Biochemicals Catalogue

New

Tools for
TLR Research
Cy5-labelled Lipopeptides
Bioactive Peptides
Antimicrobial Peptides

2024-4

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1. Tools for Toll-like receptor research

Bacterial lipopeptides activate Toll-like receptors 1, 2 and 6 and interact with TLR10

Lipopeptides: Origin and biological activity

Bacterial - including mycoplasmal - lipoproteins (bLP) are characterised by the unusual amino acid dihydroxypropylcysteine (Dhc) acylated by two or three fatty acids. Lipoproteins are part of the outer membrane of Gram negative bacteria, Gram positive bacteria, *Rhodopseudomonas viridis,* and mycoplasma (Hantke and Braun 1973; Gomes-Miguel et al. 1988; Herrmann et al. 1996; Weyer et al. 1987; Mühlradt et al. 1997; Mühlradt et al. 1998; Shibata et al. 2000).

Synthetic analogues (sLP) and the N-terminal part of the lipoprotein of *E.coli* were synthesised for the first time in 1983 (Wiesmüller et al. 1983). They act as potent immunoadjuvants *in vivo* and *in vitro* (Wiesmüller et al. 1992). Immunisation of guinea pigs and swine with a totally synthetic vaccine consisting of the built-in lipotripeptide adjuvant Pam_3Cys-Ser-Ser and of a B and T cell epitope of the foot-and-mouth disease virus lead to a long-lasting protection against virus challenge (Wiesmüller et al. 1989).

The conjugation of class I restricted peptides with Pam_3Cys-Ser-Ser resulted in efficient priming of virus-specific cytotoxic T cells for the first time in 1989 (Deres et al. 1989).

Potent hapten-specific immune responses were obtained by immunisation with conjugates of lipopeptide, hapten and (haplotype-specific) T helper cell epitopes (Hoffmann et al. 1997; Moran et al. 2002).

The outer membrane lipoprotein (OspA) from *Borrelia burgdorferi* was used in human vaccine trials (Keller et al. 1994) and proved to be protective in a mouse model even after oral immunisation (Huebner et al. 1997).

The efficacy of eight adjuvant formulations to prime cytotoxic T lymphocytes in mice was compared and the water soluble lipohexapeptide analogue of bacterial lipoproteins Pam_3Cys-Ser-$(Lys)_4$, (Fig. 1) proved to be the most effective additive for eliciting a cellular immune response in mice (Hioie et al. 1996).

Lipopeptides and Toll-like receptor research

Cell activation via lipoproteins and lipopeptides is mediated by their interaction with Toll-like receptors (TLR). Lipoproteins represent one of the molecular links between host defense mechanisms and microbial products (Aliprantis et al. 1999; Means et al. 2000). TLRs share sequence similarities with the cytoplasmic regions of the IL-1 receptor family and function through the same signalling molecules including MyD88, IRAK, TRAF, MAP kinases and NF-κB.

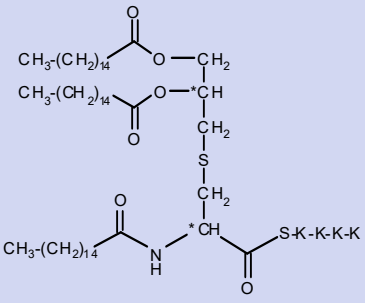

Figure 1: Structure of the water soluble lipopeptide Pam_3Cys-SKKKK

The N-terminal parts of bacterial lipoproteins are effectors of the innate immune defense. The corresponding mammalian Toll-like receptors TLR1, TLR2, and TLR6 have been identified (Akira 2003).

Lipopeptides like Pam_3Cys-SKKKK (Fig. 1), MALP-2 and FSL-1 are described to elicit cellular responses through heterodimers formed by TLR1/TLR2 or TLR2/TLR6 (Takeuchi et al. 2001, 2002; Alexopoulou et al. 2002; Okusawa et al. 2004). The crystal structures of the TLR1/TLR2 and TLR2/TLR6 heterodimers with the synthetic ligands Pam_3Cys-SKKKK (*RR*-stereoisomer) or Pam_2Cys-SKKKK (*RR*-stereoisomer) have been elucidated (Jin et al. 2007; Kang et al. 2009).

Structure-activity studies with synthetic lipopeptide analogues revealed the structural features of their interaction with TLR1, TLR2 and TLR6 (Buwitt-Beckmann et al. 2005, 2006; Farhat et al. 2007). Recently, the interaction of lipopeptides with TLR10 has been described (Guan et al. 2010).

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1.1 Lipopeptides for Toll-like receptor 1 and 2 research

Toll-like receptors 1/2 heterodimers are activated by triacylated lipoproteins and their synthetic lipopeptide analogues.

These triacylated lipopeptides are based on L-cysteine and are provided as lyophilised powders without any additives.

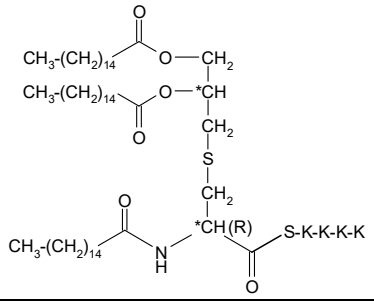
Pam_3Cys-SKKKK and analogues

Pam_3Cys-SKKKK is the mostly used synthetic analogue of naturally occurring lipoproteins and often described in literature as reference compound for TLR2/1 activation.

Pam_3Cys-SKKKK is provided as stereochemically defined compounds and as mixture of stereoisomers. Additionally, labelled analogues are available.

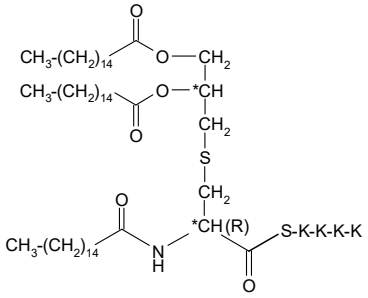
PHC-SKKKK is recommended as an appropriate negative control. This triacylated lipopeptide does not contain the dihydroxypropyl cysteine residue, which seems to be essential for the interaction with TLR1/2.

Pam_3Cys-SKKKK — L2000



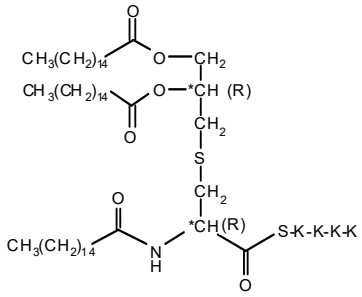
1 mg	180 €	2 mg	265 €	5 mg	520 €

Pam_3Cys-SKKKK (β-irradiated) — L2000s



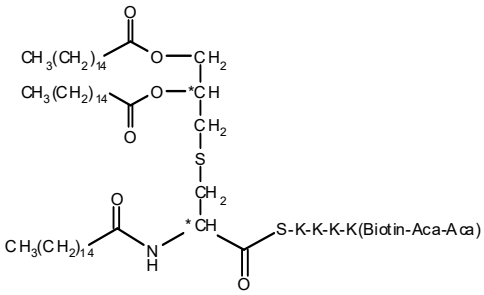
1 mg	265 €

***R*-Pam_3Cys-SKKKK** — L2048



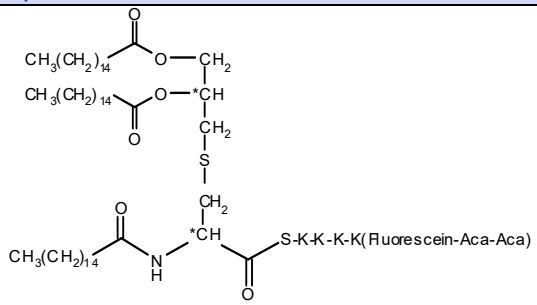
100 µg	265 €	5 x 100 µg	785 €

Pam_3Cys-SKKKK(Biotin-Aca-Aca) — L2031



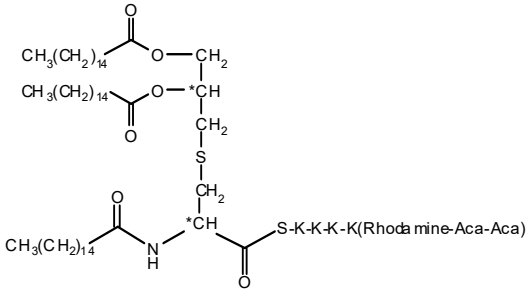
100 µg	265 €	5 x 100 µg	785 €

Pam_3Cys-SKKKK(Fluorescein-Aca-Aca) — L2034



100 µg	265 €	5 x 100 µg	785 €

Pam_3Cys-SKKKK(Rhodamine-Aca-Aca) — L2035



100 µg	265 €	5 x 100 µg	785 €

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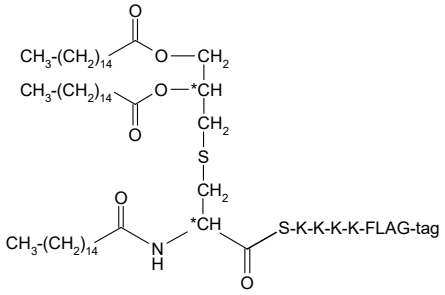
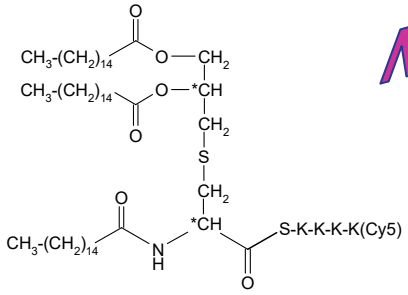
Pam_3Cys-SKKKK-FLAG-tag L2064



100 µg 265 € 5 x 100 µg 785 €

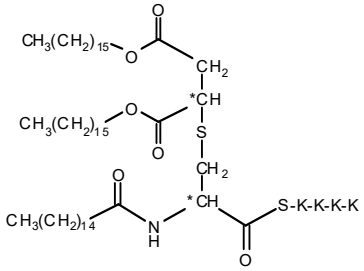
Pam_3Cys-SKKKK(Cy5) L2075

New



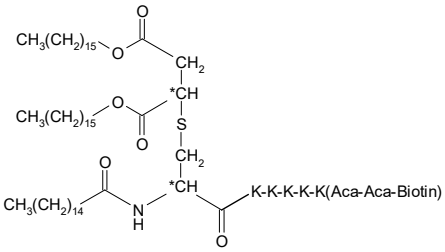
100 µg 295 € 5 x 100 µg 875 €

PHC-SKKKK L2032



1 mg 235 €

Lipobiotin L2070



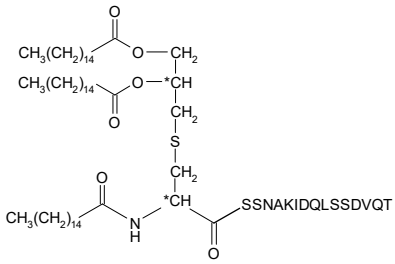
1 mg 300 €

Synthetic lipopeptides derived from bacterial lipoproteins

The synthetic triacyl lipopeptides represent the N-terminal lipohexadecapeptides Pam_3Cys-AA_{15} or liponondecapeptide Pam_3Cys-AA_{18} (product L8020) of bacterial lipoproteins. Names of lipoproteins and origin are indicated.

