LABQUALITY

External Quality Assessment Scheme

Parasites in blood, virtual microscopy Round 1, 2022

Specimens
Two virtual microscopy images in LabScala. The original specimens were human thin blood film specimens stained with either Giemsa or MGG staining.

Product 5470: Giemsa stained thin blood films S001 and S003
Product 5471: MGG stained thin blood films S002 and S004

Background information
Samples S001 and S002
A 39-year-old man returned from Senegal and has now developed intermittent fever (highest 39.5°C) and chills. Diagnosis? Laboratory tests showed: Thromb 133 E9/L, Hb 126 g/L.

Samples S003 and S004
A 43-year-old woman returned from Pakistan two weeks ago. She had started to have a fever (39-39.5°C). Laboratory tests showed: Leuc 6.1 E9/L, Thromb 140 E9/L, Hb 131 g/L. Malaria or dengue fever were suspected.

Examinations
Virtual examination and identification of blood parasites

Result reporting
Please enter the results via LabScala (www.labscala.com).

First report the finding and the parasite developmental stages you identified from the sample in question. When applicable, count also the parasitaemia percentage (instructions can be found below). Confirm the finding by pressing the plus sign (+) at the end of the row. If needed, you may report multiple findings from one sample (mixed infection).

Estimation of the percentage of parasitaemia in thin blood film
When calculating the parasitaemia, count the percentage of infected red blood cells. You should view 1000-2000 red blood cells in a thin blood film. A red cell infected with multiple parasites, counts as one parasitized cell. Gametocytes are not counted. Example: 3 parasitized red cells/100 red blood cells = 3% parasitaemia.

Results reported in the Finding part will be scored.

2022-11-14

INSTRUCTIONS

Product no. 5470-5471
LQ769522011-014/FI

Subcontracting: Sample preparation, sample pretesting, digital image services

If the kit is incomplete or contains damaged specimens, please report immediately to info@labquality.fi.

The results should be reported no later than **December 5, 2022**.

The expected results of the round are published in LabScala in the View Reports section by December 8, 2022.

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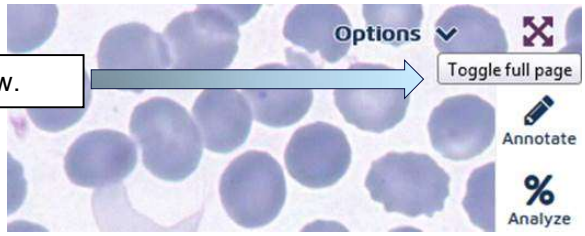
Aiforia Cloud program

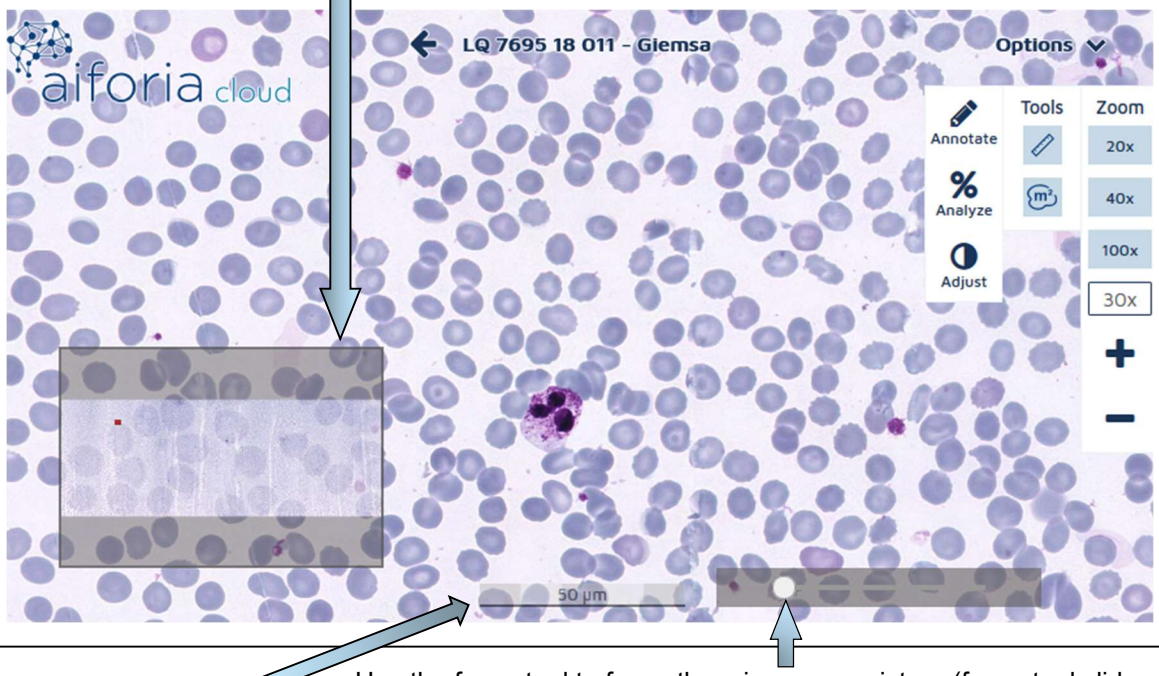
Use the “Toggle full page” tool to get a full screen view.



You can zoom in or out with the scroll wheel on your mouse, or by using the zooming controls in the right margin (x20, x40, x100). Alternatively, you can use keyboard buttons: + and -.

Cursor up, down, left and right will navigate in x/y directions in addition to the mouse control.

The small picture is an overview panel of the thin blood film specimen. You can use it as a tool to find a proper thin place on the blood film.



Use the focus tool to focus the microscope picture (focus tool slides laterally).
At the bottom you have the scale tool, which contains a measuring instrument (example 50 µm).

LABQUALITY

Parasites in blood, virtual microscopy, November, 1-2022

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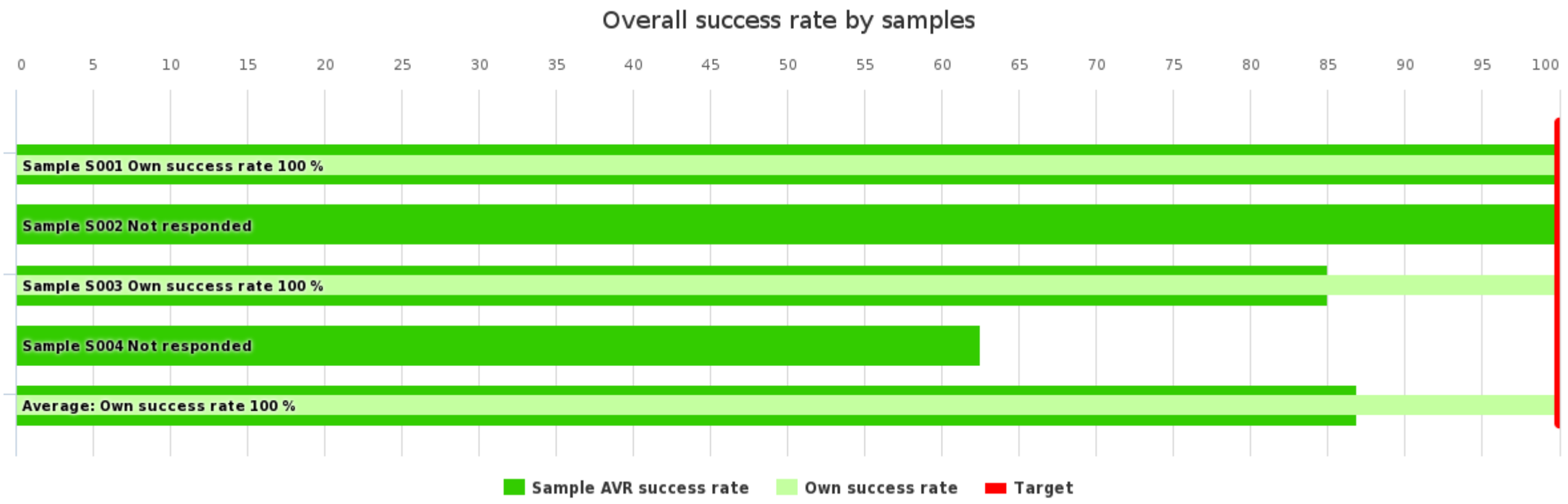
Client report

