

Biochemicals Catalogue



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Additional services

Custom peptide synthesis service:

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Screening compound collections:

EMC has more than 30,000 highly diverse drug-like compounds in stock. All are produced in-house and are sold on a non exclusive basis. SD-file or a MDL[®] ISIS/Base data base are available on request.

Custom defined synthesis of small molecules:

EMC offers customer specific synthesis of drug-like compounds, methods development and feasibility studies for optimisation of lead structures.

All catalogue products are also available in large amounts.

Please inquire.

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 lipotriptide adjuvant Pam₃Cys-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 Pam₃Cys-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 Pam₃Cys-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.

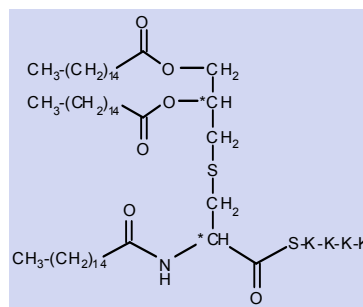


Figure 1: Structure of the water soluble lipopeptide Pam₃Cys-SK4K

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 Pam₃Cys-SK4K (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 Pam₃Cys-SK4K (*RR*-stereoisomer) or Pam₂Cys-SK4K (*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).

Check [TLR reference list](#)

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.

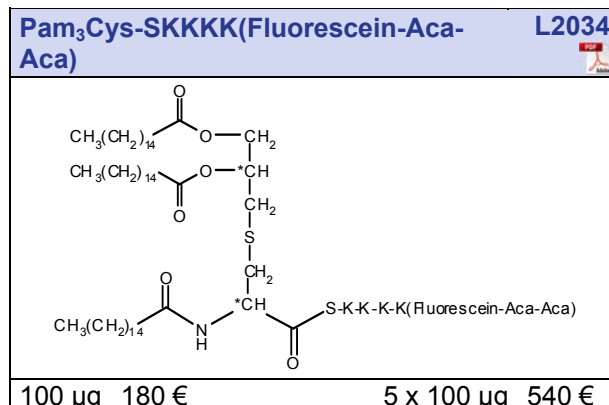
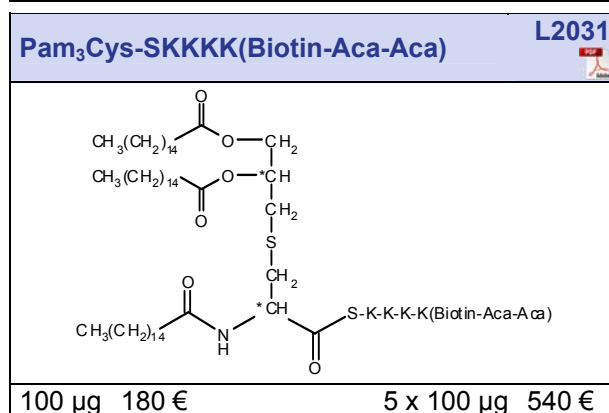
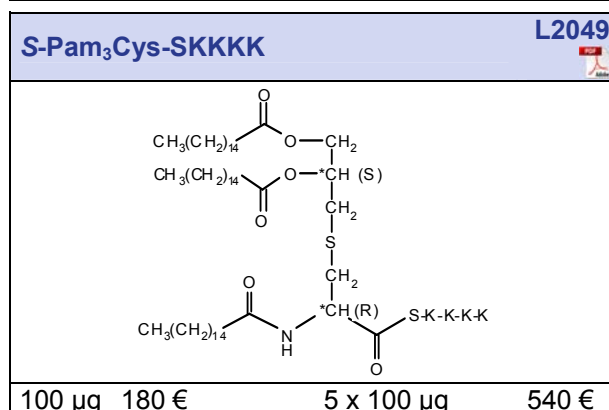
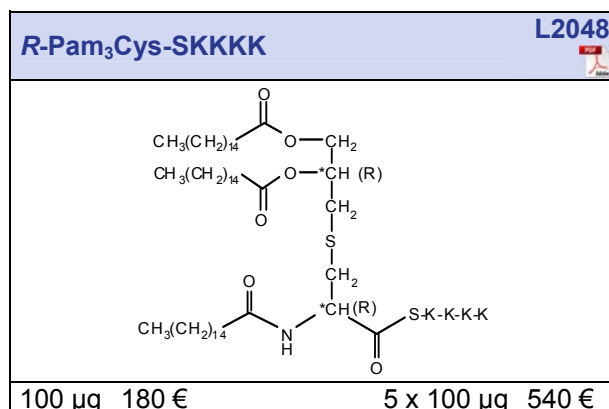
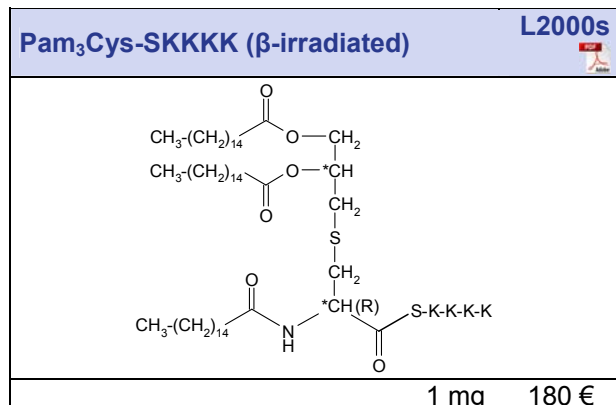
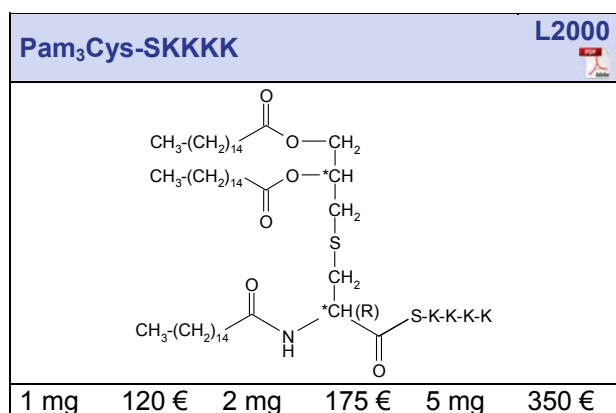
These triacylated lipopeptides are based on L-cysteine and are provided as lyophilised powders without any additives.

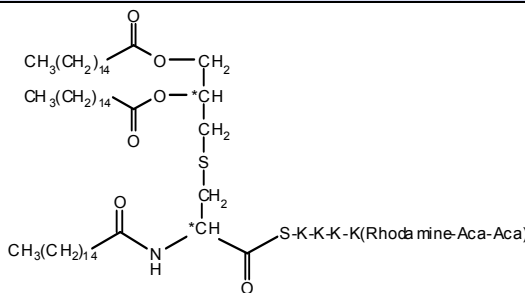
Pam₃Cys-SK₄KKK and analogues

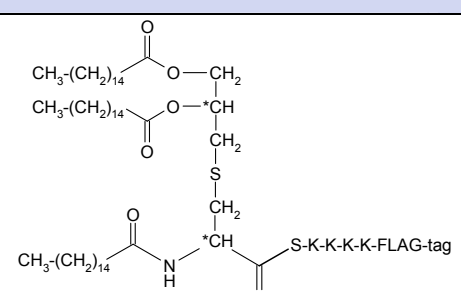
Pam₃Cys-SK₄KKK is the mostly used synthetic analogue of naturally occurring lipoproteins and often described in literature as reference compound for TLR2/1 activation.

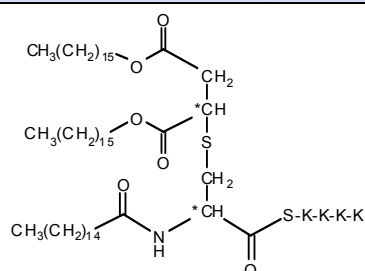
Pam₃Cys-SK₄KKK is provided as stereochemically defined compounds and as mixture of stereoisomers. Additionally, labelled analogues are available.

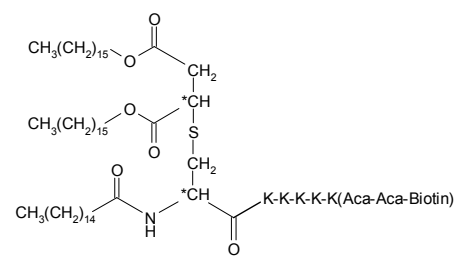
PHC-SK₄KKK is recommended as an appropriate negative control. This triacylated lipopeptide does not contain the dihydroxypropyl cysteine residue, which seems to be essential for the interaction with TLR1/2.



Pam₃Cys-SKKKK(Rhodamine-Aca-Aca)		L2035
		
100 µg	180 €	5 x 100 µg 540 €

Pam₃Cys-SKKKK-FLAG-tag		L2064
		
100 µg	180 €	5 x 100 µg 540 €

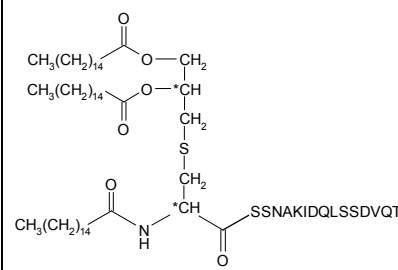
PHC-SKKKK		L2032
		
		1 mg 150 €

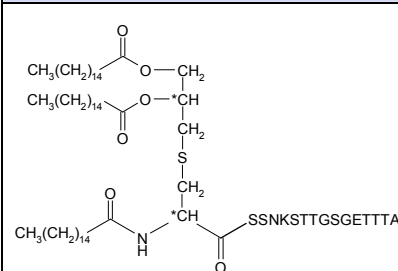
Lipobiotin		L2070
		
1 mg	180 €	10 mg 750 €

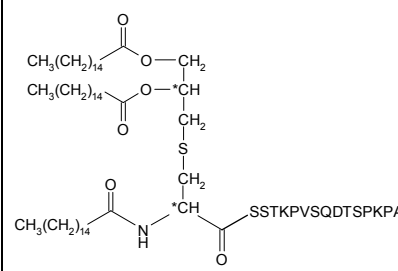
Synthetic lipopeptides derived from bacterial lipoproteins


The synthetic triacyl lipopeptides represent the N-terminal lipohexadecapeptides Pam₃Cys-AA₁₅ or lipononadecapeptide Pam₃Cys-AA₁₈ (product L8020) of bacterial lipoproteins. Names of lipoproteins and origin are indicated.

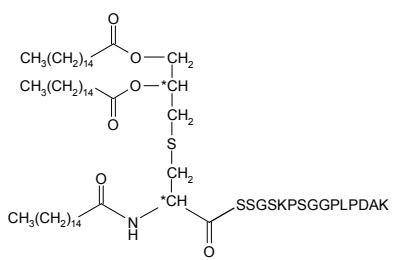
Additionally, customer defined lipopeptides are available on request.

Pam₃Cys-SSNAKIDQLSSDVQT		bLP001
		Synthetic lipopeptide derived from <i>Escherichia coli</i> (<i>E. coli</i>) major outer membrane lipoprotein
		1 mg 395 €

Pam₃Cys-SSNKSTTGSGETTGA		bLP002
		Synthetic lipopeptide derived from <i>Mycobacterium tuberculosis</i> 19 kDa lipoprotein antigen
		1 mg 395 €


Pam₃Cys-SSTKPVSQDTSPKPA		bLP MPT83
		Synthetic lipopeptide derived from <i>Mycobacterium tuberculosis</i> cell surface lipoprotein MPT83
		1 mg 395 €

