Supporting Information

Photodynamic Control of Bioactivity in a Nanofiber Matrix

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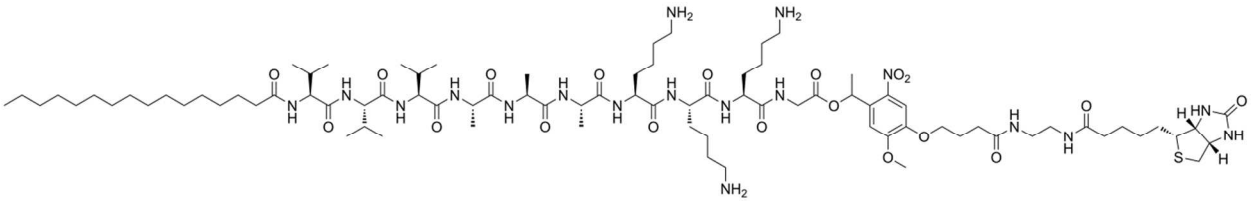
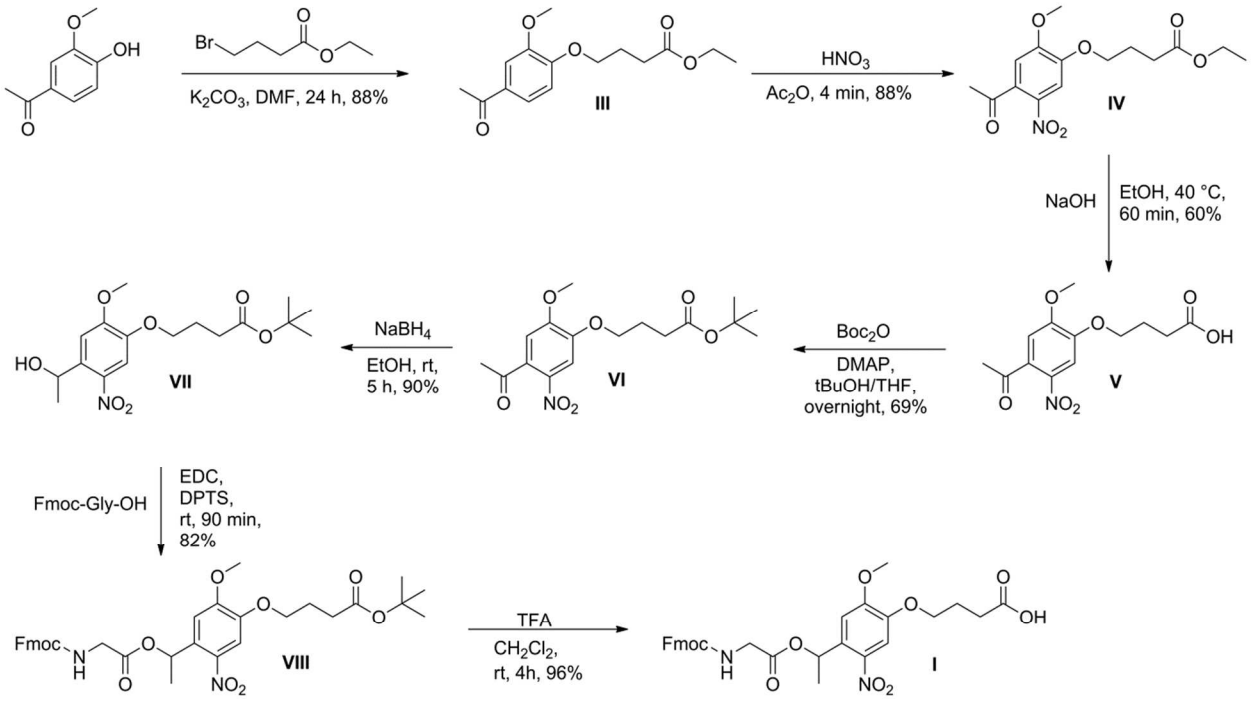
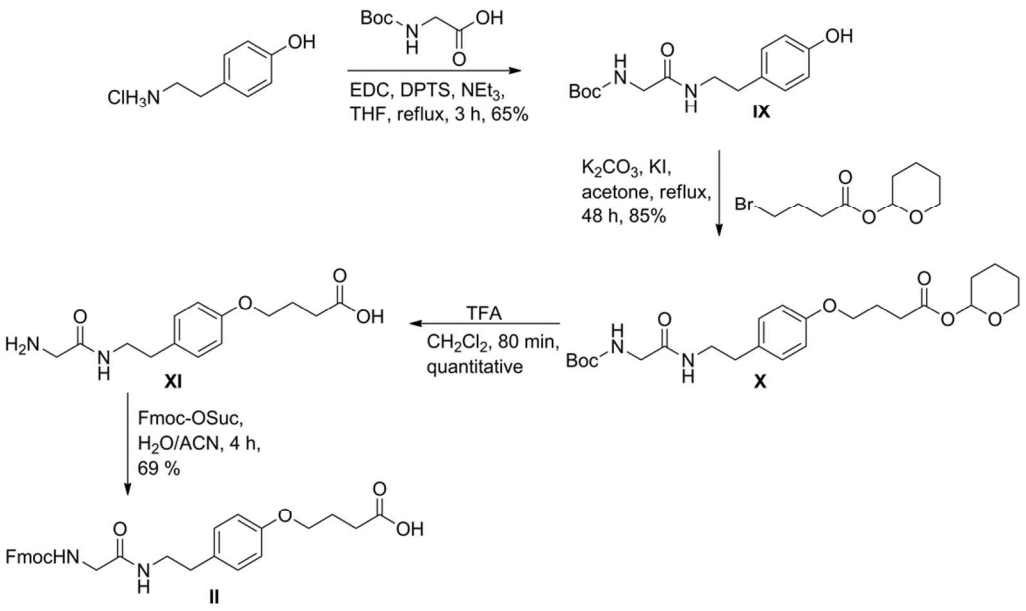


