

## Supplementary Materials

**Table S1.** Vaccine induced antibody responses in sera the day before the *C. muridarum* intranasal challenge.

Immunization groups	Anti EB serum GMT (range)		IgG2a/IgG1 ratio	Neutralizing Ab GMT (range)
	IgG1	IgG2a		
Pgp3	1131 <sup>a,b,c,d</sup> (200–12,800)	9870 <sup>a,b,c,d</sup> (6400–12,800)	8.7	<50 (<50 – <50)
PmpG	436 <sup>a,b,c,d</sup> (200–800)	6400 <sup>a,b,c,d</sup> (3200–12,800)	14.7	<50 (<50 – <50)
MOMP + Pgp3	23,475 <sup>a,b</sup> (12,800–51,200)	223,336 <sup>a</sup> (102,400–409,600)	9.5	79 (<50 – 800)
MOMP + PmpG	39,481 <sup>a</sup> (12,800–102,400)	265,593 <sup>a</sup> (102,400–819,200)	6.7	63 (<50 – 400)
MOMP	64,508 <sup>a</sup> (12,800–102,400)	409,600 <sup>a</sup> (102,400–1,638,400)	6.4	159 (<50 – 800)
PBS	<100	<100	-	<50

GMT: Geometric mean titer. <sup>a</sup>  $P < 0.05$  by the Mann-Whitney's *U*-test compared with the PBS group.

<sup>b</sup>  $P < 0.05$  by the Mann-Whitney's *U*-test compared with the MOMP group. <sup>c</sup>  $P < 0.05$  by the Mann-Whitney's *U*-test compared with the MOMP + PmpG group. <sup>d</sup>  $P < 0.05$  by the Mann-Whitney's *U*-test compared with the MOMP + Pgp3 group.

**Table S2.** Vaccine induced antibody responses in sera the day before the *C. muridarum* intranasal challenge.

Immunization groups	IgG GMT (range) in sera against Pgp3, PmpG and MOMP ( $\times 10^3$ )		
	MOMP	Pgp3	PmpG
Pgp3	n/m	2826.5 <sup>a</sup> (1,280.0–5,120.0)	n/m
PmpG	n/m	n/m	905.1 <sup>a</sup> (640.0–1,280.0)
MOMP + Pgp3	69.6 <sup>a,b</sup> (40.0–80.0)	2560.0 <sup>a</sup> (2,560.0–2,560.0)	n/m
MOMP + PmpG	89.8 <sup>a</sup> (80.0–160.0)	n/m	543.5 <sup>a,c</sup> (320.0–640.0)
MOMP	139.9 <sup>a</sup> (40.0–409.6)	n/m	n/m
PBS	<100	<100	<100

GMT: Geometric mean titer. n/m: Not measured. <sup>a</sup>  $P < 0.05$  by the Mann-Whitney's *U*-test compared with the PBS group. <sup>b</sup>  $P < 0.05$  by the Mann-Whitney's *U*-test compared with the MOMP group. <sup>c</sup>  $P < 0.05$  by the Mann-Whitney's *U*-test compared with the PmpG group.

**Table S3.** *C. muridarum*-specific IgG and IgA titers in vaginal washes the day before the *C. muridarum* i.n. challenge.

Immunization groups	Anti-EB titer	
	IgG	IgA
Pgp3	<10	<10
PmpG	<10	10
MOMP + Pgp3	160	10
MOMP + PmpG	640	20
MOMP	640	20
PBS	<10	<10

**Table S4.** In vitro cytokine production by T cells from immunized mice the day before challenge.

Immunization group	EB stimulated		ConA stimulated	
	IFN- $\gamma$ (pg/ml) (mean $\pm$ 1 SE)	IL-4 (pg/ml) (mean $\pm$ 1 SE)	IFN- $\gamma$ (pg/ml) (mean $\pm$ 1 SE)	IL-4 (pg/ml) (mean $\pm$ 1 SE)
Pgp3	<15 $\pm$ <15 <sup>a,b,c</sup>	<4 $\pm$ <4 <sup>a,b</sup>	10,458.13 $\pm$ 1990.84	86.82 $\pm$ 9.86
PmpG	<15 $\pm$ <15 <sup>a,b,c</sup>	<4 $\pm$ <4 <sup>a,b</sup>	5891.12 $\pm$ 1815.75	39.43 $\pm$ 6.13
MOMP + Pgp3	60.70 $\pm$ 41.69 <sup>a,b,d</sup>	<4 $\pm$ <4 <sup>a,b</sup>	11,845.08 $\pm$ 1218.38	136.35 $\pm$ 50.19
MOMP + PmpG	811.38 $\pm$ 411.17 <sup>d</sup>	4.43 $\pm$ 1.61 <sup>d</sup>	13,744.70 $\pm$ 2255.65	143.28 $\pm$ 37.08

MOMP	796.05 ± 530.32 <sup>d</sup>	9.59 ± 6.73 <sup>d</sup>	9032.99 ± 1550.93	112.48 ± 11.42
PBS	<15 ± <15	<4 ± <4	14,104.43 ± 2,481.78	87.58 ± 14.58

<sup>a</sup>  $P < 0.05$  by the Student's  $t$ -test compared with the MOMP group. <sup>b</sup>  $P < 0.05$  by the Student's  $t$ -test compared with the MOMP + PmpG group. <sup>c</sup>  $P < 0.05$  by the Student's  $t$ -test compared with the MOMP + Pgp3 group. <sup>d</sup>  $P < 0.05$  by the Student's  $t$ -test compared with the PBS group.