

First Regional Workshop on the Implementation of the MMS Américas Network

Meeting summary

24-26 August, 2026

Lima, Perú

Context

Malaria elimination in the Americas requires surveillance systems capable of answering increasingly specific programmatic questions. Molecular malaria surveillance (MMS) can complement clinical, epidemiological and entomological surveillance by providing information on parasite and vector genetics, including species identification, drug resistance, diagnostic failure, transmission patterns and connectivity between transmission foci.

The MMS Américas Network was established to strengthen molecular malaria surveillance across the region and to promote collaboration among countries. The network brings together more than 15 countries and aims to translate molecular and epidemiological data into evidence that can inform national malaria control and elimination strategies.

The First Regional Workshop on the Implementation of the MMS Américas network brought together national malaria program (NMP) leaders, surveillance officers, laboratory leaders and other technical partners to establish a shared understanding of molecular surveillance, identify regional and subregional priorities, assess capacity gaps, and define preliminary national and regional actions.



About the workshop

The three-day workshop was structured to move from a common technical foundation toward country-level implementation and regional coordination.

DAY 1

Focused on:

- Establishing a common understanding of molecular malaria
- MMS application
- MMS programmatic value, using six practical use cases.



DAY 2

Focused on:

- Assessing existing capacities
- Identifying national and subregional priorities
- Defining minimum laboratory capabilities
- Discussing regional harmonization
- Introducing external quality assessment.



DAY 3

Focused on:

- Translating identified gaps and priorities into preliminary national roadmaps
- Defining regional priorities for quality assurance, laboratory exchanges, technical assistance and standardized procedures.

KEY TAKEAWAYS

- Molecular surveillance should be used as a tool to answer specific programmatic questions rather than as an end in itself.
- The region has important laboratory infrastructure and technical capacity, but bioinformatics, quality assurance, access to reagents and sustained financing remain major constraints.
- No single country has all the capacities required for comprehensive molecular surveillance. Regional collaboration can therefore connect complementary expertise, infrastructure and services.
- Priority applications differ according to epidemiological and programmatic context. Across the subregions, molecular diagnosis, imported malaria, drug resistance and connectivity emerged repeatedly as priorities.
- Harmonized standard operating procedures (SOPs), external quality assessment, sample and data exchange, and technical assistance will be essential to generate comparable and actionable information across countries.
- The workshop identified strong willingness among countries to collaborate, share experience and strengthen capacities through the network.

Key contributions from the sessions:

Introduction to molecular surveillance for NMP

This session introduced the added value of genetic information for malaria programs and how different sequencing techniques can support discovery of markers and characterization of population diversity.

The central message was that molecular surveillance complements rather than replaces clinical, epidemiological and entomological surveillance. Implementation can be progressive and adapted to each country's existing capacity.



Species confirmation and mixed or submicroscopic infections

- Participants discussed the use of conventional PCR, multiplex qPCR and amplicon panels to distinguish *P. vivax*, *P. falciparum*, mixed and submicroscopic infections.
- The method selection should depend on the epidemiological question and laboratory capacity.
- Time and availability of materials were identified as practical constraints.



"Resistance" or diagnostic test failure (*pfhrp2/3* deletions)

- The importance of detecting *pfhrp2/pfhrp3* gene deletions was addressed: false negatives with HRP2-based rapid diagnostic tests and low parasitemia.
- Participants reviewed confirmatory approaches including nested PCR, single-step PCR and sequencing.
- A case study was used to discuss the investigation of discordant results and the actors involved in decisions concerning diagnostic policy.

Antimalarial drug resistance

- Participants emphasized that countries should prioritize markers according to their own context and select methods such as PCR-RFLP, ddPCR or sequencing according to the question and available capacity.
- Other causes of treatment failure, including adherence, reinfection and medicine provision, must also be considered.





Local transmission, importation and reintroduction

- Molecular tools can help distinguish local transmission, imported infections and reintroduction by assessing genetic similarity and relatedness.
- Microhaplotypes, SNP panels and sequencing offer different levels of resolution, while travel history, clinical information and geographic context remain important complementary information.
- Serological tools are recommended for low transmission areas.

Connectivity between foci and regions

- Connectivity analyses can determine whether parasite populations in different locations are linked through human mobility or a common source.
- Participants highlighted the need for representative samples, timely epidemiological information, sample exchange and agreements for cross-border data sharing.