Figure S1. Chemical structure of biotinylated photolabile PA (PA **5**).



Scheme S1. Synthesis of photocleavable Fmoc-amino acid **I**.



Scheme S2. Synthesis of non-photocleavable Fmoc-amino acid **II**.

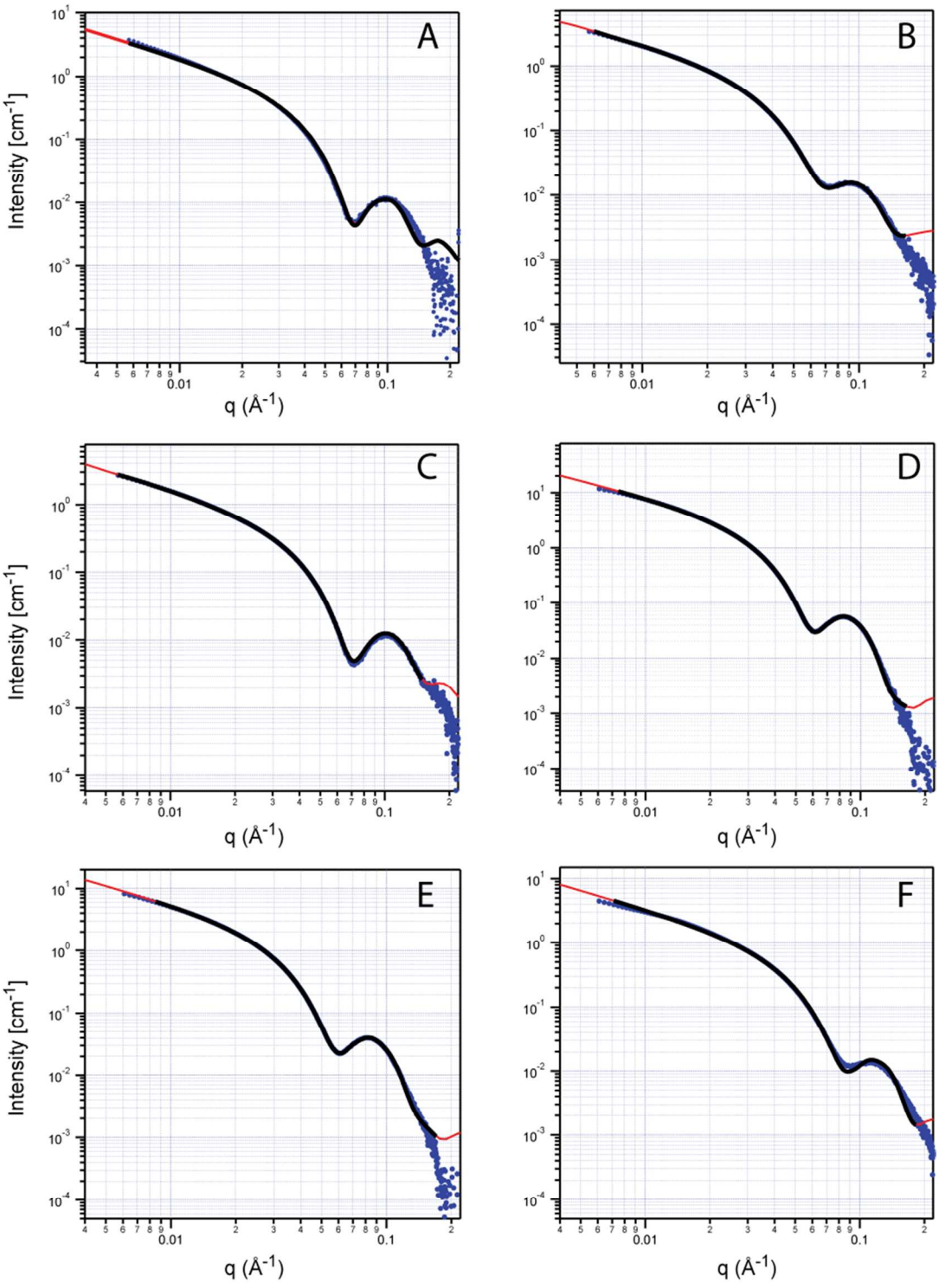


Figure S2. SAXS traces and fits of PA **1** (A), PA **2** (B), PA **2** irradiated for 10 min (C), PA **3** (D), PA **4** (E), and PA **5** (F). The blue dots represent the raw data. The solid red line represents the best fit to a core-shell cylinder form factor given by the equations below, where the core was allowed to be polydisperse according to a log-normal distribution. The solid black line represents the portion of the curves where fits were performed.

PA	**1**	**2**	**2-irr**	**3**	**4**	**5**
Mean core radius (A)	34.5	7.2	30.7	16.7	19.1	2.8
Radial shell thickness (A)	7.7	41.5	9.4	37.6	35.3	37.8
Total diameter (nm)	**8.4**	**9.7**	**8.0**	**10.8**	**10.8**	**8.1**
Radial polydispersity (σ)	0.15	0.52	0.16	0.30	0.29	0.61

Table S1. Selected SAXS data from PAs at 0.5 wt. % in water (**2-irr** indicates PA **2** irradiated for 10 min).

