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PDVAP

PROJET DE DEVELOPPEMENT DE VACCINS ANTIPALUDIQUES

BURKINA FASO

Centre National de Recherche et de Formation sur le Paludisme Burkina Faso

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TITLE

Seasonal variation and clinical protection of antibodies against a panel of malaria antigens in children under five years in Burkina Faso

INTRODUCTION

- Malaria remains one of the most devastating infectious diseases, afflicting 300 to 500 million individuals each year in many developing countries of tropical regions

- Traditional control measures have failed to prevent Plasmodium infections in million people worldwide, resulting in over 1 million deaths each year

- Many epidemiological studies have shown acquisition of non-sterile immunity to malaria by people living in different malaria transmission setting.

INTRODUCTION CON'T

- Nevertheless, the mechanism of this protection is still unknown
- Antibodies (cytophilics) were shown to play important role in this aspect
- Challenge of the identification of antigens with reliable and reproducible immune correlates of protection against *Plasmodium falciparum* remain a matter of concern.

OBJECTIVES

- Assess total IgG response against three *P.falciparum* pre-erythrocytics (LSA, CSP, MR48a) and five erythrocytics (MR198, LR179A, LR181, AS155.4 and 1574) antigens during malaria transmission seasons.

- Relationship between immune response and clinical protection against malaria across different malaria transmission seasons

METHODOLOGY

Study Area: SAPONE HEALTH DISTRICT

- Located 50 km from Ouag
- Dry season November to May,
- Rainy season June to October
- 79 villages and 14 CC
- Main *species: P. falciparum, Malariae Ovale*
- Main vectors *Anopheles gambiae* and *A. funestus*

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METHODOLOGY CON'T:
STUDY DESIGN/Data collection

- Inform consent was obtained from the parent of 529 children less than 5 years enrolled in the study
- Two cross sectional surveys were performed; one at the beginning of malaria transmission (February 2007) and the second at the peak of malaria transmission(Septembre 2007)
- Biweekly active malaria case detection was performed and lasted one year starting from the first cross sectional survey
- During each cross sectional survey, thick and thin film were prepared for malaria diagnosis
- 5 ml of venous blood was drawn and plasma use for immunological assessment

RESULTS

SEASONAL VARIATION OF ANTIBODIES LEVEL

Malaria Antigens	Low transmission N	Low transmission Geometric Means IgG (IC 95%)	High transmission Geometric Means IgG (IC 95%)	P
CSP	384	7.89 (7.84-7.95)	7.65 (7.58-7.73)	0.001
LSA1	384	9.24 (9.14-9.35)	9.36 (9.24-9.47)	0.012
MR48a	384	6.40 (6.32-6.49)	6.79 (6.71-6.87)	0.001
LR181	384	7.43 (7.33-7.53)	7.18 (7.08-7.28)	0.001
LR179a	384	6.91 (6.79-7.04)	6.83 (6.70-6.95)	0.02
AS155.4	384	6.54 (6.45-6.62)	6.27 (6.16-6.38)	0.001
1574	384	6.33 (6.24-6.42)	6.40 (6.30-6.49)	0.18
MR198	384	6.84 (6.74-6.93)	6.78 (6.67-6.88)	0.11

RESULTS CON'T:

- **Relationship between antibodies against pre-erytrocytics antigens and age during malaria low transmission seasons.**

Age group (year)	Number of children (%)	Antigens		
		LSA1	CSP	MR48a
		Geometric Means IgG(IC 95%)	Geometric Means IgG (IC 95%)	Geometric Means IgG(IC 95%)
[0-1]	44 (11.45)	8.54 (8.16- 8.94)	7.62 (7.44-7.79)	6.12 (5.85-6.40)
[1-2]	70 (20.05)	9.03 (8.80-9.26)	7.73 (7.60-7.87)	6.09 (5.93-6.26)
[2-3]	95 (24.73)	9.23 (9.01-9.46)	7.88 (7.75-8.01)	6.30 (6.13-6.48)
[3-4]	95 (24.73)	9.34 (9.15-9.54)	7.90 (7.79-8.02)	6.45 (6.30-6.61)
[4-5]	80 (20.83)	9.41 (9.19-9.63)	8.11 (7.99-8.22)	6.66 (6.51-6.82)
P		0.001	0.001	0.001

RESULTS CON'T:

- **Relationship between antibodies against pre-erytrocytics antigens and age during malaria high transmission season.**