Entomological molecular surveillance

- Molecular tools can provide key vector information: *Anopheles* species, insecticide resistance, *Plasmodium* spp. infection, blood-meal sources.
- It is needed to complement with information about vector interventions: indoor residual spraying, use of mosquito nets, and larval control strategies.
- Molecular markers such as *kdr* and *Ace-1* can complement phenotypic bioassays, which remain essential for characterizing insecticide resistance.
- Coordination, communication and sustainable resources were identified as important implementation gaps.



Regional Network Assessment: Results

The Network Assessment provided a baseline of molecular malaria and vector surveillance capacity. Sixteen countries participated in the malaria molecular surveillance assessment and 14 in the vector component.

The region showed relatively strong basic laboratory infrastructure, while the principal gaps were in bioinformatics, quality assurance, reagents and sustained financing.

The assessment also showed that specialized capacities are distributed across countries. This supports the rationale for a network that can connect laboratories through training, technical exchange and shared procedures and collaboration.

Groupwork: Subregional priorities

Participants worked in three subregional groups to validate the assessment findings, identify context-specific use cases and define strengthening needs.

Subregion	Priority use cases	Main gaps/needs
Guianan Amazon	• Drug resistance • Imported cases • Molecular diagnosis	• Sample availability • Broader analysis of imported cases • Molecular diagnostic standardization • Data/sample exchange • Bioinformatics • <i>Pfhrp2/3</i> deletion surveillance • Realistic implementation timelines
Mesoamerica & Caribbean	• Molecular diagnosis • Imported cases • Connectivity	• SOPs • External Quality Assurance • Bioinformatics • Technical training • Supplies • Expert support • Cooperation for connectivity • Vector surveillance
Andean Amazon	• Molecular diagnosis • Drug resistance • Imported cases	• Low-parasitemia detection • SOPs and guides • Standardized materials • Collaboration for imported-case analyses • Strengthened molecular entomology



Across all three subregions, participants emphasized regional cooperation, exchange of samples and information, shared control panels, timely access to supplies and stronger political support for sustained molecular surveillance.



Minimum capacities and regional harmonization

A practical framework was presented to classify laboratories across infrastructure and equipment, molecular techniques, bioinformatics, and quality and programmatic integration. Basic capacity includes conventional PCR, intermediate capacity incorporates qPCR and more specialized analysis; and advanced capacity includes sequencing, advanced bioinformatics and routine programmatic integration.

The workshop emphasized that advanced sequencing and bioinformatics are not prerequisites for starting useful molecular surveillance. Reference-laboratory collaboration can help bridge gaps while countries progressively develop their own capacity.

Participants also discussed regional harmonization of SOPs to improve comparability, support quality assurance and avoid duplication. A prioritized list of SOPs and technical guidance was proposed, with responsibilities for development, review and validation to be defined within the network's governance.

Introduction to the WHO Malaria NAAT EQA

The workshop introduced the WHO Malaria NAAT EQA scheme, developed by WHO and UK NEQAS to strengthen the quality and comparability of nucleic-acid amplification testing for malaria.

The scheme can support detection and species identification and can be extended to applications such as *pfhrp2/3* deletions and molecular resistance markers.

Participation and documented procedures were highlighted as important mechanisms for strengthening regional confidence in molecular results.

National Roadmaps

Each national delegation developed a preliminary 6-12 month roadmap based on the previous discussions from each session, identifying priority objectives, activities, timelines and support required from the network.

In summary, the national roadmaps highlighted strong demand for bioinformatics support, SOP development, training and participation in EQA, followed by technical exchanges and laboratory placements. Equipment needs were less frequently prioritized, reinforcing the finding that the main constraints are technical capacity, data analysis and quality assurance rather than basic infrastructure.



Regional priorities and next steps

The plenary review of the 16 national roadmaps identified three immediate areas for coordinated regional action:

- WHO Malaria NAAT EQA: prioritize the incorporation of additional regional laboratories, with financing and registration management identified as key barriers to participation.
- Laboratory exchanges and technical assistance: facilitate exchanges and targeted support in bioinformatics, sequencing, data analysis and assay validation.
- Regional SOPs and technical guidance: prioritize procedures for dried blood spot sample collection and shipment, DNA extraction, qPCR for species and submicroscopic infections, EQA preparation, and basic molecular resistance-marker panels.

