Transmission Workpackage: Progress to Date

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**Aim:** to determine the feasibility and potential scalability of xenomonitoring as a passive surveillance tool for VL to be used in a post-elimination setting

**Objectives:**

1. Optimise and carry out field-testing of a metacyclic-specific assay for *L. donovani* detection in *P. argentipes* to determine the proportion of caught sandflies infected with metacyclic specific promastigotes
2. Determine the best practice for sampling *P. argentipes* in terms of surveillance of *L. donovani* transmission potential
3. Determine the cost effectiveness, feasibility and scalability of xenomonitoring as a surveillance mechanism
4. Utilise generated data to improve VL transmission models
5. Utilise generated data to inform the development of guidelines for VL transmission endpoint assessment

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**Project overview**
Project structure

• Four phases:
  1. Pilot study to compare the effectiveness of CDC light traps, mechanical vacuum aspirators and Prokopacks in collecting female *P. argentipes*
  2. Optimisation of the metacyclic-specific assay for *L. donovani* detection in *P. argentipes*
  3. Xenomonitoring
  4. Analysis and model development
• **Aim:** to determine the optimal method of capturing female *P. argentipes* sandflies, for use in a visceral leishmaniasis xenomonitoring programme

• Samples will be retained for metacyclic-specific PCR analysis and inclusion in xenomonitoring study

• Three collection methods:

- Mechanical vacuum aspirators
- CDC light traps
- Prokopack
Pilot study: sample size

- Study sites: 24 households in a non-endemic block of Nalanda district that has not undergone IRS in the past three years; 24 households in an endemic block of Saran district that are currently undergoing IRS

- Number of trap nights required per treatment group calculated based on unpublished Kalanet data

<table>
<thead>
<tr>
<th>Effect size</th>
<th>Trap nights required</th>
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<tbody>
<tr>
<td>1.0</td>
<td>166</td>
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<tr>
<td>1.25</td>
<td>106</td>
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<tr>
<td>1.5</td>
<td>74</td>
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- Eight replicates of each method per day for two consecutive days in one of the study blocks (four replicates/village/day), across 20 days in May
Pilot study

• Collection methods will be rotated between households on a daily basis, following a Latin Square design balanced for carryover effects

![Latin Square Design]

• Additional measures:
  • Soil temperature, pH value, sunlight intensity and moisture recorded daily within a 1m radius of each house
  • Ambient temperature and humidity recorded daily in 6 households/village
  • Qualitative survey to determine aspects of each method householders found disruptive or unpleasant, and collection method preference, if any
Xenomonitoring

- Sampling method and protocol will be finalised based on the results of the pilot study.
- 12 villages, 10 households/village will be selected. 5 villages (3 endemic, Saran district; 2 non-endemic, Muzaffarpur district) will overlap with sero-surveillance project sites.
Xenomonitoring

- 2 replicates will be carried out per month for 1 year, one under strict research conditions and one solely by RMRI-trained field workers, to give an indication of both the theoretical and operational feasibility of xenomonitoring
  - Analysis will account for both inter- and intra-collector variations

- Sample size calculation will be refined based on the results of the pilot study, as it currently assumes:
  - Capture rates will be similar to Kalanet trial
  - Approximately 2.53% of female *P. argentipes* will be infected with *L. donovani* (based on the average proportion of positive individually tested samples from previous studies in Bihar
• September 2017: HMSC approval granted by the Ministry of Health and Family Welfare
• October 2017: Institutional ethical approval granted by RMRI
• September – October 2017: Preliminary testing of mechanical vacuum aspirator in field conditions
Effectiveness of mechanical vacuum aspirators assessed through outdoor sampling of 20 sites over 10 days (200 collections total) in one village in Nalanda district

- 5 different vegetation types sampled; bamboo stands, banana trees, short/rough palms, tall/smooth palms, and brick stacks
- 309 sandflies captured, 83.8% *P. argentipes*, 36.3% female
- Samples remained alive and in-tact following aspiration

Preliminary study results
Progress

- January 2018: LSHTM-RMRI contract prepared and delivered to RMRI for approval
- January 2018: Open Data Kit (ODK) set up for qualitative data collection
- February 2018: Two pilot study villages in Nalanda district (Bihar) and two in Saran district (Bihar) selected for pilot study
- February 2018: Xenomonitoring site selection meeting and village visit with members of the surveillance workpackage at KAMRC Muzaffarpur
- March 2018: Pilot study protocol finalised
- March 2018: Procurement of lab and field equipment
Progress

- April 2018: Pilot study recruitment of 48 households in Nalanda and Saran districts completed
- April 2018: LSHTM-RMRI contract approved and signed by RMRI
- April 2018: Research Assistant appointed to work at LSHTM on metacyclic-specific assay development
Data collection & results timeline

- Include point indicating prelim results will be available in time for COR NTD

<table>
<thead>
<tr>
<th>May '18</th>
<th>Jun '18</th>
<th>Jul '18</th>
<th>Aug '18</th>
<th>Sept '18</th>
<th>Oct '18</th>
<th>Nov '18</th>
<th>Dec '18</th>
<th>Jan '19</th>
<th>Feb '19</th>
<th>Mar '19</th>
<th>Apr '19</th>
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<tbody>
<tr>
<td>Pilot study</td>
<td>Pilot study results available</td>
<td>Preliminary xenomonitoring results</td>
<td>Conclusion of field collections</td>
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## Summary of outputs

<table>
<thead>
<tr>
<th>Pilot study</th>
<th>Xenomonitoring</th>
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<tr>
<td>Optimal sampling framework for <em>P. argentipes</em></td>
<td>Entomological inoculation rate</td>
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<td>Proportion of <em>P. argentipes</em> resting indoors v. outdoors</td>
<td>Critical infection thresholds</td>
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<td>Relationship between microclimate and <em>P. argentipes</em> emergence</td>
<td>Prevalence of <em>L. donovani</em> infection and infectiousness</td>
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<tr>
<td><em>P. argentipes</em> seasonality</td>
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<tr>
<td>Operational feasibility &amp; scalability of xenomonitoring</td>
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<tr>
<td>Cost effectiveness</td>
<td>Cost effectiveness</td>
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<tr>
<td>Metacyclic-specific PCR assay</td>
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Questions & Comments