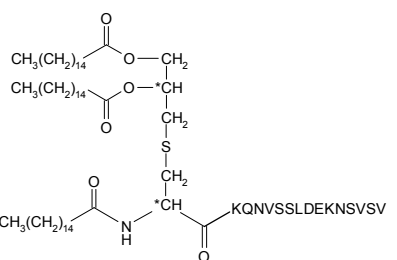
Pam₃Cys-SSGSKPSGGPLPDAK **bLP MT P27** 



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


1 mg 395 €

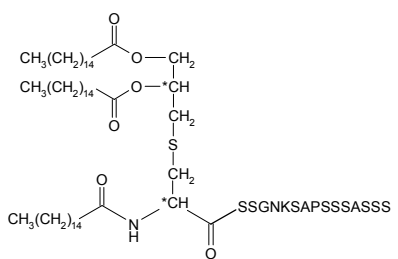
Pam₃Cys-KQNVSSLDEKNSVSV **bLP BB OspA** 



Synthetic lipopeptide derived from *Borrelia burgdorferi* OspA


1 mg 395 €

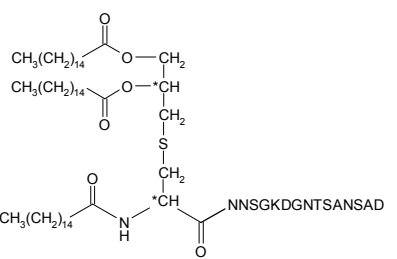
Pam₃Cys-SSGNKSAPSSSASSS **bLP003** 



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


1 mg 395 €

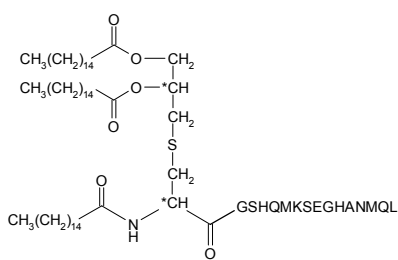
Pam₃Cys-NNSGKDGNTSANSAD **bLP BB OspC** 



Synthetic lipopeptide derived from *Borrelia burgdorferi* OspC


1 mg 395 €

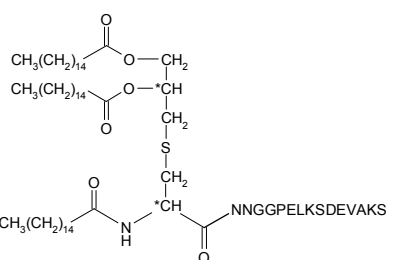
Pam₃Cys-GSHQMKSEGHANMQL **bLP HI P4** 



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


1 mg 395 €

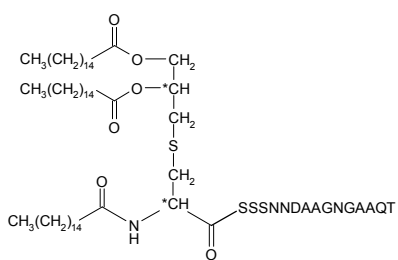
Pam₃Cys-NNGGPELKSDEVAKS **bLP BH 3** 



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


1 mg 395 €

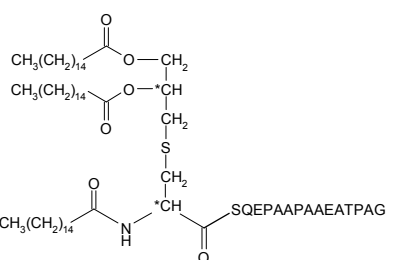
Pam₃Cys-SSSNDAAGNGAAQT **bLP HI P6** 



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

1 mg 395 €

Pam₃Cys-SQEPAAAPAAEATPAG **bLP NG H.8** 



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

1 mg 395 €

Pam₂Cys-SSSKSSDSSAPKAYG	bLP SP amiA
	<p>Synthetic lipopeptide derived from <i>Streptococcus pneumoniae</i> oligopeptide-binding protein amiA</p>
1 mg	395 €

Pam₂Cys-AQEKEAKSELDYDQTKKM	L8020
	<p>Synthetic lipopeptide derived from <i>Bacillus cereus</i> spore germination protein D GerD</p>
1 mg	395 €

Pam₂Cys-SK K K K	L2020
100 µg	95 €
1 mg	265 €

R-Pam₂Cys-SK K K K	L20201
100 µg	180 €
5 x 100 µg	540 €

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.

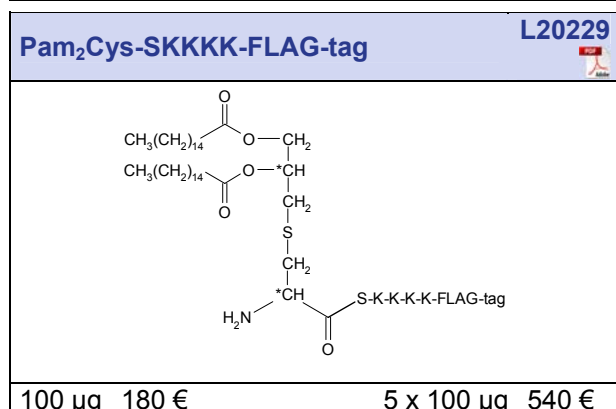
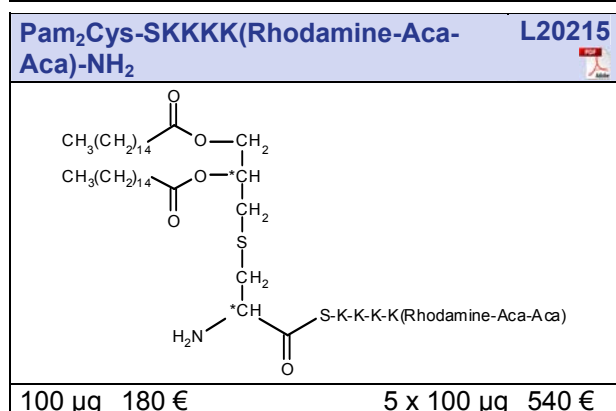
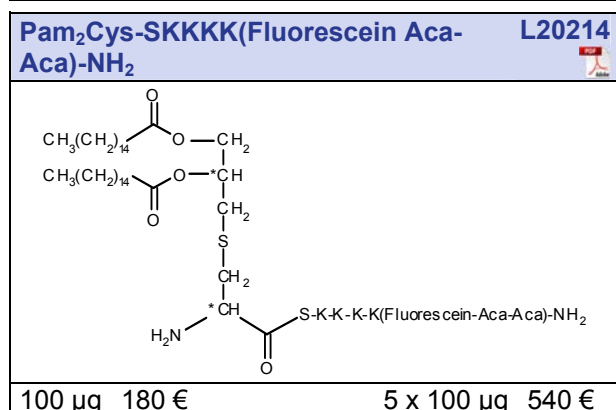
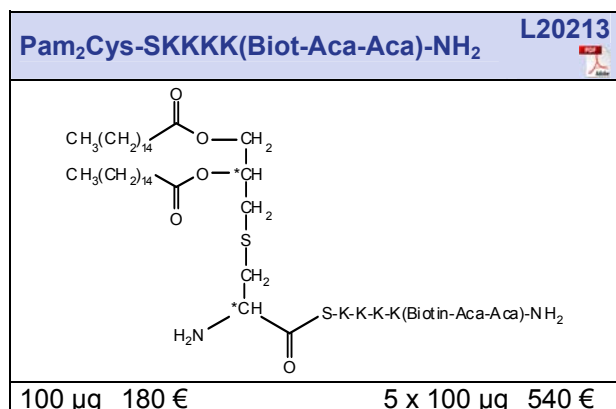
Pam₂Cys-SK K K K and analogues

Pam₂Cys-SK K K K 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 SK K K K, which is not derived from natural lipoproteins.

Pam₂Cys-SK K K K 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. Additionally, analogues with different labels are available.

S-Pam₂Cys-SK K K K	L20202
100 µg	180 €
5 x 100 µg	540 €

PamCys(Pam)-SK K K K	L2021
100 µg	180 €
5 x 100 µg	540 €



Improved MALP-2: MALP-2-DI

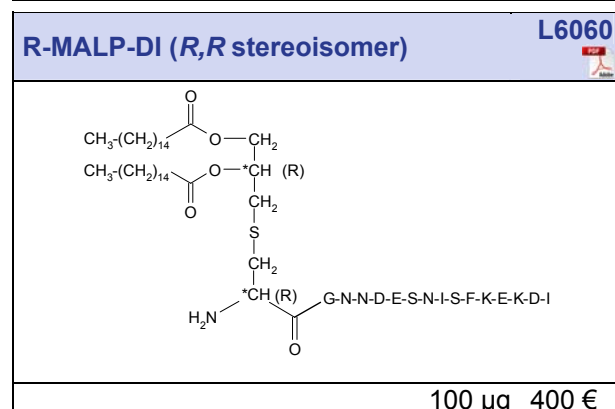
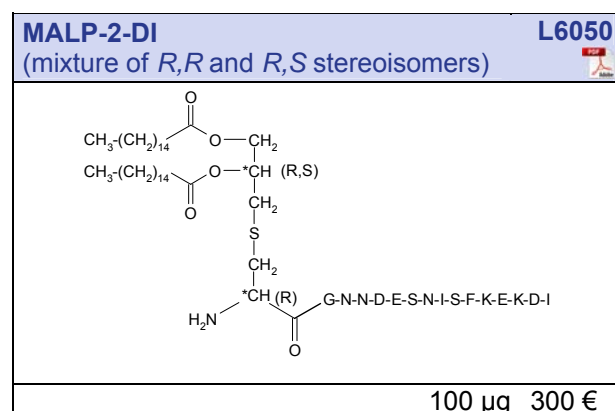
New

MALP-2-DI, Pam₂Cys-GNNDESNIKFKEKDI, represents the N-terminal sequence of the mature macrophage activating lipoprotein 404 originally isolated from *Mycoplasma fermentans*.

MALP-2, Pam₂Cys-GNNDESNIKFKEK and MALP-2-DI differ in the length of the natural amino acid sequence but not in the N-terminal lipoamino acid Pam₂Cys.

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.



FSL-1 and derivatives

FSL-1, Pam₂Cys-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 Pam₂Cys. 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 compounds and as mixture of stereoisomers. Lipopeptides with the S-dihydroxypropyl moiety are not active and therefore suitable as negative controls. Additionally, analogues with different labels or tags are available.

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

FSL-1		L7000
(mixture of <i>R,R</i> and <i>R,S</i> stereoisomers)		
1 mg		375 €

S-FSL-1 (<i>R,S</i> stereoisomer)		L7021
100 µg		180 €
5 x 100 µg		540 €

<i>R</i> -FSL-1 (<i>R,R</i> stereoisomer)		L7022
100 µg		180 €
5 x 100 µg		540 €

FSL-1-Biotin		L7030
100 µg		180 €
5 x 100 µg		540 €

FSL-1-Fluorescein		L7031
100 µg		180 €
5 x 100 µg		540 €

FSL-1-Rhodamine		L7032
100 µg		180 €
5 x 100 µg		540 €

FSL-1-FLAG-tag	L7040
100 µg 180 €	5 x 100 µg 540 €

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 Pam₃Cys-SK₄, Pam₂Cys-SK₄ 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.

Pam-Dhc-SK₄	L2010
1 mg	150 €

Pam-CSK₄	L2011
1 mg	150 €

SK₄	L2002
1 mg	150 €

GDPKHPKSF	L2004
1 mg	180 €

Dhc-SK₄	L2001
1 mg	150 €

Pam-Dhc-GDPKHPKSF	L2012
1 mg	265 €

Dhc-GDPKHPKSF	L2003
1 mg	180 €

Pam-CGDPKHPKSF	L2013
1 mg	265 €

CD14 (81-100)	P1014
Ac-QVPAQLLVGALRVLAYSRLK-NH ₂ <i>New</i>	
LPS binding peptide	
Purity	1 mg
≥ 95 %	320 €

2. Adjuvants

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

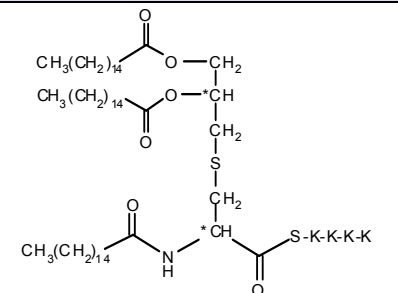
The adjuvant stimulates the immune system and enhances the antigen-specific immune response when used in combination with antigens. Without an adjuvant, usually only a poor immune response and low antibody titers are observed after immunisation.

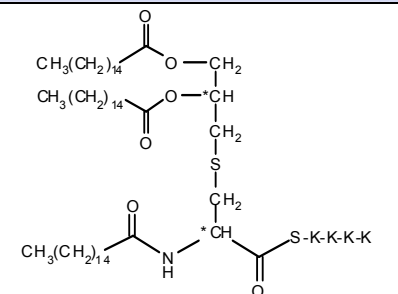
Effective immunisation and vaccination leads to the induction of antigen specific antibodies by B lymphocytes, and cytotoxic CD8⁺ T lymphocytes (CTL) that recognise and kill infected cells. The generation and maintenance of the B cell and CD8⁺ T cell responses is supported by growth factors and signals 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.

