



Co-Funded by the European Union  
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# DMC-MALVEC

[www.dmc-malvec.eu](http://www.dmc-malvec.eu)

DiagnosisManagementCommunication-MalariaVectorControl

## Editorial

DMC-MAVEC is a Horizon 2020 EU-funded project that aims to address challenges in organizing, interpreting and communicating vector control data through the development and integration of a fully automated diagnostic platform (LabDisk), a data management system (DDMS) and an innovative communication tool (GAME).

After the successful review of the first periodic report **the project entered phase II** (*page 2*). During this phase important scientific progress has been made through DMC-MALVEC. FORTH developed and patented a **novel molecular diagnostic assay** for the detection of *Plasmodium* infected mosquitoes (*page 3*), while Hahn-Schickard introduced an **innovative microfluidic method** (*page 4*) suitable for automated diagnostic platforms.

Progress was also made towards improving **DDMS** and **GAME** functionality and dissemination, via dedicated **workshops** (*page 6*) that took place in Africa (Zambia, Ethiopia).

DMC-MALVEC activities were also communicated in major scientific conferences, worldwide, including the 66<sup>th</sup> Annual Meeting of the American Society of Tropical Medicine and Hygiene in November 2017 (*page 10*).

**In 2018** DMC-MALVEC will continue to increase its visibility through scientific conferences like the Geneva Health Forum (April 10-12) and the 7th MIM Pan African Malaria Conference (MIM 2018, Dakar, Senegal, April 15-20). **Get to know the project's innovative tools** and its participants in the later and in additional meetings (details in *page 11*).

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**Figure 1** The Hahn-Schickard infrastructures including a dedicated production line in Freiburg, Germany, visited by the DMC-MALVEC participants

The second annual meeting of DMC-MALVEC took place in Freiburg, Germany (March 20-21, 2017).

The action plan for year 2 of the project was updated, IP issues were discussed and reporting activities for the first reporting period were organized.

The participants had also the chance to visit the state-of-the-art Hahn-Schickard facilities (Figure 1).

Furthermore, in October 2017 the review of the project's first reporting period was completed by the EU in Brussels with very useful comments by the independent external reviewers.

DMC-MALVEC now enters phase II.

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## FORTH develops and patents a novel and improved method for the detection of *Plasmodium* infected mosquitoes

[www.nature.com/scientificreports](http://www.nature.com/scientificreports)

# SCIENTIFIC REPORTS

OPEN

## New rapid one-step PCR diagnostic assay for *Plasmodium falciparum* infective mosquitoes

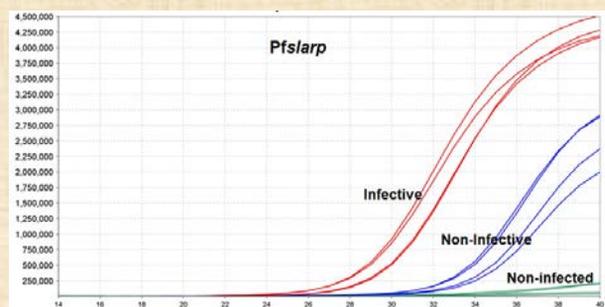
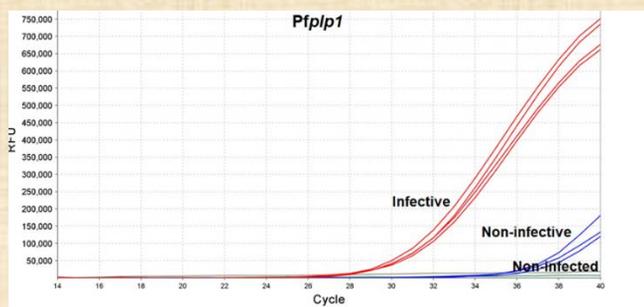
Received: 15 September 2017

Accepted: 27 December 2017

Published online: 23 January 2018

Mary Kefi<sup>1,2</sup>, Konstantinos Mavridis<sup>1</sup>, Maria L. Simões<sup>3</sup>, George Dimopoulos<sup>3</sup>, Inga Siden-Kiamos<sup>1</sup> & John Vontas<sup>1,4</sup>

An essential component of malaria vector control programmes is the detection of *Plasmodium*



- ✓ The novel assay is 100% accurate.
- ✓ This method is simple and rapid to perform in individual mosquitoes or mosquito pools (no requirement for dissection and post-PCR processing) .
- ✓ It can be used in single or multiplex formats also targeting additional markers expressed in different tissues, such as detoxification enzymes associated with insecticide resistance.



