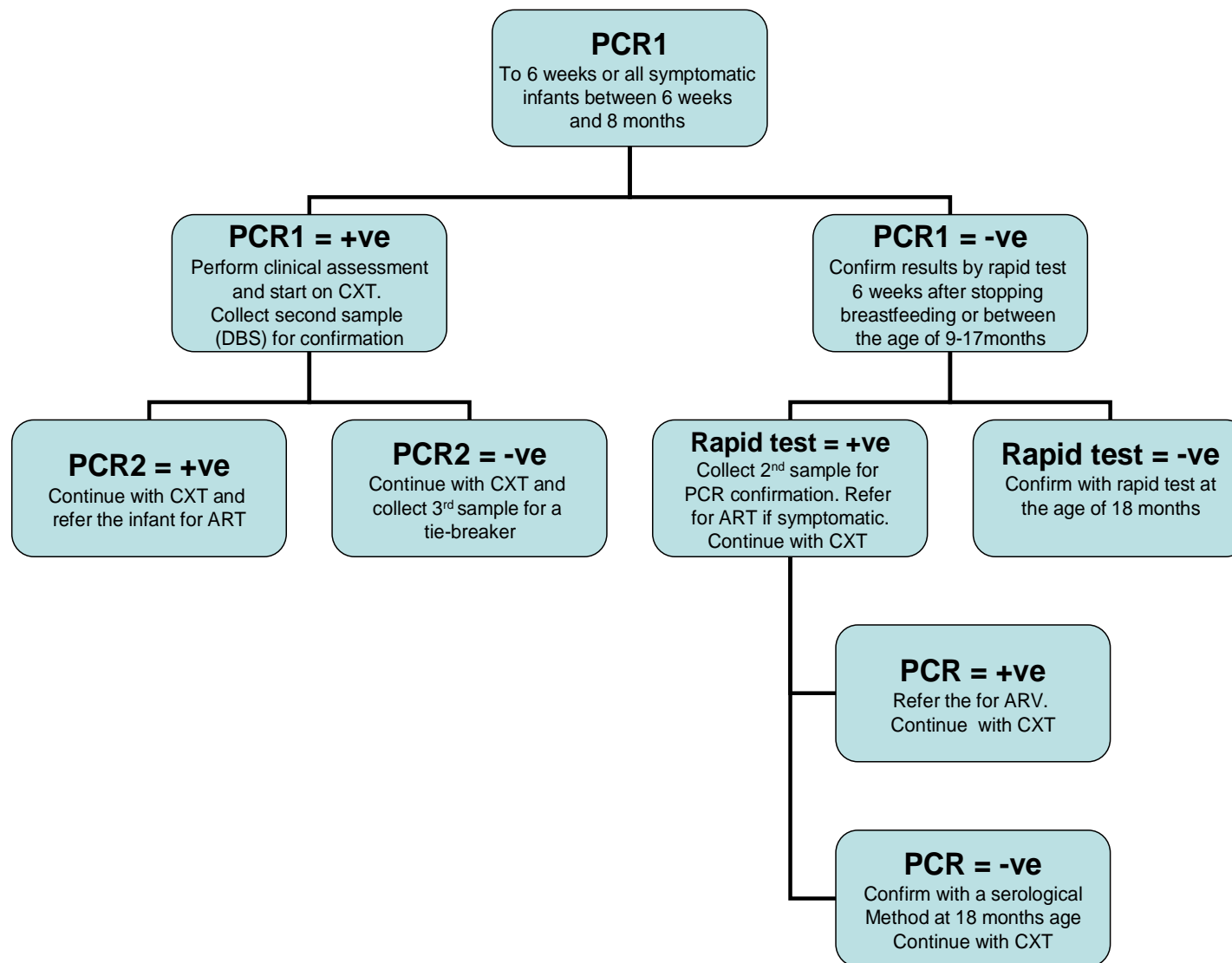
Lab HIV Diagnosis in children <18 months