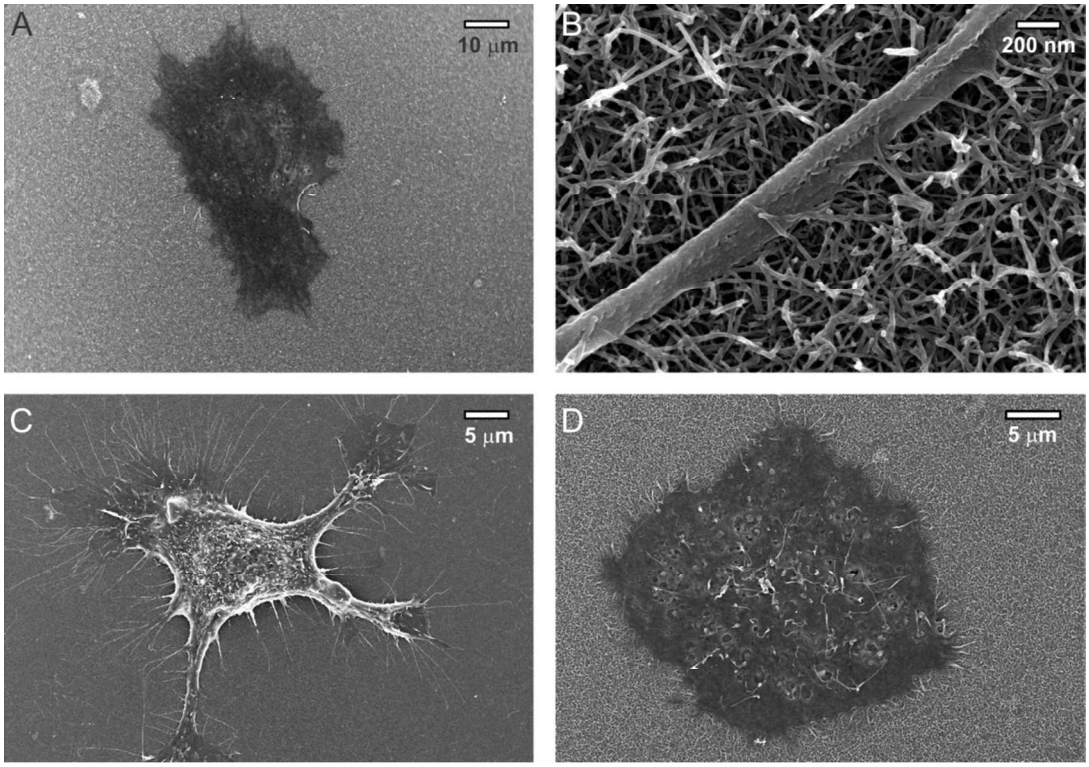


Figure S3. (A) Scanning electron micrograph (SEM) of 3T3 fibroblast on glass coverslip coated with a binary mixture of PA **2** and PA **1** at 10:90 ratio. (B) Higher magnification reveals a dense network of PA nanofibers on the surface and extension of a cellular filopodial process on it. Representative SEM images of fibroblasts on PA substrates consisting of a binary mixture of PA **2** and PA **1** at 20:80 ratio (C), and 100% PA **1** (D).