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## Hahn-Schickard introduces an innovative microfluidic method for automated diagnostic platforms



### Lab on a Chip

#### PAPER



Cite this: *Lab Chip*, 2018, 18, 362

#### Temperature change rate actuated bubble mixing for homogeneous rehydration of dry pre-stored reagents in centrifugal microfluidics†

S. Hin, <sup>a</sup> N. Paust,<sup>\*ab</sup> M. Keller, <sup>ab</sup> M. Rombach,<sup>b</sup> O. Strohmeier,<sup>ab</sup> R. Zengerle<sup>abc</sup> and K. Mitsakakis<sup>ab</sup>

- ✓ A novel microfluidics method for mixing prestored reagents in automated diagnostic platforms has been developed through work performed in the framework of the DMC-MALVEC project.
- ✓ The novel method does not require complex fabrication steps or external means.
- ✓ The novel method can homogeneously mix dry reagents with a liquid for highly consistent reagent concentrations between different aliquots and a high reproducibility between different experiments.
- ✓ A reduction of the variation by 82% was achieved.

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The **LabDisk** constitutes an ideal diagnostic tool for monitoring which mosquito species are present, the infection status of mosquitoes and whether they are resistant to insecticides.

For the first time in an operational setting, the LabDisk will enable the application of diagnostic tests in a low-resource environment, that can currently only be analyzed in centralized labs using sophisticated equipment.

The following picture summarizes the major steps that have been realized up to now towards the development of the DMC-MALVEC LabDisk.

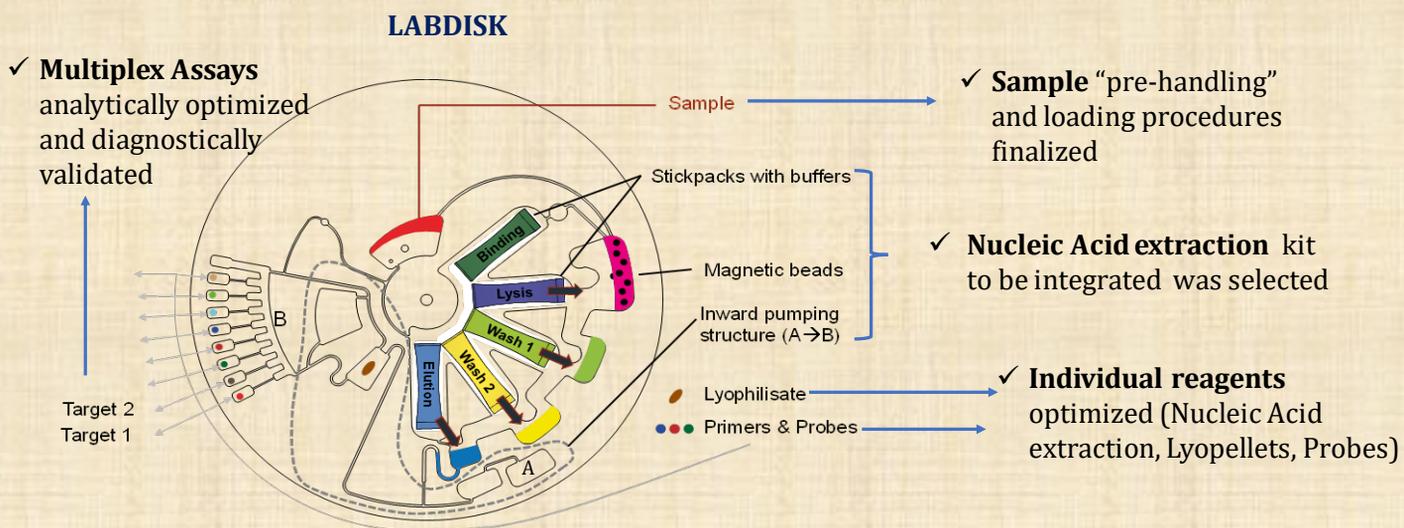


Figure 2 Overview of the progress made so far for the development of the DMC-MALVEC LabDisk



