Supplementary Table S1.

a	ALA1	ALA2	ALA3	ALA4	ALA5	ALA6	ALA7	ALA8	ALA9	RID1	RID2	RID3	RID4	RID5	RID6	RID7	RID8	RID9	RID10	RID11
								800.7		800.5			800.7		800.7	800.8		800.8		
	806.2		806.0	806.0								806.1	806.2	806.1						
AF25							809.4	809.5												
	810.7	810.8	810.5					810.6	810.7	810.4			810.7		810.8			810.7		
								812.7												
	814.7							814.7												
											819.0									
											833.0								833.0	
																			841.0	841.2
											844.0									
											849.0									
														850.1						
											855.0								855.0	
	856.1		856.0	856.0		856.0		856.1				856.1	856.1	856.1						
AF3##	857.4					857.3				857.4	857.5	857.6	857.6	857.6	857.6	857.7	857.7	857.7	857.5	857.7
	860.1			859.9		860.0					859.9	860.1	860.1						859.9	
							861.1		861.2											861.2
							862.6		862.8											
	865.1	865.2			865.1						865.0	865.0			865.1					
														866.1					866.0	
											871.0								871.0	
	873.1							873.1												
AF20##										875.3	875.4	875.5	875.5	875.5	875.5	875.6	875.7	875.6	875.4	
					875.6									877.1					877.0	877.2
							877.0		877.2					882.0					881.9	
					881.1						886.9								886.9	
					887.1		886.6		887.1											
											891.4	891.5	891.5	891.5	891.5	891.6	891.7			
														893.1				893.1	893.0	893.2
AF8#	901.5	901.6	901.4	901.4	901.6	901.4	901.5	901.5	901.6											
AF14##										905.3	905.4	905.5	905.6	905.5	905.7	905.6	905.7	905.6	905.4	
								909.5	909.6											
AF8+O	917.5	917.6	917.4	917.4	917.6	917.4	917.5	917.5	917.6											
AF26/41						920.5	920.5	920.6	920.7											
											921.4	921.5		921.5	921.5	921.6	921.7			
AF8+Na					923.6	923.4	923.5		923.6											
					927.0	926.9														
							929.4	929.4												
										933.3			933.5	933.5		933.6				
						939.4	939.4		939.6											
AF4##										958.4	958.5	958.6	958.6	958.6	958.6	958.7	958.7	958.7	958.5	
AF8G	959.5				959.6		959.5	959.5	959.6											
AF8+Cu			963.4	963.3		963.3		963.4						963.6						
										972.3				972.5		972.6				
								975.5	975.6											
										976.5	976.7		976.7	976.7		976.7		976.8	976.5	
															981.6		981.7			
AF2##										991.4	991.5	991.6	991.6	991.6	991.6	991.7	991.7	991.7	991.5	991.7

										992.9						993.2				
	994.5					994.5	994.5	994.5												
										1000.4										
																	1003.7			
						1005.5			1005.6						1005.6					
											1007.5			1007.6		1007.7	1007.7			
AF2+Na										1013.3	1013.5	1013.5	1013.6	1013.6	1013.6	1013.7	1013.7	1013.7	1013.5	1013.7
													1014.0							
							1018.5													
AF13##										1020.3	1020.5	1020.6	1020.6	1020.6	1020.6	1020.7	1020.7	1020.7	1020.5	
AF40															1023.6		1023.7			
AF2+K										1029.3	1029.4		1029.6	1029.6		1029.7	1029.7	1029.6	1029.4	1029.7
										1033.4	1033.5									
														1035.6						
											1036.5	1036.5			1036.6	1036.7	1036.7		1036.5	
										1041.3	1041.4		1041.5	1041.5					1041.4	
	1044.1		1044.0	1044.0		1044.0		1044.1			1044.0		1044.1						1044.0	
										1045.3	1045.4	1045.5	1045.5	1045.5	1045.5	1045.6	1045.7	1045.6	1045.4	
	1046.4					1046.3														
AF2G										1049.4	1049.5	1049.6	1049.6	1049.6	1049.6	1049.7	1049.7	1049.7	1049.5	1049.7
										1053.3	1053.4	1053.5	1053.5	1053.5		1053.6		1053.6	1053.4	
											1060.0								1060.0	
														1067.5						
														1071.6	1071.6					
AF27										1075.4										
										1080.4	1080.5	1080.6	1080.6	1080.6	1080.6	1080.7	1080.7	1080.7	1080.5	
										1087.3				1087.6				1087.7		
							1088.5													
										1091.4										
										1095.4	1095.5		1095.6	1095.6	1095.6	1095.7	1095.8	1095.7	1095.5	
																	1096.7			
													1103.5	1103.5	1103.5					
AF29							1106.6	1106.6	1106.7											
			1152.6	1152.5	1152.7	1152.5	1152.6	1152.6	1152.8											
	1157.0							1157.0				1157.0	1157.0	1157.0						
													1162.6	1162.6		1162.7				
							1176.6													
													1178.6	1178.6		1178.8				
AF19#	1188.7	1188.9	1188.6	1188.6	1188.8	1188.6	1188.7	1188.7	1188.8											
							1210.6	1210.7	1210.8											
AF36#	1236.7	1236.8	1236.6	1236.5	1236.8	1236.6	1236.6	1236.7	1236.8											
					1246.8		1246.7	1246.7	1246.8											
	1261.9							1261.9			1261.8		1261.9	1262.0					1261.9	
								1294.7	1294.7											
													1295.7	1295.7		1295.8				
	1300.1		1300.0	1299.9		1300.0	1300.0	1300.1	1300.2		1299.9	1300.1	1300.1	1300.1	1300.1			1300.2	1299.9	
													1321.8	1321.7		1321.9				
																1325.8				
							1327.6													
										1329.3		1329.6		1329.6		1329.8				
AF34#	1333.8	1334.0	1333.7	1333.6	1333.9	1333.7	1333.7	1333.8	1333.9				1333.8	1333.8	1333.8		1334.0			
													1337.7	1337.7		1337.9				