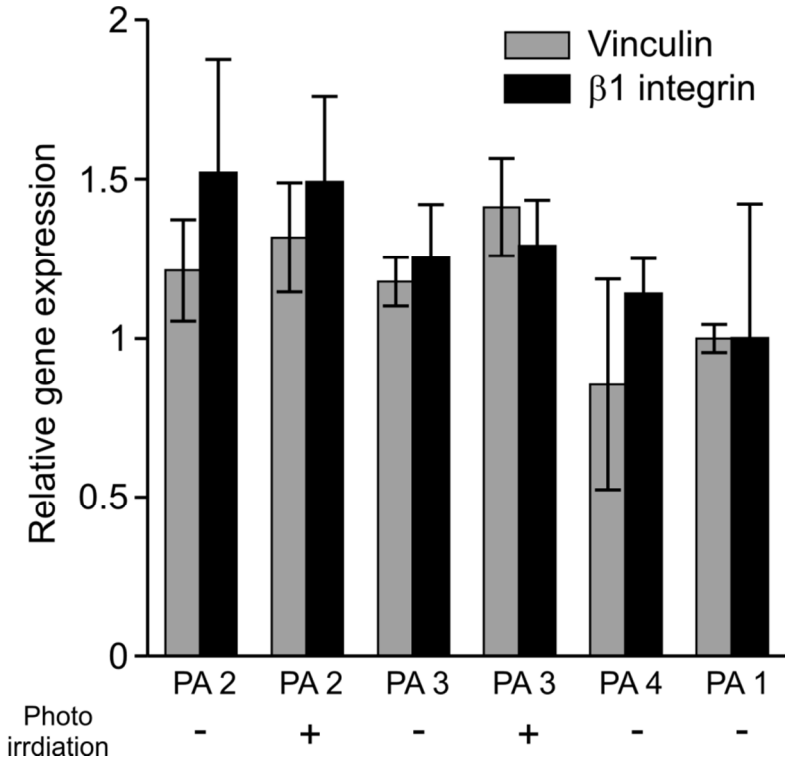


Figure S4. RT-PCR analysis of vinculin and β1 integrin gene expression in 3T3 fibroblasts cultured on various PA coated surfaces, measured 5 hours after cell plating (values shown here are normalized to the expression of GAPDH, and displayed relative to the normalized expression level of PA **1**). Error bar indicates standard error of the mean (n=3).

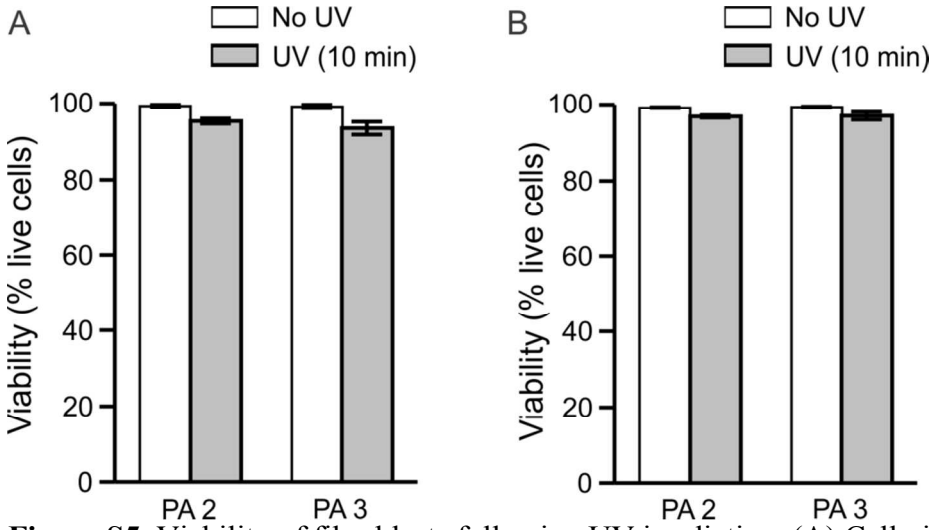


Figure S5. Viability of fibroblasts following UV irradiation. (A) Cell viability on PA substrates were measured immediately after UV irradiation using calcein AM and ethidium homodimer live-dead assay, and compared with UV untreated control. (B) Comparison of fibroblast viability after 7 hours of UV irradiation.

Instrumentation

PA Purification. Purification by preparative-scale HPLC was carried out on a Varian Prostar 210 HPLC system, eluting with of 2% ACN to 100% ACN in water on a Phenomenex C12 Jupiter column (150 x 30 mm) with 4 μm pore size and 90Å particle size. 0.1% TFA was added to both mobile phases to aid PA solubility. Product-containing fractions were confirmed by ESI mass spectrometry (Agilent 6510 Q-TOF LC/MS), combined, and lyophilized after removing ACN by rotary evaporation.