For larger amounts please inquire.

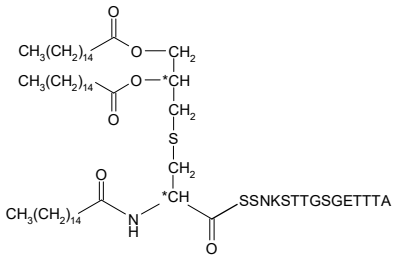
Pam_3Cys-SSNAKIDQLSSDVQT bLP001



Synthetic lipopeptide derived from *Escherichia coli (E. coli)* major outer membrane lipoprotein

100 µg 265 €

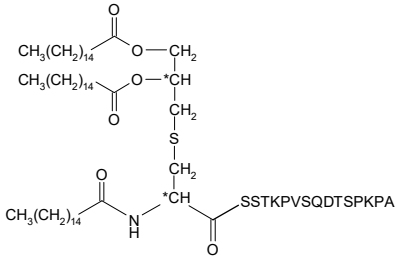
Pam_3Cys-SSNKSTTGSGETTTA bLP002



Synthetic lipopeptide derived from *Mycobacterium tuberculosis* 19 kDa lipoprotein antigen

100 µg 265 €

Pam_3Cys-SSTKPVSQDTSPKPA bLP MPT83



Synthetic lipopeptide derived from *Mycobacterium tuberculosis* cell surface lipoprotein MPT83

100 µg 265 €

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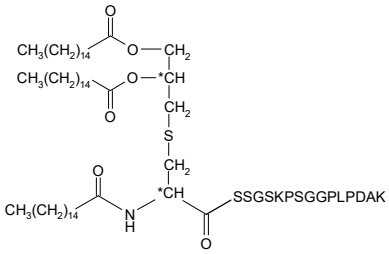
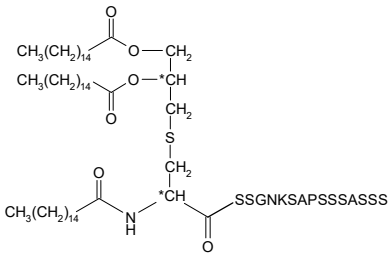
Pam_3Cys-SSGSKPSGGPLPDAK — bLP MT P27



Synthetic lipopeptide derived from *Mycobacterium tuberculosis* lipoprotein lprG (27 kDa lipoprotein)

100 µg 265 €

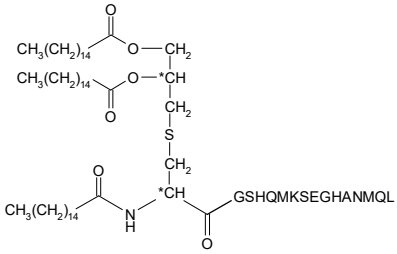
Pam_3Cys-SSGNKSAPSSSASSS — bLP003



Synthetic lipopeptide derived from *Mycobacterium avium* 19 kDa lipoprotein antigen

100 µg 265 €

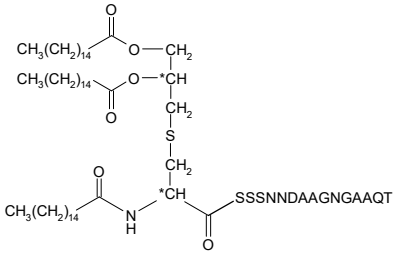
Pam_3Cys-GSHQMKSEGHANMQL — bLP HI P4



Synthetic lipopeptide derived from *Haemophilus influenzae* outer membrane protein P4

100 µg 265 €

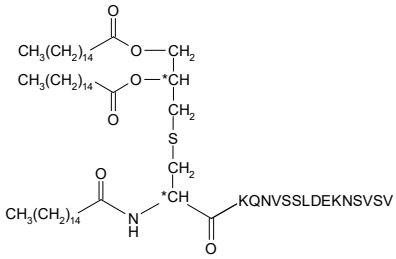
Pam_3Cys-SSSNNDAAGNGAAQT — bLP HI P6



Synthetic lipopeptide derived from *Haemophilus influenzae* outer membrane protein P6

100 µg 265 €

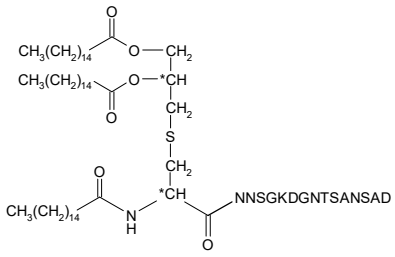
Pam_3Cys-KQNVSSLDEKNSVSV — bLP BB OspA



Synthetic lipopeptide derived from *Borrelia burgdorferi* OspA

100 µg 265 €

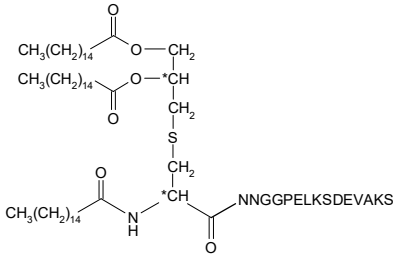
Pam_3Cys-NNSGKDGNTSANSAD — bLP BB OspC



Synthetic lipopeptide derived from *Borrelia burgdorferi* OspC

100 µg 265 €

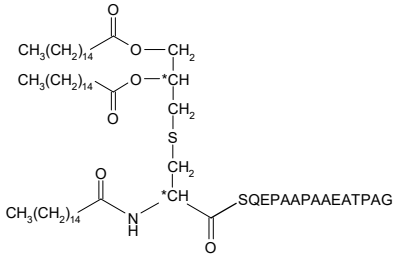
Pam_3Cys-NNGGPELKSDEVAKS — bLP BH 3



Synthetic lipopeptide derived from *Borrelia hermsii* outer membrane lipoprotein 3

100 µg 265 €

Pam_3Cys-SQEPAAPAAEATPAG — bLP NG H.8



Synthetic lipopeptide derived from *Neisseria gonorrhoeae* H.8 outer membrane protein

100 µg 265 €

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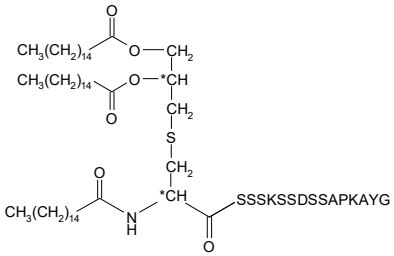
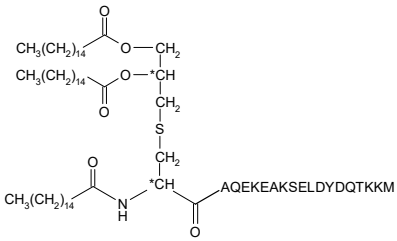
Pam_3Cys-SSSKSSDSSAPKAYG — **bLP SP amiA**



Synthetic lipopeptide derived from *Streptococcus pneumoniae* oligopeptide-binding protein amiA

0.1 mg 265 €

Pam_3Cys-AQEKEAKSELDYDQTKKM — **L8020**



Synthetic lipopeptide derived from *Bacillus cereus* spore germination protein D GerD

0.1 mg 265 €

1.2 Lipopeptides for Toll-like receptor 2 and 6 research

Toll-like receptors 2/6 heterodimers are activated by diacylated lipoproteins and their synthetic lipopeptide analogues.

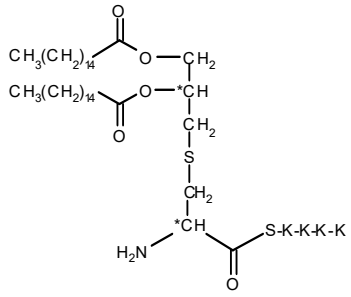
All offered diacylated lipopeptides are based on L-cysteine and are provided as lyophilised powders without any additives.

Pam_2Cys-SKKKK and analogues

Pam_2Cys-SKKKK is a frequently used synthetic analogue of naturally occurring mycoplasmal lipoproteins. The amphiphilic lipopeptide is water soluble due to its strongly hydrophilic amino acid sequence SKKKK, which is not derived from natural lipoproteins.

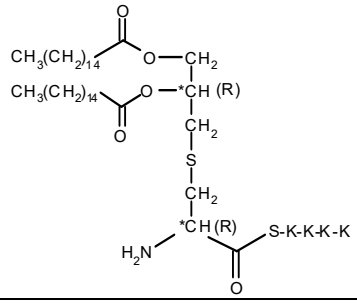
Pam_2Cys-SKKKK is provided as stereochemically defined compounds and as mixture of stereoisomers. Lipopeptides with the S-dihydroxypropyl moiety are not active and therefore suitable as negative controls.

Pam_2Cys-SKKKK — **L2020**



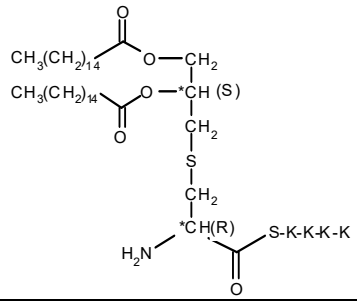
100 µg 145 € 1 mg 390 €

***R*-Pam_2Cys-SKKKK** — **L20201**



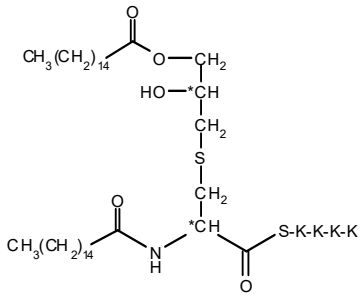
100 µg 265 € 5 x 100 µg 785 €

***S*-Pam_2Cys-SKKKK** — **L20202**



100 µg 265 € 5 x 100 µg 785 €

PamCys(Pam)-SKKKK — **L2021**



100 µg 265 € 5 x 100 µg 785 €

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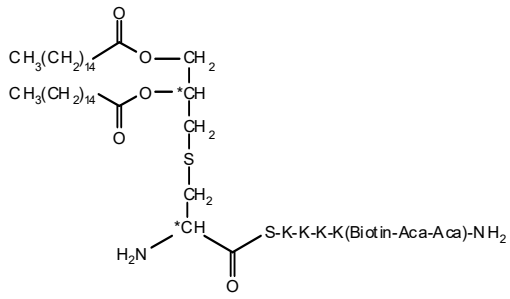
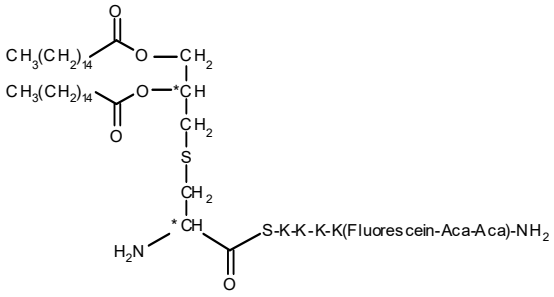
Pam_2Cys-SKKKK(Biot-Aca-Aca)-NH_2 L20213