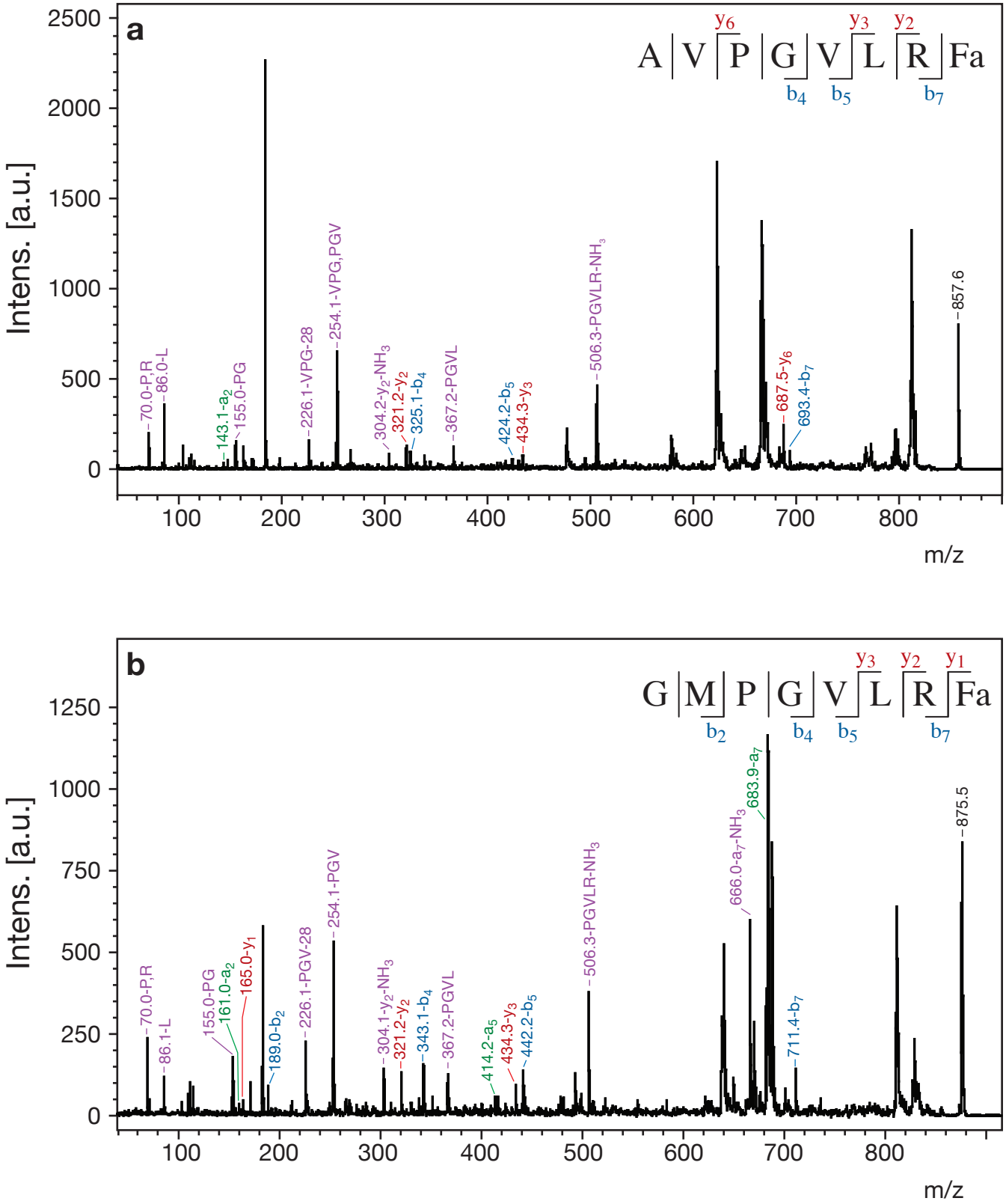
			1339.6	1339.6	1339.8	1339.6	1339.6	1339.7	1339.8	1339.4	1339.6	1339.7	1339.7	1339.7	1339.7	1339.8	1339.9	1339.8	1339.6	
		1349.9	1349.6			1349.6	1349.7	1349.8	1349.9											
							1355.7													
							1362.6													
							1368.6													
PepTT#	1374.8	1374.9	1374.6	1374.6	1374.8	1374.6	1374.7	1374.7	1374.9											
			1383.6	1383.5	1383.8	1383.6	1383.6	1383.7	1383.8	1383.4	1383.5	1383.7	1383.7	1383.7	1383.7	1383.8	1383.9	1383.8	1383.6	
							1387.6													
					1391.9		1391.7	1391.8	1391.9											
							1402.7													
							1405.6			1405.4						1405.8				
			1411.6	1411.5	1411.8	1411.6	1411.7	1411.7	1411.9	1411.4	1411.6	1411.7	1411.7	1411.7	1411.7	1411.9	1411.9	1411.9		
			1425.6	1425.6	1425.8	1425.6	1425.7	1425.7	1425.9	1425.4	1425.6	1425.7	1425.8	1425.8	1425.8	1425.9	1425.9	1425.9		
				1441.5	1441.8	1441.6	1441.6	1441.7	1441.8	1441.4	1441.5	1441.7	1441.7	1441.7	1441.7	1441.8	1441.9	1441.8		
			1453.7	1453.6	1453.9	1453.7	1453.7	1453.8	1453.9	1453.5	1453.6	1453.8	1453.8	1453.8	1453.8	1453.9	1454.0	1453.9		
				1460.5	1460.8	1460.6	1460.6	1460.7	1460.8	1460.4	1460.5	1460.7	1460.7	1460.7	1460.7	1460.8	1460.9	1460.8	1460.5	
	1464.7	1464.9			1464.8	1464.6	1464.6	1464.7	1464.8											
AF3*										1485.6	1485.7	1485.9	1485.9	1485.9	1485.9	1486.0	1486.1	1486.0	1485.8	
AF11						1493.7	1493.8	1493.8	1494.0											
					1530.1		1529.8	1529.9	1530.0											
AF10##										1541.4	1541.6	1541.8	1541.8	1541.8	1541.8	1541.9	1542.0			
PepTL#	1544.9	1545.0	1544.7	1544.6	1545.0	1544.7	1544.8	1544.8	1545.0											
										1557.4					1557.8	1557.9	1557.9			
							1560.8	1560.8	1561.0											
										1578.5	1578.7	1578.9	1578.9	1578.9	1578.9	1579.0	1579.1	1579.0	1578.7	
	1584.9	1585.0	1584.7	1584.6	1584.9	1584.7	1584.8	1584.8	1584.9											
														1599.8						
								1606.8												
			1607.9	1607.8		1607.8	1607.9	1608.0		1607.6	1607.8	1608.0	1608.0	1608.0	1608.0	1608.1	1608.2			
										1612.3		1612.7	1612.7	1612.7		1612.8	1612.9	1612.8		
					1643.0			1642.8	1642.9											
						1698.7	1698.8	1698.9	1699.0	1698.5	1698.6	1698.9	1698.9	1698.9		1699.0	1699.0	1699.0		
AF35#	1816.1	1816.2	1815.9	1815.5	1816.2	1815.8	1816.0	1816.1	1816.2											
							1874.0		1874.2											
											1963.8	1964.2		1964.2		1964.2				
PepGE#	2023.1	2023.2	2022.8	2022.7	2023.2	2022.8	2023.0	2023.1	2023.1											
			2285.0				2285.3	2285.4	2285.4											
												2306.5		2306.5						
							2617.8			2617.8						2617.7	2617.7			
		2631.6	2631.1				2631.7	2631.8												
							2856.0	2856.2												
	2871.2	2870.9	2870.4	2870.2	2871.3	2870.3	2871.1	2871.2												
							3170.3	3170.3												