	No of participants	No of responded participants	Response percentage
Parasites in blood, Giemsa stain, virtual microscopy, November, 1-2022	13	10	76.9 %
Parasites in blood, MGG stain, virtual microscopy, November, 1-2022	9	8	88.9 %

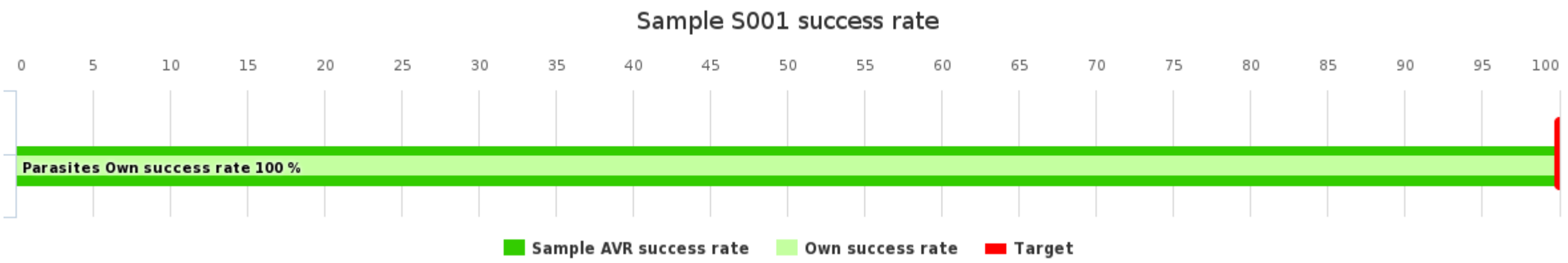
Summary



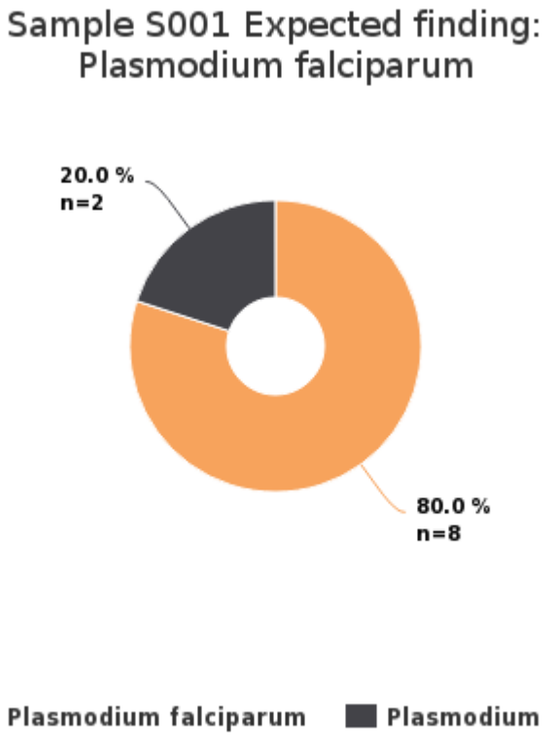
Summary	Own score	Max score	Own success rate	Difference	AVR success rate
Sample S001	4	4	100 %	0 %	100 %
Sample S002	-	-	-	-	100 %
Sample S003	4	4	100 %	15 %	85 %
Sample S004	-	-	-	-	62.5 %
Average:			100 %	13.1 %	86.9 %

History	Test nr.	Own success rate	Difference	AVR success rate
History not found				

Sample S001 | Plasmodium falciparum (Giemsa)



Sample S001 results	Responded	Own score	Max score	Own success rate	Difference	AVR success rate	Count
	Parasites	4	4	100 %	0 %	100 %	10
	Further action	-	-	-	-	-	10
Total:		4	4	100 %	0 %	100 %	20



REPORT TO THE CLINICIAN

Finding group	Finding	Finding count	Own score	Max score	Own success rate	Difference	AVR success rate	Finding Score
Expected finding: Plasmodium falciparum		**10**	**4**	**4**	**100 %**	**0 %**	**100 %**	
	◉ Plasmodium falciparum	8	4	4	100 %	0 %		4
	Plasmodium sp.	2	-					4
Total:		10	4	4	100 %	0 %	100 %	

PARASITAEMIA

Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium falciparum		**10**		
	◉ Plasmodium falciparum	8		
			< 0,1%	1
			◉ 0.1-1.9%	5
			2,0-4,0%	1
	Plasmodium sp.	2		
			0.1-1.9%	1
Total:		10		

LIFECYCLE

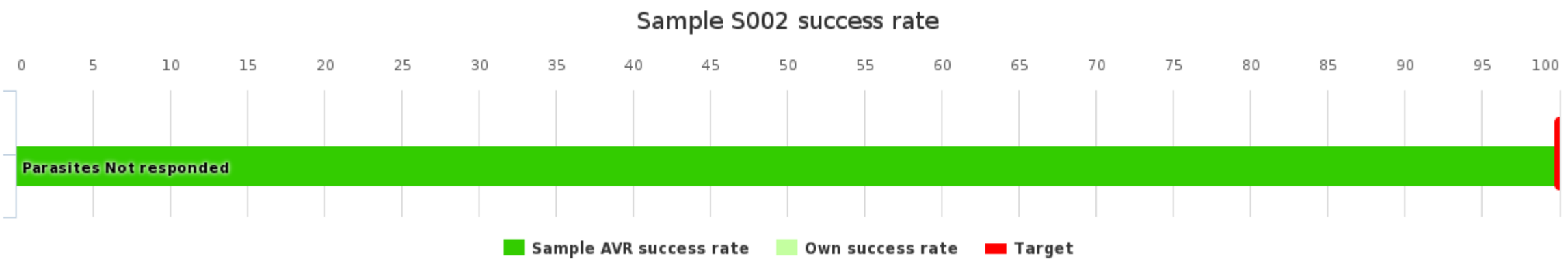
Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium falciparum		**10**		
	◉ Plasmodium falciparum	8		
			◉ Early trophozoites (ring stage)	7
			Mature trophozoites	3
			Schizonts	1

	Plasmodium sp.	2		
			Early trophozoites (ring stage)	2
			Mature trophozoites	1
			Schizonts	1
Total:		10		

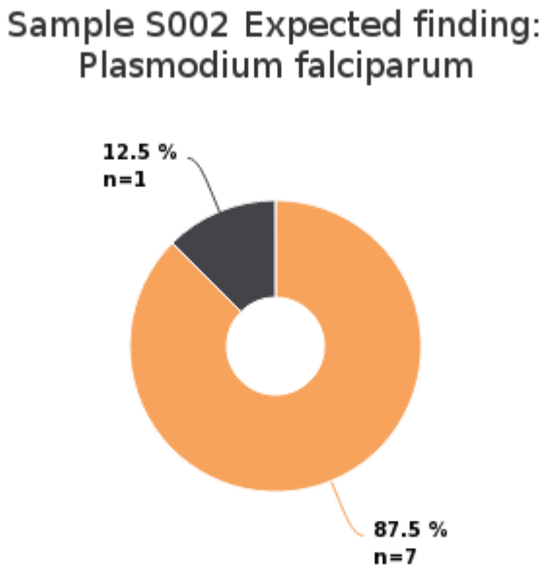
FURTHER ACTION

Result	Result count
◉ Not referred for further action	6
Referred for further action	4
Total:	10

Sample S002 | Plasmodium falciparum (MGG)



Sample S002 results	Responded	Own score	Max score	Own success rate	Difference	AVR success rate	Count
	Parasites	-	-	-	-	100 %	8
	Further action	-	-	-	-	-	8
Total:		-	-	-	-	100 %	16