Age group (year)	Number children (%)	Antigens		
		LSA1	CSP	MR48a
		Geometric Means IgG (IC 95%)	Geometric Means IgG (IC 95%)	Geometric Means IgG (IC 95%)
[0-1]	44 (11.45)	8.95 (8.62- 9.30)	7.21 (6.94-7.50)	6.35 (6.16-6.55)
[1-2]	70 (20.05)	9.20 (8.94-9.46)	7.43 (7.28-.7.58)	6.47 (6.30-6.64)
[2-3]	95 (24.73)	9.23 (9.01-9.46)	7.63 (7.49-7.78)	6.80 (6.64-6.96)
[3-4]	95 (24.73)	9.32 (9.08-9.57)	7.66 (7.52-7.79)	6.82 (6.66-6.98)
] 4-5]	80 (20.83)	9.59 (9.35-9.84)	7.96 (7.81-8.11)	7.07 (6.92-7.24)
P		0.041	0.001	0.001

RESULTS CON'T:

- **Relationship between antibodies against erytrocytics antigens and age during malaria low transmission season.**

Age group (années)	Number children (%)	Antigens				
		LR181	LR179a	AS155.4	1574	MR198
		Geometric Means IgG(IC 95%)	Geometric Means IgG (IC 95%)	Geometric Means IgG (IC 95%)	Geometric Means IgG (IC 95%)	Geometric Means IgG(IC 95%)
[0-1]	44 (11.45)	6.56 (6.23-6.91)	6.44 (6.02-6.88)	6.19 (5.86-6.55)	6.21 (5.96-6.47)	6.28 (5.99-6.59)
[1-2]	70 (20.05)	7.20 (6.99-7.43)	6.67(6.37-6.99)	6.24 (6.06-6.43)	6.07 (5.83-6.32)	6.72 (6.53-6.91)
[2-3]	95 (24.73)	7.51(7.33-7.71)	6.83 (6.58-7.10)	6.45 (6.26-6.65)	6.29 (6.10-6.49)	6.85 (6.67-7.04)
[3-4]	95 (24.73)	7.56 (7.38-7.75)	6.87 (6.61-7.14)	6.66 (6.50-6.83)	6.24 (6.06-6.43)	6.87 (6.67-7.07)
[4-5]	80 (20.83)	7.56 (7.37-7.76)	6.98 (6.72-7.25)	6.65 (6.45-6.85)	6.46 (6.25-6.67)	6.90 (6.69-7.11)
P		0.002	0.24	0.22	0.14	0.003

RESULTS CON'T:

- **Relationship between antibodies against erytrocytics antigens and age during malaria high transmission season.**

Age group (year)	Number childrens (%)	Antigens				
		LR181	LR179a	AS155.4	1574	MR198
		Geometric Means IgG(IC 95%)	Geometric Means IgG (IC 95%)	Geometric Means IgG(IC 95%)	Geometric Means IgG (IC 95%)	Geometric Means IgG(IC 95%)
[0-1]	44 (11.45)	6.55 (6.20-6.92)	6.61 (6.19-7.06)	5.96 (5.52-6.44)	6.23 (5.96-6.52)	6.58 (6.28-6.91)
[1-2]	70 (20.05)	7.12 (6.89-7.35)	6.64 (6.33-6.97)	5.90 (5.59-6.23)	6.14 (5.88-6.42)	6.63 (6.39-6.88)
[2-3]	95 (24.73)	7.30 (7.12-7.47)	6.83 (6.58-7.08)	6.29 (6.07-6.52)	6.27 (6.03-6.51)	6.76 (6.55-6.97)
[3-4]	95 (24.73)	7.19 (6.98-7.40)	6.65 (6.41-6.90)	6.25 (6.03-6.47)	6.31 (6.05-6.58)	6.79 (6.58-7.00)
[4-5]	80 (20.83)	7.12 (6.91-7.34)	6.77 (6.51-7.05)	6.22 (5.92-6.53)	6.55 (6.35-6.75)	6.64 (6.39-6.90)
P		0.002	0.83	0.19	0.22	0.74

RESULTS CON'T:

- **Relationship between antibodies level and malaria incidence**

Antibody	Antigens	Hazard Ratio of median IgG (95% CI)	*P* value
IgG	CSP	0.96 (0.75-1.24)	0.80
	LSA1	0.84 (0.67-1.06)	0.15
	MR48a	1.01 (0.79-1.28)	0.90
	MR198	0.94 (0 .75-1.17)	0.62
	LR179a	0.94 (0.75-1.16)	0.58
	LR181	1.04 (0.82-1.31)	0.72
	AS155.4	0.72 (0.57-0.92)	0.009
	1574	0.90 (0.72-1.14)	0.41

CONCLUSION

- There was a strong seasonal variation in antibody levels, with antibody levels being higher during high malaria transmission as compared to the low transmission season for the majority of the antigens assessed
- Only antibody response to AS155.4 were associated with protection against clinical malaria.
- Future investigation need to be done for cytophilic profile of the assessed antigens, mainly for AS155.4 in order to determine the type of protection conferred by this molecule.
- Determination of induced cellular immunity could also help to better understand the feature of these antigens

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