NMR. Spectra were recorded on a Varian Unity Plus 500 spectrometer, with working frequencies of 499.4 MHz for ^{1}H and 125.6 MHz for ^{13}C. Chemical shifts are reported in ppm and referenced to the residual non-deuterated solvent frequencies. High resolution mass spectra were taken by the Integrated Molecular Structure Education and Research Center (IMSERC) at Northwestern University.

LCMS. Analytical LCMS was performed on an Agilent 1200 system with an Agilent 6250 quadrupole-time-of-flight mass spectrometer using a Phenomenex Jupiter 4u Proteo column (4 μm particle size, 90 Å, 150 x 1.0 mm) eluting with a gradient of 5% ACN to 95% ACN in water, with each solvent containing 0.1% formic acid. Traces shown are total ion count.

SAXS modeling. Data analysis was based on fitting the scattering curve to an appropriate model by a least-squares method using software provided by NIST (NIST SANS analysis version 7.0 on IGOR).[1] The scattering intensity of a monodisperse system of particles of identical shape can be described as:

$$I(q) = NP(q)S(q)$$

where N is the number of particles per unit volume, P(q) is the form factor revealing the specific size and shape of the scatterers and S(q) is the structure factor that accounts for the interparticle interactions.[2] In dilute solutions, where the interactions between the objects can be neglected, S(q) equals one. In a polydisperse system of particles having identical shape, the total intensity scattered from a can be described by:

$$I(q) = N\int_0^\infty D_n(R)P(q,R)dR$$

where $D_n(R)$ is a distribution function and $D_n(R)dR$ is the number of particles, the size of which is between R and R + dR, per unit volume of sample.

A form factor for a simple polydisperse core-shell cylinder, where the core and the shell have a uniform electron density, is given by:

$$P(q) = \int_0^{\pi/2} \sin\theta \cdot d\theta \cdot \left[V_l(\rho_l - \rho_{solv}) \frac{\sin\left(\frac{qH_l\cos\theta}{2}\right)}{\frac{qH_l\cos\theta}{2}} \frac{2J_1(qR_l\sin\theta)}{qR_l\sin\theta} + V_p(\rho_p - \rho_l) \frac{\sin\left(\frac{qH_p\cos\theta}{2}\right)}{\frac{qH_p\cos\theta}{2}} \frac{2J_1(qR_p\sin\theta)}{qR_p\sin\theta} \right]^2$$

$$V_x = \pi R_x^2 H_x$$

where $J_1(x)$ is the first order Bessel function. Theta is defined as the angle between the cylinder axis and the scattering vector, q. R_p and R_l are the core and shell radii respectively. H_p and H_l are the core and shell lengths and ρ is electron density.
The polydispersity of the core radius is modeled using a log-normal distribution

$$D_n(R_p) = \frac{\exp\left(-\frac{1}{2}\left[\frac{\ln\left((R_p/R_0\right)}{\sigma_p}\right]^2\right)}{\sqrt{(2\pi)}\sigma_p R_p}$$

where R_o is the mean core radius and σ is equivalent to the standard deviation of the log-normal distribution.

Scanning electron microscopy (SEM). Cells plated on PA coatings were fixed with 2.5% glutaraldehyde in PBS (1 hour, RT) and dehydrated in a graded series of ethanol concentration. Dehydrated samples (in 100% ethanol) were then dried using a critical point dryer (Tousimis Samdri-795) to preserve structural details. Dried samples were coated with a thin film (14 nm) of osmium metal using an osmium plasma coater (Filgen, OPC-60A) and imaged using a Hitachi S-4800 Field Emission Scanning Electron Microscope at an accelerating voltage of 5 kV.