REPORT TO THE CLINICIAN

Finding group	Finding	Finding count	Own score	Max score	Own success rate	Difference	AVR success rate	Finding Score
Expected finding: Plasmodium falciparum		**8**	**-**	**-**			**100 %**	
	Plasmodium falciparum	7	-					4
	Plasmodium sp.	1	-					4
Total:		8	-	-	-	-	100 %	

PARASITAEMIA

Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium falciparum		**8**		
	Plasmodium falciparum	7		
			< 0,1%	1
			0.1-1.9%	6
	Plasmodium sp.	1		
			2,0-4,0%	1
Total:		8		

LIFECYCLE

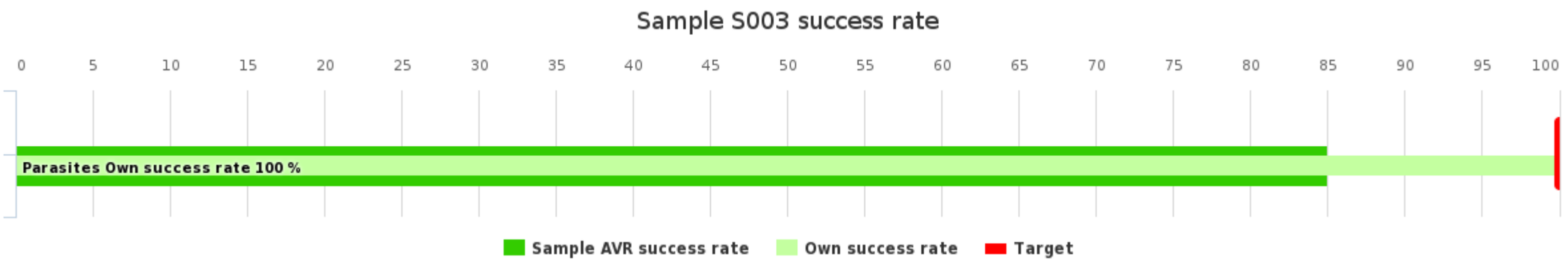
Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium falciparum		**8**		
	Plasmodium falciparum	7		
			Early trophozoites (ring stage)	6
			Mature trophozoites	3
			Schizonts	2
	Plasmodium sp.	1		
			Early trophozoites (ring stage)	1

Total:		8		

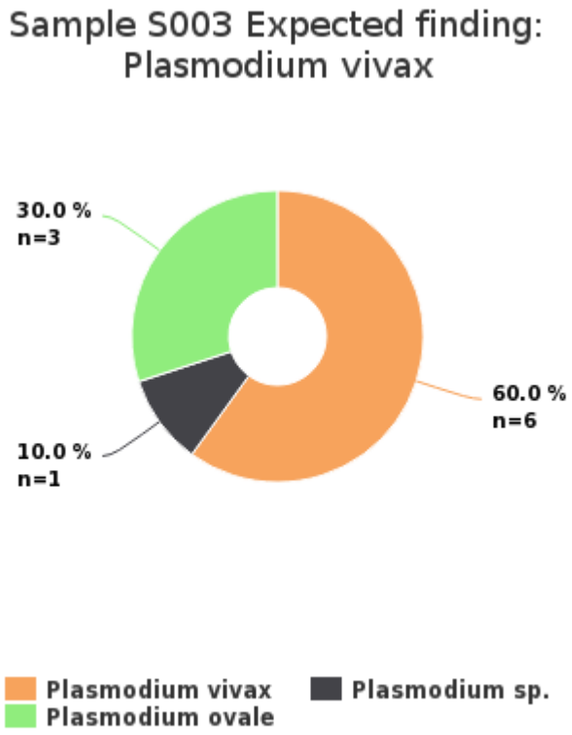
FURTHER ACTION

Result	Result count
Not referred for further action	3
Referred for further action	5
Total:	8

Sample S003 | Plasmodium vivax (Giemsa)



Sample S003 results	Responded	Own score	Max score	Own success rate	Difference	AVR success rate	Count
	Parasites	4	4	100 %	15 %	85 %	10
	Further action	-	-	-	-	-	10
Total:		4	4	100 %	15 %	85 %	20



REPORT TO THE CLINICIAN

Finding group	Finding	Finding count	Own score	Max score	Own success rate	Difference	AVR success rate	Finding Score
Expected finding: Plasmodium vivax		**10**	**4**	**4**	**100 %**	**15 %**	**85 %**	
	◉ Plasmodium vivax	6	4	4	100 %	0 %		4
	Plasmodium sp.	1	-					4
	Plasmodium ovale	3	-					2
Total:		10	4	4	100 %	15 %	85 %	

PARASITAEMIA

Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium vivax		**10**		
	◉ Plasmodium vivax	6		
			0.1-1.9%	2
	Plasmodium sp.	1		
			0.1-1.9%	1
	Plasmodium ovale	3		
			< 0,1%	1
			0.1-1.9%	2
Total:		10		

LIFECYCLE

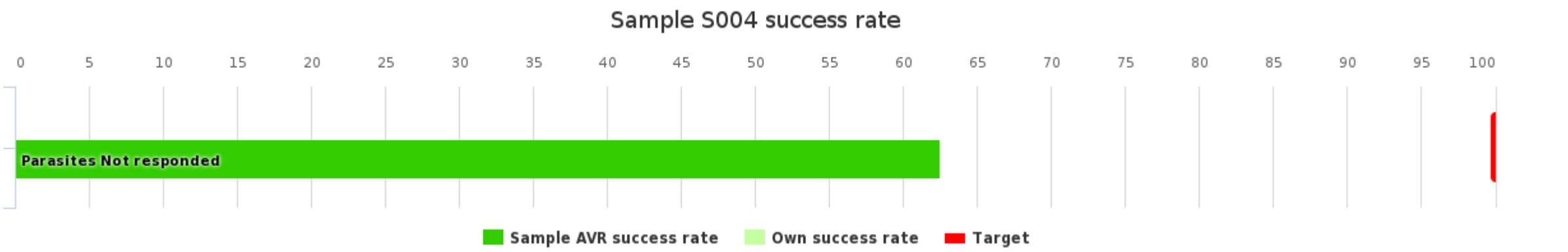
Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium vivax		**10**		
	◉ Plasmodium vivax	6		
			Early trophozoites (ring stage)	4
			Gametocytes	1

			◉ Mature trophozoites	3
			Schizonts	1
	Plasmodium sp.	1		
			Gametocytes	1
			Mature trophozoites	1
			Schizonts	1
	Plasmodium ovale	3		
			Early trophozoites (ring stage)	1
			Mature trophozoites	2
			Schizonts	1
Total:		10		

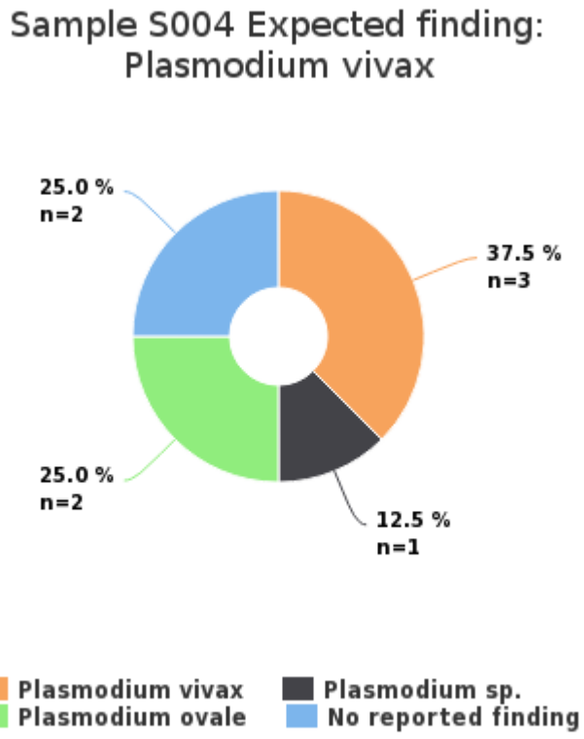
FURTHER ACTION

Result	Result count
◉ Not referred for further action	5
Referred for further action	5
Total:	10