Implementation horizons:

0-6 months	Develop priority SOPs and initiate capacity-building activities.
6-12 months	Implement priority activities and expand participation in EQA.
12-24 months	Advance connectivity analyses, next-generation sequencing and genomic surveillance.

These priorities are intended to establish a sequence for implementation and do not replace other needs identified by participating countries. The workshop concluded that many national needs are shared and that the region already contains complementary capacities that can address them. The principal challenge is to coordinate and facilitate the exchange of knowledge, tools, samples and services across the network.



Conclusion

The First Regional Workshop established a common technical and programmatic foundation for the MMS Américas Network. It demonstrated that the region has substantial laboratory structure, scientific expertise and willingness to collaborate, while also identifying important gaps in bioinformatics, quality assurance, standardized procedures, supplies and sustainable financing.

The workshop moved the network from a shared assessment of needs toward a preliminary implementation agenda. By connecting complementary capacities, supporting harmonized procedures and quality systems, and facilitating technical exchange and data collaboration, MMS Américas can help countries progressively integrate molecular surveillance into routine malaria programs and use genomic and molecular evidence to inform control and elimination decisions.



Workshop Agenda

Día 1 — ¿Qué puede aportar la vigilancia molecular a la eliminación de la malaria?

Day 1 — What can molecular surveillance contribute to malaria elimination?

Objetivo: establecer una comprensión común sobre los principios, aplicaciones y potencial programático de la vigilancia molecular de malaria, alineando a directores de programas nacionales de malaria, responsables de vigilancia y jefes de laboratorio en torno a preguntas operativas relevantes para la eliminación.

Objective: to establish a common understanding of the principles, applications and programmatic potential of malaria molecular surveillance, aligning national malaria programme directors, surveillance leads and laboratory heads around operational questions relevant to elimination.

Hora Time	Actividad Activity	Responsable / Facilitador Lead / Facilitator
09:00–09:30	Registro de participantes <i>Registration of participants</i>	UPCH / Secretaría Técnica
09:30–10:00	Inauguración oficial y palabras de bienvenida <i>Official opening and welcome remarks</i>	UPCH (Rector de la Universidad), OPS (OPS Perú y OPS Washington)
10:00–10:30	Presentación de la Red MMS Américas: visión, objetivos y expectativas <i>Presentation of the MMS Américas Network: vision, objectives and expectations</i>	Dionicia Gamboa
10:30–11:00	Panorama regional de la eliminación de malaria en las Américas y oportunidades para MMS Américas <i>Regional overview of malaria elimination in the Americas and opportunities for MMS Américas</i>	María Paz Ade (OPS)
11:00–11:15	Café <i>Coffee break</i>	
11:15–11:45	Introducción a la vigilancia molecular para programas nacionales de malaria <i>Introduction to molecular surveillance for national malaria programmes</i>	Dan Neafsey + Dionicia Gamboa
11:45–13:00	Almuerzo <i>Lunch</i>	
13:00–14:00	Caso de uso 1: Confirmación de especies e infecciones mixtas/submicroscópicas <i>Use case 1: Species confirmation and mixed or submicroscopic infections</i>	Gustavo Fontecha. Relator: Fabián Saenz
14:00–14:30	Caso de uso 2: Resistencia o falla de pruebas diagnósticas (<i>pfhrp2/pfhrp3</i>) <i>Use case 2: Resistance or diagnostic test failure (pfhrp2/pfhrp3 deletions)</i>	Dionicia Gamboa. Relator: Hugo Valdivia.
14:30–15:00	Caso de uso 3: Resistencia a medicamentos antimaláricos <i>Use case 3: Antimalarial drug resistance</i>	Stella Chenet. Relatora: Lise Musset
15:00–15:30	Café <i>Coffee break</i>	
15:30–16:00	Caso de uso 4: Transmisión local, importación y reintroducción <i>Use case 4: Local transmission, importation and reintroduction</i>	Shazia Ruybal Pesantez. Relatora: Anna Rosanas
16:00–16:30	Caso de uso 5: Conectividad entre focos y regiones <i>Use case 5: Connectivity between foci and regions</i>	Marcelo Ferreira. Relator: Dan Neafsey.
16:30–17:00	Caso de uso 6: Vigilancia molecular entomológica <i>Use case 6: Entomological molecular surveillance</i>	Denis Escobar. Relatora: María Paz Ade.
17:00–17:15	Discusión plenaria y conclusiones del día <i>Plenary discussion and conclusions of the day</i>	María Paz Ade Daniel Neafsey

Workshop Agenda

Día 2 — ¿Cuáles son las prioridades de cada país y qué capacidades se requieren?