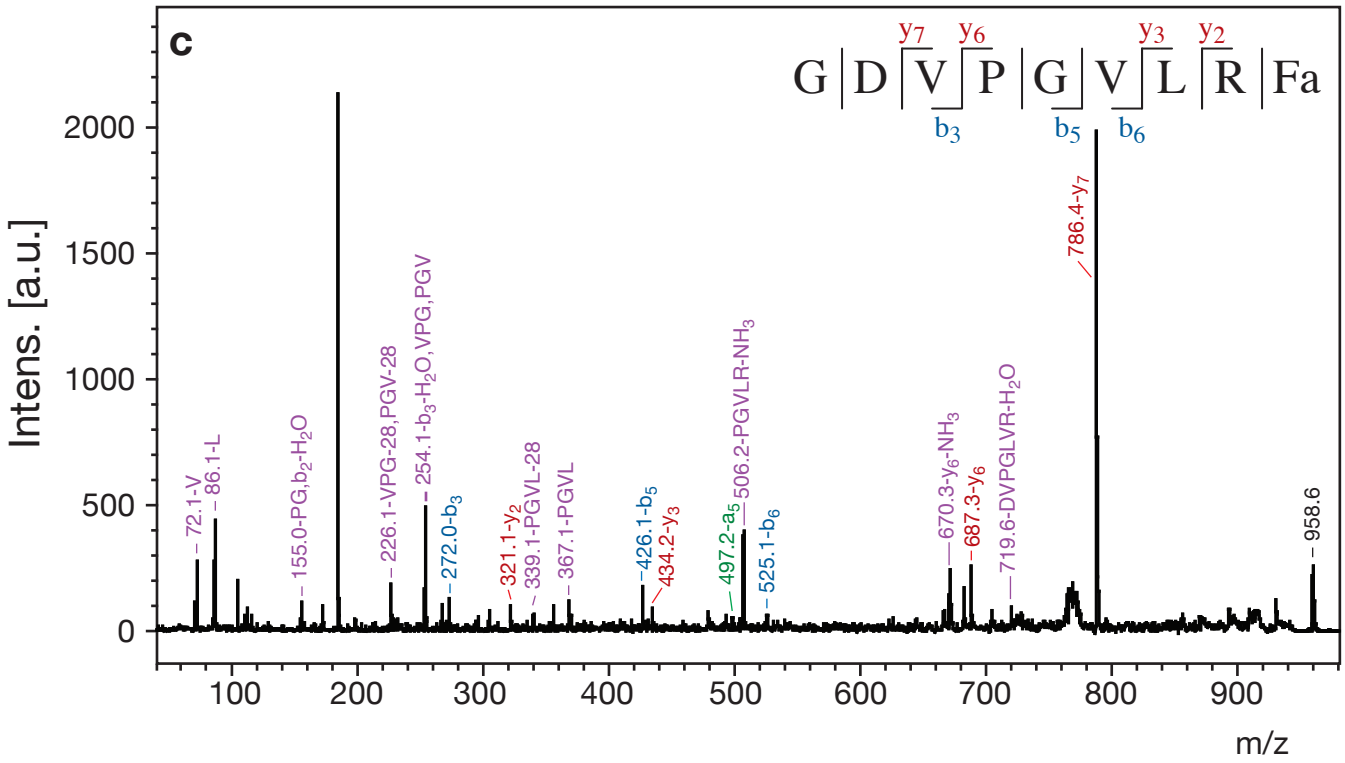
b

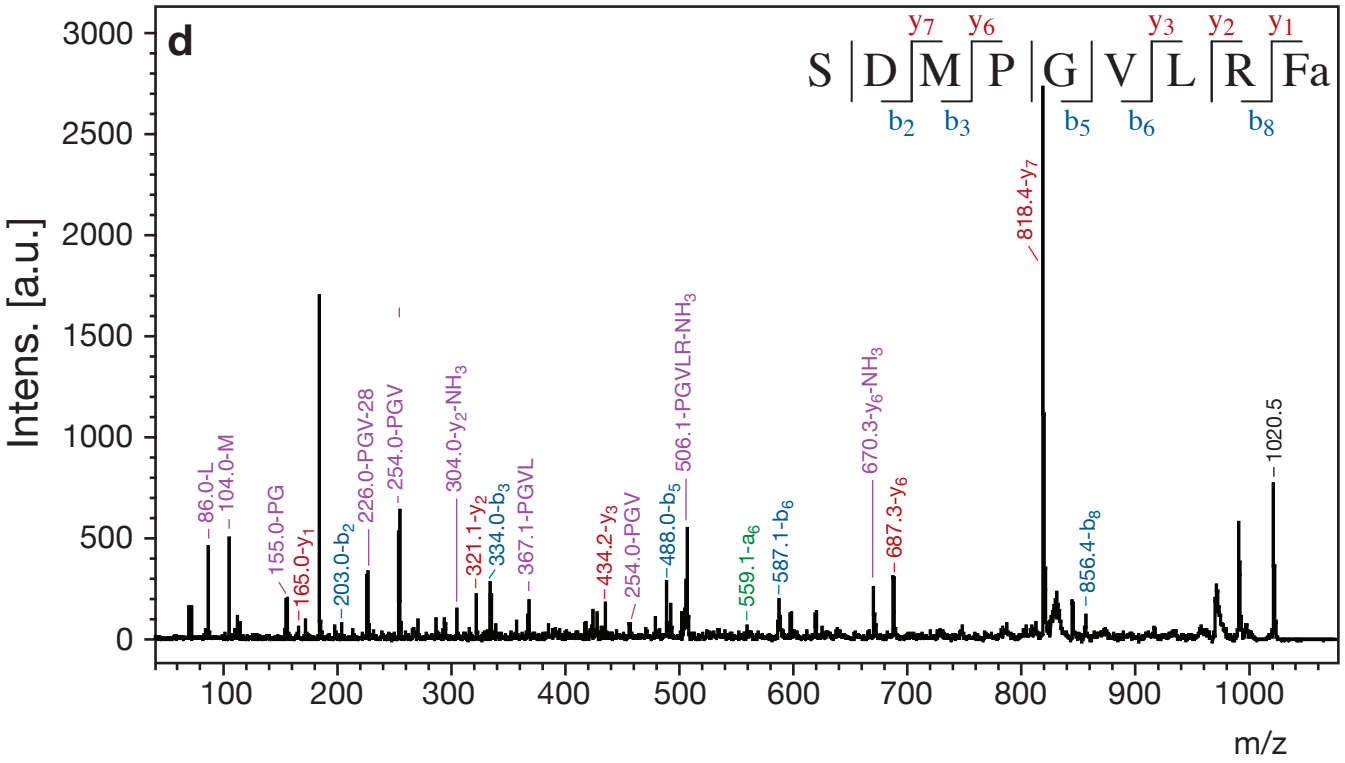
810.7
856.0
857.5-AF3##
875.5
891.5
901.5-AF8#
905.6-AF14##
917.5-AF8+O
921.5
958.6-AF4##
959.5-AF8G
976.7
991.6-AF2##
1013.6
1020.6-AF13##
1029.6
1036.6
1044.0
1045.5
1049.6-AF2G
1053.5
1080.6
1095.6
1152.6
1188.7-AF19#
1236.7-AF36#
1300.0
1333.8-AF34#
1339.7
1349.7
1374.7-PepTT#
1383.7
1411.7
1425.7
1441.7
1453.8
1460.7
1464.7
1485.9-AF3*
1541.8-AF10##
1544.8-PepTL#
1578.9
1584.8
1607.9
1612.7
1698.8
1816.0-AF35#
2023.0-PepGE#
2870.8

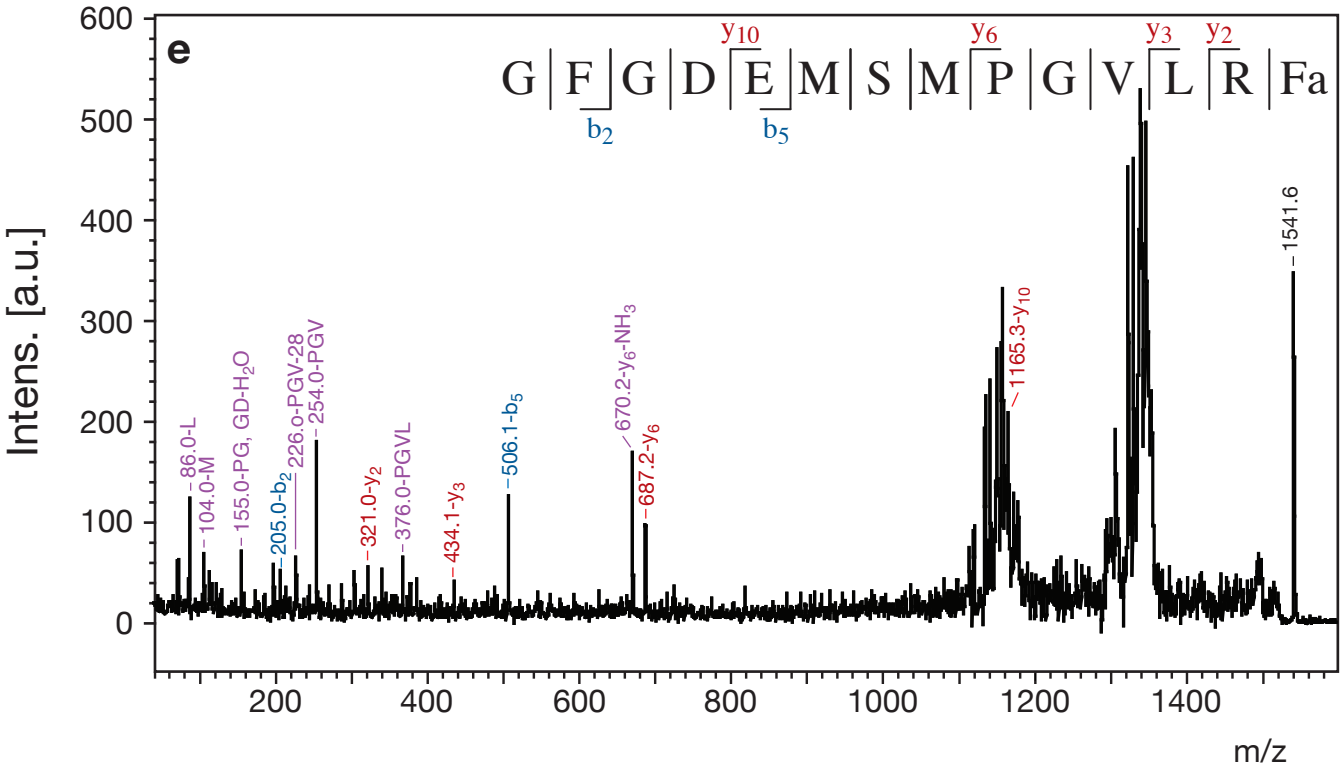
Supplementary Table S1. Comparisons of peaks from ALA and RID. (a) Peak lists from 9 ALA cells (orange) and 11 RID cells (blue) with no modifications. Relative peak height is indicated by 3 intensities of color; the highest intensity peaks are indicated by the darkest colors, and lowest intensity peaks are indicated by the lightest colors. (b) Direct comparison of peaks from ALA and RID. Orange indicates a peak found in a majority of ALA spectra. Blue indicates a peak found in a majority of RID spectra. Green indicates a peak found in a majority of both ALA and RID spectra. #, sequenced by MS/MS in RID; ##, sequenced by MS/MS in ALA; G, nonamidated form; o, oxygen; Na, sodium; Cu, copper; *, extended form of peptide.