Sample S004 | Plasmodium vivax (MGG)



Sample S004 results	Responded	Own score	Max score	Own success rate	Difference	AVR success rate	Count
	Parasites	-	-	-	-	62.5 %	8
	Further action	-	-	-	-	-	8
Total:		-	-	-	-	62.5 %	16



REPORT TO THE CLINICIAN

Finding group	Finding	Finding count	Own score	Max score	Own success rate	Difference	AVR success rate	Finding Score
Expected finding: Plasmodium vivax		**8**	**-**	**-**			**62.5 %**	
	Plasmodium vivax	3	-					4
	Plasmodium sp.	1	-					4
	Plasmodium ovale	2	-					2
	No reported finding	2	-					0
Total:		8	-	-	-	-	62.5 %	

PARASITAEMIA

Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium vivax		**8**		
	Plasmodium vivax	3		
			< 0,1%	1
			0.1-1.9%	1
	Plasmodium sp.	1		
			0.1-1.9%	1
	Plasmodium ovale	2		
			< 0,1%	1
			0.1-1.9%	1
	No reported finding	2		
			No reported finding	2
Total:		8		

LIFECYCLE

Finding group	Finding	Finding count	Result	Result count

Expected finding: Plasmodium vivax		**8**		
	Plasmodium vivax	3		
			Early trophozoites (ring stage)	1
			Gametocytes	1
			Mature trophozoites	2
			Merozoites	1
			Schizonts	1
	Plasmodium sp.	1		
			Early trophozoites (ring stage)	1
			Schizonts	1
	Plasmodium ovale	2		
			Mature trophozoites	2
			Schizonts	1
	No reported finding	2		
Total:		8		

FURTHER ACTION

Result	Result count
Not referred for further action	3
Referred for further action	5
Total:	8

Report Info

PARTICIPANTS

Altogether 18 laboratories from 9 countries participated in this EQA round.

REPORT INFO

On the front page you can see summaries of overall success rate and sample specific success rates which have been calculated from the scores.
In general, the expected results are marked with green color. Accepted results may also be indicated with yellow color. Laboratory's own results are indicated with a black radio button ◉. The findings reported by the participants have been grouped according to the expected findings of each sample. If a laboratory has reported multiple findings indicating a mixed infection, the additional findings have been grouped to a separate finding group.
If you have not reported results you will get a note: "You have not responded in time, only global report is available."
For information on report interpretation and performance evaluation, please see the "EQAS Interpretation guidelines" in LabScala User instructions. In case you have any questions regarding the reports, please contact the EQA Coordinator.

SCORING

The results in the "Report to the clinician" part can be scored when at least 60% of the participants have reported the correct/expected result and when there are at least three reported results.
The report includes a sample specific scoring summary.
Laboratory's scores have been converted to percentage (own success rate, % from maximum scores) with a target at 100%. Own success rate is compared with the success rate of all results.

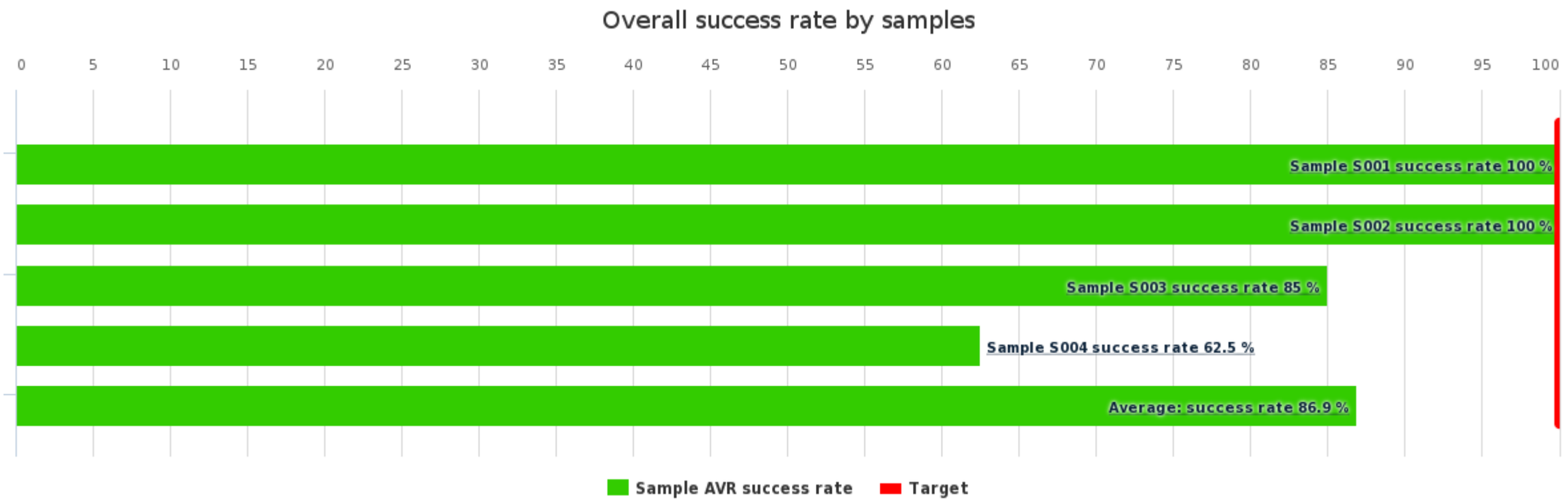
The following general rules are applied:
4 points is reached by reporting the expected correct result
1-3 points is given to results that are partly correct/insufficient regarding the expected finding
0 points is given for an incorrect/false result

Parasites in blood, virtual microscopy, November, 1-2022

GLOBAL REPORT

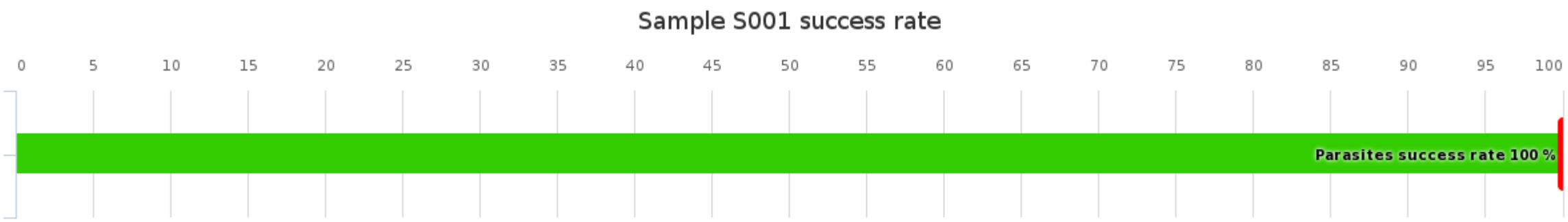
	No of participants	No of responded participants	Response percentage
Parasites in blood, Giemsa stain, virtual microscopy, November, 1-2022	13	10	76.9 %
Parasites in blood, MGG stain, virtual microscopy, November, 1-2022	9	8	88.9 %

Summary

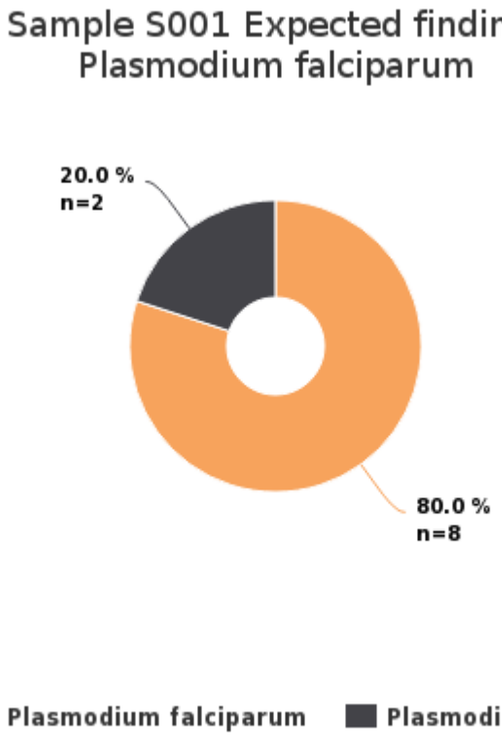


Summary	AVR success rate
Sample S001	100 %
Sample S002	100 %
Sample S003	85 %
Sample S004	62.5 %
Average:	86.9 %