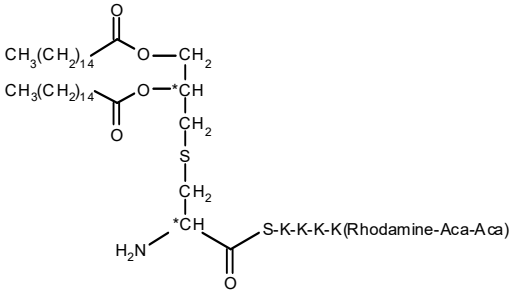
100 µg 265 € 5 x 100 µg 785 €

Pam_2Cys-SKKKK(Fluorescein Aca-Aca)-NH_2 L20214



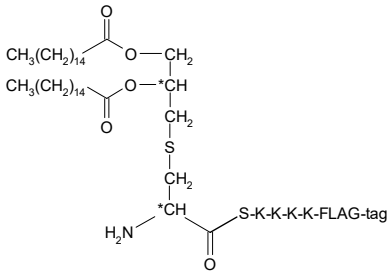
100 µg 265 € 5 x 100 µg 785 €

Pam_2Cys-SKKKK(Rhodamine-Aca-Aca)-NH_2 L20215



100 µg 265 € 5 x 100 µg 785 €

Pam_2Cys-SKKKK-FLAG-tag L20229



100 µg 265 € 5 x 100 µg 785 €

Improved MALP-2: MALP-2-DI

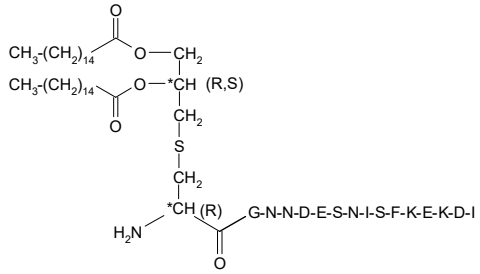
MALP-2-DI, Pam_2Cys-GNNDESNISFKEKDI, represents the N-terminal sequence of the mature macrophage activating lipoprotein 404 originally isolated from *Mycoplasma fermentans*.

MALP-2, Pam_2Cys-GNNDESNISFKEK and MALP-2-DI differ in the length of the natural amino acid sequence but not in the N-terminal lipoamino acid Pam_2Cys.

The C-terminal sequence elongation leads to **improved physicochemical properties** compared to MALP-2. MALP-2-DI can be used without any additives or detergents.

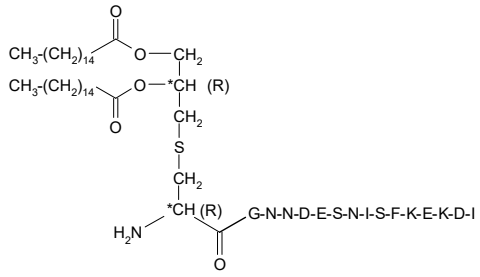
MALP-2-DI is provided in reproducible high quality. as mixture of RR and RS stereoisomers and as stereochemically defined compound R-MALP-2-DI.

MALP-2-DI (mixture of *R,R* and *R,S* stereoisomers) L6050



100 µg 445 €

R-MALP-DI (*R,R* stereoisomer) L6060



100 µg 590 €

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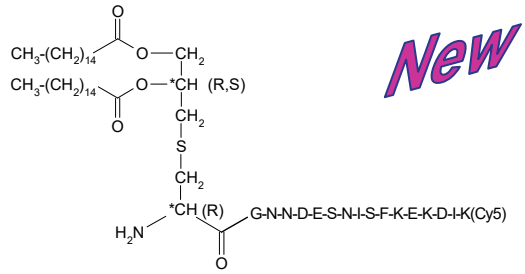
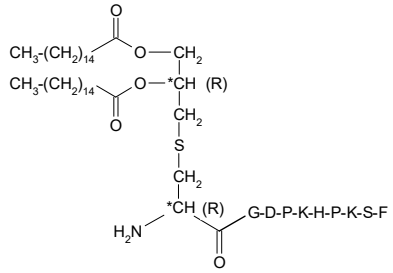
MALP-2-DI-Cy5 (mixture of *R*,*R* and *R*,*S* stereoisomers) L6055



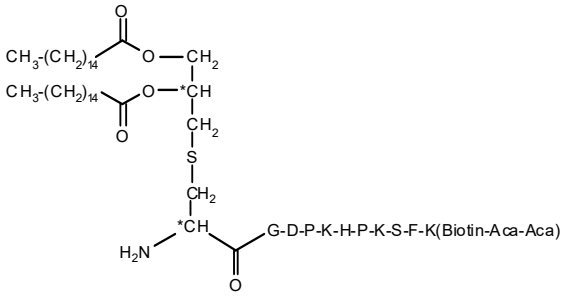
100 µg 595 €

R-FSL-1 (*R*,*R* stereoisomer) L7022



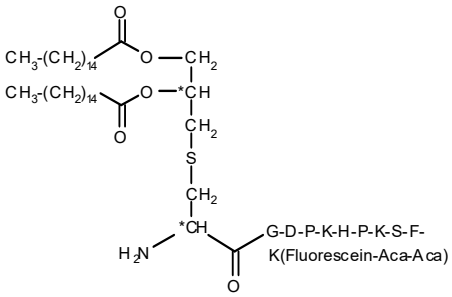
100 µg 265 € 5 x 100 µg 785 €

FSL-1-Biotin L7030



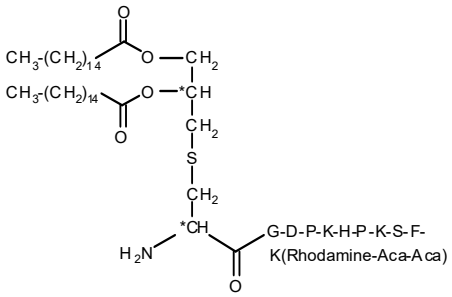
100 µg 265 € 5 x 100 µg 785 €

FSL-1-Fluorescein L7031



100 µg 265 € 5 x 100 µg 785 €

FSL-1-Rhodamine L7032



100 µg 265 € 5 x 100 µg 785 €

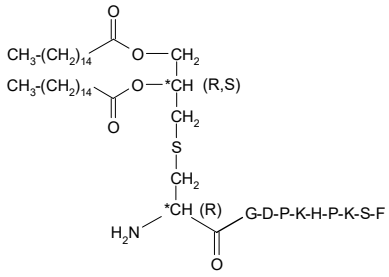
FSL-1 and derivatives

FSL-1, Pam_2Cys-GDPKHPKSF, represents the N-terminal part of the 44-kDa lipoprotein LP44 of *Mycoplasma salivarium*. Compared to *Mycoplasma fermentans* derived synthetic lipopeptide MALP-2, FSL-1 differs in the amino acid sequence but not in the N-terminal lipoamino acid Pam_2Cys. FSL-1 is highly active and favourable in comparison to many other lipopeptides derived from naturally occurring lipoproteins with respect to its good solubility in aqueous solutions without any detergent.

FSL-1 is provided as stereochemically defined compound and as mixture of stereoisomers. Lipopeptides with the S-dihydroxypropyl moiety are not active and therefore suitable as negative controls.

EMC offers further TLR 2/6 ligands with improved physico-chemical features or with neutral charge. Please inquire.

FSL-1 (mixture of *R*,*R* and *R*,*S* stereoisomers) L7000



100 µg 180 € 1 mg 545 €

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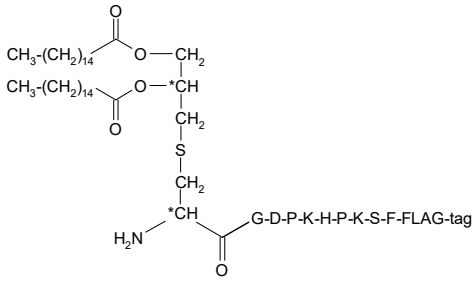
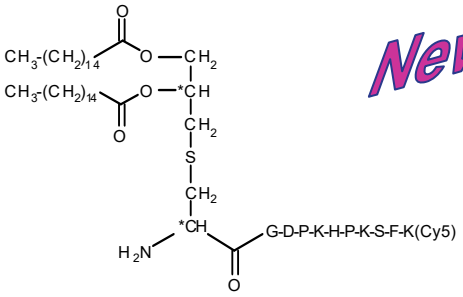
FSL-1-FLAG-tag L7040



100 µg 265 € 5 x 100 µg 785 €

FSL-1-Cy5 L7050



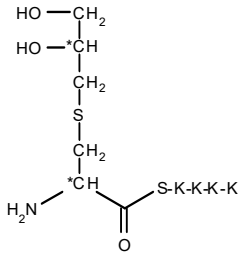
New

100 µg 295 € 5 x 100 µg 875 €

1.3 Miscellaneous peptides and lipopeptides for Toll-like receptor research

Monoacylat lipopeptides, peptides with the unusual amino acid dihydroxypropylcystein (Dhc), or peptides representing the peptide moieties of Pam_3Cys-SKKKK, Pam_2Cys-SKKKK or FSL-1 are analogues or substructures of TLR2 ligands and valuable as negative controls. The Dhc is based on L-cysteine. All peptides are provided as lyophilised powder without any additives.

Dhc-SKKKK L2001

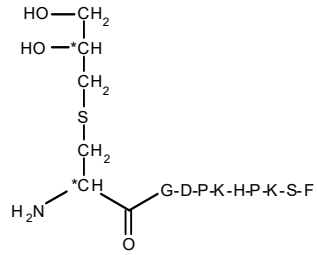


1 mg 235 €

SKKKK L2002

1 mg 235 €

Dhc-GDPKHPKSF L2003

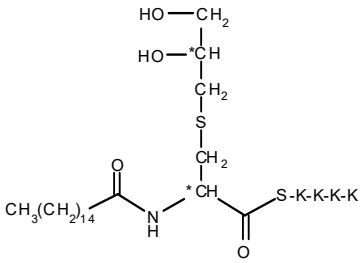


1 mg 265 €

GDPKHPKSF L2004

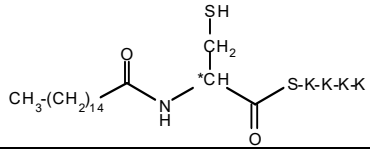
1 mg 265 €

Pam-Dhc-SKKKK L2010



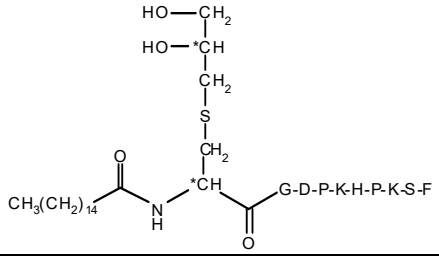
1 mg 235 €

Pam-CSKKKK L2011



1 mg 235 €

Pam-Dhc-GDPKHPKSF L2012



1 mg 390 €

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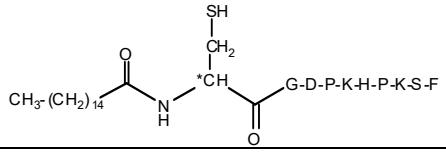
Pam-CGDPKHPKSF	L2013
	
1 mg 390 €	

2. Adjuvants

Effective immunisation requires two main constituents, the antigen itself and an adjuvant.