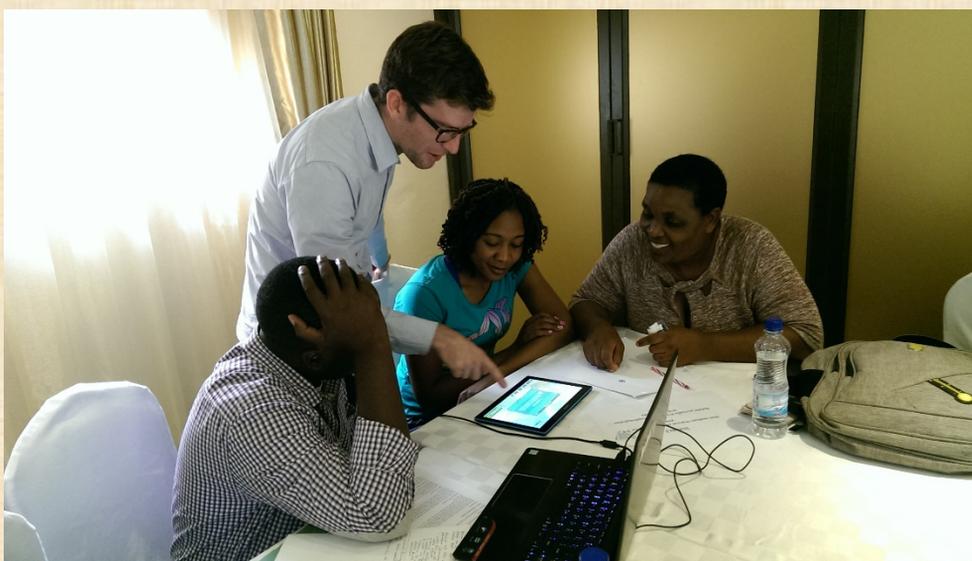
# Training for DDMS and GAME

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**LSTM** performed the training of individuals for DDMS and GAME use in Zambia (October and November 2017) and Ethiopia (October 2017).

The **DDMS** entomology module expanded to incorporate data from any diagnostic tool including the LabDisk.

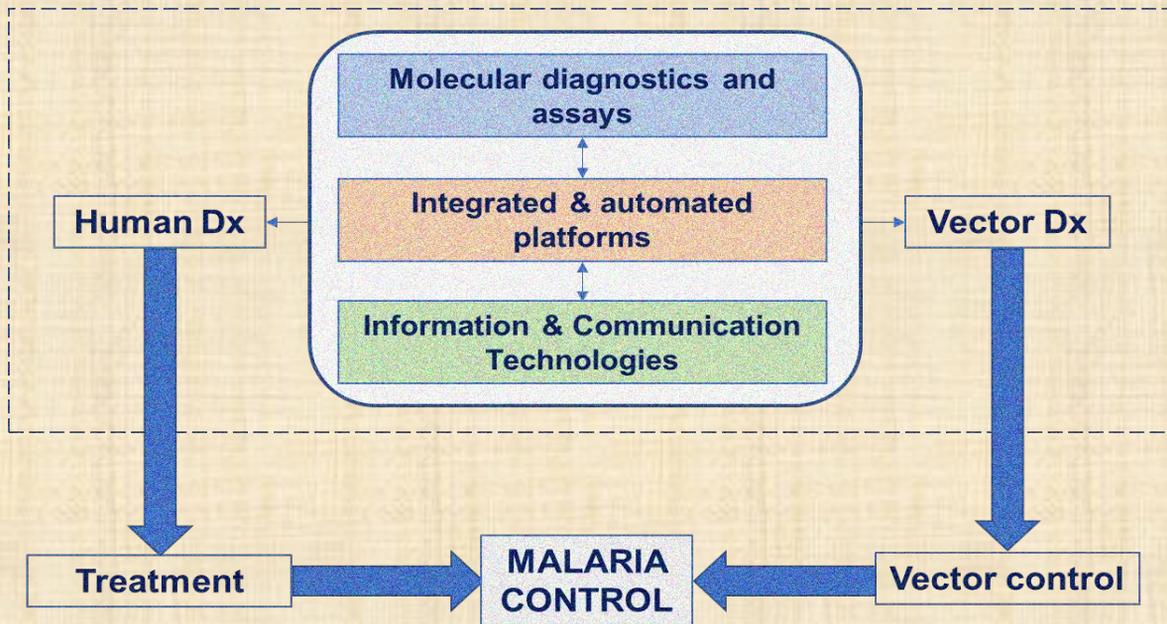
**ResistanceSIM**, a simulation-based Serious Game has evolved to allow the user to interact with a fictitious vector control program. The users can choose how to monitor mosquito populations (with scenarios relevant to the LabDisk use), what interventions to deploy, and how to monitor the efficacy of those interventions.



**Figure 3** DMC-MALVEC's Eddie Thomsen training individuals for ResistanceSIM in Chisamba, Zambia (6-10 November 2017).



**Figure 4** Participants giving feedback on GAME functionalities during the workshop held in Addis Ababa, Ethiopia, during 2-6 October 2017.

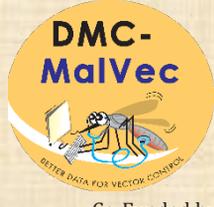


**Figure 5** Overview of the sample-to-answer process for the DMC-MALVEC LabDisk (Mitsakakis K. et al, IJERPH, Feb 2018).

Monitoring malaria prevalence in humans as well as vector populations for the presence of *Plasmodium* is an integral component of effective malaria control. Nevertheless, the two fields of human diagnostics and vector control are rarely combined resulting in mis- or non-communication between various stakeholders.