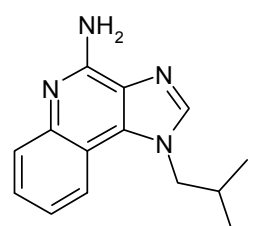
Toll-like receptors are key components of the innate immune system that detect microbial infection and trigger antimicrobial host defence responses. TLRs also control multiple dendritic cell functions and activate signals that are critically involved in the initiation of adaptive immune response. Promising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

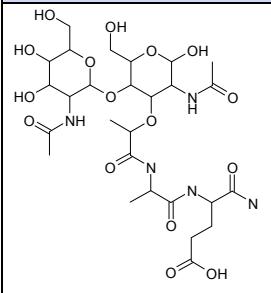
Lipoproteins and their synthetic analogues are known as strong enhancers of the immune system. Lipopeptide vaccinations have been carried out in all relevant animal models. So far, no toxic side effects have been observed (Wiedemann et al 1990, J. Pathology 164, 1–7). The efficacy of eight adjuvant formulations to prime cytotoxic T lymphocytes in mice was compared and the water soluble lipohexapeptide analogue of bacterial lipoproteins Pam₃Cys-SK₆, 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 ₃ Cys-SK ₆ admixed to lipoamino acid conjugate with T helper cell epitope of the sperm whale myoglobin (AA 106-121) FISEAIIHVLHSRHPG			
1.5 mg	150 €	5 x 1.5 mg	490 €

Pam ₃ Cys-SK ₆		L2000	
			
1 mg	120 €	2 mg	175 €
5 mg	350 €		

Pam ₃ Cys-SK ₆ (β-irradiated)		L2000s	
			
		1 mg	180 €

Imiquimod		IMI-001	
			
		5 mg	140 €

GMDP		GMDP	
			
		1 mg	250 €

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 (1-40) human	BAP-012	
		
DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIGLMVGGVV		
Purity	1 mg	5 mg
$\geq 95\%$	145 €	645 €

Amyloid-β (1-40) human HCl salt	BAP-013	
		
DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIGLMVGGVV		
Purity	1 mg	5 mg
$\geq 95\%$	240 €	950 €


Amyloid-β (1-40) rat	BAP-014	
		
DAEFGHDSGFEVRRHQLVFFAEDVGSNKGAIIGLMVGGVV		
Purity	1 mg	5 mg
$\geq 95\%$	145 €	645 €


Amyloid-β (1-40) rat HCl salt	BAP-015	
		
DAEFGHDSGFEVRRHQLVFFAEDVGSNKGAIIGLMVGGVV		
Purity	1 mg	5 mg
$\geq 95\%$	240 €	950 €

Aη 46-peptide	BAP-016	
		
ADSVPANTENEVEPVDARPAADRGLTTRPGSGLTNIKTEEISEVKM		
Purity	1 mg	5 mg
$\geq 95\%$	240 €	950 €

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	
		
VVGGMVLLGIIAGKNSGVDEAFFVLKQHHVEYGS DHRFEAD		
Purity	1 mg	5 mg
$\geq 95\%$	145 €	645 €


Control peptide amyloid-β (40-1) rat	BAP-023	
VVGGVMLGIIAGKNSGVDEAFFVLKQHRVEFGS DHGFEAD		
Purity	1 mg	5 mg
$\geq 95\%$	145 €	645 €

Biotinylated amyloid- β -peptides

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 peptides are 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- DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIG LMVGGVV		
Purity	1 mg	5 mg
$\geq 95\%$	285 €	1150 €


Biotinylated amyloid-β (1-40) rat	BAP-032	
Biotin-Aca-Aca- DAEFGHDSGFVRRHQKLVFFAEDVGSNKGAIIG LMVGGVV		
Purity	1 mg	5 mg
$\geq 95\%$	285 €	1150 €


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
$\geq 70\%$		95 €
$\geq 95\%$	95 €	125 €


Ac-KLVFF-NH₂	BAP-042	
Purity	1 mg	5 mg
$\geq 70\%$		95 €
$\geq 95\%$	95 €	125 €


RIIGL	BAP-043	
Purity	1 mg	5 mg
$\geq 70\%$		95 €
$\geq 95\%$	95 €	125 €


DWGKGGWRLWPGASGKTEA	BAP-044	
Purity	1 mg	5 mg
$\geq 70\%$		125 €
$\geq 95\%$	95 €	285 €

PGRSPFTGKKLFNQEFSDQDQ	BAP-045	
Purity	1 mg	5 mg
$\geq 70\%$		125 €
$\geq 95\%$	95 €	285 €

qshyrhispaqv (D-amino acids)	BAP-046	
Purity	1 mg	5 mg
$\geq 95\%$	125 €	375 €

FYLKVPSSLHHHHGRDKLVFFHHHH	BAP-047	
Purity	1 mg	5 mg
$\geq 70\%$		125 €
$\geq 95\%$	125 €	375 €

NYSKMIFSHHHH	BAP-048	
Purity	1 mg	5 mg
$\geq 70\%$		95 €
$\geq 95\%$	95 €	285 €

HNHKLVFFHHQH	BAP-049	
Purity	1 mg	5 mg
$\geq 70\%$		95 €
$\geq 95\%$	95 €	285 €

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:

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- 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.
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- 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 %		135 €
≥ 95 %	95 €	280 €


MOG (35-55) human		BAP-102
MEVGWYRPPFSRVVHLYRNGK		
Purity	1 mg	5 mg
≥ 70 %		135 €
≥ 95 %	95 €	280 €


MOG (92-106)		BAP-103
DEGGYTCFFRDHSYQ		
Purity	1 mg	5 mg
≥ 70 %		125 €
≥ 95 %	125 €	280 €


MOG (97-108)		BAP-104
TCFFRDHSYQEE		
Purity	1 mg	5 mg
≥ 70 %		125 €
≥ 95 %	95 €	280 €


MOG (183-191)		BAP-106
FVIVPVLGP		
Purity	1 mg	5 mg
≥ 70 %		125 €
≥ 95 %	95 €	280 €

MOG (91-108)		BAP-107
SDEGGYTCFFRDHSYQEE		
Purity	1 mg	5 mg
≥ 70 %		125 €
≥ 95 %	95 €	280 €

MBP (1-11) human		BAP-110	
Ac-ASQKRPSQRHG			
Purity	1 mg	5 mg	
≥ 70 %		125 €	
≥ 95 %	95 €	280 €	

MBP (54-72) human		BAP-111	
SHHAARTTHYGSLPQKSQR			
Purity	1 mg	5 mg	
≥ 70 %		125 €	
≥ 95 %	95 €	280 €	

PLP (139-151)		BAP-120	
HCLGKWLGHDPKF			
Purity	1 mg	5 mg	
≥ 70 %		125 €	
≥ 95 %	95 €	280 €	

PLP (178-191)		BAP-121	
NTWTTCQSIAPFSK			
Purity	1 mg	5 mg	
≥ 70 %		125 €	
≥ 95 %	95 €	280 €	

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).
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 K. Falk, O. Rötzschke, S. Stevanović, G. Jung, H.-G. Rammensee (1991) *Nature* 351, 290 – 296. doi:10.1038/351290a0.


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


Influenza A NP (366-374)		BAP-202	
ASNENMETM			
Purity		5 mg	
≥ 70 %		95 €	
≥ 95 %		195 €	


Influenza A matrix protein (58-66)		BAP-203	
GILGFVFTL			
Purity	1 mg	5 mg	
≥ 70 %		125 €	
≥ 95 %	125 €	195 €	

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

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

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

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

Melan-A / MART-1 (26 - 35)		BAP-209	
EAAGIGILTV			
Purity		5 mg	
≥ 70 %		95 €	
≥ 95 %		195 €	

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 %		95 €	
≥ 95 %	95 €	145 €	


PADRE		BAP-251	
AKFVAAWTLKAAA			
Purity	1 mg	5 mg	
≥ 70 %		125 €	
≥ 95 %	125 €	195 €	


LCMV GP (64-80)		BAP-253	
GPDYKGVYQFKSVEFD			
Purity	1 mg	5 mg	
≥ 70 %		125 €	
≥ 95 %	125 €	195 €	


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).


Arg₉ Arg₉-NH₂		BAP-301	
 BAP-301a			
RRRRRRRRR RRRRRRRRR-NH ₂			
Purity	1 mg	5 mg	
≥ 70 %		95 €	
≥ 95 %	95 €	145 €	


D-Arg₉ (r₉)		BAP-302	
			
rrrrrrrrr			
Purity	1 mg	5 mg	
≥ 70 %		180 €	
≥ 95 %	180 €	280 €	


TAT (47-57)		BAP-303	
			
YGRKKRRQRRR-NH ₂			
Purity	1 mg	5 mg	
≥ 70 %		95 €	
≥ 95 %	95 €	145 €	


D-TAT (47-57)		BAP-304	
			
ygrkkrrqrrr-NH ₂			
Purity	1 mg	5 mg	
≥ 70 %		180 €	
≥ 95 %	180 €	280 €	


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


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


CyLoP-1		BAP-307	
			
CRWRWKCKK			
Purity	1 mg	5 mg	
≥ 70 %		95 €	
≥ 95 %	95 €	145 €	

Transportan 10 (TP10)		BAP-308	
			
AGYLLGKINLKALAALAKKIL			
Purity	1 mg	5 mg	
≥ 70 %		145 €	
≥ 95 %	95 €	260 €	

MAP (KLAL)		BAP-309	
			
KLALKLALKALKKAALKLA			
Purity	1 mg	5 mg	
≥ 70 %		120 €	
≥ 95 %	95 €	240 €	

EB1		BAP-310	
			
LIRLWSHLIHIWFQNRRLKWKKK			
Purity	1 mg	5 mg	
≥ 70 %		145 €	
≥ 95 %	95 €	260 €	

hLF	BAP-311	
		
KCFQWQRNMRKVRGPPVSCIKR-NH ₂		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	95 €	260 €

Pep1	BAP-312	
		
KETWWETWWTEWSQPKKRKV		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	95 €	260 €


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 either 5(6)-carboxyfluorescein (CF) or Cy5. For CPPs with other fluorophores please inquire.


CPPs for conjugation to a cargo via click chemistry (azidopeptides or alkyne-modified peptides) or via disulfide formation (peptides with activated Cys(NPYS) (N-terminal) or cysteine) are also available. Please inquire.


For the synthesis of your **peptide conjugated to CPPs** please inquire.


Cy5-TAT (47-57)	BAP-303-Cy5	
		
Cy5-YGRKKRRQRRR-NH ₂		
Purity		1 mg
≥ 95 %		350 €


CF-TAT (48-60)	BAP-305-CF	
		
5(6)-CF-GRKKRRQRRRPPQ		
Purity		1 mg
≥ 95 %		250 €


Cy5-TAT (48-60)	BAP-305-Cy5	
		
Cy5-GRKKRRQRRRPPQ		
Purity		1 mg
≥ 95 %		350 €


CF-Arg₉	BAP-301-CF	
CF-Arg₉-NH₂	BAP-301a-CF	
		
5(6)-CF-RRRRRRRRR		
5(6)-CF-RRRRRRRRR-NH ₂		
Purity		1 mg
≥ 95 %		250 €

CF-Antennapedia (43-58)	BAP-306-CF	
(CF-penetratin)		
5(6)-CF-RQIKIWFQNRRMKWKK		
Purity		1 mg
≥ 95 %		250 €

Cy5-Arg₉	BAP-301-Cy5	
Cy5-Arg₉-NH₂	BAP-301a-Cy5	
		
Cy5-RRRRRRRRR		
Cy5-RRRRRRRRR-NH ₂		
Purity		1 mg
≥ 95 %		350 €

Cy5-Antennapedia (43-58)	BAP-306-Cy5	
(penetratin)		
Cy5-RQIKIWFQNRRMKWKK		
Purity		1 mg
≥ 95 %		350 €

CF-TAT (47-57)	BAP-303-CF	
		
5(6)-CF-YGRKKRRQRRR-NH ₂		
Purity		1 mg
≥ 95 %		250 €

CF-CyLoP-1	BAP-307-CF	
		
5(6)-CF-CRWRWKCKK		
Purity		1 mg
≥ 95 %		250 €

Cy5-CyLoP-1	BAP-307-Cy5
Cy5-CRWRWKCKK	
Purity	1 mg
≥ 95 %	350 €

CF-Transportan 10 (CF-TP10)	BAP-308-CF
5(6)-CF-AGYLLGKINLKALAALAKKIL	
Purity	1 mg
≥ 95 %	250 €

Cy5-Transportan 10 (Cy5-TP10)	BAP-308-Cy5
Cy5-AGYLLGKINLKALAALAKKIL	
Purity	1 mg
≥ 95 %	350 €

CF-MAP (KLAL)	BAP-309-CF
5(6)-CF-KLALKLALKALKKAALKLA	
Purity	1 mg
≥ 95 %	250 €

Cy5-MAP (KLAL)	BAP-309-Cy5
Cy5-KLALKLALKALKKAALKLA	
Purity	1 mg
≥ 95 %	350 €

CF-EB1	BAP-310-CF
5(6)-CF-LIRLWSHLIHIWFQNRRLKWKKK	
Purity	1 mg
≥ 95 %	250 €

Cy5-EB1	BAP-310-Cy5
Cy5-LIRLWSHLIHIWFQNRRLKWKKK	
Purity	1 mg
≥ 95 %	350 €

CF-hLF	BAP-311-CF
5(6)-CF-KCFQWQRNMRKVRGPPVSCIKNH ₂	
Purity	1 mg
≥ 95 %	250 €

Cy5-hLF	BAP-311-Cy5
Cy5-KCFQWQRNMRKVRGPPVSCIKNH ₂	
Purity	1 mg
≥ 95 %	350 €

CF-Pep1	BAP-312-CF
5(6)-CF-KETWWETWWTEWSQPKKRKV	
Purity	1 mg
≥ 95 %	250 €

Cy5-Pep1	BAP-312-Cy5
Cy5-KETWWETWWTEWSQPKKRKV	
Purity	1 mg
≥ 95 %	350 €

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	0.1 mg	1 mg
≥ 95 %	140 €	600 €

Histatin 5		AMP-010
DSHAKRHHGYKRKFHEKHSHRGY		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	435 €