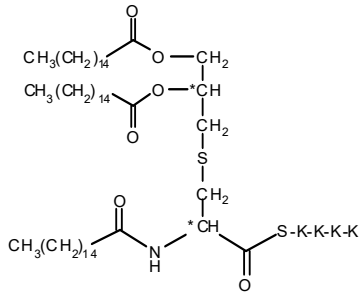
The adjuvant stimulates the immune system and enhances the antigen-specific immune response when used in combination with antigens. Without an adjuvant, usually only a poor immune response and low antibody titers are observed after immunisation.

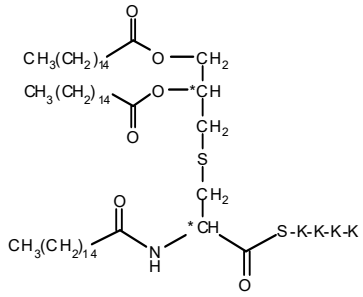
Effective immunisation and vaccination leads to the induction of antigen specific antibodies by B lymphocytes, and cytotoxic CD8+ T lymphocytes (CTL) that recognise and kill infected cells. The generation and maintenance of the B cell and $CD8^+$ T cell responses is supported by growth factors and signals provided by CD4+ T helper lymphocytes. This cellular response and support is in particular important for B cell activation, antibody class switch and for memory immune response.

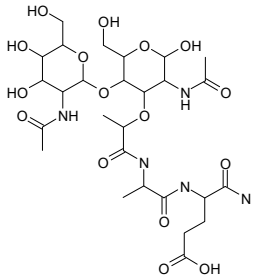
Toll-like receptors are key components of the innate immune system that detect microbial infection and trigger antimicrobial host defence responses. TLRs also control multiple dendritic cell functions and activate signals that are critically involved in the initiation of adaptive immune response. Promising adjuvants used today in vaccine development are based on natural TLR ligands.

Lipoproteins and their synthetic analogues are known as strong enhancers of the immune system. Lipopeptide vaccinations have been carried out in all relevant animal models. So far, no toxic side effects have been observed (Wiedemann et al 1990, J. Pathology 164, 1–7). The efficacy of eight adjuvant formulations to prime cytotoxic T lymphocytes in mice was compared and the water soluble lipohexapeptide analogue of bacterial lipoproteins Pam_3Cys-SKKKK, proved to be the most effective additive for eliciting a cellular immune response in mice (Hioe et al. 1996, Vaccine 5, 412–8).

Lipopeptide adjuvant	L4000
Synthetic TLR2/1 ligand Pam_3Cys-SKKKK admixed to lipoamino acid conjugate with T helper cell epitope of the sperm whale myoglobine (AA 106-121) FISEAIIHVLHSRHPG	
1.5 mg 235 €	5 x 1.5 mg 715 €

Pam_3Cys-SKKKK	L2000
	
1 mg 180 € 2 mg 265 € 5 mg 520 €	

Pam_3Cys-SKKKK (β-irradiated)	L2000s
	
1 mg 265 €	

GMDP	GMDP
	N-acetyl-D-glucosaminyl-(β1,4)-N-acetylmuramyl-L-alanyl-D-isoglutamine
1 mg 360 €	

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3. Bioactive peptides

EMC offers customer defined peptides and peptidomimetics. Additionally, EMC offers ex stock biologically active peptides and respective control peptides.

All peptides are provided as lyophilised powders. They are characterised by RP-HPLC and ESI mass spectrometry (analytical data sheet included). If not otherwise specified, the counter-ion of positively charged peptides is trifluoroacetic acid.

3.1 Peptides for Alzheimer disease research

Characteristic of Alzheimer disease is the accumulation of amyloid plaques in the brain. The major components of these plaques are 36-42 residue-long amyloid-β-peptides, which form insoluble fibrils via self-assembly.

The amyloid-β-peptides are fragments of the broadly distributed, membrane-bound amyloid precursor protein APP, encoded on chromosome 21. They are formed from the proteolytic cleavage of APP by β- and γ-secretases.

One of the most common and intensively studied amyloid β isoforms is amyloid β (1-40), which is present in amyloid plaques.

References:

M. Ahmed, J. Davis, D. Aucoin, T. Sato, S. Ahuja, S. Aimoto, J. I. Elliott, W. E. Van Nostrand, S. O. Smith (2010) Nat. Struct. Mol. Biol. 17, 561-567.
T. Hartmann, S. C. Bieger, B. Brühl, P. J. Tienari, N. Ida, D. Allsop, G. W. Roberts, C. L. Masters, C. G. Dotti, K. Unsicker, K. Beyreuther (1997) Nat. Med. 3, 1016-1020.

Amyloid-β-peptides and innate immunity

In Alzheimer's disease, deposition of amyloid-β triggers a protracted sterile inflammatory response. Chronic stimulation of the innate immune system is believed to underlie the pathology of this disease. It was shown, that amyloid-β triggers inflammatory signalling through a heterodimer of Toll-like receptors 4 and 6. Assembly of this recently identified heterodimer is regulated by signals from the scavenger receptor CD36, CD36-TLR4-TLR6 activation was identified as a common molecular mechanism by which atherogenic lipids and amyloid-β stimulate sterile inflammation (Stewart et al. 2010, Nature Immunology 11, 155-161 doi:10.1038/ni.1836).

Amyloid-β (1-42) human	**BAP-010**
DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIG LMVGGVVIA	
Purity	1 mg
≥ 90 %	540 €

Amyloid-β (1-40) human	**BAP-012**
DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIG LMVGGVV	
Purity	1 mg
≥ 95 %	215 €

Amyloid-β (1-40) human HCl salt	**BAP-013**
DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIG LMVGGVV	
Purity	1 mg
≥ 95 %	360 €

Reverse control peptides of amyloid-β-peptides

The negative control peptides represent the reverse amino acid sequences of the corresponding amyloid-β-peptides.

Control peptide amyloid-β (40-1) human		**BAP-022**
VVGGVMLGIIAGKNSGVDEAFFVLKQHHVEYGS DHRFEAD		
Purity	1 mg	5 mg
≥ 95 %	215 €	935 €

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Biotinylated amyloid-β-peptide

Biotinylated peptides are a useful tool in many important applications. Biotin has a strong affinity for avidin or streptavidin. This interaction can be used for qualitative and quantitative detection, labelling or immobilisation.

The biotinylated amyloid-β peptide is N-terminally labelled. Two 6-aminohexanoic acid residues (Aca) are inserted as spacer between the amyloid-β peptide itself and biotin. The enlarged distance minimise steric hindrance and improve the availability of biotin for avidin or streptavidin binding.

Biotinylated amyloid-β (1-40) human		**BAP-031**
Biotin-Aca-Aca-DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIGLMVGGVV		
Purity	1 mg	5 mg
≥ 95 %	415 €	1.670 €

Peptides as inhibitors of amyloid-β

Several inhibitors of amyloid-β aggregation have been published. Many of them are fragments and modified peptides derived from the native amyloid-β sequence. Others were identified by phage display approaches.
An overview about peptides that target amyloid-β is described by Stains et al. (2007) ChemMedChem 2, 1674-1692.

KLVFF		**BAP-041**
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	580 €

Ac-KLVFF-NH_2		**BAP-042**
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	580 €

RIIGL		**BAP-043**
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	580 €

DWGKGGRWRLWPGASGKTEA		**BAP-044**
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	145 €	415 €

PGRSPFTGKKLFNQEFSQDQ		**BAP-045**
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	145 €	415 €

qshyrhispaqv (D-amino acids)		**BAP-046**
Purity	1 mg	5 mg
≥ 95 %	185 €	545 €

FYLKVPSSLHHHHGRDKLVFFHHHH		**BAP-047**
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	185 €	545 €

NYSKMIFSHHHH		**BAP-048**
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	415 €

HNHKLVFFHHQH		**BAP-049**
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	415 €

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3.2 Immunologically active peptides

Peptides for multiple sclerosis research

Multiple sclerosis (MS), an autoimmune disease of the central nervous system (CNS), is characterised by primary demyelination. It is widely thought that this is the result of an autoimmune attack against myelin components.

Potential target antigens in MS are proteins of the myelin sheath such as myelin oligodendrocyte glycoprotein (MOG), myelin basic protein (MBP), and proteolipid protein (PLP). Experimental autoimmune encephalomyelitis (EAE) has proven to be a particularly useful animal model. T cell epitopes of MOG for the induction of EAE in mice have been identified.

References:

T. G. Forsthuber, C. L. Shive, W. Wienhold, K. L. de Graaf, E. G. Spack, R. Sublett, A. Melms, J. Kort, M. K. Racke, R. Weissert (2001) J. Immunol. Dec 15, 167(12), 7119-25.
R. Weissert, J. Kuhle, K. L. de Graaf, W. Wienhold, M. M. Herrmann, C. Müller, T. G. Forsthuber, K.-H. Wiesmüller, A. Melms (2002) J. Immunol. Jul 1, 169(1), 548-56.
M. Khare, M. Rodriguez, C. S. David (2003) Int. Immunol. Apr, 15(4), 535-46.
K. L. de Graaf, S. Barth, M. M. Herrmann, M. K. Storch, C. Otto, T. Olsson, A. Melms, G. Jung, K.-H. Wiesmüller, R. Weissert (2004) J. Immunol. Aug 15, 173(4), 2792-802.
H. Duyar, J. Dengjel, K. L. de Graaf, K.-H. Wiesmüller, S. Stevanović, R. Weissert (2005) Immunogenetics Apr, 57(1-2), 69-76. Epub 2005 Feb 12.
J. Klehmet, C. Shive, R. Guardia-Wolff, I. Petersen, E. G. Spack, B. O. Boehm, R. Weissert, T. G. Forsthuber (2004) Clin. Immunol. Apr, 111(1), 53-60.
K. L. de Graaf, S. Barth, M. M. Herrmann, M. K. Storch, K.-H. Wiesmüller, R. Weissert (2008) Eur. J. Immunol. Jan, 38(1), 299-308.