Supplementary Figure S2.



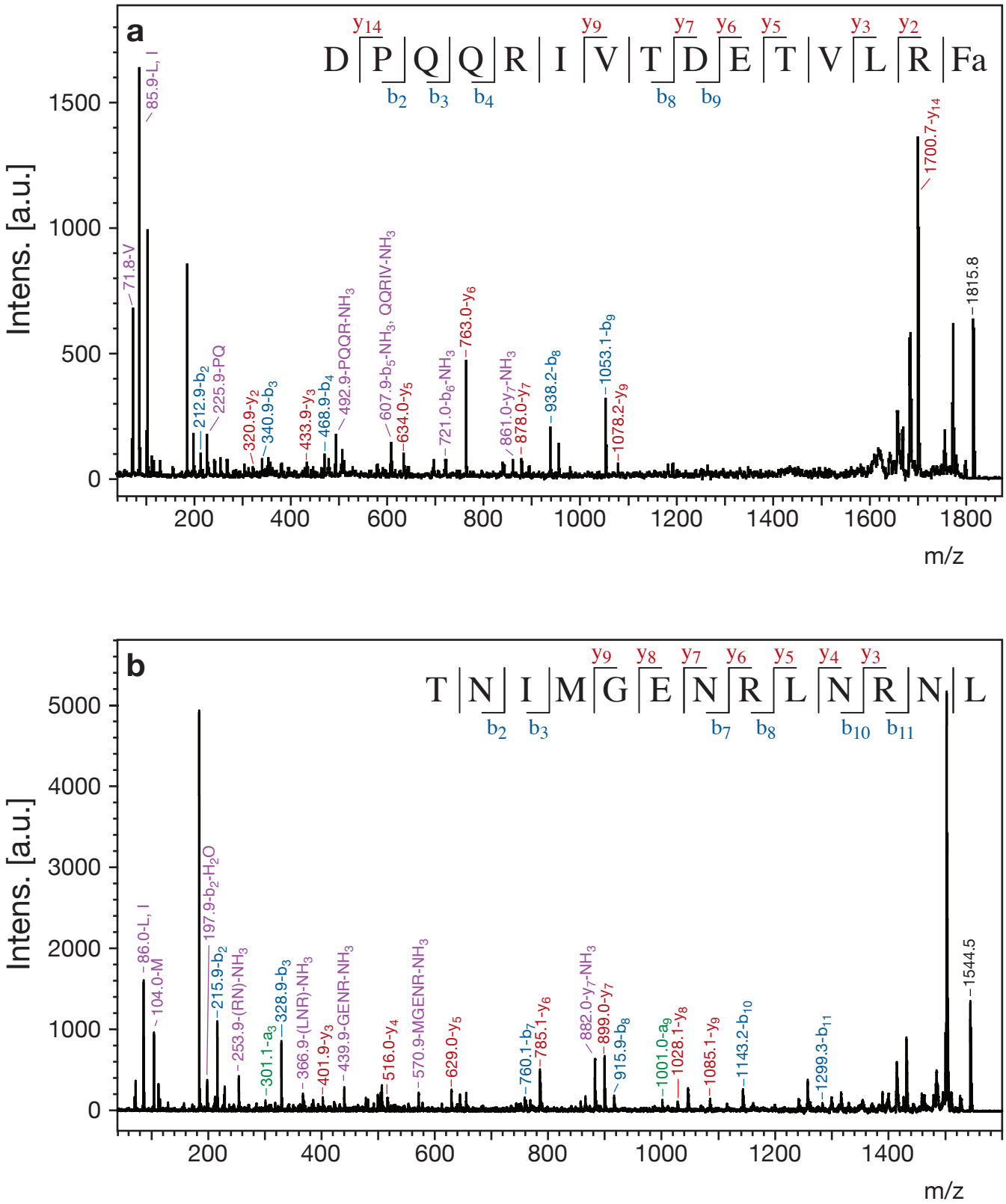

c
G D V P G V L R Fa
y7 y6 y3 y2
b3 b5 b6
Intens. [a.u.]
m/z
72.1-V
86.1-L
155.0-PG,b2-H2O
226.1-VPG-28,PGV-28
254.1-b3-H2O,VPG,PGV
272.0-b3
321.1-y2
339.1-PGVL-28
367.1-PGVL
426.1-b5
434.2-y3
497.2-a5
506.2-PGVLR-NH3
525.1-b6
670.3-y6-NH3
687.3-y6
719.6-DVPGLVR-H2O
786.4-y7
958.6