PCR. Samples for PCR were prepared identically to those used for immunostaining and quantification. Following 5 hours of culture, cell media was removed and surfaces were treated with 1 mL TRIzol® reagent (Invitrogen) for 5 minutes. After transfer to microcentrifuge tubes, 200 μL chloroform was added, samples were mixed, and then phase-separated by centrifugation. The upper aqueous phase was isolated and mixed with isopropanol and glycogen to pellet total RNA. The pellet was washed once with 70% ethanol, dried, and then resuspended in nuclease-free water. A standard two-step qPCR protocol was then performed, using reagents, plates and supplies from Bio-Rad. Total complimentary DNA (cDNA) was generated using an iScript™ Reverse Transcription Supermix following the manufacturer's instructions. RT-qPCR was then performed in 96-well plates with transparent seals by mixing cDNA with iQ™ SYBR® Supermix and primers (Integrated DNA Technologies) at 500 nM for the particular gene of interest. Primer sequences used were as follows. Mouse Vinculin (Accession Number NP_033528): 5'-GAG GCT GAA CTG CTT CAA TCA-3' (sense) and 5'-CCA GAT TTG ACG AGG TGC CTA-3' (antisense). Mouse β1 Integrin (Accession Number: BC050906) 5'-TGT GAC CCA TTG CAA GGA GAA GGA-3' (sense) and 5'-AAT TGG GAT GAT GTC GGG ACC AGT-3' (antisense). Mouse GAPDH (Accession Number NM_008084) 5'-TGT GTC CGT CGT GGA TCT GA-3' (sense) and 5' TTG CTG TTG AAG TCG CAG GAG-3' (antisense). Samples were analyzed using a Bio-Rad iQ™5 thermocycler with real-time fluorescence detection and well-factor determination with a fluoroscein internal standard in the Supermix. The thermocycler protocol began with a 15 minute hold at 95°C, followed by 35 cycles between an annealing step at 55°C for 30 seconds and 95°C for 15 seconds. At the end of 35 cycles, a melting curve was collected beginning at 55°C and heating to 95°C at a rate of 3°C/minute. The Bio-Rad analysis software was used to determine the threshold cycle (Ct) for

each sample. The expression of Vinculin and β1 Integrin were each normalized to that for GAPDH using the standard ddCt method, and values are presented relative to the control PA 1.

Cell viability assay: PA coatings were prepared on a 48 well plate following the method already described, and 15,000 cells were plated on each well. After 1 hour of incubation in serum free media to ensure attachment, cultures were exposed to 365 nm UV irradiation (9.5 mW/cm^2, 10 min), and either proceeded for viability assay, or further incubated in serum containing culture medium to perform the assay after 7 hours. Live and dead cells were fluorescently labeled with calcein AM and ethidium homodimer, respectively, using a commercially available Live/Dead® Viability/Cytotoxicity kit (Life technologies) and following the manufacturer's protocol. An inverted fluorescence microscope (Nikon, Eclipse TE2000U) operating at 10X objective magnification was used for image acquisition. Quantification was made from 3 images per well, and 2 wells for each condition. Live and dead cells were counted manually using the "Cell counter" plugin in ImageJ software.

Materials. Rink Amide MBHA resin and Fmoc-protected amino acids purchased from Novabiochem Corporation. Boc_2O was purchased from Oakwood Products and used as received. EDC was purchased from Novabiochem Corporation and used as received (EDC = N-(3-dimethylaminopropyl)-N′-ethylcarbodiimide hydrochloride). DPTS was synthesized as reported (DPTS = dimethylaminopyridinium p-toluene sulfonate).[3] All other reagents were purchased from Aldrich and used as received. CH_2Cl_2 and THF were dried over activated alumina on a solvent purification system before use. All other solvents were ACS reagent grade and purchased from Mallinckrodt; other reagents were purchased from Aldrich and used as received. The tetrahydropyranyl ester of 4-bromobutryic acid was synthesized according to a literature procedure.[4] Synthesis of photocleavable amino acid (**VII**) was carried out according to Scheme S1 based on similar molecules in the literature.[5] Synthesis of control amino acid (**XI**) was carried out according to Scheme S2.