MOG (35-55) rat/mouse		**BAP-101**
MEVGWYRSPFSRVVHLYRNGK		
Purity	1 mg	5 mg
≥ 70 %		200 €
≥ 95 %	145 €	420 €

MOG (35-55) human		**BAP-102**
MEVGWYRPPFSRVVHLYRNGK		
Purity	1 mg	5 mg
≥ 70 %		200 €
≥ 95 %	145 €	420 €

MOG (92-106)		**BAP-103**
DEGGYTCFFRDHSYQ		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	185 €	

MOG (97-108)		**BAP-104**
TCFFRDHSYQEE		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	145 €	420 €

MOG (183-191)		**BAP-106**
FVIVPVLGP		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	145 €	

MOG (91-108)		**BAP-107**
SDEGGYTCFFRDHSYQEE		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	145 €	420 €

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MBP (1-11) human		BAP-110
Ac-ASQKRPSQRHG		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	145 €	420 €

MBP (54-72) human		BAP-111
SHHAARTTHYGSLPQKSQR		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	145 €	420 €

PLP (139-151)		BAP-120
HCLGKWLGHPDKF		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	145 €	420 €

PLP (178-191)		BAP-121
NTWTTCQSIAFPSK		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	145 €	

MHC-I restricted peptide epitopes

MHC-I glycoproteins are designed for the recognition of infected cells and tumor cells.

T cell epitopes are presented on the surface of antigen-presenting cells by MHC molecules. T cell epitopes presented by MHC class I molecules are typically peptides between 8 and 11 amino acids in length and exhibiting MHC-specific sequence motifs.

These antigenic peptides are derived from non-structural and structural proteins through proteolysis in the cytosolic compartment. Peptide-MHC-I complexes are then transported to the cell surface of antigen presenting cells and are recognised by CD8+ cytotoxic T lymphocytes (CTL). This interaction induces the differentiation of CTLs. Activated CTL lyse the infected cell, secrete cytokines, and proliferate.

This mechanism ensures that cells infected by viruses or intracellular bacteria or cancer cells can be detected, since pathogen or cancer-specific MHC peptide complexes are displayed on the cell surface. CTL can recognise such abnormal cells and eliminate them.

The genes of MHC I and II molecules are polymorphic. Each MHC allele has a distinct peptide binding motif which favours certain amino acid anchor residues at defined sequence positions.

References:

R. Vita, L. Zarebski, J. A. Greenbaum, H. Emami, I. Hoof, N. Salimi, R. Damle, A. Sette, B. Peters (2010) Nucleic Acids Res. Jan. 38 D854-62. Epub 2009 Nov. 11 (www.immuneepitope.org).
H.-G. Rammensee, J. Bachmann, N.N. Emmerich, O.A. Bachor, S. Stevanović (1999) Immunogenetics 50, 213-219 (www.syfpeithi.de).
H.-G. Rammensee, T. Friede, S. Stevanović (1995) Immunogenetics 41, 178-228.
K. Falk, O. Rötzschke, S. Stevanović, G. Jung, H.-G. Rammensee (1991) Nature 351, 290 – 296. doi:10.1038/351290a0.

Ova (257-264): SIINFEKL		BAP-201
SIINFEKL		
Purity		5 mg
≥ 70 %		145 €
≥ 95 %		215 €

Influenza A NP (366-374)		BAP-202
ASNENMETM		
Purity		5 mg
≥ 70 %		145 €
≥ 95 %		290 €

Influenza A matrix protein (58-66)		BAP-203
GILGFVFTL		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	185 €	290 €

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HIV-1 p17 Gag (77-85)		BAP-204
SLYNTVATL		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	215 €

HCV-NS5b		BAP-205
ALYDVVSKL		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	215 €

LCMV GP (33-41)	BAP-206
KAVYNFATM	
Purity	5 mg
≥ 70 %	145 €
≥ 95 %	215 €

MAGE-3 antigen (271-279)	BAP-208
FLWGPRALV	
Purity	5 mg
≥ 70 %	145 €
≥ 95 %	215 €

Melan-A / MART-1 (26 - 35)	BAP-209
EAAGIGILTV	
Purity	5 mg
≥ 70 %	145 €
≥ 95 %	290 €

MHC-II restricted peptide epitopes

MHC-II class molecules are designed for the recognition of epitopes of exogenous antigens and for discriminating self from non-self. They are expressed on the surface of antigen presenting cells.

The peptide binding groove of MHC II molecules is open at both ends, thus allowing MHC II-bound peptides to extend beyond both termini. Therefore MHC II epitopes are usually longer than MHC I epitopes and exhibit considerable length variation of 11–25 amino acids.

MHC class II molecules activate CD4+ helper T lymphocytes, which modulate humoral (B cell) and cell-mediated (CTL) immune response.

Activation of helper T lymphocytes lead to cell proliferation and secretion of cytokines which activate effector cells and trigger B cell proliferation and their differentiation into antibody-secreting plasma cells.

The genes of MHC-I and II molecules are polymorphic. Each MHC allele has a distinct peptide binding motif which favours certain amino acid anchor residues at defined sequence positions. Several promiscuous peptides, capable of binding to many different MHC class II alleles, have been identified.

References:

R. Vita, L. Zarebski, J. A. Greenbaum, H. Emami, I. Hoof, N. Salimi, R. Damle, A. Sette, B. Peters (2010) Nucleic Acids Res. Jan. 38 D854-62. Epub 2009 Nov. 11 (www.immuneepitope.org).
H.-G. Rammensee, J. Bachmann, N. N. Emmerich, O. A. Bachor, S. Stevanović (1999) Immun. 50, 213-219 (www.syfpeithi.de).

Ova (323-339)		BAP-250
ISQAVHAAHAEINEAGR		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	215 €

PADRE		BAP-251
AKFVAAWTLKAAA		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	185 €	420 €

LCMV GP (64-80)		BAP-253
GPDIYKGVYQFKSVEFD		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	185 €	290 €

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3.3 Cell penetrating peptides

Cell penetrating peptides (CPPs) are characterised by their ability to promote the receptor-independent cellular uptake of membrane-impermeable macromolecules, such as peptides, proteins, nucleic acids and nanoparticles. CPPs are usually short peptides with less than 30 amino acids. They are mostly amphipathic and highly cationic and usually rich of amino acids arginine and lysine.

Cellular internalisation of CPPs is observed for virtually all cells, although with different efficiencies that depend on the CPP, the cargo and the cell type (Verdurmen and Brock 2011, Trends Pharmacol. Sci. 32, 116-124).

Arg_9 **Arg_9-NH_2**		**BAP-301** **BAP-301a**
RRRRRRRRR RRRRRRRRR-NH_2		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	215 €

D-Arg_9 (r_9)		**BAP-302**
rrrrrrrrr		
Purity	1 mg	5 mg
≥ 70 %		265 €
≥ 95 %	265 €	420 €

TAT (47-57)		**BAP-303**
YGRKKRRQRRR-NH_2		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	215 €

D-TAT (47-57)		**BAP-304**
ygrkkrrqrrr-NH_2		
Purity	1 mg	5 mg
≥ 70 %		265 €
≥ 95 %	265 €	420 €

TAT (48-60)		**BAP-305**
GRKKRRQRRRPPQ		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	215 €

Antennapedia (43-58) (penetratin)		**BAP-306**
RQIKIWFQNRRMKWKK		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	215 €

CyLoP-1		**BAP-307**
CRWRWKCCKK		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	215 €

Transportan 10 (TP10)		**BAP-308**
AGYLLGKINLKALAALAKKIL		
Purity	1 mg	5 mg
≥ 70 %		215 €
≥ 95 %	145 €	385 €

MAP (KLAL)		**BAP-309**
KLALKLALKALKAALKLA		
Purity	1 mg	5 mg
≥ 70 %		245 €
≥ 95 %	145 €	360 €

hLF		**BAP-311**
KCFQWQRNMRKVRGPPVSCIKR-NH_2		
Purity	1 mg	5 mg
≥ 70 %		245 €
≥ 95 %	145 €	385 €

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Pep1		**BAP-312**
KETWWETWWTEWSQPKKRKV		
Purity	1 mg	5 mg
≥ 70 %		215 €
≥ 95 %	145 €	385 €

Labelled CPPs, CPP peptide conjugates

Fluorescence based methods are often used e.g. to study the uptake fluorescence microscopy, to quantify the peptides by fluorimetry or to localise the CPPs inside living cells by confocal microscopy.

Our **fluorescently labelled CPPs** are covalently coupled to 5(6)-carboxyfluorescein.

***CF*-Arg$_9$** ***CF*-Arg$_9$-NH$_2$**	**BAP-301-CF** **BAP-301a-CF**
5(6)-CF-RRRRRRRRR *5(6)-CF*-RRRRRRRRR-NH$_2$	
Purity	1 mg
≥ 95 %	360 €

***CF*-TAT (47-57)**	**BAP-303-CF**
5(6)-CF-YGRKKRRQRRR-NH$_2$	
Purity	1 mg
≥ 95 %	360 €

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3.4 Microbial and antimicrobial peptides

Antimicrobial peptides (AMPs) offer a broad spectrum of antimicrobial activity against bacteria, viruses, and fungi. They are an evolutionarily conserved component of the innate immune response and are found amongst all life forms. AMPs are usually amphiphilic and positively charged. Microorganisms are affected by AMP through diverse mechanisms.

References:

K. A. Brogden (2005) Nature Reviews Microbiology 3, 238-250.
M. A. Kohanski, D. J. Dwyer, J. J. Collins (2010) Nature Reviews Microbiology 8, 423-435 doi:10.1038/nrmicro 2333.
M. N. Melo, R. Ferre, M. A. R. B. Castanho (2009) Nature Reviews Microbiology 7, 245-250 doi:10.1038/nrmicro2095.

