## Data S1. NMR spectra, statistics and chemical shifts. Related to Figure 2

(A) 1 H NMR spectrum of FADDI-118 (D2 O, 600 MHz). (B) Expansions of 1 H NMR spectrum of FADDI-118 (D2 O, 600 MHz). (C). 13 C NMR spectrum of FADDI-118 (D2 O, 150 MHz). (D) Expansions of 13 C NMR spectrum of FADDI-118 (D2 O, 150 MHz). (E) COSY NMR spectrum of FADDI-118 (D2 O). (F) TOCSY NMR spectrum of FADDI-118 (D2 O).
(G) edHSQC NMR spectrum of FADDI-118 (D2 O). (H) HMBC NMR spectrum of FADDI-118 (D2 O). (I) 1H and 13C Chemical shifts for octapeptin C4 peptide in water at 22°C. (J) NMR statistics for the solution structure of octapeptin C4 and FADDI-115 in DPC micelles. (K) NMR assignments of FADDI-118 TFA salt in D2O (1H 600 MHz, 13C 150 MHz) derived from analysis of 2D NMR spectra.

Α







С





FADDI-118 D20 gCOSY



Current Data Parameters NAME MCC6399_001 EXPNO 5 PROCNO 1
F2 - Acquisition Parameters           Date20151008           Time20151008           INSTRUM         spect           PROBHD         nm CPTC1           PROBHD         nm CPTC1           PULPROG         mlevesgpp1           SOLVENT         D20           NS         16           NS         16
SWH         7183.908 Hz           FIDRES         3.507768 Hz           AQ         0.1425408 sec           RG         574.7           DW         69.600 usec           DE         12.00 usec
1E         226.0 K           D0         0.00004498 sec           D1         2.0000000 sec           D9         0.0800000 sec           D12         0.00020000 sec           D16         0.00020000 sec           IN0         0.00013920 sec
L1 42
NUC1         1H           P1         7.25         usec           P2         14.50         usec           P5         13.60         usec           P6         56.00         usec           P7         56.00         usec           P12         2400.00         usec           PL0         120.00         dB           PL1         2.00         dB           PL10         13.74         dB
PLUW         0 W         9.65199947 W           PL10W         0.64657265 W           SF01         600.1330006 MHz           SP1         41.78 dB           SPNAM[1]         Sincl.1000           SPOFFS1         0 Hz
======         GRADIENT CHANNEL =====           GPNAM[1]         sine.100           GPNAM[2]         sine.100           GPZ1         31.00 %           GPZ2         11.00 %           P16         1000.00 usec
Fl - Acquisition parameters TD 256 SF01 600.133 MHz FIDRES 56.124283 Hz SW 11.971 ppm FnMODE States-TFPI
F2         - Processing parameters           SI         1024           SF         600.1293054 MHz           WDW         QSINE           SSB         2           LB         0 Hz           GB         0           FC         1.00
F1 - Processing parameters           SI         1024           MC2         States-TPFI           SF         600.1299347           MDW         QSINE           SSB         2           LB         0           HZ         0