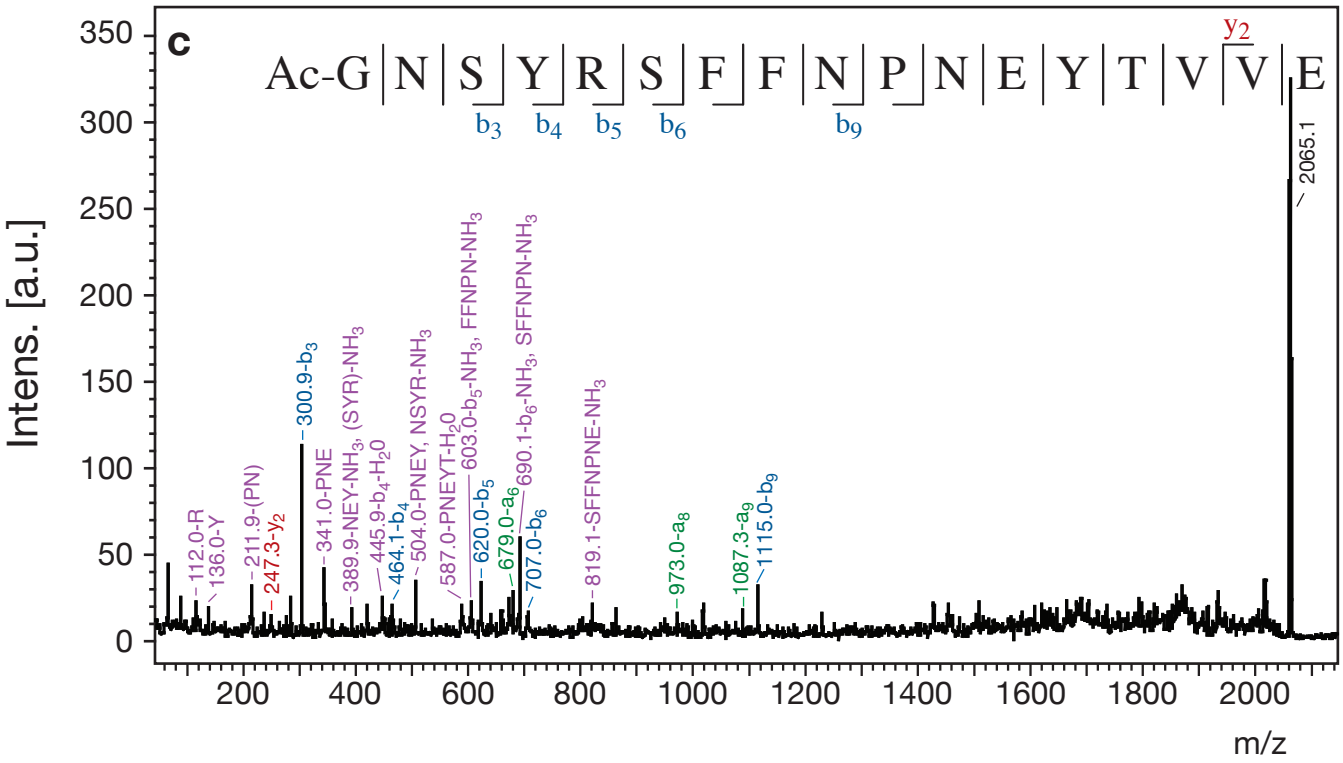

d
S D M P G V L R Fa
y7 y6 y3 y2 y1
b2 b3 b5 b6 b8
Intens. [a.u.]
m/z
86.0-L
104.0-M
155.0-PG
165.0-y1
203.0-b2
226.0-PGV-28
254.0-PGV
304.0-y2-NH3
321.1-y2
334.0-b3
367.1-PGVL
434.2-y3
254.0-PGV
488.0-b5
506.1-PGVLR-NH3
559.1-a6
587.1-b6
670.3-y6-NH3
687.3-y6
818.4-y7
856.4-b8
1020.5



Supplementary Figure S2. MS/MS from RID of 5 *afp-1* peptides (see also Figure 3). Peaks representing a (green), b (blue), y (red), and high intensity internal fragment (purple) ions are labeled and b and y ions are summarized at the top of each spectrum. (a) MS/MS spectrum of AF3, m/z 857.6. (b) MS/MS spectrum of AF20, m/z 875.5. (c) MS/MS spectrum of AF4, m/z 958.6. (d) MS/MS spectrum of AF13, m/z 1020.6. (e) MS/MS spectrum of AF10, m/z 1541.6.

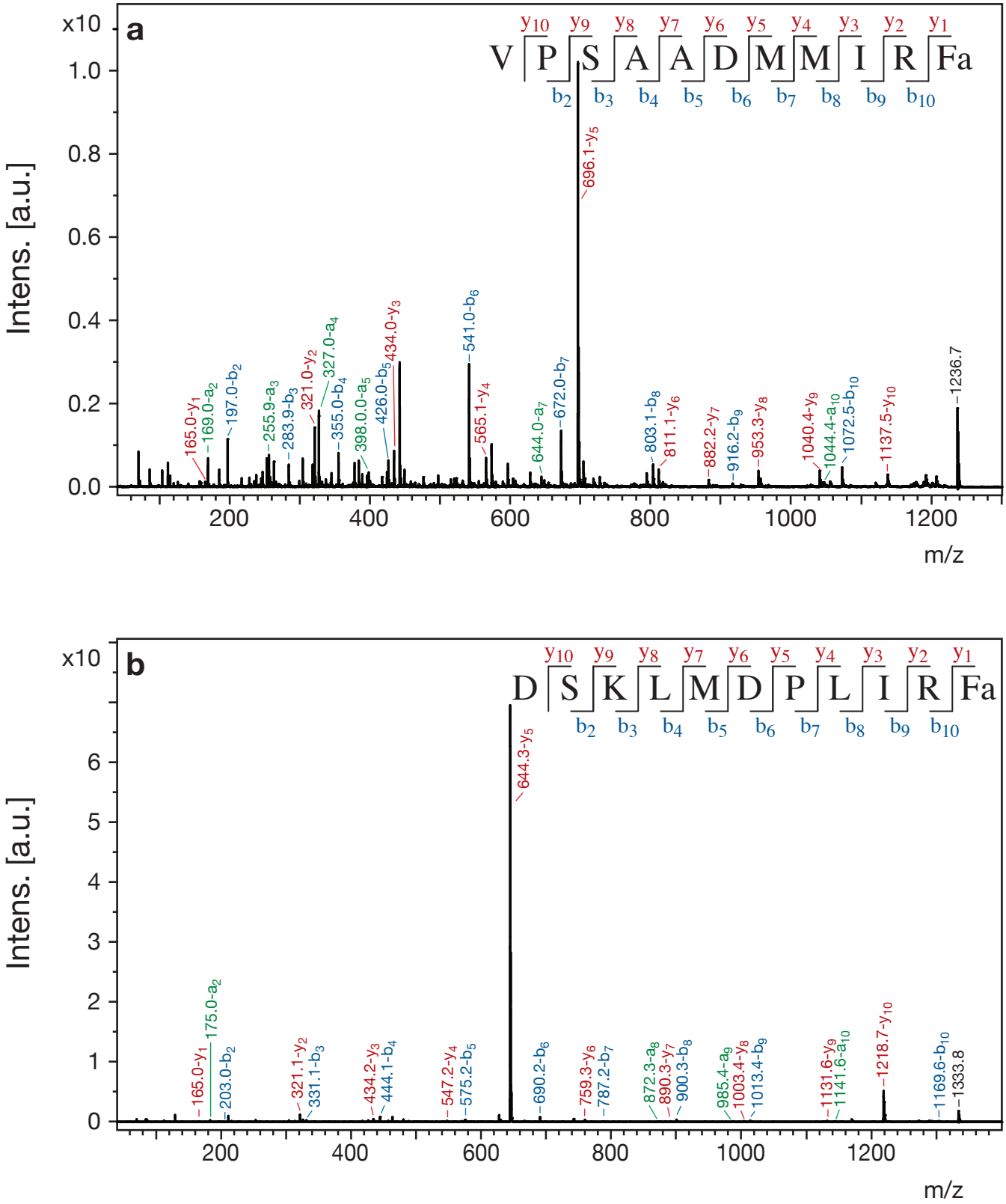
Supplementary Figure S3.