- Antibody detection is not useful in this age group
 - Passively acquired maternal antibodies
 - Presence of antibodies indicates 'HIV exposed' status
 - Rapid tests and ELISA can not be used to reach diagnosis

- Diagnosis is by detection of virus nucleic acid (RNA or DNA)
 - Polymerase chain reaction (PCR) is the most commonly used method
 - Children born to HIV infected mothers to be tested from 4 weeks or at any time thereafter when they make contact with health facility

- p24 Antigen detection
 - Not well standardised

DNA PCR testing Algorithm





Tests for treatment eligibility and efficacy



CD4 Cell Count/Percentage

- CD4 T-cells depletion is one of the most consistent immunological feature in HIV disease
- Staging of HIV infection, recommendations for ARV treatment, and prophylaxis against OIs are based on the degree of immunosuppression
- CD4 together with clinical staging is of vital importance in assessing the patient.
- CD4 count is the most useful test for assessing immune deterioration
- Normal range: 500-1400/ μ l in adults



CD4 Cell Count/Percentage

- Done at baseline and during follow up
- Done by Automated CD4 counters
- High volume testing (at Zonal/Referral labs):
 - High throughput (250 – 300 samples/day)
 - Provides both absolute counts and percentages
- Low volume testing (at regional and district labs):
 - Low throughput (30 – 50 samples/day)
- Microscopy using antibody coated beads (Dynabeads)
- New instruments under development
 - Their use in the ART program will require endorsement by MoHSW (after in-country evaluation)



Viral Load Testing

- Is useful in diagnosing treatment failure
- The technology is technically demanding
- Costly
- Capacity in public facilities has been developed at referral HF's



Tests for monitoring treatment safety



Chemistry and Haematology

- Haematology
 - Full blood count (FBC)
 - Samples should be tested on the same day; ideally testing should be done on-site

- Chemistry
 - ALT, AST, serum creatinine

- Need to standardise testing platforms
 - Use of automated analyzers is recommended; to handle anticipated workload
 - Quality and Quality assurance issues
 - Harmonize training
 - Equipment maintenance

National Laboratory tests menu

Test	Zonal HIV reference laboratory	Regional hospital lab	District hospital lab	Primary healthcare center
HIV rapid test	+ (and ELISA)	+ (and ELISA)	+	+
HIV DNA PCR	+	-	-	-
Clinical Chemistry	+	+	+	-
Hematology	+	+	+	-
CD4 Cell Count	+	+	-/+	-
TB diagnosis	+	+	+	-/+
STI diagnosis	+	+	+	-

Key Laboratory Requirements to Support ART

- Adequate physical facilities and equipment
- Adequate trained technical staff
- Reliable supply of reagents with storage space
- Reliable equipment maintenance
- Internal and external quality assurance and laboratory quality management plan
- Good sample transportation network
- Reliable result management, storage and dispatch system

Projected Minimal Laboratory Space Requirements (number of rooms)

Test	Zonal Lab	Regional Lab	District Lab
Reception area	1	1	1
HIV diagnosis (Rapid test/ELISA), RPR, Chemistry	1	1	1
CD4 count, Haematology	1	1	1
PCR, Viral load	3		
TB, Other pathology	1	1	1
Office, data management	1	1	1
Store	1	1	1
Total	4-9	2-4	2-4

Laboratory Staff at different levels

	Zonal	Regional	District
Specialized Technologist	10	6 (3 minimum)	2 (1 minimum)
General Technologist	15	4 (1 minimum)	2 (2 minimum)



Testing Platforms

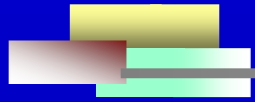
- Need to be standardised
 - Quality management
 - Training
 - EQA Performance comparison
 - Equipment maintenance
 - Service contracts
 - Reagent supply
 - Reagent deals (bundled purchase)



Important issues

- Laboratory – clinic communication
 - Quality specimens
 - Specimens transportation and results backflow

- Strengthening of laboratory quality system
 - Accuracy of results
 - Proper record keeping
 - Laboratory management



THANK YOU