Indolicidin		AMP-020
ILPWKWPWWPWR-NH ₂		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	435 €

LL-37 human		AMP-030
LLGDFFRKSKEKIGKEFKRIVQRIKDFLRNLPRTES		
Purity	1 mg	5 mg
≥ 70 %		185 €
≥ 95 %	185 €	555 €

Magainin-1		AMP-040
GIGKFLHSAGKFGKAFVGEIMKS		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	435 €

Pep27		AMP-050
MRKEFHNVLSGQLLADKRPARDYNRK		
Purity	1 mg	5 mg
≥ 70 %		145 €
≥ 95 %	145 €	435 €

Dermcidin DCD-1L		AMP-055
SSLLEKGLDGAKKAVGGLGKLGKDAVEDLESV GKGAVHDVKDVLDSVL		
Purity	1 mg	5 mg
≥ 95 %	290 €	865 €

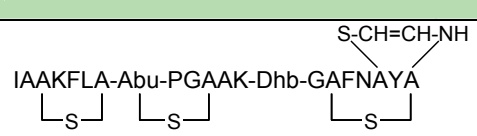
Dermcidin DCD-1		AMP-056
SSLLEKGLDGAKKAVGGLGKLGKDAVEDLESV GKGAVHDVKDVLDSV		
Purity	1 mg	5 mg
≥ 95 %	290 €	865 €

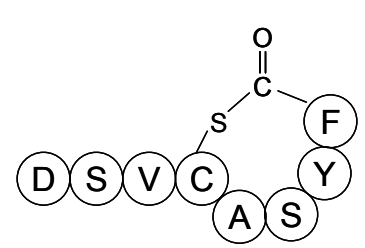
Dermcidin SSL25		AMP-057
SSLLEKGLDGAKKAVGGLGKLGKDA		
Purity	1 mg	5 mg
≥ 95 %	145 €	435 €

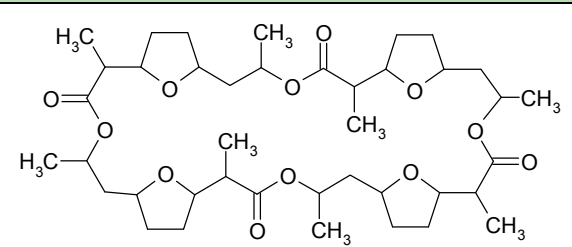
Alamethicin F30		AMP-060
Ac-Aib-Pro-Aib-Ala-Aib-Ala-Gln-Aib-Val-Aib-Gly-Leu-Aib-Pro-Val-Aib-Aib-Glu-Gln-Pheol (Pheol = Phenylalaninol)		
Purity	1 mg	5 mg
≥ 70 %	95 €	145 €
≥ 95 %	95 €	250 €

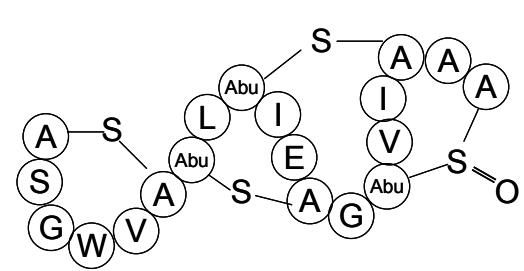
Alamethicin F50		AMP-061
Ac-Aib-Pro-Aib-Ala-Aib-Ala-Gln-Aib-Val-Aib-Gly-Leu-Aib-Pro-Val-Aib-Aib-Gln-Gln-Pheol (Pheol = Phenylalaninol)		
Purity	1 mg	5 mg
≥ 70 %	95 €	145 €
≥ 95 %	95 €	250 €

Omphalotin A		AMP-065
c[Trp-MeVal-Ile-MeVal-MeVal-Sar-MeVal-Melle-Sar-Val-Melle-Sar]		
Purity	1 mg	5 mg
≥ 70 %	150 €	450 €
≥ 95 %	210 €	630 €

Gallidermin		AMP-070
		
(A-S-A: lanthionine, Abu-S-A: 3-methylanthionine)		
Purity	1 mg	5 mg
≥ 85 %	95 €	195 €

S. epidermidis Pheromone Peptide		MP-010
		
Purity	0,5 mg	1 mg
≥ 95 %	550 €	980 €

Nonactin		AMP-075
		
Purity	1 mg	5 mg
≥ 85 %	95 €	155 €

Actagardin		AMP-090
		
Purity	1 mg	5 mg
≥ 85 %	225 €	790 €

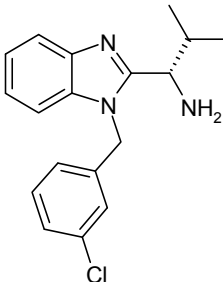
4. Antimicrobial compounds (AMCs)

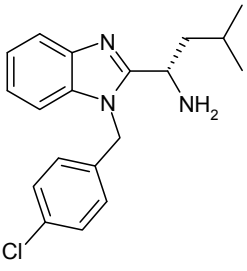
An important concern in health care, especially in clinical practice, is the rapidly growing number of resistant strains, resulting in a demand for novel anti-infectives.

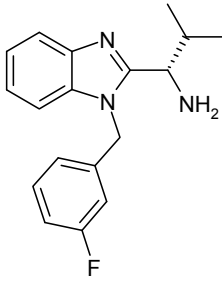
The antimicrobial compounds contain novel, non-cytotoxic benzimidazoles which have been shown to be effective against clinical relevant *Candida* species. The antifungal potency against fluconazole resistant strains of *Candida* makes them a reasonable supplement for antifungal screening and an important tool in antifungal research.

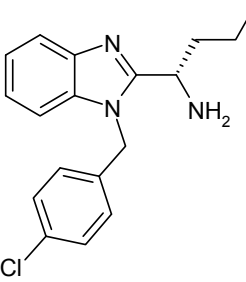
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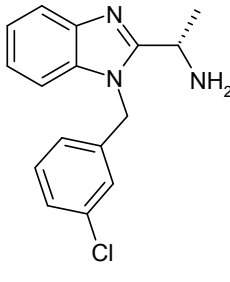
A. Burger-Kentischer et al. (2011) Antimicrob. Agents Chemother. 55, 4789-4801.
 J. Bauer et al. (2011) J. Med. Chem. doi: 10.1021/jm200571e.

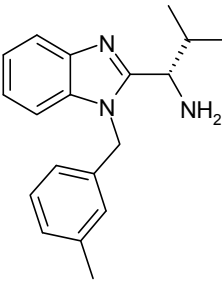
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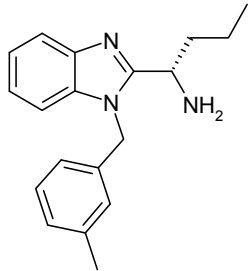
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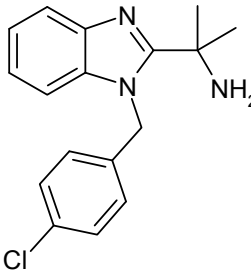
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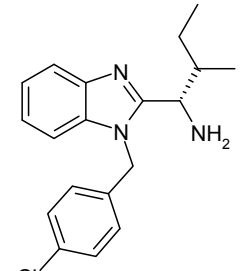
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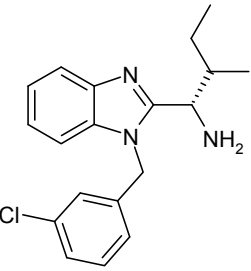
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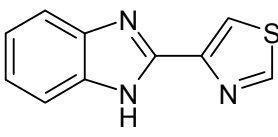
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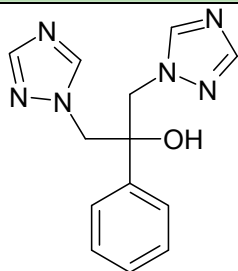
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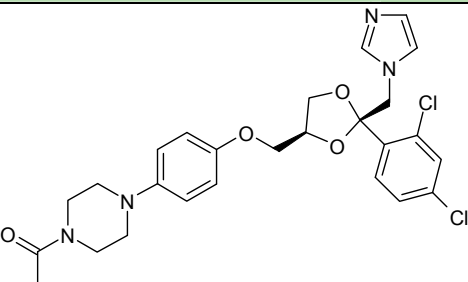
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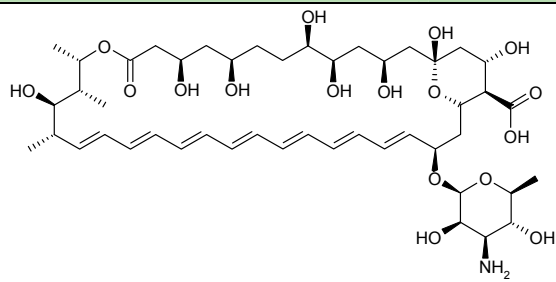
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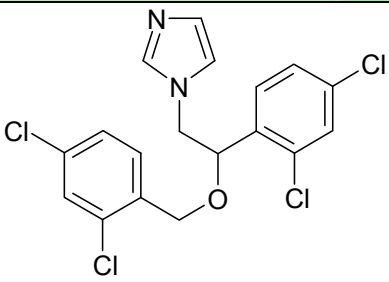
CAS 1116121-80-2	AMC-010
	
1 mg 95 €	5 mg 140 € 10 mg 220 €

Thiabendazole	AMC-011
	
1 g 95 €	

Fluconazole	AMC-012
	
20 mg 95 € 50 mg 140 €	

Ketoconazole	AMC-013
	
20 mg 95 € 50 mg 140 €	

Amphotericin B	AMC-014
	
10 mg 95 € 20 mg 140 €	

Miconazole		AMC-015
		
20 mg	95 €	50 mg 140 €

5. HDAC inhibitors

Histone deacetylases (HDAC) are enzymes which play an important role in the modification of histones. They are involved in different biological pathways in the cell cycle and have been investigated intensively in recent years in epigenetics and cancer research.

The general role of HDACs is to regulate transcription through the removal of acetyl groups from lysines in histones.

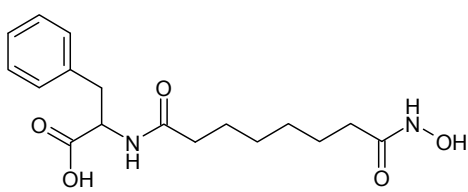
The unique function of the HDAC inhibitors is to modulate the expression of multiple genes and pathways. By modulating genes associated with cellular apoptosis and cell proliferation, these agents may have utility in combination cancer therapy.

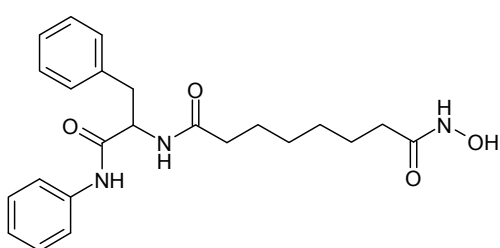
HDAC inhibitors are promising therapeutic agents for cancer therapy. Clinical trials are examining the use of HDAC inhibitors as stand-alone therapeutics, or for combination therapy.

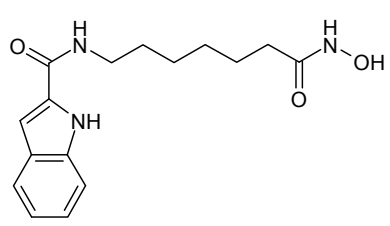
For basic research, HDAC inhibitors are versatile tools for investigation of the cell cycle and in screening assays for novel anticancer drugs.

References:

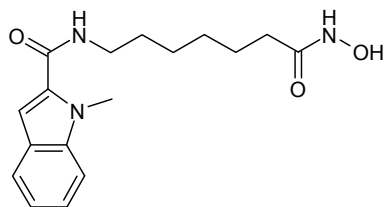
- L. Ellis, P. W. Atadja, R. W. Johnstone (2009) Mol. Cancer Ther. 8(6), 1409-1420.
- O. Witt, H. E. Deubzer, T. Milde, I. Oehme (2008) Cancer Lett. 277, 8–21.
- I. Hoshino, H. Matsubara (2010) Surg. Today 40, 809–815.