Sample S001 | Plasmodium falciparum (Giemsa)



Sample S001 results	Responded	AVR success rate	Count
	Parasites	100 %	10
	Further action	-	10
Total:		100 %	20



REPORT TO THE CLINICIAN

Finding group	Finding	Finding count	AVR success rate	Finding Score
Expected finding: Plasmodium falciparum		**10**	**100 %**	
	Plasmodium falciparum	8		4
	Plasmodium sp.	2		4
Total:		10	100 %	

PARASITAEMIA

Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium falciparum		**10**		
	Plasmodium falciparum	8		
			< 0,1%	1
			0.1-1.9%	5
			2,0-4,0%	1
	Plasmodium sp.	2		
			0.1-1.9%	1
Total:		10		

LIFECYCLE

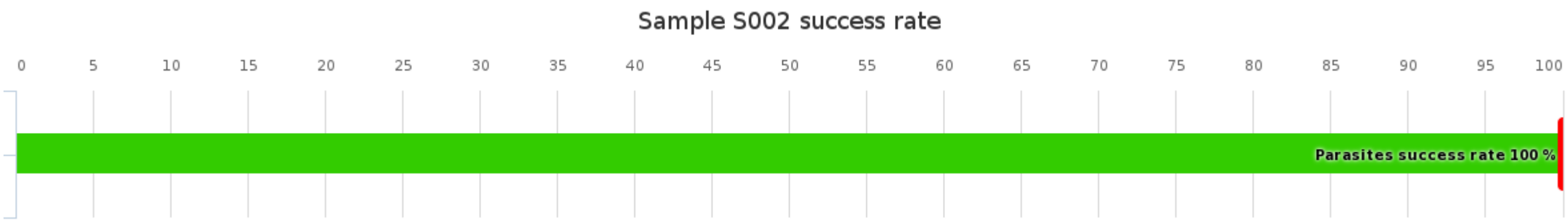
Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium falciparum		**10**		
	Plasmodium falciparum	8		
			Early trophozoites (ring stage)	7
			Mature trophozoites	3
			Schizonts	1
	Plasmodium sp.	2		

			Early trophozoites (ring stage)	2
			Mature trophozoites	1
			Schizonts	1
Total:		10		

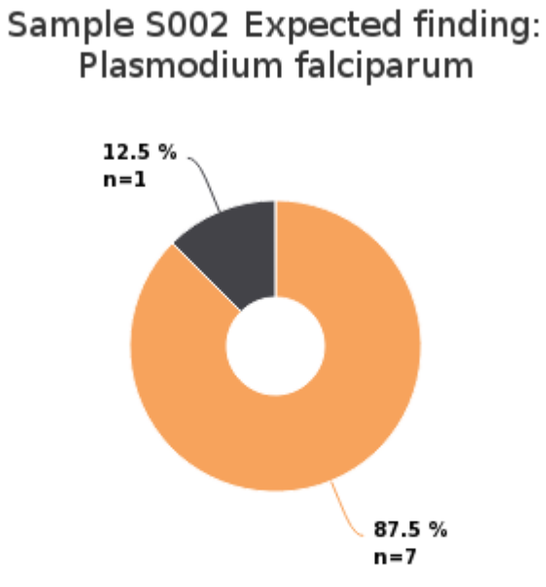
FURTHER ACTION

Result	Result count
Not referred for further action	6
Referred for further action	4
Total:	10

Sample S002 | Plasmodium falciparum (MGG)



Sample S002 results	Responded	AVR success rate	Count
	Parasites	100 %	8
	Further action	-	8
Total:		100 %	16



REPORT TO THE CLINICIAN

Finding group	Finding	Finding count	AVR success rate	Finding Score
Expected finding: Plasmodium falciparum		**8**	**100 %**	
	Plasmodium falciparum	7		4
	Plasmodium sp.	1		4
Total:		8	100 %	

PARASITAEMIA

Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium falciparum		**8**		
	Plasmodium falciparum	7		
			< 0,1%	1
			0.1-1.9%	6
	Plasmodium sp.	1		
			2,0-4,0%	1
Total:		8		

LIFECYCLE

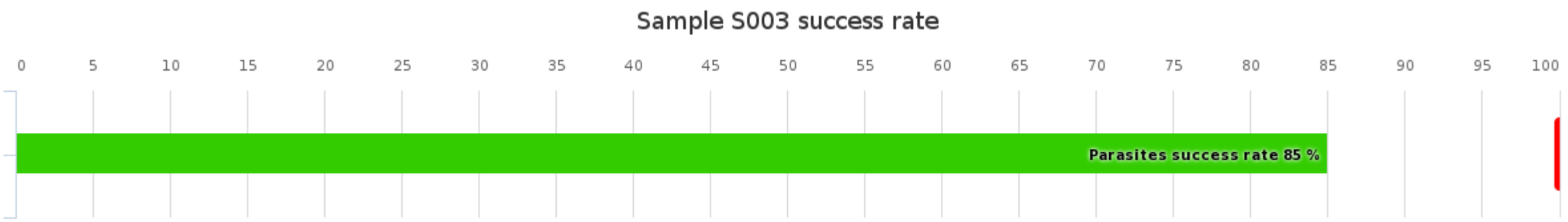
Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium falciparum		**8**		
	Plasmodium falciparum	7		
			Early trophozoites (ring stage)	6
			Mature trophozoites	3
			Schizonts	2
	Plasmodium sp.	1		
			Early trophozoites (ring stage)	1

Total:		8		

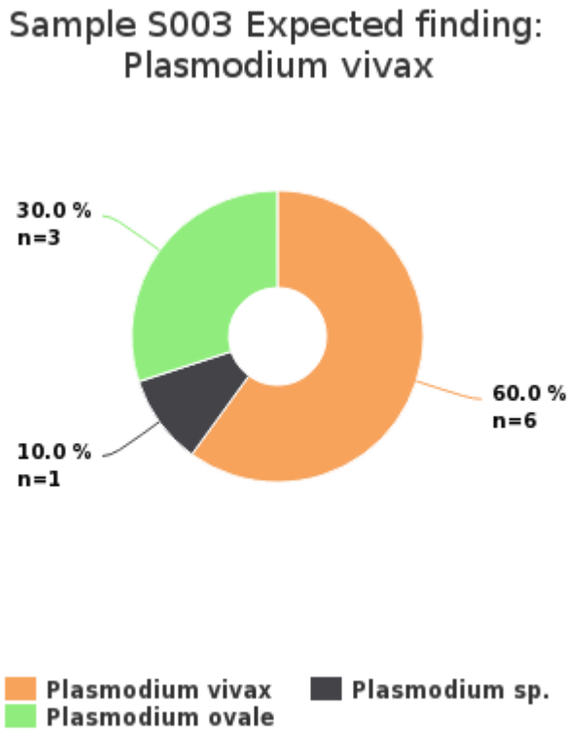
FURTHER ACTION

Result	Result count
Not referred for further action	3
Referred for further action	5
Total:	8

Sample S003 | Plasmodium vivax (Giemsa)



Sample S003 results	Responded	AVR success rate	Count
	Parasites	85 %	10
	Further action	-	10
Total:		85 %	20