F







	G				H	_	T			<del></del>	
Res	Atom	Shift	Res	Atom	Shift	Res	Atom	Shift	Res	Atom	Shift
HDec	CA	45.61	2	CA	54	4	НА	4.58	7	CA	54.49
HDec	СВ	71.58	2	СВ	33.22	4	HN	8.78	7	СВ	31.48
HDec	сс	38.88	2	CG	38.03	4	HZ	7.34	7	CG	39.08
HDec	CD	27.24	2	HA	4.15	4	QB	3.08	7	HA	4.32
HDec	CE	31.01	2	HB2	2	4	QD	7.26	7	HB2	2.15
HDec	CF	30.99	2	HB3	1.86	4	QE	7.4	7	HB3	2.03
HDec	CG	33.62	2	HD	7.92				7	HG2	3.06
HDec	СН	24.61	2	HG2	3.44	5	CA	54.39	7	HG3	3
HDec	CI	15.97	2	HG3	3.08	5	СВ	41.89	7	HN	8.34
HDec	HA1	2.52	2	HN	8.56	5	CD1	24.78			
HDec	HA2	2.39				5	CD2	22.98	8	CA	55.62
HDec	НВ	3.99	3	CA	53.13	5	CG2	26.13	8	СВ	41.13
HDec	QC	1.51	3	СВ	32.13	5	HA	4.24	8	CD1	24.46
HDec	HD1	1.3	3	CG	38.66	5	HG	0.87	8	CD2	23.55
HDec	HD2	1.39	3	HA	4.47	5	HN	8.56	8	CG2	26.84
HDec	QE	1.3	3	HB2	2	5	QB	1.44	8	HA	4.24
HDec	QF	1.27	3	HB3	1.93	5	QD1	0.78	8	HG	1.54
HDec	QG	1.26	3	HG2	2.89	5	QD2	0.71	8	HN	8.29
HDec	QH	1.28	3	HG3	2.77				8	QB	1.62
HDec	QI	0.86	3	HN	8.31	6	CA	54.72	8	QD1	0.92
1	CA	54.19				6	СВ	30.28	8	QD2	0.87
1	СВ	31.23	4	CA	58.16	6	CG	39.28			
1	CG	39.07	4	СВ	39.34	6	HA	4.21			
1	HA	4.38	4	CD	131.53	6	HB2	2.26			
1	HB2	2.21	4	CE	131.48	6	HB3	2.2			
1	HB3	2.1	4	CZ	129.93	6	HN	8.42		ļ	
1	HN	8.52				6	QG	3.1		ļ	
1	QG	3.13									

The nomenclature of the *R*-3-hydroxydecanoyl (HDec) group is shown below. Protons with the same apparent chemical shift in the <sup>1</sup>H NMR spectrum are denoted by the pseudoatom Q.



Res	Atom	Shift	Res	Atom	Shift	Res	Atom	Shift	Res	Atom	Shift
Dec	CA	38.42	2	CA	54.58	4	НА	4.57	7	CA	55.05
Dec	СВ	28.36	2	СВ	33.85	4	HN	8.72	7	СВ	32.14
Dec	СС	31.62	2	CG	38.65	4	HZ	7.32	7	CG	39.79
Dec	C-DEF	31.82	2	HA	4.14	4	QB	3.07	7	HA	4.32
Dec	CG	34.34	2	HB2	1.96	4	QD	7.25	7	HB2	2.14
Dec	СН	25.24	2	HB3	1.84	4	QE	7.38	7	HB3	2.01
Dec	CI	16.6	2	HD	7.93				7	HG2	3.03
Dec	QA	2.28	2	HG2	3.44	5	CA	55.03	7	HG3	2.97
Dec	QB	1.54	2	HG3	3.06	5	СВ	42.52	7	HN	8.33
Dec	QC	1.26	2	HN	8.58	5	CD1	25.4			
Dec	Q-DEF	1.27				5	CD2	23.61	8	CA	56.23
Dec	QG	1.27	3	CA	53.83	5	CG2	26.82	8	СВ	41.82
Dec	QH	1.26	3	СВ	32.72	5	HA	4.24	8	CD1	25.09
Dec	QI	0.84	3	CG	39.34	5	HG	0.9	8	CD2	24.17
			3	HA	4.42	5	HN	8.54	8	CG2	27.47
1	CA	54.91	3	HB2	1.96	5	QB	1.42	8	HA	4.23
1	СВ	31.9	3	HB3	1.91	5	QD1	0.78	8	HG	1.52
1	CG	40.01	3	HG2	2.87	5	QD2	0.71	8	HN	8.26
1	HA	4.32	3	HG3	2.75				8	QB	1.59
1	HB2	2.16	3	HN	8.24	6	CA	55.38	8	QD1	0.91
1	HB3	2.08				6	СВ	30.81	8	QD2	0.82
1	HN	8.43	4	CA	58.66	6	CG	39.68			
1	QG	3.1	4	СВ	40.08	6	HA	4.18			
			4	CD	132.18	6	HB2	2.26			
			4	CE	132.11	6	HB3	2.17			
			4	CZ	130.56	6	HN	8.46			
						6	QG	3.1			

The nomenclature of the decanoyl (Dec) group is shown below. Protons with the same apparent chemical shift in the <sup>1</sup>H NMR spectrum are denoted by the pseudoatom Q.