CAS 449729-12-8		HDI-001
		
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CAS 449729-03-7		HDI-002
		
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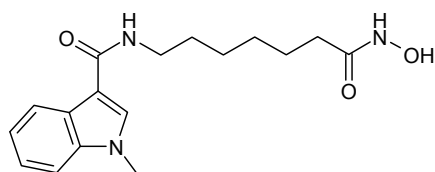
CAS 593252-26-7		HDI-004
		
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CAS 593252-20-1 **HDI-005**



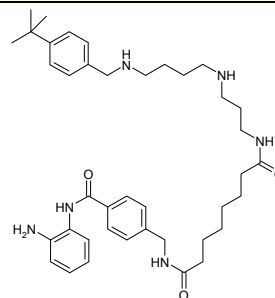
1 mg 95 € 5 mg 140 € 10 mg 220 €

CAS 593252-21-2 **HDI-006**



1 mg 95 € 5 mg 140 € 10 mg 220 €

CAS 1020675-37-9 **HDI-007**



1 mg 95 € 5 mg 140 € 10 mg 220 €

6. DPP-4 inhibitors

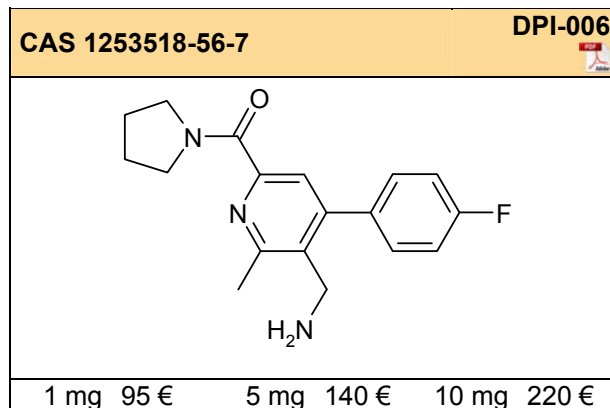
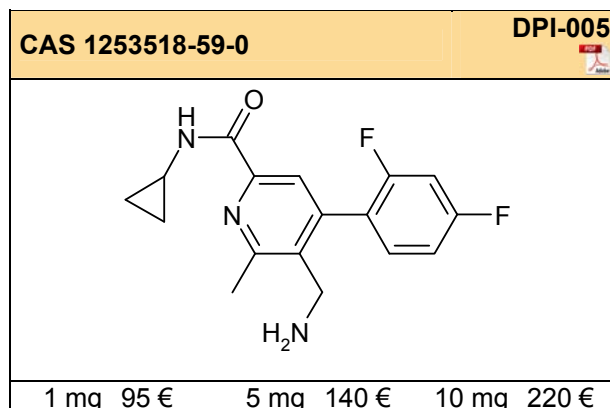
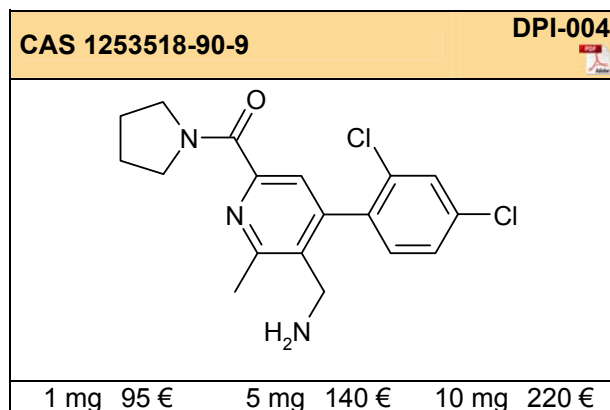
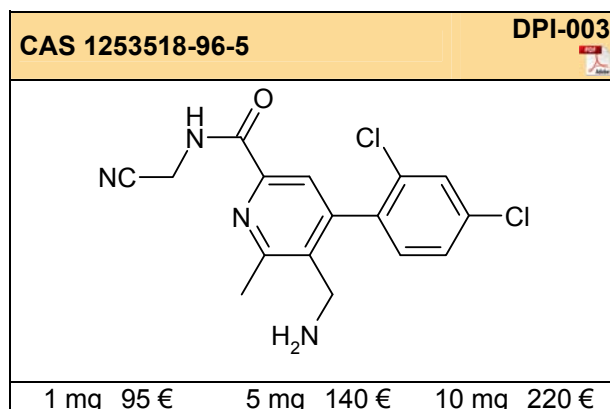
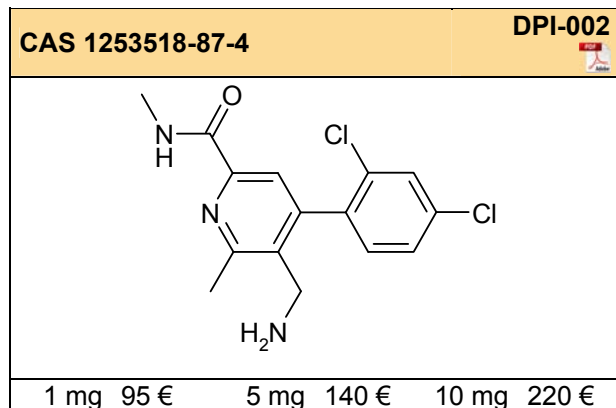
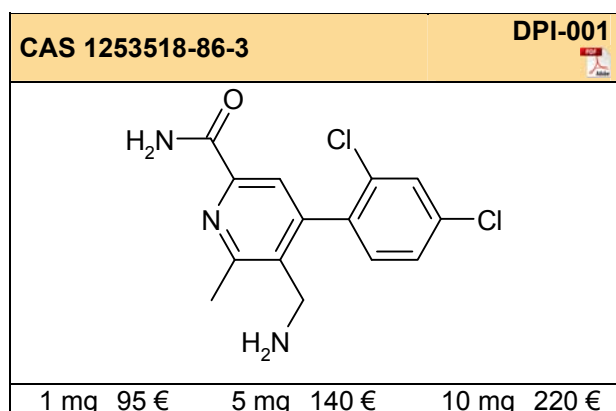
Dipeptidyl peptidase-4 (DPP-4) plays a major role in glucose metabolism. Inhibition of the DPP-4 enzyme prolongs and enhances the activity of incretins that play an important role in insulin secretion and blood glucose regulation.

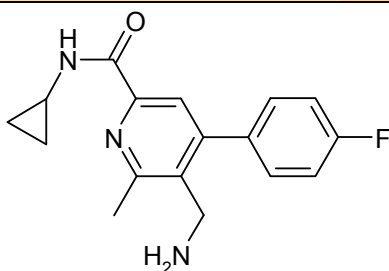
DPP-4 is a target for the treatment of type 2 diabetes, a rapidly emerging chronic metabolic disease. Some DPP-4 inhibitors have entered the market in the recent years showing the importance of this field of antidiabetic medication.

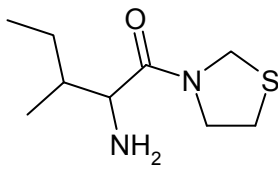
Selective inhibition of DPP-4 is required for an acceptable safety and tolerability profile. EMC DPP-4 inhibitors DPI-001 – DPI-003 show a very high selectivity against DPP-4 in comparison to DPP-8.

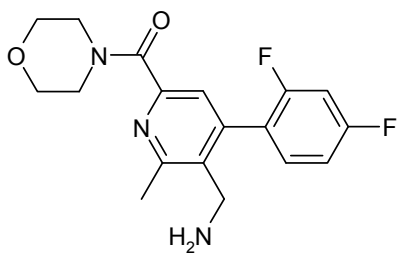
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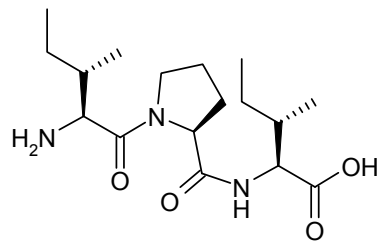
A.-P. Schaffner, K. Kaczanowska, D. Baechele (2011) Eur. Pat. Appl. EP 2308847 A1 20110413.
K. Kaczanowska, K.-H. Wiesmüller, A.-P. Schaffner (2010) ACS Med. Chem. Lett. 1(9), 530-535.

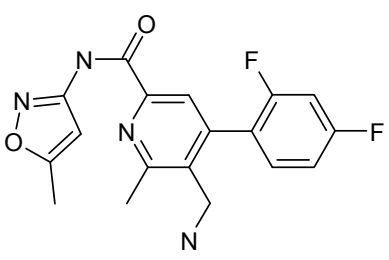


CAS 1253518-55-6	DPI-007
	
1 mg 95 €	5 mg 140 € 10 mg 220 €

CAS 136259-20-6	DPI-010
	
1 mg 95 €	5 mg 140 € 10 mg 220 €

CAS 1253518-62-5	DPI-008
	
1 mg 95 €	5 mg 140 € 10 mg 220 €

Diprotin A	DPI-011
	
1 mg 95 €	5 mg 140 € 10 mg 220 €

CAS 1253518-63-6	DPI-009
	
1 mg 95 €	5 mg 140 € 10 mg 220 €

7. Biophore Research Products

Siderophores: General aspects

Siderophores (greek: iron carriers) are low-molecular-weight (500 – 1.700 Da) microbial iron complexing compounds (chelators) which function in iron utilisation of almost all aerobic bacteria and fungi. In an aerobic environment iron exists as insoluble hydroxide polymers which are not readily taken up by microorganisms in the absence of siderophores. This was the reason why siderophores have evolved. Siderophores are biosynthesised and excreted under iron limiting growth conditions. The siderophores chelate ferric iron and the Fe(III)siderophores are subsequently taken up by microorganisms via special membrane located transport systems where they deliver iron to various iron requiring enzymes especially in electron transport enzymes.

Classification of siderophores

We now know more than 200 structurally different types of siderophores with approximately the same number of derivatives and degradation products. The structural variation of siderophores is impressive. Oxygen and nitrogen ligands are the predominant iron binding groups.

We classify siderophores according to the presence of involved ligating groups into catecholates (or catecholamides), hydroxamates, α -hydroxy-carboxylates and mixed ligand compounds among which hydroxyphenyl-oxazolones, α -aminocarboxylates and α -hydroxyimidazoles are found.

A further classification is based on the denticity, i.e. hexadentate when 3 bidentates are coordinated octahedrally around the central iron atom, tetradentate with two bidentates or even a single bidentate complexed with iron. In most cases 1:1 complexes (siderophore: iron) are formed. However, for tetradentate siderophores, like rhodotorulic acid or dimerum acid, multinuclear complexes are formed in which 3 siderophores bind 2 iron atoms.

Stability of iron complexes

A characteristic feature of siderophores is their high affinity for iron (III), known as stability constant or formation constant. Formation constants of $K_f \sim 10^{20}$ - 10^{30} have been determined for most siderophores, like rhizoferrins, pyoverdines, ferrioxamines and ferrichromes. Some catecholamide siderophores like enterobactin may even reach a K_f of $\sim 10^{49}$.

Although other metal ions may be complexed by microbial siderophores, their stability is

considerably lower than that with ferric iron, so that competition with other metals is excluded. For example, the stability constant for the Al-ferrichrome is $\sim 10^{20}$ which is ten orders of magnitude lower than that of the Fe(III)-ferrichrome complex. Interestingly, siderophores have a very low stability with ferrous iron, so that Fe(III)siderophores loose iron after reduction. The removed ferrous iron may then be bonded to other acceptor molecules. This is the basis for iron removal within microbial cells.

Redox behaviour

A further important property of siderophores is their redox chemistry. We observe highly negative redox potentials for enterobactin (-750 mV), which excludes iron reduction in Fe(III)enterobactin by cellular reductants (NADH and NADPH) under equilibrium conditions. Therefore, reduction of Fe(III)enterobactin is assumed to occur after degradation of enterobactin by esterases. On the other hand ferrioxamines and ferrichromes have redox potentials of -460 mV and -400 mV respectively, which is in the range of natural reductants.

Ecology of siderophores

An interesting aspect of siderophores is their environmental stability. Siderophores are generally excreted into the environment in order to fulfil their iron collecting functions. Therefore, they must possess a relatively high chemical stability. Most trishydroxamate siderophores are highly resistant to proteases and peptidases in the soil and tolerate pH values down to pH 2. This is the reason why such siderophores persist for long times in the soil and can be extracted from the soil. This is in contrast to the catecholate siderophores which are degraded by esterases and loose their iron under acidic conditions. However, under alkaline conditions as found in the colon, marine environments and in alkaline soil, catecholate siderophores (enterobactin, vibriobactin, azotobactin, agrobactin or parabactin) are stable and abundant.

Siderophores as virulence factors

Infections of humans, animals and plants are often enabled due to siderophore activity of invading microorganisms. Those pathogens which survive in the presence of iron binding proteins like transferrin, lactoferrin and ferritin, overcome iron restriction by producing siderophores that extract iron from the host proteins. In these cases siderophores act as virulence factors. For example *Salmonella enterica* and uropathogenic *E.coli* strains produce several siderophores (enterobactin, salmochelin,

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aerobactin and yersiniabactin) which allow survival in the enterum and other organs which together with toxin production make them highly pathogenic. Mycobactin, carboxymycobactin and exochelin production allows survival of *Mycobacterium tuberculosis* and related *M. species* in various human and animal cells. However, in some cases where no siderophores are involved, it is assumed that pathogens obtain iron by direct contact and iron transfer from iron-binding proteins or from haemin and haemoglobin degradation by oxygenases. Similar iron scavenging mechanisms are observed with plant pathogens where iron citrate and nicotianamine serve as the main iron sources.

If siderophores are available as ferric and iron-free, only the ferric structure is shown.

References

- R. C. Hider, X. Kong (2010) Nat Prod Rep. 27, 637-57.
 J. M. Harrington, A. L. Crumbliss (2009) Biometals 22, 679-89.
 G. Winkelmann (2007) Biometals 20, 379-392.