REPORT TO THE CLINICIAN

Finding group	Finding	Finding count	AVR success rate	Finding Score
Expected finding: Plasmodium vivax		**10**	**85 %**	
	Plasmodium vivax	6		4
	Plasmodium sp.	1		4
	Plasmodium ovale	3		2
Total:		10	85 %	

PARASITAEMIA

Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium vivax		**10**		
	Plasmodium vivax	6		
			0.1-1.9%	2
	Plasmodium sp.	1		
			0.1-1.9%	1
	Plasmodium ovale	3		
			< 0,1%	1
			0.1-1.9%	2
Total:		10		

LIFECYCLE

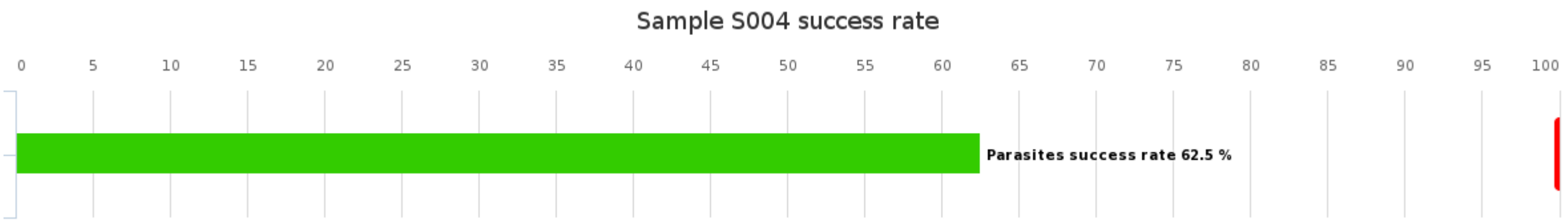
Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium vivax		**10**		
	Plasmodium vivax	6		
			Early trophozoites (ring stage)	4
			Gametocytes	1

			Mature trophozoites	3
			Schizonts	1
	Plasmodium sp.	1		
			Gametocytes	1
			Mature trophozoites	1
			Schizonts	1
	Plasmodium ovale	3		
			Early trophozoites (ring stage)	1
			Mature trophozoites	2
			Schizonts	1
Total:		10		

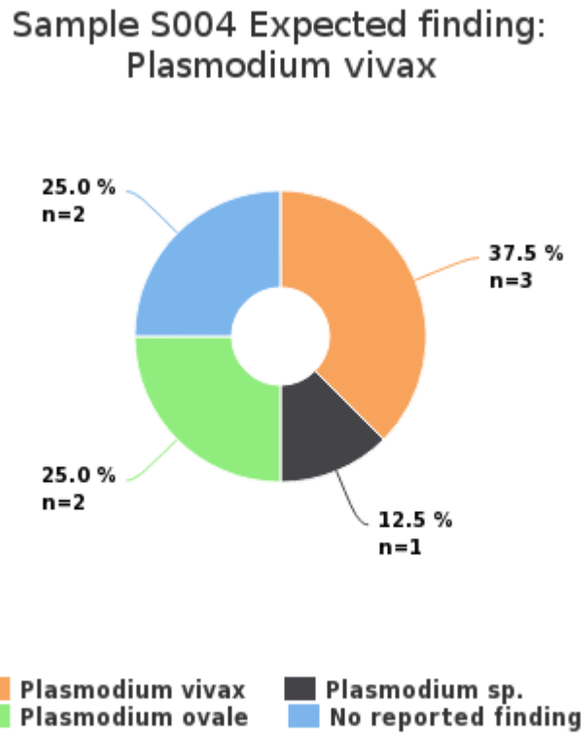
FURTHER ACTION

Result	Result count
Not referred for further action	5
Referred for further action	5
Total:	10

Sample S004 | Plasmodium vivax (MGG)



Sample S004 results	Responded	AVR success rate	Count
	Parasites	62.5 %	8
	Further action	-	8
Total:		62.5 %	16



REPORT TO THE CLINICIAN

Finding group	Finding	Finding count	AVR success rate	Finding Score
Expected finding: Plasmodium vivax		**8**	**62.5 %**	
	Plasmodium vivax	3		4
	Plasmodium sp.	1		4
	Plasmodium ovale	2		2
	No reported finding	2		0
Total:		8	62.5 %	

PARASITAEMIA

Finding group	Finding	Finding count	Result	Result count
Expected finding: Plasmodium vivax		**8**		
	Plasmodium vivax	3		
			< 0,1%	1
			0.1-1.9%	1
	Plasmodium sp.	1		
			0.1-1.9%	1
	Plasmodium ovale	2		
			< 0,1%	1
			0.1-1.9%	1
	No reported finding	2		
			No reported finding	2
Total:		8		

LIFECYCLE

Finding group	Finding	Finding count	Result	Result count

Expected finding: Plasmodium vivax		**8**		
	Plasmodium vivax	3		
			Early trophozoites (ring stage)	1
			Gametocytes	1
			Mature trophozoites	2
			Merozoites	1
			Schizonts	1
	Plasmodium sp.	1		
			Early trophozoites (ring stage)	1
			Schizonts	1
	Plasmodium ovale	2		
			Mature trophozoites	2
			Schizonts	1
	No reported finding	2		
Total:		8		

FURTHER ACTION

Result	Result count
Not referred for further action	3
Referred for further action	5
Total:	8

Report Info

PARTICIPANTS

Altogether 18 laboratories from 9 countries participated in this EQA round.

REPORT INFO

On the front page you can see summaries of overall success rate and sample specific success rates which have been calculated from the scores.
In general, the expected results are marked with green color. Accepted results may also be indicated with yellow color. Laboratory's own results are indicated with a black radio button ◉. The findings reported by the participants have been grouped according to the expected findings of each sample. If a laboratory has reported multiple findings indicating a mixed infection, the additional findings have been grouped to a separate finding group.
If you have not reported results you will get a note: "You have not responded in time, only global report is available."
For information on report interpretation and performance evaluation, please see the "EQAS Interpretation guidelines" in LabScala User instructions. In case you have any questions regarding the reports, please contact the EQA Coordinator.

SCORING

The results in the "Report to the clinician" part can be scored when at least 60% of the participants have reported the correct/expected result and when there are at least three reported results.
The report includes a sample specific scoring summary.
Laboratory's scores have been converted to percentage (own success rate, % from maximum scores) with a target at 100%. Own success rate is compared with the success rate of all results.

The following general rules are applied:
4 points is reached by reporting the expected correct result
1-3 points is given to results that are partly correct/insufficient regarding the expected finding
0 points is given for an incorrect/false result

LABQUALITY

External Quality Assessment Scheme

Parasites in blood, virtual microscopy Round 1, 2022

Specimens
Samples of this EQA round were digital images of stained thin blood films for the examination of the presence of blood parasites. The digital sample material was identical for all participants, stable, and suitable for external quality assessment.

Giemsa staining:	Samples S001 and S003
MGG staining:	Samples S002 and S004

The content of the samples was as follows:

Samples S001 (LQ769522011) and S002 (LQ769522012):
Expected finding: *Plasmodium falciparum*
Background information: A 39-year-old man returned from Senegal and has now developed intermittent fever (highest 39.5°C) and chills. Diagnosis? Laboratory tests showed: Thromb 133 E9/L, Hb 126 g/L.

Samples S003 (LQ769522013) and S004 (LQ769522014):
Expected finding: *Plasmodium vivax*
Background information: A 43-year-old woman returned from Pakistan two weeks ago. She had started to have a fever (39-39.5°C). Laboratory tests showed: Leuc 6.1 E9/L, Thromb 140 E9/L, Hb 131 g/L. Malaria or dengue fever were suspected.

The samples were examined in a reference laboratory.

Report info
Please see the description of the data analysis on the last page of the laboratory-specific reports and global reports. It is important to read the Final report first, because it contains important information of the samples and results in each round.

Comments – Expert

Samples S001 and S002
The samples were positive for blood parasites and the expected finding was trophozoites of *Plasmodium falciparum.* Parasitaemia percentage was approximately 2%.