	Octapeptin C	4		FADDI-115				
Residue	<sup>3</sup> J <sub>HNHα</sub> (Hz)	$\Delta T_{HN} \times 10^3$		Residue	<sup>3</sup> J <sub>HNHα</sub> (Hz)	$\Delta T_{HN} \times 10^3$		
1	6.75	-6.73 ± 0.25		1	6.3	-7.8 ± 0.14		
2	6.86	-6.80 ± 0.25		2	6.98	-7.6 ± 0.17		
3	8.28	-4.90 ± 0.25		3	7.4	-4.5 ± 0.13		
4	5.8	-9.10 ± 0.08	]	4	5.90	-8.9 ± 0.14		
5	8.12	-8.76 ± 0.03		5	7.89	-9.8 ± 0.22		
6	5.3	-4.23 ± 0.06	1	6	6.5	-4.6 ± 0.09		
7	4.4	-0.87 ± 0.13		7	5.12	-2.0 ± 0.13		
8	6.38	-9.70 ± 0.13		8	6.7	-10.1 ± 0.23		
2HD	8.2, 4.5	-8.40 ± 0.22	]	2HD	8.6,4.3	-8.6 ± 0.27		

 $^{3}J_{HNH\alpha}$  (Hz) and  $^{1}H$  amide temperature coefficients ( $\Delta T_{HN}$ ) x 10 $^{3}$  for octapeptin C4 and FADDI-115 peptide in water at 22°C

OH O												
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1	G	E	_ C	- A	, i							
					Н							
Res	Atom	Shift	Res	Atom	Shift	Res	Atom	Shift	Res	Atom	Shift	
Dec	CA	44.5	2	CA	52.09	4	НА	4.48	7	CA	53.31	
Dec	СВ	70.27	2	СВ	30.73	4	HB2	2.96	7	СВ	29.67	
Dec	СС	38.37	2	CG	36.14	4	HB3	3.02	7	CG	37.44	
Dec	CD	26.83	2	HA	3.92	4	HN	8.9	7	HA	4.25	
Dec	CE	30.62	2	HB2	2.07	4	HZ	7.11	7	HB2	2.08	
Dec	CF	31.13	2	HB3	1.92	4	QD	7.19	7	HB3	1.99	
Dec	CG	32.93	2	HD	7.43	4	QE	7.21	7	HG2	3.01	
Dec	СН	23.6	2	HG2	3.5				7	HN	8.42	
Dec	CI	14.85	2	HG3	2.95	5	CA	52.19				
Dec	HA1	2.4	2	HN	8.51	5	CB	39.86	8	CA	53.85	
Dec	HA2	2.3				5	CD1	24.02	8	СВ	39.7	
Dec	QB	3.88	3	CA	51.57	5	CD2	22.07	8	CD1	23.62	
Dec	HC1	1.48	3	СВ	29.78	5	CG2	25.56	8	CD2	22.1	
Dec	HC2	1.43	3	CG	37.18	5	HA	4.29	8	CG2	25.98	
Dec	HD1	1.43	3	HA	4.42	5	HG	1.49	8	HA	4.12	
Dec	HD2	1.28	3	HB2	1.97	5	HN	8.14	8	HG	1.52	
Dec	QE	1.26	3	HB3	1.95	5	QB	1.43	8	HN	8.09	
Dec	QF	1.18	3	HG3	2.87	5	QD1	0.77	8	QB	1.64	
Dec	QG	1.24	3	HN	7.98	5	QD2	0.7	8	QD1	0.89	
Dec	QH	1.24							8	QD2	0.82	
Dec	QI	0.83	4	CA	56.07	6	CA	53.94				
1	CA	53.86	4	СВ	37.64	6	СВ	29.02				
1	СВ	29.04	4	CD	130.26	6	CG	37.67				
1	CG	37.61	4	CE	129.27	6	HA	4.22				
1	HA	4.19	4	CZ	127.49	6	HB2	2.17				
1	HB2	2.11				6	HB3	2.14				
1	HB3	2.08				6	HN	8.53				
1	HN	8.86				6	QG	3.1				
1	QG	3.04										