Day 2 — What are each country's priorities, and what capacities are required?

Objetivo: identificar prioridades nacionales o subregionales, relacionarlas con los casos de uso presentados y discutir los requisitos mínimos para su implementación.

Objective: to identify national or subregional priorities, link them to the use cases presented, and discuss the minimum requirements for their implementation.

Hora Time	Actividad Activity	Responsable / Facilitador Lead / Facilitator
09:00–09:15	Resumen del día anterior <i>Recap of the previous day</i>	Luis Cabrera
09:15–10:15	Resultados del <i>Network Assessment</i> regional <i>Regional Network Assessment: results</i>	Gustavo Fontecha + Equipo MMS
10:15–10:45	Discusión plenaria sobre capacidades y brechas <i>Plenary discussion on capacities and gaps</i>	Maria Paz Ade
10:45–11:00	Café <i>Coffee break</i>	
11:00–12:30	Trabajo grupal por subregiones (Mesoamérica/Caribe, Amazonía Andina, Amazonía Guayanesa) <i>Subregional group work (Mesoamerica/Caribbean, Andean Amazon, Guiana Shield Amazon)</i>	Mesoamérica/Caribe: Daniel Neafsey Amazonía Andina: Anna y Shazia Amazonía Guayanesa: Marcelo y Lisse
12:30–13:30	Almuerzo <i>Lunch</i>	
13:30–14:30	Presentación de prioridades por subregión <i>Presentation of priorities by subregion</i>	Relatores electos de los grupos
14:30–15:15	Capacidades mínimas para PCR, qPCR, secuenciación y bioinformática <i>Minimum capacities for PCR, qPCR, sequencing and bioinformatics</i>	Dionicia Gamboa Gustavo Fontecha
15:15–15:30	Café <i>Coffee break</i>	
15:30–16:30	Discusión sobre armonización regional de procedimientos y necesidades de POEs <i>Discussion on regional harmonisation of procedures and SOP needs</i>	Dionicia Gamboa & SC
16:30–17:00	Introducción al WHO Malaria NAAT EQA <i>Introduction to the WHO Malaria NAAT EQA</i>	Maria Paz Ade / OMS (o Jane C.)

Workshop Agenda

Día 3 — ¿Cómo se implementa la vigilancia molecular en cada país?

Day 3 — How is molecular surveillance implemented in each country?

Objetivo: desarrollar planes preliminares de implementación y definir prioridades regionales para las actividades futuras de la red.

Objective: to develop preliminary implementation plans and define regional priorities for the network's future activities.

Hora Time	Actividad Activity	Responsable / Facilitador Lead / Facilitator
09:00–09:15	Resumen del día anterior <i>Recap of the previous day</i>	Luis Cabrera
09:15–10:45	Trabajo grupal: diseño de hojas de ruta nacionales (6–12 meses) <i>Group work: designing national roadmaps (6–12 months)</i>	Dionicia y Gustavo
10:45–11:00	Café <i>Coffee break</i>	
11:00–12:30	Continuación del trabajo grupal <i>Continuation of the group work</i>	Dionicia y Gustavo
12:30–13:30	Almuerzo <i>Lunch</i>	
13:30–15:00	Presentación de hojas de ruta nacionales y discusión <i>Presentation of national roadmaps and discussion</i>	Delegaciones nacionales (seleccionar representantes por subregión)
15:00–15:15	Café <i>Coffee break</i>	
15:15–16:00	Priorización regional para EQA, intercambios, asistencia técnica y desarrollo de POEs <i>Regional prioritisation for EQA, exchanges, technical assistance and SOP development</i>	Comité directivo
16:00–16:30	Discusión sobre laboratorios de referencia subregionales y mecanismos de colaboración <i>Discussion on subregional reference laboratories and collaboration mechanisms</i>	María Paz Ade y Panel técnico
16:30–17:00	Declaración de Lima, acuerdos finales y clausura <i>Lima Declaration, final agreements and closing</i>	Dionicia Gamboa + OPS