α-Defensin 5 human		**AMP-001**
ATCYCRTGRCATRESLSGVCEISGRLYRLCCR Disulfide bridges : 3 – 31, 5 – 20, 10 – 30		
Purity	100 µg	1 mg
≥ 95 %	215 €	870 €

Histatin 5		**AMP-010**
DSHAKRHHGYKRKFHEKHHSHRGY		
Purity	1 mg	5 mg
≥ 70 %		215 €
≥ 95 %	215 €	635 €

Indolicidin		**AMP-020**
ILPWKWPWWPWRR-NH_2		
Purity	1 mg	5 mg
≥ 70 %		215 €
≥ 95 %	215 €	635 €

LL-37 human		**AMP-030**
LLGDFFRKSKEKIGKEFKRIVQRIKDFLRNLVPR TES		
Purity	1 mg	5 mg
≥ 70 %		275 €
≥ 95 %	275 €	810 €

Magainin-1		**AMP-040**
GIGKFLHSAGKFGKAFVGEIMKS		
Purity	1 mg	5 mg
≥ 70 %		215 €
≥ 95 %	215 €	635 €

Pep27		**AMP-050**
MRKEFHNVLSSGQLLADKRPARDYNRK		
Purity	1 mg	5 mg
≥ 70 %		215 €
≥ 95 %	215 €	635 €

Dermcidin SSL25		**AMP-057**
SSLLEKGLDGAKKAVGGLGKLGKDA		
Purity	1 mg	5 mg
≥ 95 %	215 €	635 €

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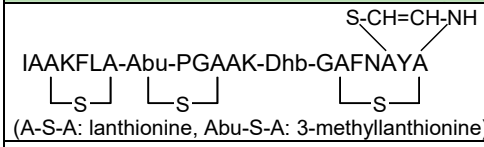
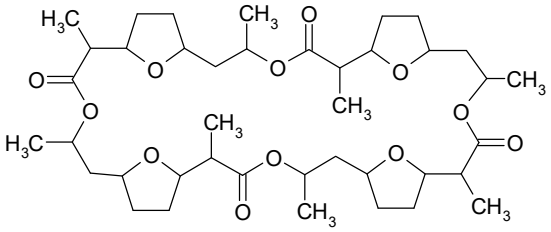
Alamethicin F30	AMP-060
Ac-Aib-Pro-Aib-Ala-Aib-Ala-Gln-Aib-Val-Aib-Gly-Leu-Aib-Pro-Val-Aib-Aib-Glu-Gln-Pheol (Pheol = Phenylalaninol)	
Purity	1 mg / 5 mg
≥ 70 %	145 € / 215 €
≥ 95 %	185 € / 360 €

Alamethicin F50	AMP-061
Ac-Aib-Pro-Aib-Ala-Aib-Ala-Gln-Aib-Val-Aib-Gly-Leu-Aib-Pro-Val-Aib-Aib-Gln-Gln-Pheol (Pheol = Phenylalaninol)	
Purity	1 mg / 5 mg
≥ 70 %	145 € / 215 €
≥ 95 %	185 € / 360 €

Omphalotin A	AMP-065
c[Trp-MeVal-Ile-MeVal-MeVal-Sar-MeVal-MeIle-Sar-Val-MeIle-Sar]	
Purity	1 mg / 5 mg
≥ 70 %	220 € / 655 €

Gallidermin	AMP-070
 (A-S-A: lanthionine, Abu-S-A: 3-methyllanthionine)	
Purity	1 mg / 5 mg
≥ 85 %	145 € / 290 €

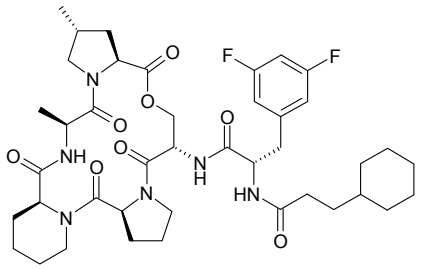
Nonactin	AMP-075
	
Purity	1 mg / 5 mg
≥ 85 %	145 € / 235 €

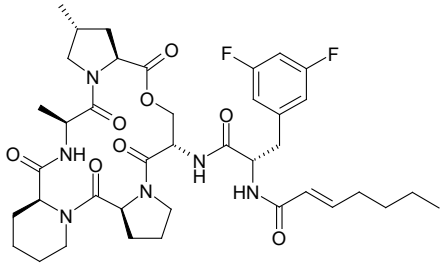
Ezrin Peptide	AMP-100
TEKKRRETVEREKE	
Purity	2 mg
≥ 95 %	180 €

3.6 Depsipeptides

Cyclodepsipeptides have been identified from bacteria, fungi, plants, and marine organisms and are characterized by replacement of amide bonds by at least one ester bond in the cyclic structure. Depsipeptides are investigated as enzyme inhibitors, antibacterials (e.g. ADEPs), antifungals, antivirals, anti-helmintic, anti-inflammatory and as anticancer agents.

References:
H. Broetz-Oesterheldt et al. (2005) Nature Medicine 11, 1082-1087. doi:101038/nm1306
C. Fu et al. (2015) J. Am. Chem. Soc. 137, 7692−7705. doi: 10.1021/jacs.5b01794
R. Süssmuth, J. Müller, H. von Döhren, I. Molnar Nat. Prod. Rep. 28, 99-125. doi: 10.1039/c001463j

Acyldepsipeptide ADEP 2	AMP-080
	
Purity	500 µg / 1 mg
≥ 95 %	720 € / 1.290 €

Acyldepsipeptide ADEP 4	AMP-082
	
Purity	500 µg / 1 mg
≥ 95 %	720 € / 1.290 €

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4. Abbreviations

Code	Residue of
Abu	2-aminobutyric acid
Ac	acetic acid
Aca	ε-aminocaproic acid (6-aminohexanoic acid)
AMC	antimicrobial compound
AMP	antimicrobial peptide
APC	antigen presenting cell
APP	amyloid precursor protein APP
BAP	bioactive peptides
Biot	biotin
CF	5(6)-Carboxyfluorescein
Cy5	Cyanine5
Dhc	S-(2,3-dihydroxypropyl)-*(R)*-cysteine
ESI-MS	electrospray mass spectrometry
FSL	fibroblast-stimulating lipopeptide
HCl	hydrochloric acid
HPLC	high-performance liquid chromatography
MAGE	melanoma-associated antigen
MALP	monocyte activating lipopeptide
MBP	myelin basic protein
MHC	major histocompatibility complex
MOG	myelin oligodendrocyte glycoprotein
OVA	ovalbumin
Pam	palmitic acid (hexadecanoic acid)
Pam_3Cys	N-Palmitoyl-S-[2,3-bis(palmitoyloxy)-(2*RS*)-propyl]-*(R)*-cysteine
Pam_2Cys	S-[2,3-bis(palmitoyloxy)-(2*RS*)-propyl]-*(R)*-cysteine
PLP	myelin proteolipid protein
RP (HPLC)	reversed-phase HPLC
TFA	trifluoroacetic acid
TLR	Toll-like receptor research

Amino acids according to one-letter code; upper case: L-amino acids, lower case: D-amino acids

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5. General information

5.1 Contact information

Mail : EMC microcollections GmbH
Ernst-Simon-Str. 11
D-72072 Tübingen
Germany
Phone: + 49-70 71-40 74-0
Email: sales@microcollections.de
Web: www.microcollections.de

5.2 Order information

We deliver directly to our customers all over the world. We will be glad to accept your purchase order or inquiry by

- e-mail
- online via our homepage
- traditional mail
- phone

To place an order, the following information is needed:

- Institution or company name
- Contact name
- Email address
- Shipping address
- Billing address
- Purchase order number (if available)
- FedEx account number (if available)
- VAT number (for EU customers)
- Product name and catalogue number
- Size, quantity and price of the product

Order forms are provided on our homepage.

5.3 Pricing and quotations

All prices are in Euro, exclusive VAT and delivery costs, and are subject to change without notice.

Prices do not include shipping and handling charges, shipping insurance, any fees, duties or taxes.

5.4 Payment options

Payments are to be made in Euro.

EMC will accept payment by check and bank transfer.

All payments are due within 20 days of the invoice date.

5.5 Shipping information

Products are usually shipped by post (air mail) or parcel service. If the customer has a FedEx account, the account number should be provided with the purchase order. In this case we add handling charges of 10.00 Euro to the product invoice. If the customer does not provide a FedEx account number, shipping costs will be added to the product invoice. The shipping costs depend on the destination.

5.6 Delivery times

Products in stock:

Shipment usually takes place latest within one week after receiving a purchase order with all the needed information.

Products not in stock:

In response to a request for a product not in stock, the customer will be informed of the availability and the expected delivery time.

6. Catalogue number index

Product code	Description	Unit [mg]	Price [EUR] excl. VAT
Tools for Toll-like receptor research, adjuvants			
L2000	Pam_3Cys-SKKKK	1	180
		2	265
		5	520
L2000s	Pam_3Cys-SKKKK sterilised by β-irradiation	1	265
L2001	Dhc-SKKKK	1	235
L2002	SKKKK	1	235
L2003	Dhc-GDPKHPKSF	1	265
L2004	GDPKHPKSF	1	265
L2010	Pam-Dhc-SKKKK	1	235
L2011	PamCSKKKK	1	235
L2012	Pam-Dhc-GDPKHPKSF	1	390
L2013	PamCGDPKHPKSF	1	390
L2020	Pam_2Cys-SKKKK	0.1	145
		1	390
L20201	*R*-Pam_2Cys-SKKKK *(RR)*	0.1	265
		5 x 0.1	785
L20202	*S*-Pam_2Cys-SKKKK *(RS)*	0.1	265
		5 x 0.1	785
L2021	PamCys(Pam)-SKKKK	0.1	265
		5 x 0.1	785
L20213	Pam_2Cys-SKKKK(Biotin-Aca-Aca)	0.1	265
		5 x 0.1	785
L20214	Pam_2Cys-SKKKK(Fluorescein-Aca-Aca)	0.1	265
		5 x 0.1	785
L20215	Pam_2Cys-SKKKK(Rhodamine-Aca-Aca)	0.1	265
		5 x 0.1	785
L20229	Pam_2Cys-SKKKK-FLAG-tag	0.1	265
		5 x 0.1	785
L2031	Pam_3Cys-SKKKK(Biotin-Aca-Aca)	0.1	265
		5 x 0.1	785
L2032	PHC-SKKKK	1	235
L2034	Pam_3Cys-SKKKK(Fluorescein-Aca-Aca)	0.1	265
		5 x 0.1	785
L2035	Pam_3Cys-SKKKK(Rhodamine-Aca-Aca)	0.1	265
		5 x 0.1	785
L2048	*R*-Pam_3Cys-SKKKK	0.1	265
		5 x 0.1	785
L2064	Pam_3Cys-SKKKK-FLAG-tag	0.1	265
		5 x 0.1	785
L2070	Lipobiotin	1	300
L2075	Pam_3Cys-SKKKK(Cy5)	0.1	295
		5 x 0.1	875
L4000	Lipopeptide Adjuvant	1.5	235
		5 x 1.5	715

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Product code	Description	Unit [mg]	Price [EUR] excl. VAT
L6050	MALP-2-DI	0.1	445
L6060	R-MALP-2-DI	0.1	590
L6055	MALP-2-Cy5	0.1	595
L7000	FSL-1	0.1 1	180 545
L7022	*R*-FSL-1	0.1 5 x 0.1	265 785
L7030	FSL-1-Biotin	0.1 5 x 0.1	265 785
L7031	FSL-1-Fluorescein	0.1 5 x 0.1	265 785
L7032	FSL-1-Rhodamine	0.1 5 x 0.1	265 785
L7040	FSL-1-FLAG-tag	0.1 5 x 0.1	265 785
L7055	FSL-1-Cy5	0.1 5 x 0.1	295 875
GMDP	GMDP, N-acetyl-D-glucosaminyl-(β1,4)-N-acetylmuramyl-L-alanyl-D-isoglutamine	1	360