The nomenclature of the R-3-hydroxydecanoyl (HDec) group is shown below. Protons with the same apparent chemical shift in the <sup>1</sup>H NMR spectrum are denoted by the pseudoatom Q.

O											
Н	∑ F	:~	D	B	< _/	/					
I G E C A   H											
Res	Atom	Shift	Res	Atom	Shift	Res	Atom	Shift	Res	Atom	Shift
Dec	CA	36.15	2	CA	51.47	4	HA	4.51	7	CA	54.05
Dec	CB	26.42	2	CB	30.82	4	HN	8.72	7	CB	29.54
Dec	CC	30.69	2	CG	35.97	4	HZ	7.11	7	HA	4.26
Dec	C-DEF	31.28	2	HA	4.09	4	QB	2.97	7	HB2	2.08
Dec	CG	32.92	2	HB2	2.12	4	QD	7.2	7	НВЗ	1.97
Dec	СН	23.69	2	HB3	1.81	4	QE	7.2	7	HG2	3.03
Dec	СІ	14.88	2	HG2	3.51				7	HG3	3
Dec	HA2	2.29	2	HG3	2.95	5	СВ	39.7	7	HN	8.79
Dec	HA3	2.18	2	HN	8.65	5	CD1	23.99			
Dec	HB2	1.52	2	HND	7.43	5	CD2	22.14	8	CA	53.58
Dec	HB3	1.47				5	CG2	30.36	8	СВ	39.83
Dec	QC	1.23	3	CA	51.9	5	HA	4.35	8	CD1	23.56
Dec	Q-DEF	1.21	3	СВ	29.61	5	HB2	1.47	8	CD2	22.01
Dec	QG	1.23	3	CG	37.21	5	HB3	1.44	8	CG2	25.33
Dec	QH	1.23	3	HA	4.36	5	HG	1.16	8	HA	4.17
Dec	QI	0.82	3	QB	1.94	5	HN	8.33	8	HB2	1.66
			3	QG	2.84	5	QD1	0.8	8	HB3	1.62
1	CA	53.55	3	HN	7.96	5	QD2	0.72	8	HG	1.49
1	СВ	29.23							8	HN	8.06
1	CG	37.64	4	CA	55.58	6	CA	53.29	8	QD1	0.89
1	HA	4.13	4	СВ	37.66	6	СВ	28.8	8	QD2	0.81
1	HN	8.71	4	CD	130.1	6	CG	37.53			
1	QB	2.11	4	CE	129.2	6	HA	4.26			
1	QG	3.08	4	CZ	127.36	6	HN	8.59			
						6	QB	2.17			
						6	QG	3.09			

The nomenclature of the decanoyl (Dec) group is shown below. Protons with the same apparent chemical shift in the <sup>1</sup>H NMR spectrum are denoted by the pseudoatom Q.

NOE distance restraints	Octapeptin C4	FADDI-115
Total Number	217	192
Intra residual,  i – j =0	60	53
Sequential,  i – j =1	83	88
Mediumrange,1< i – j <5	41	33
Long range <sup>a</sup> ,  i – j  ≥ 5	36	21
Maximal violation	0.06	0.12
Final CYANA target function value	0.0084+/-0.0009Å <sup>2</sup>	0.12+/-0.0003Å <sup>2</sup>
RMSD to mean coordinates:		
Back bone atoms N,C $^{\alpha}$ ,C'	0.05+/-0.01Å	0.06+/-0.01Å
All heavy atoms	0.38+/-0.05Å	0.38+/-0.08Å

<sup>a</sup>4 upper and 3 lower distance restraints were implemented to maintain an amide bond with trans geometry between Dab3 and Leu9 during the calculation and are included in the table.