7.1 Siderophores (ferric or iron-free)

Aerobactin Desferriaerobactin	Fe-AERO DES-AERO
Fe-AERO	1 mg 300 €
DES-AERO (iron-free)	1 mg 350 €

Arthrobactin Desferriarthrobactin	ARTHRO DES-ARTHRO
ARTHRO	1 mg 300 €
DES-ARTHRO (iron-free)	1 mg 350 €

Fe-Carboxymycobactins	CARB-MYCO-SM
CARB-MYCO-SM	1 mg 500 €

Coprogen Desferricoprogen	COP DES-COP
COP	1 mg 300 €
DES-COP (iron-free)	1 mg 350 €

Fusigen Desferrifusigen		FUS DES-FUS
FUS	1 mg	300 €
DES-FUS (iron-free)	1 mg	350 €

Fe-Rhodotorulic acid Rhodotorulic acid (iron-free)		Fe-RHODO RHODO
Fe-RHODO	1 mg	300 €
RHODO (iron-free)	1 mg	350 €

Ferrioxamine E Desferrioxamine E		FOX-E DES-FOX-E
FOX-E	1 mg	300 €
DES-FOX-E (iron-free)	1 mg	350 €

Ferrichrome Desferrichrome		FCH DES-FCH
FCH	1 mg	300 €
DES-FCH (iron-free)	1 mg	350 €

Ferrioxamine G Desferrioxamine G		FOX-G DES-FOX-G
FOX-G	1 mg	300 €
DES-FOX-G (iron-free)	1 mg	350 €

Ferrichrome A Desferrichrome A		FCH-A DES-FCH-A
<p style="text-align: center;"> $R_1 = R_2 = \text{CH}_2\text{OH}$ $R_3 = \text{CH}=\text{C}(\text{CH}_3)\text{CH}_2\text{COOH (trans)}$ </p>		
FCH-A	1 mg	300 €
DES-FCH-A (iron-free)	1 mg	350 €

Ferrichrysin Desferrichrysin	FCHRY DES-FCHRY
FCHRY	1 mg 300 €
DES-FCHRY (Iron-free)	1 mg 350 €

Ferrirubin Desferrirubin	FRU DES-FRU
FRU	1 mg 300 €
DES-FRU (iron-free)	1 mg 350 €

Ferricrocin Desferricrocin	FCR DES-FCR
FCR	1 mg 300 €
DES-FCR (iron-free)	1 mg 350 €

Ornibactin (mixture C₄, C₆, C₈) Desferriornibactin (C₄, C₆, C₈)	ORNIB DES-ORNIB
ORNIB	1 mg 300 €
DES-ORNIB (iron-free)	1 mg 350 €

Ferrirhodin Desferrirhodin	FRH DES-FRH
FRH	1 mg 300 €
DES-FRH (iron-free)	1 mg 350 €

Ornibactin C₆ Desferriornibactin C₆	ORNIB-C6 DES-ORNIB-C6
ORNIB-C6	1 mg 300 €
DES-ORNIB-C6 (iron-free)	1 mg 350 €

Fe-Rhizoferrin Rhizoferrin (iron-free)	Fe-RHIZO RHIZO	
Fe-RHIZO	1 mg	300 €
RHIZO (iron-free)	1 mg	350 €

Fe-Enterobactin Enterobactin (iron-free)	Fe-ENB ENB	
Fe-ENB	1 mg	400 €
ENB (iron-free)	1 mg	400 €

Fe-Schizokinen Schizokinen (iron-free)	Fe-SCHIZO SCHIZO	
Fe-SCHIZO	1 mg	300 €
SCHIZO (iron-free)	1 mg	350 €

DHBS Trimer (iron-free)	ENB-TRI	
ENB-TRI	1 mg	400 €

Triacetylfusarinine C Desferritriacetylfusarinine C	TAFC DES-TAFC	
TAFC	1 mg	300 €
DES-TAFC (iron-free)	1 mg	350 €

DHBS Dimer (iron-free)	ENB-DIM	
ENB-DIM	1 mg	400 €

DHBS Monomer (iron-free)	ENB-MONO	
ENB-MONO	1 mg	400 €

Fe-Vibriobactin	Fe-VIB	
Vibriobactin (iron-free)	VIB	
Fe-VIB	1 mg	450 €
VIB (iron-free)	1 mg	450 €

Fe-Salmochelin S₄	Fe-SAL-S4	
Salmochelin S₄ (iron-free)	SAL-S4	
Fe-SAL-S4	1 mg	450 €
SAL-S4 (iron-free)	1 mg	450 €

Fe-Bacillibactin	Fe-BAC	
Bacillibactin (iron-free)	BAC	
Fe-BAC	1 mg	400 €
BAC (iron-free)	1 mg	450 €

Fe-Yersiniabactin	Fe-YER	
Yersiniabactin (iron-free)	YER	
Fe-YER	1 mg	450 €
YER (iron-free)	1 mg	450 €

7.2 Sideromycins

Albomycin (ferric form)	ALBO	
Ferric	1 mg	400 €

7.3 HPLC Calibration Kits

HPLC Calibration Kit Enterobactin + degr. products	ENB-MIX
Mixture of Fe-enterobactin and degradation products which appear as iron-free compounds during HPLC at pH 2	
1 mg	450 €

HPLC Calibration Kit Salmochelin mixture	SAL-MIX
Mixture of Salmochelin S ₁ , S ₂ , S ₄ (iron-free)	
1 mg	450 €

HPLC Calibration Kit Ferrioxamines	FOX-MIX
Mixture of Ferrioxamines B, D ₁ , E, G ₁	
1 mg	450 €

HPLC Calibration Kit Ferrichromes	FCH-MIX
Mixture of Ferrichrome, Ferricrocin, Ferrichrysin, Ferrirubin, Ferrirhodin and Ferrichrome A	
1 mg	450 €

HPLC Calibration Kit Coprogens & Fusarinines	COP-MIX
Mixture of Fe-dimerum acid, Coprogen, Neocoprogen I, Neocoprogen II, Fusigen and Triacetylfusigen	
1 mg	450 €

7.4 Pyoverdines (iron-free) from *Pseudomonas* strains

Ferric forms are also available. Please contact us.

Pyoverdine from <i>P. fluorescens</i> ATCC 13525	PYO-Pfl-13525
1 mg	350 €

Pyoverdine from <i>P. fluorescens</i> ATCC 17400	PYO-Pfl-17400
1 mg	350 €

Pyoverdine from <i>P. aeruginosa</i> ATCC 27853	PYO-Pa-27853
1 mg	350 €

Pyoverdine from <i>P. aeruginosa</i> ATCC 15692	PYO-PAO1
1 mg	350 €

Pyoverdine from <i>P. aeruginosa</i> Pa 6	PYO-Pa6
1 mg	350 €

Pyoverdine from <i>P. putida</i> WCS358	PYO-WCS358
1 mg	350 €

Pyoverdine from <i>P. putida</i> ATCC 12633	PYO-Pp-12633
1 mg	350 €

Pyoverdine from <i>P. tolaasii</i>	PYO-Pt
1 mg	350 €

Pyoverdine from <i>P. protegens</i> Pf5	PYO-Pf5
1 mg	350 €

Further pyoverdines can be supplied on request.

8. 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
DHBS	2,3-dihydroxybenzoylserine
Dhc	S-(2,3-dihydroxypropyl)-(R)-cysteine
DPP	depeptidyl peptidase
ESI-MS	electrospray mass spectrometry
FSL	fibroblast-stimulating lipopeptide
HCl	hydrochloric acid
HDAC	histone deacetylases
HDACI	HDAC inhibitor
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
NAD	nicotinamide adenine dinucleotide
NADPH	nicotinamide adenine dinucleotide phosphate
OVA	ovalbumin
Pam	palmitic acid (hexadecanoic acid)
Pam ₃ Cys	N-Palmitoyl-S-[2,3-bis(palmitoyloxy)-(2RS)-propyl]-(R)-cysteine
Pam ₂ Cys	S-[2,3-bis(palmitoyloxy)-(2RS)-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	

9. General information

9.1 Contact information

Mail : EMC microcollections GmbH
Sindelfinger Str. 3
D-72070 Tübingen
Germany

Phone: + 49-70 71-40 74-0

Fax: + 49-70 71-40 74-22

Email: sales@microcollections.de

Web: www.microcollections.de

9.2 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
- on-line
- fax
- 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
- Credit card information (if desired)

A standard order form is provided on the next page of this catalogue and is also available for [downloading](#) on our homepage.

9.3 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.

9.4 Payment options

Payments are to be made in Euro.

For customer convenience EMC will accept payment by check, bank transfer, Visa, MasterCard, or JCB.



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

For credit card payment we can only accept orders by fax or traditional mail.

9.5 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.

9.6 Delivery times

Products in stock:

Shipment usually takes place within 1 to 2 working days after receiving a purchase order with all the needed information.

Non-stock products:

In response to a request for a product not in stock, the customer will be informed of the expected day of shipment.

EMC FACSIMILE ORDER FORM

Please print and complete this order form and send via facsimile to EMC microcollections GmbH, Germany

+49-7071 - 40 74 22

Name			
Company/Institution name			
Shipping address			
Billing address			
E-mail address			
Purchase order number			
FedEx account number			
VAT number*		Date	

*EU customers must indicate their VAT number. VAT is not payable outside the EU.

Product code	Product description	Size	Qty	Price ex. VAT#	Total

Shipping/Handling charges will be added to your invoice. They are calculated based on the destination country of your order.

Name of card holder	
Credit card number	
Expiry date	
Card verification number**	
Signature	

**the last three digits of the card number printed in the signature stripe

10. Catalogue number index

Product code	Description	Unit [mg]	Price [EUR] excl. VAT
Tools for Toll-like receptor research, adjuvants			
L2000	Pam ₃ Cys-SK ₄	1	120
		2	175
		5	350
L2000s	Pam ₃ Cys-SK ₄ sterilised by β -irradiation	1	180
L2001	Dhc-SK ₄	1	150
L2002	SK ₄	1	150
L2003	Dhc-GDPKHPKSF	1	180
L2004	GDPKHPKSF	1	180
L2010	Pam-Dhc-SK ₄	1	150
L2011	PamCSK ₄	1	150
L2012	Pam-Dhc-GDPKHPKSF	1	265
L2013	PamCGDPKHPKSF	1	265
L2020	Pam ₂ Cys-SK ₄	0.1	95
		1	265
L20201	<i>R</i> -Pam ₂ Cys-SK ₄ (<i>RR</i>)	0.1	180
		5 x 0.1	540
L20202	<i>S</i> -Pam ₂ Cys-SK ₄ (<i>RS</i>)	0.1	180
		5 x 0.1	540
L2021	PamCys(Pam)-SK ₄	0.1	180
		5 x 0.1	540
L20213	Pam ₂ Cys-SK ₄ (Biotin-Aca-Aca)	0.1	180
		5 x 0.1	540
L20214	Pam ₂ Cys-SK ₄ (Fluorescein-Aca-Aca)	0.1	180
		5 x 0.1	540
L20215	Pam ₂ Cys-SK ₄ (Rhodamine-Aca-Aca)	0.1	180
		5 x 0.1	540
L20229	Pam ₂ Cys-SK ₄ -FLAG-tag	0.1	180
		5 x 0.1	540
L2031	Pam ₃ Cys-SK ₄ (Biotin-Aca-Aca)	0.1	180
		5 x 0.1	540
L2032	PHC-SK ₄	1	150
L2034	Pam ₃ Cys-SK ₄ (Fluorescein-Aca-Aca)	0.1	180
		5 x 0.1	540
L2035	Pam ₃ Cys-SK ₄ (Rhodamine-Aca-Aca)	0.1	180
		5 x 0.1	540
L2048	<i>R</i> -Pam ₃ Cys-SK ₄	0.1	180
		5 x 0.1	540
L2049	<i>S</i> -Pam ₃ Cys-SK ₄	0.1	180
		5 x 0.1	540
L2064	Pam ₃ Cys-SK ₄ -FLAG-tag	0.1	180
		5 x 0.1	540
L2070	Lipobiotin	1	180
		10	750
L4000	Lipopeptide Adjuvant	1.5	150
		5 x 1.5	490
L6050	MALP-2-DI	0.1	300
L6060	R-MALP-2-DI	0.1	400