Molecular technologies, their integration in automated platforms, and the co-assessment of data from multiple diagnostic sources through ICT is possible towards a unified human-vector approach, a concept encouraged by DMC-MALVEC.

**Figure 5** displays the schematic representation of the interconnection between human and vector diagnostics.



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During the current reporting period we have published, through DMC-MALVEC, two research articles in the fields of microfluidics and vector diagnostics, as well as one review article that addresses the One Health approach for malaria control:

1. Temperature change rate actuated bubble mixing for homogeneous rehydration of dry pre-stored reagents in centrifugal microfluidics. Hin S. et al, *Lab Chip*. 18(2): 362-370, 2018, 362-370 [DOI: 10.1039/c7lc01249g], Dec 2017.
2. New rapid one-step PCR diagnostic assay for Plasmodium falciparum infective mosquitoes. Kefi M. et al, *Scientific Reports* 8:1462, 2018 1-9. [DOI:10.1038/s41598-018-19780-6], Jan 2018
3. Converging human and malaria vector diagnostics with data management towards an integrated holistic One Health approach. Mitsakakis K et al, *International Journal of Environmental Research and Public Health*, Feb 2018



# Dissemination conferences, meetings, public events, and other activities

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Type of activity	Title	Date	Place	Audience type	Audience Size	Countries addressed
Meeting Oral presentation	International Society for Neglected Tropical Diseases Festival	22-23 February 2017	London, UK	Scientific community, industry, media	80	International
Popular press article	Games, not handbooks, to beat insecticide resistance	29 March 2017	www.scidev.net	Public	>200	International
Conference Oral presentation	WHO 3rd Global Forum on Medical Devices	09-12 May 2017	Geneva, Switzerland	Scientific community, industry, media	>200	International
Conference Oral presentation	Chemistry for the Future 2017	05-07 July 2017	Pisa, Italy	Scientific community	80	European
Conference Poster presentation	Molecular and Population Biology of Mosquitoes and Other Disease Vectors Vector and Disease Control (EMBO)	24-28 July 2017	Kolymbari, Greece	Scientific community	>200	International
Training	DDMS Intervention Monitoring Training 14th - 17th August 2017,	14-17 August 2017	Chisamba, Zambia	Scientific community	15	African
Public Event Poster	European Researcher's night FORTH	29 September 2017	Heraklion, Greece	Public	>200	European
Training	Insecticide Resistance Management (IRM) training involving the use of Resistance 101 and ResistanceSim	2-6 October 2017	Addis Ababa, Ethiopia	Scientific community	25	African
Conference Poster presentation	Micro TAS International Conference on Miniaturized Systems for Chemistry and Life Sciences ( $\mu$ TAS 2017)	22-26 October 2017	Savannah, Georgia, US	Scientific community	>100	International
Conference oral presentation	American Society of Tropical Medicine and Hygiene ASTMH 2017, 66th Annual Meeting	5-9 November 2017	Baltimore, Maryland, US	Scientific community	>4500	International
Conference oral presentation	Entomological Society of America, Entomology 2017	5-8 November 2017	Denver, Colorado, US	Scientific community	>500	International
Training	Insecticide Resistance Management (IRM) training involving the use of Resistance 101 and ResistanceSim	6-10 November 2017	Luzaka, Zambia	Scientific community	25	African

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**Figure 6** DMC-MALVEC’s Kostas Mavridis presenting the LabDisk portable diagnostic in his talk “New tools for monitoring insecticide resistance” in the annual American Society of Tropical Medicine and Hygiene conference, Baltimore, USA, 2017

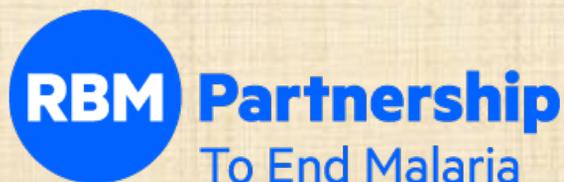


**Figure 7** LabDisk DVD cases distributed as demonstration material to major malaria-related conferences and events



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**Meet us in  
2018...**



**13<sup>th</sup> Roll Back Malaria Vector  
Control Working Group Meeting**

**Geneva, FEBRUARY 7-9, 2018**

[rollbackmalaria.com](http://rollbackmalaria.com)



The forum of innovative practices in global  
health- 7th Edition

**Geneva, APRIL 10-12, 2018**

[ghf2018.g2hp.net](http://ghf2018.g2hp.net)



7<sup>th</sup> MIM Pan African Malaria Conference  
Multilateral Initiative on Malaria (MIM 2018)

**Dakar, APRIL 15-20, 2018**

[mim2018.com](http://mim2018.com)



XI European Congress of Entomology

**Naples, July 2-6, 2018**

[ece2018.com](http://ece2018.com)



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