

Product Specification Sheet

PPPP31, repeat-sequence peptide of the *P. berghei* circumsporozoite protein (CSP)

□ Cat. # PPPP312-P (PPPPNPPND)₃ peptide (CSP, *P. berghei*) SIZE: 1 mg

Malaria is a severe and debilitating disease caused by the parasitic protozoan *Plasmodium*, which is transmitted by many species of anopheline mosquitoes. Four *Plasmodium* species, *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium ovale* and *Plasmodium malariae* infect humans. *Plasmodium berghei* infects rodents. *P. falciparum* is the most widespread and also the most serious and potentially fatal form of *Plasmodium* species. Recent estimates of the annual number of clinical malaria cases worldwide range from 214 to 397 million. Estimates of annual mortality (nearly all from *P. falciparum* malaria) are thought to be around 1.1 million. The life cycle of the malaria is complex, with phases both in human host and the insect vector, the female anopheline mosquito. Parasite may encode in the order of 2000 proteins, several hundred of which are antigenic. The development of a malaria vaccine is one of the highest priorities in infectious disease research, as such a vaccine could be enormously helpful in reducing the 500 million new *Plasmodium* infections and over 1 million deaths due to malaria annually.

The circumsporozoite protein-1 (CSP-1), an approximate 60 kDa protein located on the surface of developing and mature sporozoites and present in developing exoerythrocytic forms is the best-characterized protein of sporozoites. It constitutes the major surface protein of the sporozoite and is a multifunctional molecule that plays a crucial role at various points of the malaria life cycle. The CSP-1 is synthesized as a precursor protein of 67 kDa, which is processed by removal of approximately 50-100 residues to generate the mature protein of 58 kDa. The central domain of CSP-1 is composed of an extensive array of tandemly repeated short sequences. CSP of *P. berghei* has a total of 13 copies of three octapeptides PPPPNPND, PPPPNAND and PAPPNAND.

A synthetic peptide (DPPPPNPN)₂D reproducing the PPPPNPN repeat of the *P. berghei* CS protein was conjugated to tetanus toxoid using bisdiazobenzidine. Immunization of mice and rats with the conjugate induced high serum titers of antibodies to the parasite, and most of the animals were completely protected from malaria infection when challenged with sporozoites. A synthetic peptide Y(DPPPPNPN)₃ was used for the immunization of mice using complete Freund's adjuvant. T- and B-cell response to the CS repeat obtained with this synthetic peptide immunization is not sufficient for a protective immunity. Several *P. berghei* CS peptides containing PPPPNPND sequence with monopalmitic fatty acid tails were prepared, suspended in an oil-in-water emulsion, and used to immunize and boost female A/J mice. Multiple antigen constructs using (PPPPNPND)₂ along with a *P. berghei* T-helper epitope KQIRDSITEEWS were individually capable of inducing strong and protective immune responses to this species of rodent malaria, and this protection can be passively transferred. When multiple antigen construct formulations were used together as a combined vaccine, *P. berghei* multiple antigen construct induced a strong protective antibody response. The CSP epitopes PPPPNPND and NAPPNAPP, both fused as duplicates in one construct were bound to grampositive enhancer matrix (GEM) particles. This vaccine was nasally administered to mice without the use of an additional adjuvant. The immunization of BALB/c mice with a branched peptide containing either the 20-39 or the 57-70 sequence and two repeats (B epitope) containing PPPPNPND in a linear sequence induced high titers of anti-repeat and anti-sporozoite antibodies. Therefore, BALB/c mice can be protected either by effector T cells or by high levels of anti-repeat antibodies.

Specificity

PPPP312-P shares 88% of identity with (PPPPNPND)₃ polypeptide of *P. berghei* CSP, it has 3 additional Pro residues as compared to the latter. The *P. berghei* CSP sequence, NCBI database accession number P06915, is given below:

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1 mkkctilvva slllvnsllp gygqnkiiga qrnlnelcyn egndnklyhv lnskngkiyn
61 rntvnrllpm lrrkknekkn ekiernnklk gppppnpnd pppppndpp pppndpppp
121 npndppppna ndppppnand pappnandpa ppnandpapp nandpappna ndpappnand
181 pappnandpp ppppndpapp qgnnnpqpp rpppppppp qpppppppp rpppppppp
241 nnnknndnd dsyipsaeki lefvkqirds iteewsqcnv tcgsgivrkr rkgsnkkaed
301 ltledidtei ckmkdcssif nivnsnlgfv illvlvffn
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Sources of Peptides

Cat. # PPPP312-P

Sequence: PPPPNPPND PPPPNPPND PPPPNPPND
Mol. Wt: 2796
Formula: C₁₂₆H₁₇₉N₃₃O₄₀
Form: Powder
Solubility: not tested
Storage: Store powder at -20°C for up to 6 months.

After reconstitution in water, store solution in small aliquots at -20°C for 3-6 months. Do not freeze and thaw or store diluted solutions.

General References: Reed R.J. et al (1997) Vaccine, 15, 65-70 (1); Reed R.J. et al (1997) Vaccine, 15, 482-488 (2); Bosma T. et al (2006) Appl. And Environ. Microbiol., 72, 880-889; Zavala F. et al (1987) J. Exp. Med., 166, 1591-1596; Miglionini P. et al (1990) Scand. J. Immunol., 31, 237-242; Miglionini P. et al (1993) Eur. J. Immunol., 23, 582-585.

Related items:

Cat. #	Description
NANP51-P,	repeat-sequence peptide of <i>P. falciparum</i>
NANP51-BSA	CSP and its BSA conjugate
NANP101-P	repeat-sequence peptide of <i>P. falciparum</i> CSP
NVDP41-P,	repeat-sequence peptide of <i>P. falciparum</i>
NVDP41-BSA	CSP/ its BSA conjugate
DRAA31-P,	repeat-sequence peptide of <i>P. vivax</i>
DRAA31-BSA	CSP/ its BSA conjugate
DRAD31-P	repeat-sequence peptide of <i>P. vivax</i> CSP
PAPP31-P	repeat-sequence peptide of <i>P. berghei</i> CSP
PPPP321-P,	repeat-sequence peptide of <i>P. berghei</i>
PPPP321-BSA	CSP/ its BSA conjugate

**This product is for In vitro research use only.*

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