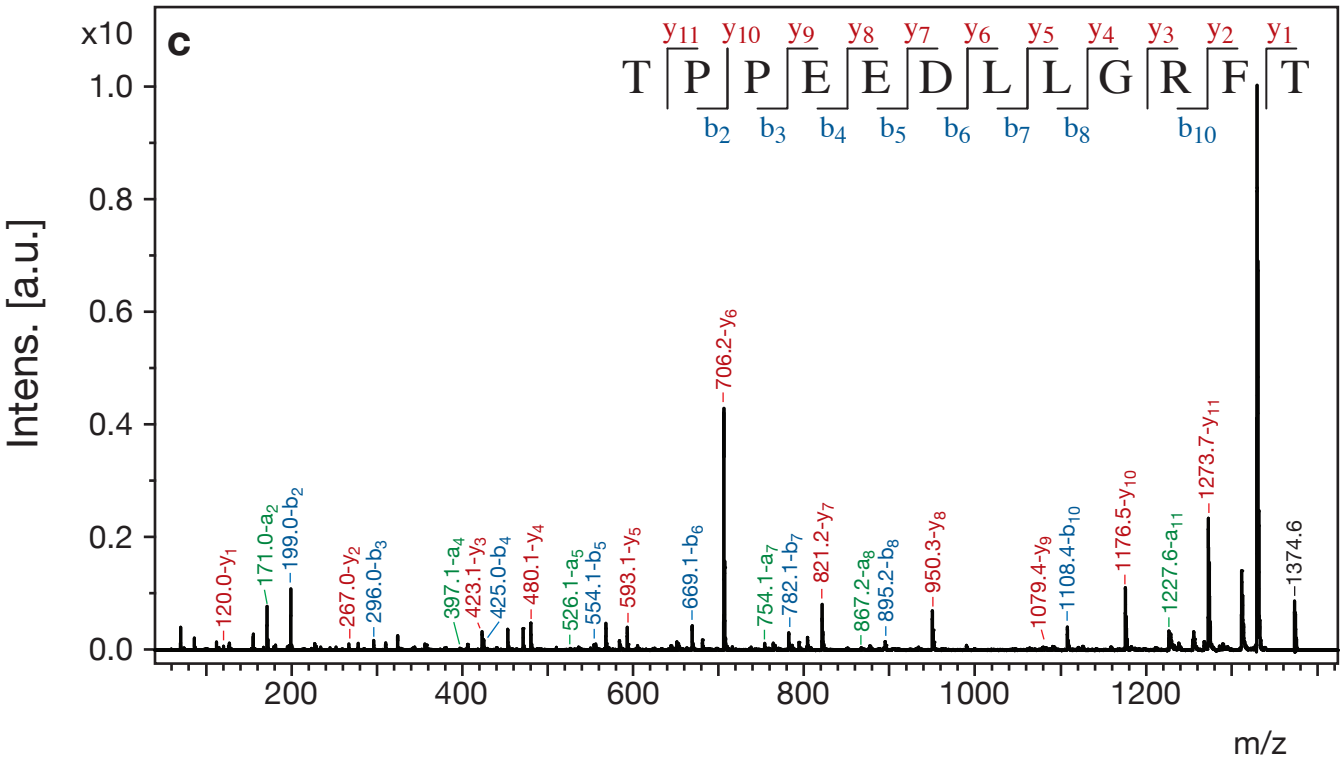


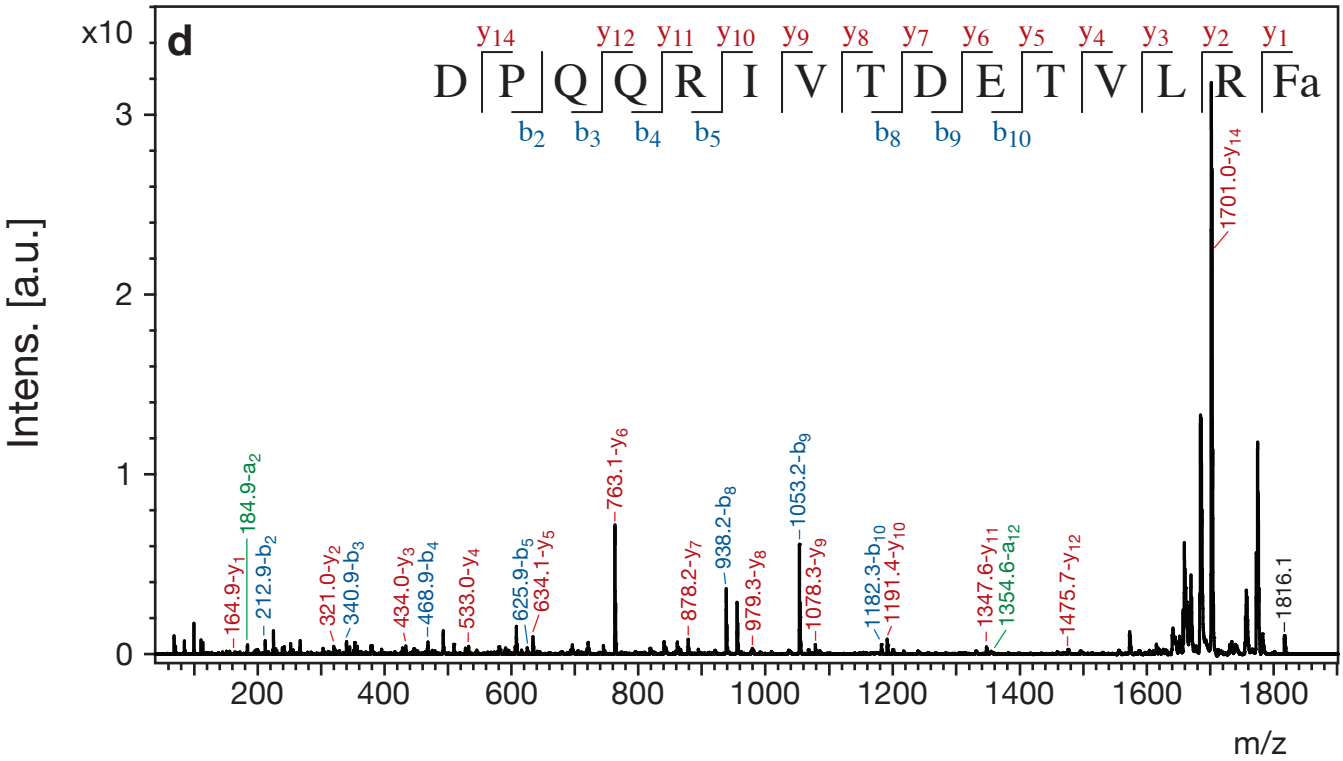


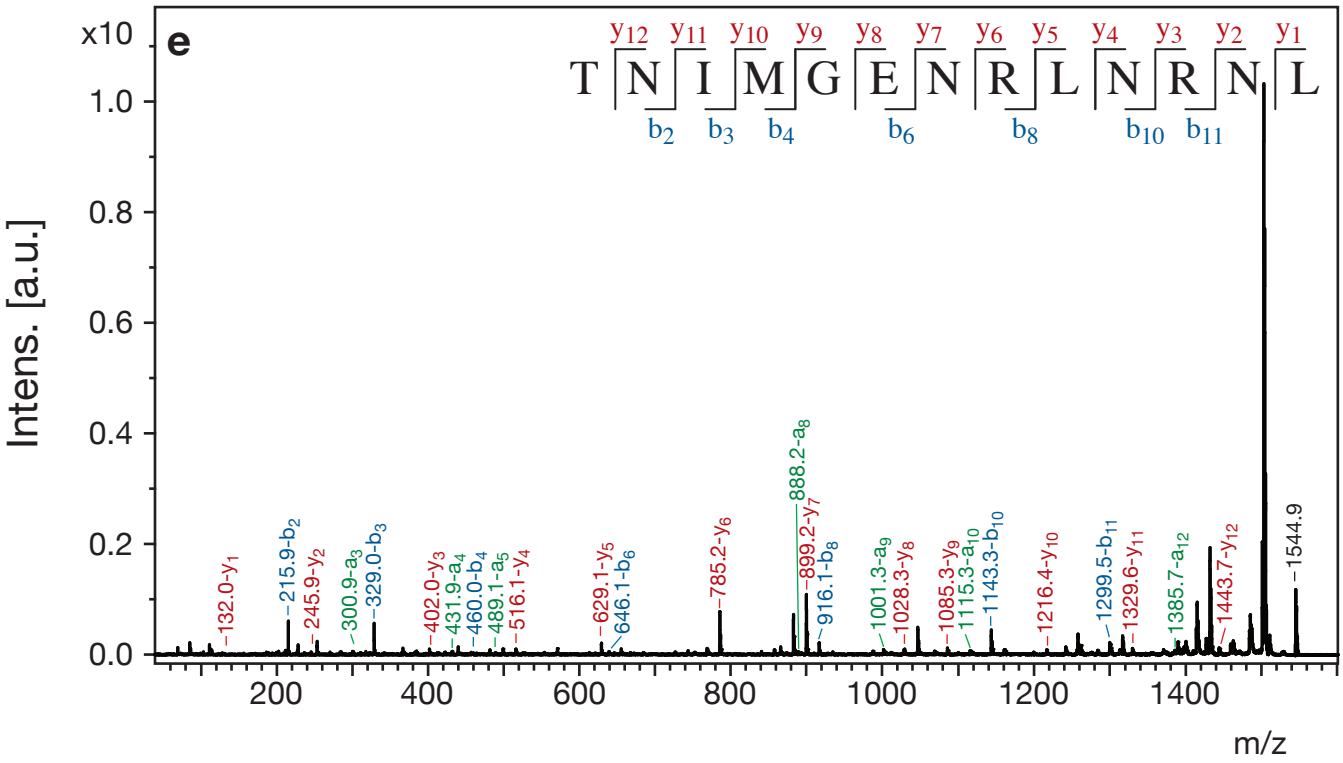
Supplementary Figure S3. MS/MS from ALA of 3 *afp-13* peptides (see also Figure 5). Peaks representing a (green), b (blue), y (red), and high intensity internal fragment (purple) ions are labeled and b and y ions are summarized at the top of each spectrum. (a) MS/MS spectrum of AF35, m/z 1815.8. (b) MS/MS spectrum of PepTL, m/z 1544.5. (c) MS/MS spectrum of PepGE+Ac, m/z 2065.1.

Supplementary Figure S4.




c
x10
1.0
0.8
0.6
0.4
0.2
0.0
Intens. [a.u.]
T P P E E D L L G R F T
y11 y10 y9 y8 y7 y6 y5 y4 y3 y2 y1
b2 b3 b4 b5 b6 b7 b8 b10
120.0-y1
171.0-a2
199.0-b2
267.0-y2
296.0-b3
397.1-a4
423.1-y3
425.0-b4
480.1-y4
526.1-a5
554.1-b5
593.1-y5
669.1-b6
706.2-y6