## Κ

NMR assignments of FADDI-118 TFA salt in D<sub>2</sub>O (<sup>1</sup>H 600 MHz, <sup>13</sup>C 150 MHz) derived from analysis of 2D NMR spectra.<sup>a</sup>

Amino Acid <sup>b</sup>	<sup>13</sup> C δ (ppm) <sup>c</sup>	<sup>1</sup> Η δ (mult., <i>J</i> (Hz)) <sup>d</sup>	Amino Acid <sup>b</sup>	<sup>13</sup> C δ (ppm) <sup>c</sup>	<sup>1</sup> Η δ (mult., <i>J</i> (Hz)) <sup>d</sup>
Dab1			Dab1		
1	174.0*		1	173.6	
2	52.3	4.33 (dd, 5.4, 9.2)	2	52.6	4.24 (dd, o)
3	29.3*	2.07 (m) 2.15 (m)	3	28.4	2.19 (m) 2.25 (m)
4	37.0 <sup>e</sup>	3.09 (m)	4	36.9 <sup><i>e</i></sup>	3.08 (o)
Dab2			Dab7		
1	173.8		1	173.2	
2	51.9	4.17 (o)	2	52.9	4.37 (dd, 5.8, 8.8)
3	31.2	1.86 (m) 1.99 (m)	3	29.3*	2.07 (m) 2.19 (m)
4	36.1	3.10 (o) 3.41 (ddd, 6.7, 9.3, 14.4)	4	37.3	3.02 (o) 3.05 (o)
Dab3			Thr8		
1	172.26		1	172.25	
2	51.3	4.41 (dd, 5.4, 9.2)	2	60.1	4.16 (d, 5.4))
3	30.2	1.88 (m) 1.92 (m)	3	39.2	4.19 (o)
4	36.6	2.75 (ddd, 6.7, 9.3, 13.0) 2.85 (ddd, 5.1, 9.7, 13.0)	4	19.8	1.18 (d, 6.3)
Phe4			n -C8 fatty a	acid	
1	174.0*		1	178.4	
2	56.1	4.59 (t, 8.2)	2	35.9	2.28 (o)
3	37.7	3.06 (o)	3	25.9	1.54 (tt, 6.5, 6.5)
4	136.4		4	29.9	1.26 (o)
7	128.1	7.33 (dd, 7.5, 7.5)	5	28.8	1.26 (o)
5,9	129.67	7.25 (d, 7.5)	6	31.6	1.24 (o)
6,8	129.68	7.38 (dd, 7.5, 7.5)	7	22.7	1.25 (o)
Leu5			8	14.1	0.85 (t, 7.1)
1	175.5				
2	52.5	4.24 (o)			
3	39.9	1.41 (ddd, 4.5, 10.8, 14.0) 1.47 (ddd, 4.5, 10.4, 14.0)			
4	24.3	0.90 (br m)			
5	21.1	0.71 (d, 6.5)			
6	22.9	0.78 (d. 6.5)			

<sup>a</sup> The <sup>1</sup>H and <sup>13</sup>C NMR spectra were externally calibrated to NaOAc ( $\delta_{\rm H}$  1.90 and 8.44 and  $\delta_{\rm C}$  24.0 and 171.7; 10 mg in 500  $\mu$ L D<sub>2</sub>O) (H. E. Gottlieb, V. Kotlyar and A. Nudelman, *J. Org. Chem.*, 1997, **62**, 7512). <sup>b</sup> Numbering from the carbonyl group of the amino acids. <sup>c 13</sup>C NMR chemical shifts quoted to one decimal except where resonances resolved, <sup>d</sup> s = singlet, d = doublet, t = triplet, o = overlap. <sup>e</sup> assignment may be interchanged, \*= co-incident resonances.