Synthetic lipopeptides derived from bacterial lipoproteins (for larger amounts please inquire)			
bLP001	Pam_3Cys-SSNAKIDQLSSDVQT from *E.coli* major outer membrane lipoprotein	0.1	265
bLP002	Pam_3Cys-SSNKSTTGSGETTTA from *Mycobacterium tuberculosis* 19 kDa lipoprotein antigen	0.1	265
bLP003	Pam_3Cys-SSGNKSAPSSSASSS from *Mycobacterium avium* 19 kDa lipoprotein antigen	0.1	265
bLP BB OspA	Pam_3Cys-KQNVSSLDEKNSVSV from *Borrelia burgdorferi* OspA	0.1	265
bLP BB OspC	Pam_3Cys-NNSGKDGNTSANSAD from *Borrelia burgdorferi* OspC	0.1	265
bLP BH 3	Pam_3Cys-NNGGPELKSDEVAKS from *Borrelia hermsii* outer membrane lipoprotein 3	0.1	265
bLP HI P4	Pam_3Cys-GSHQMKSEGHANMQL from *Haemophilus influenzae* outer membrane protein P4	0.1	265
bLP HI P6	Pam_3Cys-SSSNNDAAGNGAAQT from *Haemophilus influenzae* outer membrane protein P6	0.1	265
bLP MPT83	Pam_3Cys-SSTKPVSQDTSPKPA from *Mycobacterium tuberculosi:* cell surface lipoprotein MPT83	0.1	265
bLP MT P27	Pam_3Cys-SSGSKPSGGPLPDAK from *Mycobacterium tuberculosis* lipoprotein lprG (27 kDa lipoprotein)	0.1	265
bLP NG H.8	Pam_3Cys-SQEPAAPAAEATPAG from *Neisseria gonorrhoeae* H.8 outer membrane protein	0.1	265
bLP SP amiA	Pam_3Cys-SSSKSSDSSAPKAYG from *Streptococcus pneumoniae* oligopeptide-binding protein amiA	0.1	265
L8020	Pam_3Cys-AQEKEAKSELDYDQTKKM from *Bacillus cereus* spore germination protein D GerD	0.1	265

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Product code	Description	Unit [mg]		Price [EUR] excl. VAT
Bioactive Peptides				
BAP-010	Amyloid-β (1-42) human: DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIGLMVGGVVIA	≥ 95%	1	540
BAP-012	Amyloid-β (1-40) human: DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIGLMVGGVV	≥ 95%	1	215
BAP-013	Amyloid-β (1-40) human HCl salt: DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIGLMVGGVV	≥ 95%	1	360
BAP-022	Control peptide amyloid-β (40-1) human: VVGGVMLGIIAGKNSGVDEAFFVLKQHHVEYGSDHRFEAD	≥ 95%	1	215
			5	935
BAP-031	Biotinylated amyloid-β (1-40) human: Biotin-Aca-Aca-DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIGLMVGGVV	≥ 95%	1	415
			5	1.670
BAP-041	KLVFF	≥ 70%	5	145
		≥ 95%	1	145
			5	580
BAP-042	Ac-KLVFF-NH_2	≥ 70%	5	145
		≥ 95%	1	145
			5	580
BAP-043	RIIGL	≥ 70%	5	145
		≥ 95%	1	145
			5	580
BAP-044	DWGKGGRWRLWPGASGKTEA	≥ 70%	5	185
		≥ 95%	1	145
			5	415
BAP-045	PGRSPFTGKKLFNQEFSQDQ	≥ 70%	5	185
		≥ 95%	1	145
			5	415
BAP-046	qshyrhispaqv (D-amino acids)	≥ 95%	1	185
			5	545
BAP-047	FYLKVPSSLHHHHGRDKLVFFHHHH	≥ 70%	5	185
		≥ 95%	1	185
			5	545
BAP-048	NYSKMIFSHHHH	≥ 70%	5	145
		≥ 95%	1	145
			5	415
BAP-049	HNHKLVFFHHQH	≥ 70%	5	145
		≥ 95%	1	145
			5	415
BAP-101	MOG (35-55) rat/mouse: MEVGWYRSPFSRVVHLYRNGK	≥ 70%	5	200
		≥ 95%	1	145
			5	420

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Product code	Description	Unit [mg]		Price [EUR] excl. VAT
BAP-102	MOG (35-55) human: MEVGWYRPPFSRVVHLYRNGK	≥ 70%	5	200
		≥ 95%	1	145
			5	420
BAP-103	MOG (92-106): DEGGYTCFFRDHSYQ	≥ 70%	5	185
		≥ 95%	1	185
BAP-104	MOG (97-108): TCFFRDHSYQEE	≥ 70%	5	185
		≥ 95%	1	145
			5	420
BAP-106	MOG (183-191): FVIVPVLGP	≥ 70%	5	185
		≥ 95%	1	145
BAP-107	MOG (91-108): SDEGGYTCFFRDHSYQEE	≥ 70%	5	185
		≥ 95%	1	145
			5	420
BAP-110	MBP (1-11) human: Ac-ASQKRPSQRHG	≥ 70%	5	185
		≥ 95%	1	145
			5	420
BAP-111	MBP (54-72) human: SHHAARTTHYGSLPQKSQR	≥ 70%	5	185
		≥ 95%	1	145
			5	420
BAP-120	PLP (139-151): HCLGKWLGHPDKF	≥ 70%	5	185
		≥ 95%	1	145
			5	420
BAP-121	PLP (178-191): NTWTTCQSIAFPSK	≥ 70%	5	185
		≥ 95%	1	145
BAP-201	Ova (257-264): SIINFEKL	≥ 70%	5	145
		≥ 95%	5	215
BAP-202	Influenza A NP (366 – 374): ASNENMETM	≥ 70%	5	145
		≥ 95%	5	290
BAP-203	Influenza A matrix protein (58-66): GILGFVFTL	≥ 70%	5	185
		≥ 95%	1	185
			5	290
BAP-204	HIV-1 p17 Gag (77-85): SLYNTVATL	≥ 70%	5	145
		≥ 95%	1	145
			5	215
BAP-205	HCV-NS5b: ALYDVVSKL	≥ 70%	5	145
		≥ 95%	1	145
			5	215
BAP-206	LCMV GP (33-41): KAVYNFATM	≥ 70%	5	145
		≥ 95%	5	215
BAP-208	MAGE-3 antigen (271-279): FLWGPRALV	≥ 70%	5	145
		≥ 95%	5	215
BAP-209	Melan-A / MART-1 (26-35): EAAGIGILTV	≥ 70%	5	145
		≥ 95%	5	290
BAP-250	Ova (323-339): ISQAVHAAHAEINEAGR	≥ 70%	5	145
		≥ 95%	1	145
			5	215

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Product code	Description	Unit [mg]	Price [EUR] excl. VAT
BAP-251	PADRE: AKFVAAWTLKAAA	≥ 70% 5	185
		≥ 95% 1	185
		5	420
BAP-253	LCMV GP (64-80): GPDIYKGVYQFKSVEFD	≥ 70% 5	185
		≥ 95% 1	185
		5	290
BAP-301	Arg_9: RRRRRRRRR	≥ 70% 5	145
		≥ 95% 1	145
		5	215
BAP-301a	Arg_9: RRRRRRRRR-NH_2	≥ 70% 5	145
		≥ 95% 1	145
		5	215
BAP-302	D-Arg_9 (r_9): rrrrrrrrr	≥ 70% 5	265
		≥ 95% 1	265
		5	420
BAP-303	TAT (47-57): YGRKKRRQRRR-NH_2	≥ 70% 5	145
		≥ 95% 1	145
		5	215
BAP-304	D-TAT (47-57): ygrkkrrqrrr-NH_2	≥ 70% 5	265
		≥ 95% 1	265
		5	420
BAP-305	TAT (48-60): GRKKRRQRRRPPQ	≥ 70% 5	145
		≥ 95% 1	145
		5	215
BAP-306	Antennapedia (43-58) (penetratin): RQIKIWFQNRRMKWKK	≥ 70% 5	145
		≥ 95% 1	145
		5	215
BAP-307	CyLoP-1: CRWRWKCCKK	≥ 70% 5	145
		≥ 95% 1	145
		5	215
BAP-308	Transportan 10 (TP10) AGYLLGKINLKALAALAKKIL	≥ 70% 5	215
		≥ 95% 1	145
		5	385
BAP-309	MAP (KLAL) KLALKLALKALKAALKLA	≥ 70% 5	245
		≥ 95% 1	145
		5	360
BAP-311	hLF KCFQWQRNMRKVRGPPVSCIKR-NH_2	≥ 70% 5	245
		≥ 95% 1	145
		5	385
BAP-312	Pep1 KETWWETWWTEWSQPKKRKV	≥ 70% 5	215
		≥ 95% 1	145
		5	385
BAP-301-CF	*CF*-Arg_9: *5(6)-CF*-RRRRRRRRR	≥ 95% 1	360
BAP-303-CF	*CF*-TAT (47-57): *5(6)-CF*-YGRKKRRQRRR-NH_2	≥ 95% 1	360

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Product code	Description	Unit [mg]		Price [EUR] excl. VAT
Microbial and anti-microbial peptides (AMPs, MPs)				
AMP-001	α-Defensin 5 human: ATCYCRHGRCATRESLSGVCEISGRLYRLCCR Disulfide bridges : 3 – 31, 5 – 20, 10 – 30	≥ 95%	0.1	215
			1	870
AMP-010	Histatin 5: DSHAKRHHGYKRKFHEKHHSHRGY	≥ 70%	5	215
		≥ 95%	1	215
			5	635
AMP-020	Indolicidin: ILPWKWPWWPWRR-NH_2	≥ 70%	5	215
		≥ 95%	1	215
			5	635
AMP-030	LL-37 human: LLGDFFRKSKEKIGKEFKRIVQRIKDFLRNLVPRTES	≥ 70%	5	275
		≥ 95%	1	275
			5	810
AMP-040	Magainin-1: GIGKFLHSAGKFGKAFVGEIMKS	≥ 70%	5	215
		≥ 95%	1	215
			5	635
AMP-050	Pep27: MRKEFHNVLSSGQLLADKRPARDYNRK	≥ 70%	5	215
		≥ 95%	1	215
			5	635
AMP-057	Dermcidin SSL25 SSLLEKGLDGAKKAVGGLGKLGKDA	≥ 95%	1	215
			5	635
AMP-060	Alamethicin F30: Ac-Aib-Pro-Aib-Ala-Aib-Ala-Gln-Aib-Val-Aib-Gly-Leu-Aib-Pro-Val-Aib-Aib-Glu-Gln-Pheol (Pheol = Phenylalaninol)	≥ 70%	1	145
			5	215
		≥ 95%	1	185
			5	360
AMP-061	Alamethicin F50: Ac-Aib-Pro-Aib-Ala-Aib-Ala-Gln-Aib-Val-Aib-Gly-Leu-Aib-Pro-Val-Aib-Aib-Gln-Gln-Pheol (Pheol = Phenylalaninol)	≥ 70%	1	145
			5	215
		≥ 95%	1	185
			5	360
AMP-065	Omphalotin A: c[Trp-MeVal-Ile-MeVal-MeVal-Sar-MeVal-MeIle-Sar-Val-MeIle-Sar]	≥ 70%	1	220
			5	655
AMP-070	Gallidermin	≥ 85%	1	145
			5	290
AMP-075	Nonactin	≥ 85%	1	145
			5	235
AMP-080	ADEP 2	≥ 90%	0.5	720
			1	1.290
AMP-082	ADEP 4	≥ 90%	0.5	720
			1	1.290
AMP-100	Ezrin Peptide TEKKRRETVEREKE	≥ 95%	2	180

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7. General terms and conditions

The following terms and conditions shall exclusively apply to all sales and shall be an integral part of each single agreement concluded between the parties. Verbal agreements are only valid if confirmed in writing. By placing an order the Buyer acknowledges our terms and conditions. Other conditions require our previous consent in writing.