754.1-a7
782.1-b7
821.2-y7
867.2-a8
895.2-b8
950.3-y8
1079.4-y9
1108.4-b10
1176.5-y10
1227.6-a11
1273.7-y11
1374.6
200
400
600
800
1000
1200
m/z


d
x10
3
2
1
0
Intens. [a.u.]
D P Q Q R I V T D E T V L R Fa
y14 y12 y11 y10 y9 y8 y7 y6 y5 y4 y3 y2 y1
b2 b3 b4 b5 b8 b9 b10
164.9-y1
184.9-a2
212.9-b2
321.0-y2
340.9-b3
434.0-y3
468.9-b4
533.0-y4
625.9-b5
634.1-y5
763.1-y6
878.2-y7
938.2-b8
979.3-y8
1053.2-b9
1078.3-y9
1182.3-b10
1191.4-y10
1347.6-y11
1354.6-a12
1475.7-y12
1701.0-y14
1816.1
200
400
600
800
1000
1200
1400
1600
1800
m/z



Supplementary Figure S4. MS/MS of synthetic novel peptides. (a) MS/MS spectrum of AF36, m/z 1236.7. (b) MS/MS spectrum of AF34, m/z 1333.8. (c) MS/MS spectrum of PepTT, m/z 1374.6. (d) MS/MS spectrum of AF35, m/z 1816.1. (e) MS/MS spectrum of PepTL, m/z 1544.9.