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Product code	Description	Unit [mg]	Price [EUR] excl. VAT
L7000	FSL-1	1	375
L7021	S-FSL-1	0.1 5 x 0.1	180 540
L7022	R-FSL-1	0.1 5 x 0.1	180 540
L7030	FSL-1-Biotin	0.1 5 x 0.1	180 540
L7031	FSL-1-Fluorescein	0.1 5 x 0.1	180 540
L7032	FSL-1-Rhodamine	0.1 5 x 0.1	180 540
L7040	FSL-1-FLAG-tag	0.1 5 x 0.1	180 540
IMI-001	Imiquimod	5	140
GMDP	GMDP, N-acetyl-D-glucosaminyl-(β1,4)-N-acetylmuramyl-L-alanyl-D-isoglutamine	1	250
P1014	CD14 (81-100)	1	320
Synthetic lipopeptides derived from bacterial lipoproteins (further are available on request)			
bLP001	Pam ₃ Cys-SSNAKIDQLSSDVQT from <i>E.coli</i> major outer membrane lipoprotein	1	395
bLP002	Pam ₃ Cys-SSNKSTTGSGETTTA from <i>Mycobacterium tuberculosis</i> 19 kDa lipoprotein antigen	1	395
bLP003	Pam ₃ Cys-SSGNKSAPSSSASSS from <i>Mycobacterium avium</i> 19 kDa lipoprotein antigen	1	395
bLP BB OspA	Pam ₃ Cys-KQNVSSLDEKNSVSV from <i>Borrelia burgdorferi</i> OspA	1	395
bLP BB OspC	Pam ₃ Cys-NNSGKDGNTSANSAD from <i>Borrelia burgdorferi</i> OspC	1	395
bLP BH 3	Pam ₃ Cys-NNGGPELKSDEVAKS from <i>Borrelia hermsii</i> outer membrane lipoprotein 3	1	395
bLP HI P4	Pam ₃ Cys-GSHQMKSEGHANMQL from <i>Haemophilus influenzae</i> outer membrane protein P4	1	395
bLP HI P6	Pam ₃ Cys-SSSNDAAGNGAAQT from <i>Haemophilus influenzae</i> outer membrane protein P6	1	395
bLP MPT83	Pam ₃ Cys-SSTKPVSQDTSPKPA from <i>Mycobacterium tuberculosis</i> : cell surface lipoprotein MPT83	1	395
bLP MT P27	Pam ₃ Cys-SSGSKPSGGPLPDAK from <i>Mycobacterium tuberculosis</i> lipoprotein IprG (27 kDa lipoprotein)	1	395
bLP NG H.8	Pam ₃ Cys-SQEPAAAPAAATPAG from <i>Neisseria gonorrhoeae</i> H.8 outer membrane protein	1	395
bLP SP amiA	Pam ₃ Cys-SSSKSSDSSAPKAYG from <i>Streptococcus pneumoniae</i> oligopeptide-binding protein amiA	1	395
L8020	Pam ₃ Cys-AQEKEAKSELDYDQTKKM from <i>Bacillus cereus</i> spore germination protein D GerD	1	395
Bioactive Peptides (further bioactive peptides are available on request)			
BAP-012	Amyloid-β (1-40) human: DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIGLMVGGVV	≥ 95% 1 5	145 645
BAP-013	Amyloid-β (1-40) human HCl salt: DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIGLMVGGVV	≥ 95% 1 5	240 950

Product code	Description	Unit [mg]	Price [EUR] excl. VAT
BAP-014	Amyloid- β (1-40) rat: DAEFGHDSGFVRRHQKLVFFAEDVGSNKGAIIGLMVGGVV	$\geq 95\%$ 1	145
		5	645
BAP-015	Amyloid- β (1-40) rat HCl salt: DAEFGHDSGFVRRHQKLVFFAEDVGSNKGAIIGLMVGGVV	$\geq 95\%$ 1	240
		5	950
BAP-016	A η 46-peptide	$\geq 95\%$ 1	240
		5	950
BAP-022	Control peptide amyloid- β (40-1) human: VGGVMLGIIAGKNSGVDEAFFVLKQHHEVEYGSDFRFEAD	$\geq 95\%$ 1	145
		5	645
BAP-023	Control peptide amyloid- β (40-1) rat: VGGVMLGIIAGKNSGVDEAFFVLKQHRVEFGSDHGFEAD	$\geq 95\%$ 1	145
		5	645
BAP-031	Biotinylated amyloid- β (1-40) human: Biotin-Aca-Aca- DAEFRHDSGYEVHHQKLVFFAEDVGSNKGAIIGLMVGGVV	$\geq 95\%$ 1	285
		5	1150
BAP-032	Biotinylated amyloid- β (1-40) human: Biotin-Aca-Aca- DAEFGHDSGFVRRHQKLVFFAEDVGSNKGAIIGLMVGGVV	$\geq 95\%$ 1	285
		5	1150
BAP-041	KLVFF	$\geq 70\%$ 5	95
		$\geq 95\%$ 1	95
		5	125
BAP-042	Ac-KLVFF-NH ₂	$\geq 70\%$ 5	95
		$\geq 95\%$ 1	95
		5	125
BAP-043	RIIGL	$\geq 70\%$ 5	95
		$\geq 95\%$ 1	95
		5	125
BAP-044	DWGKGGRWRLWPGASGKTEA	$\geq 70\%$ 5	125
		$\geq 95\%$ 1	95
		5	285
BAP-045	PGRSPFTGKKLFNQEFSDQ	$\geq 70\%$ 5	125
		$\geq 95\%$ 1	95
		5	285
BAP-046	qshyrhispaqv (D-amino acids)	$\geq 95\%$ 1	125
		5	375
BAP-047	FYLKVSSLHHHHGRDKLVFFHHHH	$\geq 70\%$ 5	125
		$\geq 95\%$ 1	125
		5	375
BAP-048	NYSKMIFSHHHH	$\geq 70\%$ 5	95
		$\geq 95\%$ 1	95
		5	285
BAP-049	HNHKLVFFHHQH	$\geq 70\%$ 5	95
		$\geq 95\%$ 1	95
		5	285
BAP-101	MOG (35-55) rat/mouse: MEVGWYRSPFSRVVHLYRNGK	$\geq 70\%$ 5	135
		$\geq 95\%$ 1	95
		5	280

Product code	Description	Unit [mg]	Price [EUR] excl. VAT
BAP-102	MOG (35-55) human: MEVGWYRPPFSRVVHLYRNGK	≥ 70%	5 135
		≥ 95%	1 95
			5 280
BAP-103	MOG (92-106): DEGGYTCFRDHSYQ	≥ 70%	5 125
		≥ 95%	1 125
			5 280
BAP-104	MOG (97-108): TCFRDHSYQEE	≥ 70%	5 125
		≥ 95%	1 95
			5 280
BAP-106	MOG (183-191): FVIVPVLGP	≥ 70%	5 125
		≥ 95%	1 95
			5 280
BAP-107	MOG (91-108): SDEGGYTCFRDHSYQEE	≥ 70%	5 125
		≥ 95%	1 95
			5 280
BAP-110	MBP (1-11) human: Ac-ASQKRPSQRHG	≥ 70%	5 125
		≥ 95%	1 95
			5 280
BAP-111	MBP (54-72) human: SHHAARTTHYGSLPQKSQR	≥ 70%	5 125
		≥ 95%	1 95
			5 280
BAP-120	PLP (139-151): HCLGKWLGHDPDKF	≥ 70%	5 125
		≥ 95%	1 95
			5 280
BAP-121	PLP (178-191): NTWTTCSIAFPSK	≥ 70%	5 125
		≥ 95%	1 95
			5 280
BAP-201	Ova (257-264): SIINFEKL	≥ 70%	5 95
		≥ 95%	5 145
BAP-202	Influenza A NP (366 – 374): ASNENMETM	≥ 70%	5 95
		≥ 95%	5 195
BAP-203	Influenza A matrix protein (58-66): GILGFVFTL	≥ 70%	5 125
		≥ 95%	1 125
			5 195
BAP-204	HIV-1 p17 Gag (77-85): SLYNTVATL	≥ 70%	5 95
		≥ 95%	1 95
			5 145
BAP-205	HCV-NS5b: ALYDVVSKL	≥ 70%	5 95
		≥ 95%	1 95
			5 145
BAP-206	LCMV GP (33-41): KAVYNFATM	≥ 70%	5 95
		≥ 95%	5 145
BAP-208	MAGE-3 antigen (271-279): FLWGPRALV	≥ 70%	5 95
		≥ 95%	5 145
BAP-209	Melan-A / MART-1 (26-35): EAAGIGILTV	≥ 70%	5 95
		≥ 95%	5 195
BAP-250	Ova (323-339): ISQAVHAAHAEINEAGR	≥ 70%	5 95
		≥ 95%	1 95
			5 145

Product code	Description	Unit [mg]	Price [EUR] excl. VAT
BAP-251	PADRE: AKFVAAWTLKAAA	≥ 70% 5	125
		≥ 95% 1	125
		5	195
BAP-253	LCMV GP (64-80): GPDIYKGVYQFKSVEFD	≥ 70% 5	125
		≥ 95% 1	125
		5	195
BAP-301	Arg ₉ : RRRRRRRRRR	≥ 70% 5	95
		≥ 95% 1	95
		5	145
BAP-301a	Arg ₉ : RRRRRRRRRR-NH ₂	≥ 70% 5	95
		≥ 95% 1	95
		5	145
BAP-302	D-Arg ₉ (r ₉): rrrrrrrrr	≥ 70% 5	180
		≥ 95% 1	180
		5	280
BAP-303	TAT (47-57): YGRKKRRQRRR-NH ₂	≥ 70% 5	95
		≥ 95% 1	95
		5	145
BAP-304	D-TAT (47-57): ygrkkrrqrrr-NH ₂	≥ 70% 5	180
		≥ 95% 1	180
		5	280
BAP-305	TAT (48-60): GRKKRRQRRRPPQ	≥ 70% 5	95
		≥ 95% 1	95
		5	145
BAP-306	Antennapedia (43-58) (penetratin): RQIKIWFQNRRMKWKK	≥ 70% 5	95
		≥ 95% 1	95
		5	145
BAP-307	CyLoP-1: CRWRWKCKCK	≥ 70% 5	95
		≥ 95% 1	95
		5	145
BAP-308	Transportan 10 (TP10) AGYLLGKINLKALAALAKKIL	≥ 70% 5	145
		≥ 95% 1	95
		5	260
BAP-309	MAP (KLAL) KLALKLALKALKKAALKLA	≥ 70% 5	120
		≥ 95% 1	95
		5	240
BAP-310	EB1 LIRLWSHLIHIWFQNRRLKWKKK	≥ 70% 5	145
		≥ 95% 1	95
		5	260
BAP-311	hLF KCFQWQRNMRKVRGPPVSCIQR-NH ₂	≥ 70% 5	120
		≥ 95% 1	95
		5	260
BAP-312	Pep1 KETWWETWWTEWSQPKRKRV	≥ 70% 5	145
		≥ 95% 1	95
		5	260
BAP-301-CF	CF-Arg ₉ : 5(6)-CF-RRRRRRRRRR	≥ 95% 1	250
BAP-301-Cy5	Cy5-Arg ₉ : Cy5-RRRRRRRRRR	≥ 95% 1	350
BAP-301a-CF	CF-Arg ₉ : 5(6)-CF-RRRRRRRRRR-NH ₂	≥ 95% 1	250
BAP-301a-Cy5	Cy5-Arg ₉ : Cy5-RRRRRRRRRR-NH ₂	≥ 95% 1	350

Product code	Description	Unit [mg]	Price [EUR] excl. VAT
BAP-303-CF	CF-TAT (47-57): 5(6)-CF-YGRKKRRQRRR-NH ₂	≥ 95% 1	250
BAP-303-Cy5	Cy5-TAT (47-57): Cy5-YGRKKRRQRRR-NH ₂	≥ 95% 1	350
BAP-305-CF	CF-TAT (48-60): 5(6)-CF-GRKKRRQRRRPPQ	≥ 95% 1	250
BAP-305-Cy5	Cy5-TAT (48-60): Cy5-GRKKRRQRRRPPQ	≥ 95% 1	350
BAP-306-CF	CF-Antennapedia (43-58) (CF-penetratin): 5(6)-CF-RQIKIWFQNRRMKWKK	≥ 95% 1	250
BAP-306-Cy5	Cy5-Antennapedia (43-58) (Cy5-penetratin): Cy5-RQIKIWFQNRRMKWKK	≥ 95% 1	350
BAP-307-CF	CF-CyLoP-1: 5(6)-CF-CRWRWKCKK	≥ 95% 1	250
BAP-307-Cy5	Cy5-CyLoP-1: Cy5-CRWRWKCKK	≥ 95% 1	350
BAP-308-CF	CF-Transportan 10 (TP10) 5(6)-CF-AGYLLGKINLKALAALAKKIL	≥ 95% 1	250
BAP-308-Cy5	Cy5-Transportan 10 (TP10) Cy5-AGYLLGKINLKALAALAKKIL	≥ 95% 1	350
BAP-309-CF	CF-MAP (CF-KLAL) 5(6)-CF-KLALKLALKALKALKLA	≥ 95% 1	250
BAP-309-Cy5	Cy5-MAP (Cy5-KLAL) Cy5-KLALKLALKALKALKLA	≥ 95% 1	350
BAP-310-CF	CF-EB1 5(6)-CF-LIRLWSHLIHIWFQNRRLKWKKK	≥ 95% 1	250
BAP-310-Cy5	Cy5-EB1 Cy5-LIRLWSHLIHIWFQNRRLKWKKK	≥ 95% 1	350
BAP-311-CF	CF-hLF 5(6)-CF-KCFQWQRNMRKVRGPPVSCIQR-NH ₂	≥ 95% 1	250
BAP-311-Cy5	Cy5-hLF Cy5-KCFQWQRNMRKVRGPPVSCIQR-NH ₂	≥ 95% 1	350
BAP-312-CF	CF-Pep1 5(6)-CF-KETWWETWWTEWSQPCKRKV	≥ 95% 5	250
BAP-312-Cy5	Cy5-Pep1 Cy5-KETWWETWWTEWSQPCKRKV	≥ 95% 5	350