The identification was very successful as all responding participants had reported the finding as *Plasmodium falciparum* or *Plasmodium* sp.

The sample contained erythrocytes infected with *P. falciparum*. The cells were of normal size and typically more than one trophozoite could be seen in some of the infected cells. Trophozoites are thick bluish rings, the nucleus of which is visible as a dark red spot. Since *P. falciparum* can infect all types of red blood cells, the parasitaemia level can be above 1%.

2022-12-19

FINAL REPORT

Product no. 5470-5471

Subcontracting: Sample preparation, sample pretesting, Digital image services

Samples sent	2022-11-14
Round closed	2022-12-05
Expected results	2022-12-07
Final report	2022-12-19

Request for correction
Typing errors in laboratory's result forms are on laboratory's responsibility. Labquality accepts responsibility only for result processing. Requests must be notified by writing within three weeks from the date of this letter.

Authorized by
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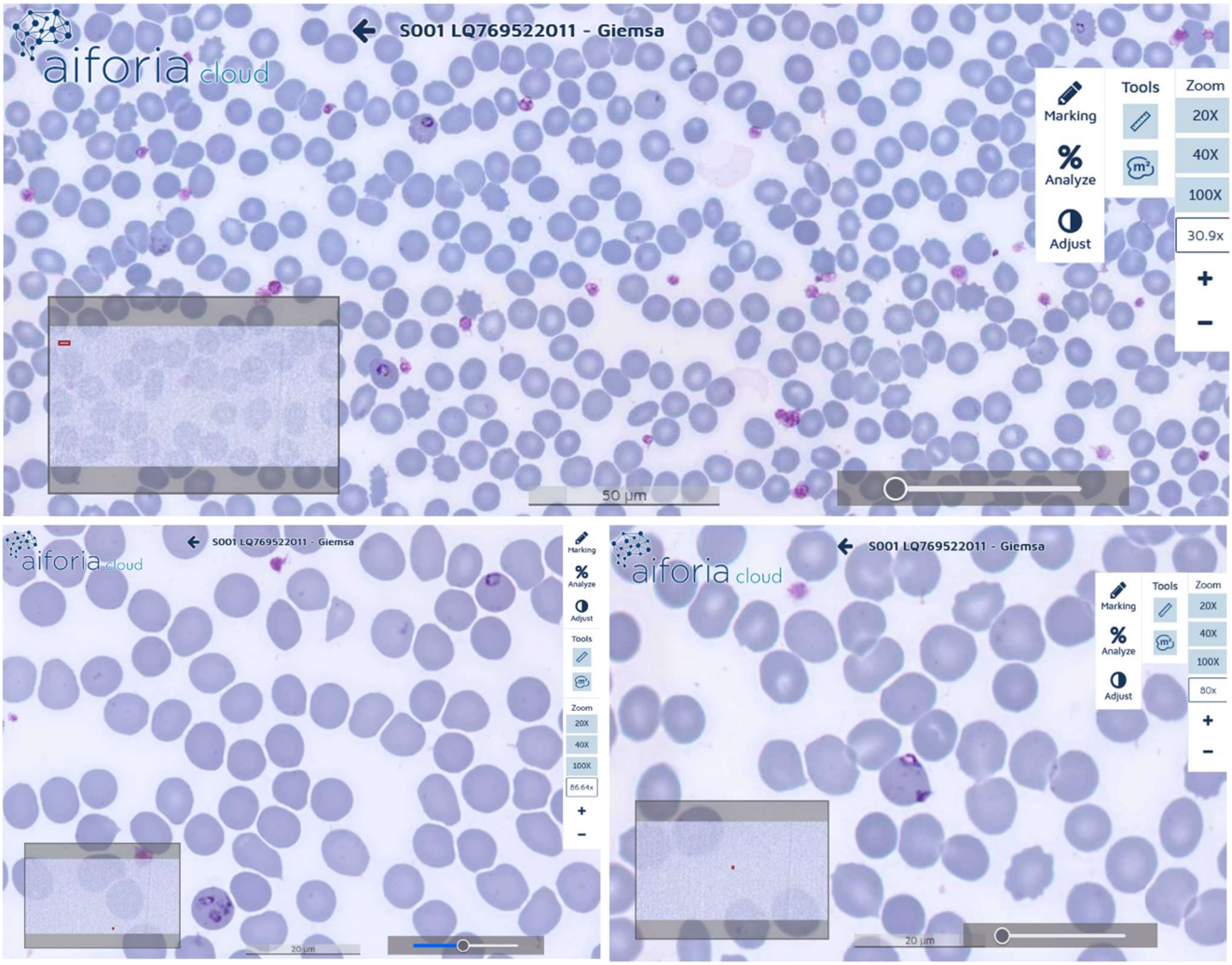
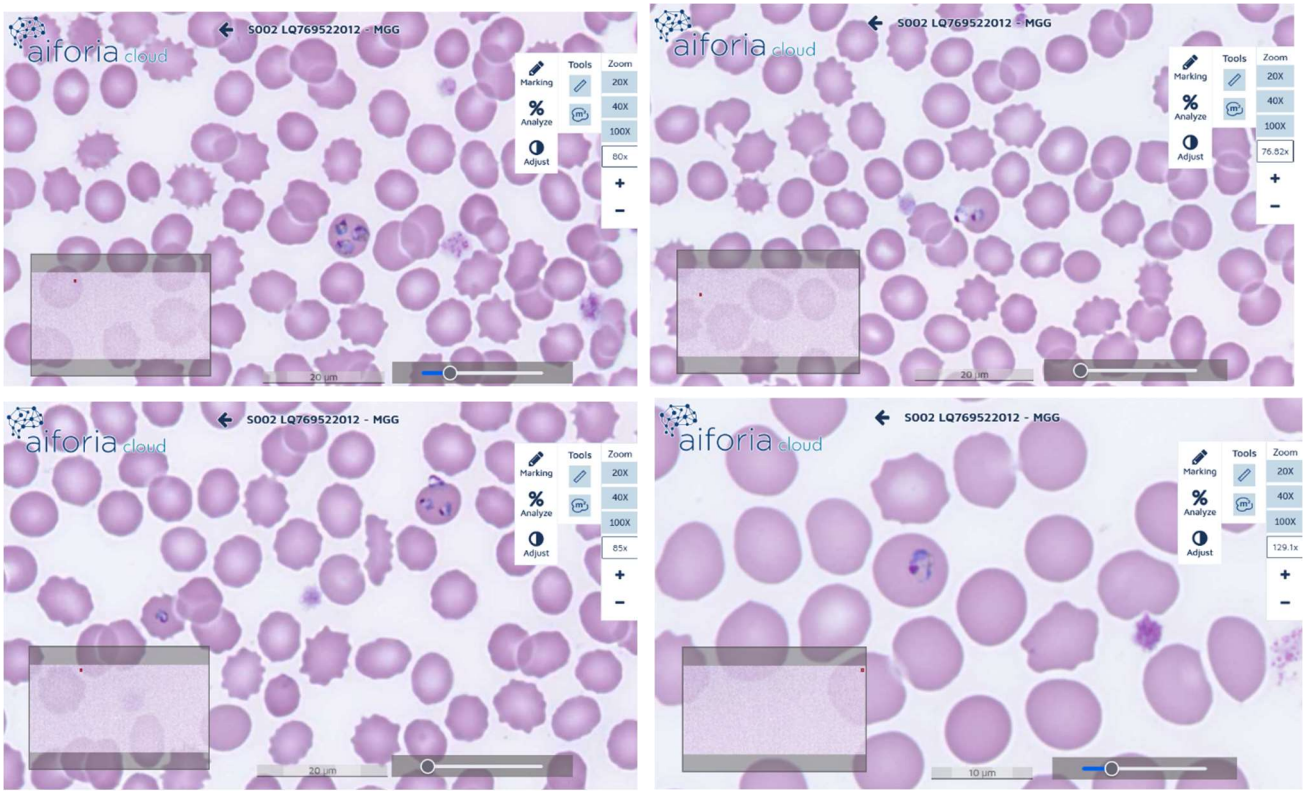
Figures 1 a-c. *Plasmodium falciparum* in sample S001 (Giemsa stain).