Offers and orders

Our offers are subject to change without prior notice with respect to price, quantity, delivery time and availability. The Buyer's orders shall become binding for EMC upon receipt by the Buyers of EMC's written order acknowledgment (or invoice or delivery note).

Statements and any details in advertising materials shall not constitute any kind of warranty.

Any information, statements or representations, written or oral, by EMC's employees, agents or representatives are not binding unless confirmed in writing on our business paper signed by a duly authorized officer. EMC reserves the right to insist on a written order and/or references from the Buyer before proceeding the order. There is no minimum order value.

Prices

All prices of this price list are net prices in Euro (EUR / €) except if otherwise indicated. Our prices are exclusive of VAT. Goods are charged with the prices valid on the date of delivery. Payment in other currency requires a written quotation in the foreign currency.

Any tax, duty or charge imposed by governmental authority or otherwise and any other applicable taxes, duties or charges shall be charged to the Buyer's account.

Freight and packing charges will be added, they can be invoiced as a lump-sum charge.

Delivery / transfer of perils

Unless otherwise agreed by the Buyer and EMC, the price shall be for delivery ex factory, packing excluded.

From the time of delivery the goods shall be at the risk of the Buyer. We are not liable for damage or loss during transportation. Except when explicitly specified by the Buyer we will decide on the appropriate type of transportation. If the type of transportation is specified, the Buyer has to bear any additional costs. The same shall apply in the case of raised transportation costs, additional expenses incurred by deviation, storage, tec. unless freight free delivery was explicitly agreed upon, after signing the agreement but before delivery.

Date of delivery / force majeure

EMC intends to ship the goods within 7 working days from receipt of order, if possible within 28 days. There shall be no fixed period of delivery. Notwithstanding the preceding paragraph, if a fixed period for delivery has been agreed upon, and should EMC default with the supply, the Buyer shall grant EMC a reasonable respite, normally four weeks. If EMC is unable to meet Buyers written delivery conditions, or a 28 day delivery, EMC will inform the Buyer at the earliest opportunity. Delivery shall be subject to punctual delivery of the appropriate goods by EMC's own suppliers. The day of delivery shall be the day on which the goods leave EMC's plant or, if that day cannot be ascertained, the day on which the goods are put at the Buyer's disposal.

Force Majeure and unforeseeable hindrances of any kind beyond the control of EMC (e.g. shortage of raw materials and supplies, Force Majeure) shall relieve the party from its obligation to supply as long as and to the extent that the hindrance prevails.

If unforeseeable hindrances of any kind beyond the control of EMC occur (e.g. shortage of raw materials, force majeure) delivery period shall be extended as long as and to the extent that the hindrance prevails.

If delivery is delayed due to the above reasons the Buyer cannot claim any rights.

Terms of payment

Terms for customers with an open account are 20 days from invoice date unless otherwise agreed in writing. Other terms of payment require our previous written consent. For unpaid invoices 20 days beyond maturity we will charge interest on arrears amounting to the usual bank rate, at least 3 % per annum exceeding the base rate of the European Central Bank. Delayed payment or irregular payments entitle us to discontinue delivery to the Buyer without any compensation. Instead of the agreed terms of payment we can ask for advance payment or security deposit, should doubts as to the solvency of a Buyer arise. In case of liquidation of the Buyer's company, or if EMC learns about an oath of manifestation or a change of ownership due to financial difficulties we reserve the right to withdraw from the contract. We reserve the right to use incoming payments for liquidation of the oldest debts, in sequence as follows: costs, interests and then debt claims. Prepayments and advance payments must be paid plus VAT.

Intellectual property rights / patents

No warranty or representation is given by EMC that the Products do not infringe any letters patent, trademarks, registered designs or other industrial rights. The Buyer is liable for his infringements of copyrights and industrial or intellectual properties, especially patents and trademarks.

If products are custom-made to specification, the Buyer assumes the responsibility that the manufacture of these products does not infringe any patents or rights of a third party. The Buyer is liable for all damages and claims resulting from such infringement and hold the seller free and harmless from all claims.

The Buyer further warrants to EMC that any use of the Products in the United States of America shall not result in the Products becoming adulterated or misbranded within the meaning of the Federal Food, Drug and Cosmetic Act (or such equivalent legislation in force in the Buyer's jurisdiction) and shall not be materials which may not, under sections 404, 505 or 512 of the Act, be introduced into interstate commerce.

Retention of title

Title of the goods shall not pass to the Buyer until he has fulfilled all liabilities arising from his business connection with EMC, which shall include settling accessory claims and claims for damages and honouring cheques and bills. In the event of non-payment, we shall have the right to re-sell the goods to a third party. EMC shall have the absolute authority to retake, sell or otherwise deal with or dispose of all or any part of the goods in which title remains vested in the seller. Until such time as the property in the goods passes to the Buyer, the Buyer shall hold the goods as the seller's fiduciary agent, and shall keep the goods properly stored, protected, and insured on his own costs.

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Damages

No claims for compensation may be lodged by the Buyer including those of a non-contractual nature – for any minor negligent breach of duty by EMC, his executive staff or other agents, unless such breach concerns damages resulting from death, injury or damage to health. However, this shall not affect the applicability of compelling statutory liability regulations.

Notifications of defects

All goods have to be checked immediately on receipt. Damage claims are only acceptable in writing within 8 working days of receipt of all the goods. In case of legitimate claims the Buyer can only require replacement of the goods. If replacement is not possible, the Buyer has the right to choose between alternative products with same value or refund. The Buyer cannot claim further compensation. All returns must first be authorized by us in writing.

Technical support, use and processing, properties of goods

Technical advice provided by EMC verbally, in writing or by way of trials is given in good faith but without warranty, and this shall also apply where proprietary rights of third parties are involved. EMC's technical advice shall not release the Buyer from the obligation to test the products supplied by EMC as to their suitability for the intended processes and uses. The application, use and processing of the products are beyond EMC's control and therefore entirely in the Buyer's responsibility.
Attention should be paid to the enclosed product descriptions, warnings and instruction leaflets.
Any arbitrary modification of the documents (e.g. instruction leaflets) and/or modification of the product is at your own risk.

Safety

At the Buyer's firm, all chemicals must be handled only by competent, suitably trained persons, familiar with laboratory procedures and potential chemical hazards. The burden of safe use of the Products of EMC vests in the Buyer. The Buyer assumes all responsibility for warning his employees, and any person who might reasonably be expected to come into contact with the Products, of all risks to person and property in any way connected with the Products and for instructing them in their safe handling and use. The Buyer also assumes the responsibility for the safe disposal of all products in accordance with all applicable laws.

Product quality, specifications and technical information

Products are sold in gross weight and are analysed in the laboratories of EMC by methods and procedures which EMC considers appropriate. In the event of any dispute concerning reported discrepancies arising from the Buyer's analytical results, determined by the Buyer's own analytical procedures, EMC reserves the right to rely on the results of own analytical methods of EMC. Certificates of Analysis or Certificates of Conformity are available at the discretion of EMC for bulk orders but not normally for pre-pack orders. EMC reserves the right to make a charge for such Certification.

Specifications may change and reasonable variation from any value listed should not form the basis of a dispute. Any supply by EMC of bespoke or custom Product for a Buyer shall be to a specification agreed by both parties in writing.

Technical information provided orally, in writing, or by electronic means by or on behalf of EMC, including any descriptions, references, illustrations or diagrams in any Catalogue or brochure, is provided for guidance purposes only and is subject to change.

Uses, warranties and liabilities

All products of EMC microcollections GmbH are not for any commercial use or resale. They are intended solely for laboratory research and development purposes and are not to be used for any other purpose. EMC microcollections GmbH offers no warranty regarding the fitness of any Product for a particular purpose and shall not be responsible for any loss or damage whatsoever arising there from.

The Buyer acknowledges that, since the products of EMC are intended for research purposes, they may not be on the Toxic Substances Control Act 1976 ("TSCA") inventory. The Buyer warrants that it shall ensure that the Products are approved for use under the TSCA (or such other equivalent legislation in force in the Buyer's jurisdiction), if applicable. The Buyer shall be responsible for complying with any legislation or regulations governing the use of the Products and their import into the country of destination (for the avoidance of doubt to include, without limitation, the TSCA and all its amendments, all EINECS, ELINCS and NONS regulations).

If any licence or consent of any government or other authority shall be required for the acquisition, carriage or use of the products by the Buyer the Buyer shall obtain the same at its own expense and if necessary produce evidence of the same to EMC on demand. Failure to do so shall not entitle the Buyer to withhold or delay payment. Any additional expenses or charges incurred by EMC resulting from such failure shall be for the Buyer's account.

Workings and syntheses are undertaken with all due care and attention. In case(s) of claims involving negligence, liability for such claims shall be limited to the total amount paid in respect of the invoice. In particular, liability cannot be accepted for results obtained with the product(s) or for loss of profits.

Applicable law and jurisdiction / miscellaneous clauses

All contracts are subject to the laws of the Federal Republic of Germany. In the case of a legal dispute the jurisdiction of the court in Tübingen (Germany) will be decisive and have exclusive jurisdiction. EMC shall have the right to bring a claim before a court at the Buyer's principal place of business or at his discretion before any other court being competent according to any national or international law.

Application of the Uniform Law on the International Sale of Goods and the Uniform Law on the Formation of Contracts for the International Sale of Goods and of the UN agreement on the sale of goods shall be excluded. Customary clauses shall be interpreted in accordance with the applicable Incoterms.

Even if it has been agreed that EMC pays the customs and import duties of the destination country, any increase in such duties which becomes effective between the date of the order acknowledgement and delivery of the goods shall be borne by the Buyer. All other charges, taxes and costs connected with the purchase contract shall also be borne by the Buyer.

In the event that any provision of these Terms and Conditions is invalid or becomes invalid, the remainder of the Terms and Conditions shall remain unaffected thereby. The invalid provision shall then be replaced by such provision as comes as close as possible to the economic purpose of such invalid provision, taking reasonable account of the interests of both Parties.

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