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	140 600
AMP-010	Histatin 5: DSHAKRHHGYKRKFHEKHHSHRGY	≥ 70% 5 ≥ 95% 1 5	145 145 435
AMP-020	Indolicidin: ILPWKWPWWPWRR-NH ₂	≥ 70% 5 ≥ 95% 1 5	145 145 435
AMP-030	LL-37 human: LLGDFFRKSKEKIGKEFKRIVQRIKDFLRNLVPRTES	≥ 70% 5 ≥ 95% 1 5	185 185 555
AMP-040	Magainin-1: GIGKFLHSAGKFGKAFVGEIMKS	≥ 70% 5 ≥ 95% 1 5	145 145 435
AMP-050	Pep27: MRKEFHNVLSSGQLLADKRPARDYNRK	≥ 70% 5 ≥ 95% 1 5	145 145 435
AMP-055	Dermcidin DCD-1L SSLLEKGLDGAKKAVGGLGKLGKDAVEDLESVGKGAHVHDVKD VLDSVL	≥ 95% 1 5	290 865
AMP-056	Dermcidin DCD-1 SSLLEKGLDGAKKAVGGLGKLGKDAVEDLESVGKGAHVHDVKD VLDSV	≥ 95% 1 5	290 865

Product code	Description	Unit [mg]	Price [EUR] excl. VAT
AMP-057	Dermcidin SSL25 SSLLEKGLDGAKKAVGGLGKLGKDA	≥ 95% 1	145
		5	435
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	95
		5	145
		≥ 95% 1	95
		5	250
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	95
		5	145
		≥ 95% 1	95
		5	250
AMP-065	Omphalotin A: c[Trp-MeVal-Ile-MeVal-MeVal-Sar-MeVal-Melle-Sar-Val-Melle-Sar]	≥ 70% 1	150
		5	450
		≥ 95% 1	210
		5	630
AMP-070	Gallidermin	≥ 85% 1	95
		5	195
AMP-075	Nonactin	≥ 85% 1	95
		5	155
AMP-090	Actagardin	≥ 85% 1	225
		5	790
MP-010	Pheromone Peptide	≥ 95% ^{0.5}	550
		1	980
Anti-microbial compounds (AMCs)			
AMC-001	(S)-2-(1-Aminoisobutyl)-1-(3-chlorobenzyl) benzimidazole CAS 1240099-07-3	1	95
		5	140
		10	220
AMC-002	(S)-2-(1-Amino-3-isopentyl)-1-(4-chlorobenzyl) benzimidazole CAS 1116121-82-4	1	95
		5	140
		10	220
AMC-003	(S)-2-(1-Aminoisobutyl)-1-(3-fluorobenzyl) benzimidazole CAS 1332482-87-7	1	95
		5	140
		10	220
AMC-004	(S)-2-(1-Aminoethyl)-1-(3-fluorobenzyl) benzimidazole CAS 1116121-84-6	1	95
		5	140
		10	220
AMC-005	(S)-2-(1-Aminoethyl)-1-(3-fluorobenzyl) benzimidazole CAS 1332482-88-8	1	95
		5	140
		10	220
AMC-006	(S)-2-(1-Aminoisobutyl)-1-(3-methylbenzyl) benzimidazole CAS 1332482-86-6	1	95
		5	140
		10	220
AMC-007	(S)-2-(1-Aminoethyl)-1-(3-fluorobenzyl) benzimidazole CAS 1116121-83-5	1	95
		5	140
		10	220
AMC-008	(S)-2-(1-Amino-1-methylethyl)-1-(4-chlorobenzyl) benzimidazole CAS 1116121-85-7	1	95
		5	140
		10	220

Product code	Description	Unit [mg]	Price [EUR] excl. VAT
AMC-009	(S)-2-(1-Amino-2-methyl-butyl)-1-(4-chlorobenzyl) benzimidazole CAS 1116121-81-3	1	95
		5	140
		10	220
AMC-010	(S)-2-(1-Amino-2-methyl-butyl)-1-(3-chlorobenzyl) benzimidazole CAS 1116121-80-2	1	95
		5	140
		10	220
AMC-011	Thiabendazole CAS 148-79-8	1000	95
AMC-012	Fluconazole CAS 86386-73-4	20	95
		50	140
AMC-013	Ketoconazole CAS 65277-42-1	20	95
		50	140
AMC-014	Amphotericin B CAS 1397-89-3	10	95
		20	140
AMC-015	Miconazole CAS 22916-47-8	20	95
		50	140
HDAC inhibitors			
HDI-001	2-(7-Hydroxycarbamoyl-heptanoylamino)-3-phenyl-propionic acid CAS 449729-12-8	1	95
		5	140
		10	220
HDI-002	2-(7-Hydroxycarbamoyl-heptanoylamino)-3-phenyl-propionic acid phenylamide CAS 449729-03-7	1	95
		5	140
		10	220
HDI-004	1H-Indole-2-carboxylic acid (6-hydroxycarbamoyl-hexyl)-amide CAS 593252-26-7	1	95
		5	140
		10	220
HDI-005	1-Methyl-1H-indole-2-carboxylic acid (6-hydroxycarbamoyl-hexyl)-amide CAS 593252-20-1	1	95
		5	140
		10	220
HDI-006	1-Methyl-1H-indole-3-carboxylic acid (6-hydroxycarbamoyl-hexyl)-amide CAS 593252-21-2	1	95
		5	140
		10	220
HDI-007	Octanedioic acid 4-(2-amino-phenylcarbamoyl)-benzylamide {3-[4-(4-tert-butyl-benzylamino)-butylamino]-propyl}-amide CAS 1020675-37-9	1	95
		5	140
		10	220
DPP-4 inhibitors			
DPI-001	5-Aminomethyl-4-(2,4-dichloro-phenyl)-6-methyl-pyridine-2-carboxylic acid amide CAS 1253518-86-3	1	95
		5	140
		10	220
DPI-002	5-Aminomethyl-4-(2,4-dichloro-phenyl)-6-methyl-pyridine-2-carboxylic acid methylamide CAS 1253518-87-4	1	95
		5	140
		10	220

Product code	Description	Unit [mg]	Price [EUR] excl. VAT
DPI-003	5-Aminomethyl-4-(2,4-dichloro-phenyl)-6-methyl-pyridine-2-carboxylic acid cyanomethylamide CAS 1253518-96-5	1	95
		5	140
		10	220
DPI-004	[5-Aminomethyl-4-(2,4-dichloro-phenyl)-6-methyl-pyridin-2-yl]-pyrrolidin-1-yl-methanone 1253518-90-9	1	95
		5	140
		10	220
DPI-005	5-Aminomethyl-4-(2,4-difluoro-phenyl)-6-methyl-pyridine-2-carboxylic acid cyclopropylamide CAS 1253518-59-0	1	95
		5	140
		10	220
DPI-006	[5-Aminomethyl-4-(4-fluoro-phenyl)-6-methyl-pyridin-2-yl]-pyrrolidin-1-yl-methanone CAS 1253518-56-7	1	95
		5	140
		10	220
DPI-007	5-Aminomethyl-4-(4-fluoro-phenyl)-6-methyl-pyridine-2-carboxylic acid cyclopropylamide CAS 1253518-55-6	1	95
		5	140
		10	220
DPI-008	[5-Aminomethyl-4-(2,4-difluoro-phenyl)-6-methyl-pyridin-2-yl]-morpholin-4-yl-methanone CAS 1253518-62-5	1	95
		5	140
		10	220
DPI-009	5-Aminomethyl-4-(2,4-difluoro-phenyl)-6-methyl-pyridine-2-carboxylic acid (5-methyl-isoxazol-3-yl)-amide CAS 1253518-63-6	1	95
		5	140
		10	220
DPI-010	2-Amino-3-methyl-1-thiazolidin-3-yl-pentan-1-one CAS 136259-20-6	1	95
		5	140
		10	220
DPI-011	Diprotin A CAS 90614-48-5	1	95
		5	140
		10	220
Biophore Research Products, siderophores			
Fe-AERO	Fe-Aerobactin	1	300
DES-AERO	Desferriaerobactin	1	350
ALBO	Albomycin HPLC-pure (ferric form)	1	400
ARTHRO	Arthrobactin	1	300
DES-ARTHRO	Desferriarthrobactin	1	350
CARB-MYCO SM	Fe-Carboxymycobactins (mixture) from M. smegmatis (mixture)	1	500
COP	Coprogen	1	300
DES-COP	Desferricoprogen	1	350
COP-MIX	HPLC Calibration Kit Coprogens & Fusarinines	1	450
Fe-ENB	Fe-Enterobactin	1	400
ENB	Enterobactin (iron-free)	1	400
ENB-MONO	DHBS Monomer (iron-free)	1	400

Product code	Description	Unit [mg]	Price [EUR] excl. VAT
ENB-DIM	DHBS Dimer (iron-free)	1	400
ENB-TRI	DHBS Trimer (iron-free)	1	400
ENB-MIX	HPLC Calibration Kit Enterobactin and degradation products	1	450
FCH	Ferrichrome	1	300
DES-FCH	Desferrichrome	1	350
FCH-A	Ferrichrome A	1	300
DES-FCH-A	Desferrichrome A	1	350
FCH-MIX	HPLC Calibration Kit Ferrichromes	1	450
FCHRY	Ferrichrysin	1	300
DES-FCHRY	Desferrichrysin	1	350
FCR	Ferricrocin	1	300
DES-FCR	Desferricrocin	1	350
FOX-E	Ferrioxamine E	1	300
DES-FOX-E	Desferrioxamine E	1	350
FOX-G	Ferrioxamine G	1	300
DES-FOX-G	Desferrioxamine G	1	350
FOX-MIX	HPLC Calibration Kit Ferrioxamines	1	450
FRH	Ferrirhodin	1	300
DES-FRH	Desferrirhodin	1	350
FRU	Ferrirubin	1	300
DES-FRU	Desferrirubin	1	350
FUS	Fusigen	1	300
DES-FUS	Desferrifusigen	1	350
ORNIB	Ornibactin (mixture C ₄ , C ₆ , C ₈)	1	300
DES-ORNIB	Desferriornibactin (C ₄ , C ₆ , C ₈)	1	350
ORNIB-C6	Ornibactin C ₆	1	300
DES-ORNIB-C6	Desferriornibactin C ₆	1	350
Fe-RHIZO	Fe-Rhizoferrin	1	300
RHIZO	Rhizoferrin (iron-free)	1	350
Fe-RHODO	Fe-Rhodotorulic acid	1	300
RHODO	Rhodotorulic acid (iron-free)	1	350
Fe-SAL-S4	Fe-Salmochelin S ₄	1	450
SAL-S4	Salmochelin S ₄ (iron-free)	1	450
SAL-MIX	HPLC Calibration Kit Salmochelin mixture	1	450
Fe-SCHIZO	Fe-Schizokinen	1	300
SCHIZO	Schizokinen (iron-free)	1	350
TAFC	Triacetylfusarinine C	1	300
DES-TAFC	Desferritriacetylfusarinine C	1	350
Fe-VIB	Fe-Vibriobactin	1	450
VIB	Vibriobactin (iron free)	1	450
Fe-YER	Fe-Yersiniabactin	1	450
YER	Yersiniabactin (iron-free)	1	450
Fe-BAC	Fe-Bacillibactin	1	400
BAC	Bacillibactin (iron-free)	1	450

Product code	Description	Unit [mg]	Price [EUR] excl. VAT
Pyoverdines from <i>Pseudomonas</i> strains (iron-free, also available as ferric)			
PYO-Pa 27853	Pyoverdine <i>P. aeruginosa</i> ATCC 27853	1	350
PYO-Pa6	Pyoverdine <i>P. aeruginosa</i> Pa 6	1	350
PYO-PAO1	Pyoverdine <i>P. aeruginosa</i> ATCC 15692	1	350
PYO-Pfl- 13525	Pyoverdine <i>P. fluorescens</i> ATCC 13525	1	350
PYO-Pfl- 17400	Pyoverdine <i>P. fluorescens</i> ATCC 17400	1	350
PYO-Pp- 12633	Pyoverdine <i>P. putida</i> ATCC 12633	1	350
PYO-WCS358	Pyoverdine <i>P. putida</i> WCS358	1	350
PYO-Pt	Pyoverdine <i>P. tolaasii</i>	1	350
PYO-Pf5	Pyoverdine <i>P. protegens</i> Pf5	1	350

Further pyoverdines can be supplied on request.

11. 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, etc. 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.

Government/Corporate Visa, MasterCard and JCB credit card may be accepted on approved accounts for payment of the Products. Payment by credit card will only be taken when ordered by fax or mail.

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.