Figures 2 a-d. *Plasmodium falciparum* in sample S002 (MGG stain).



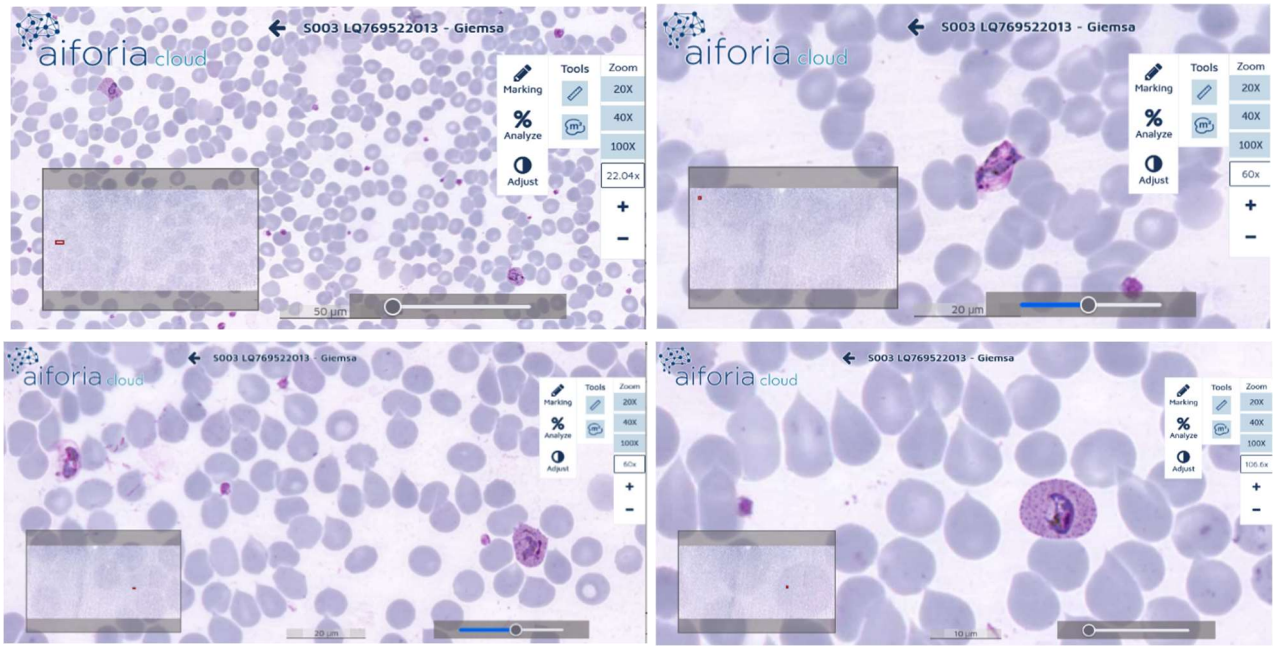
Samples S003 and S004

The samples were positive for blood parasites and the expected finding was trophozoites and other developmental stages of *Plasmodium vivax*. Parasitaemia percentage was approximately 0.1 - 0.5%.

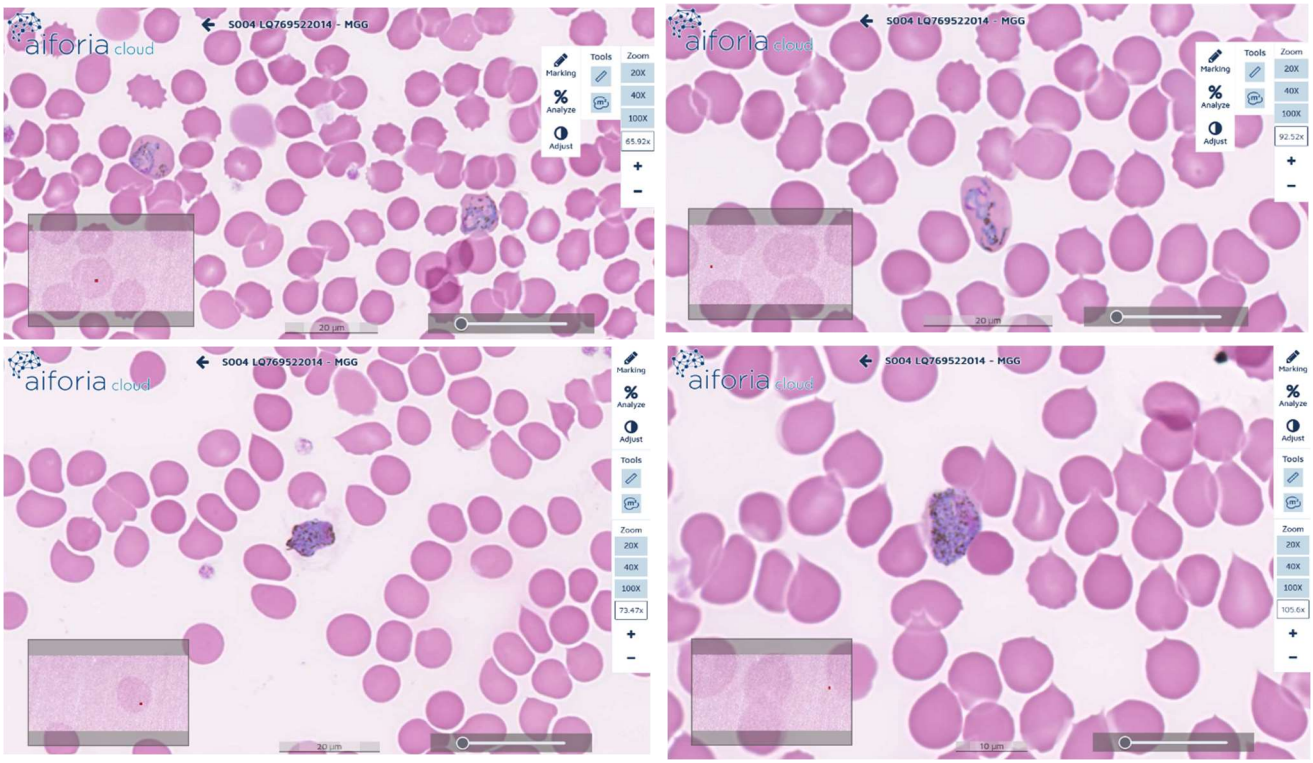
Almost all participating laboratories had found plasmodia in the samples and the majority responded *P. vivax* or *Plasmodium* sp. Three laboratories had reported *P. ovale* and two units did not report a finding at all from this sample.

P. vivax parasites have a diverse appearance in blood smear preparations and may resemble *P. ovale* forms. *P. vivax* increases the size of the red blood cell. Infected cells rapidly transform into amoeba-like structures, in which the trophozoite appears irregularly shaped. The nuclear structures are reddish and the cytoplasm is blue. The infected cells have so-called Schüffner's dots, which are depressions containing parasite material on the surface of infected cells. Gametocytes densely fill almost the entire red blood cell. The *P. ovale* form can be distinguished from *P. vivax* by the more compact structure of the parasite, the more oval shape of the infected cell and possible ruptures of the cell membrane. Both forms infect only early forms of red blood cells, i.e. reticulocytes, whose number usually does not exceed 1%.

Figures 3 a-d. *Plasmodium vivax* in sample S003 (Giemsa stain).



Figures 4 a-d. *Plasmodium vivax* in sample S004 (MGG stain).



Postanalytics
- 83% (15/18) of the laboratories returned their results in time.
- Of the responders, 53% (8/15) would have sent sample S001/S002 to a reference laboratory.
- Of the responders, 60% (9/15) would have sent sample S003/S004 to a reference laboratory.
- No apparent mix-up of samples was observed.

Exceptions in scoring
No exceptions.

End of report