Ethyl 4-(4-acetyl-2-methoxyphenoxy)butanoate (**III**). Briefly, to a solution of ethyl 4-bromobutyrate (7.2 mL, 50.3 mmol) in DMF (65 mL) was added vanillylacetone (10.3 g, 62.0 mmol) and K_2CO_3 (16.1 g, 116.5 mmol). The reaction mixture was stirred overnight at room temperature, then diluted with water (50 mL) and EtOAc (50 mL). The aqueous layer was extracted again with EtOAc (50 mL). The combined organic layers were then washed with water (4 x 30 mL) and brine (30 mL), then dried over Na_2SO_4. The solvent was removed in vacuo to afford an off-white powder in 88 % yield. (12.46 g). The product was used in the next step without further purification. ^{1}H NMR($CDCl_3$): 7.51 (dd, *J*=2, 8.5 Hz, 1H), 7.48 (s, 1H), 6.86 (d, *J*=8.5 Hz, 1H), 4.08-4.13 (m, 4H), 3.86 (s, 3H), 2.52 (s, 3H), 2.50 (t, *J*=7.5 Hz, 2H), 2.15 (quintet, *J*=6.5 Hz, 2H), 1.22 (t, *J*=7.0 Hz, 3H). ^{13}C NMR($CDCl_3$): 196.85, 173.07, 152.73, 149.36, 130.58, 123.29, 111.38, 110.56, 67.89, 60.55, 56.06, 30.65, 26.27, 24.40, 14.29. HRMS (M+Na): calc'd: 303.1203; found: 303.1209.

Ethyl 4-(4-acetyl-2-methoxy-5-nitrophenoxy)butanoate (IV). To a solution of **III** (11.8 g, 42.1mmol) in Ac_2O (200 mL) at 0 °C was added 70% HNO_3 (7 mL) dropwise over 2 min. The reaction mixture turned light brown. The reaction mixture was poured into 1800 mL ice water 4 min after beginning addition of HNO_3. The mixture was stirred for 30 minutes then filtered.

The recovered yellow solid was taken up in CH_2Cl_2 (200 mL), washed with sat. aq. $NaHCO_3$ (3 x 150 mL) and brine (1 x 150 mL), and then dried over Na_2SO_4. The solvent was removed in vacuo to afford a yellow powder in 88 % yield (12.05 g), including approximately 5% of a side-product that was presumably due to overnitration. The product was used in the next step without further purification. ^{1}H NMR($CDCl_3$): 7.61 (s, 1H), 6.75 (s, 1H), 4.09-4.18 (m 4H), 3.96 (s, 3H), 2.55 (t, J=7.0 Hz, 2H), 2.49 (s, 3H), 2.20 (quintet, J=7 Hz, 2H), 1.26 (t, J = 7.0 Hz, 3H). ^{13}C NMR($CDCl_3$): 200.07, 172.82, 154.32, 148.86, 132.81, 108.77, 108.01, 68.49, 60.56, 56.63, 30.52, 30.36, 24.20, 14.23. HRMS (M+Na): calc'd: 348.1054; found: 348.1061.

4-(4-acetyl-2-methoxy-5-nitrophenoxy)butanoic acid (V). Ester hydrolysis was carried out by adding 1M aqueous NaOH solution (51 mL, 51 mmol) to a suspension of **IV** (11.12 g, 34.2 mmol) in EtOH (150 mL). The reaction mixture was heated at 40 °C for 60 min, and then the EtOH was removed by rotary evaporation. The aqueous residue was taken up in sat. aq. $NaHCO_3$ (50 mL) and washed with CH_2Cl_2 (3x 50 mL). The aqueous layer was acidified to pH=1 with conc. HCl, causing a white precipitate to crash out. The mixture was extracted with CH_2Cl_2 (3 x 200 mL), and the combined organic layers were washed with 0.5 N HCl (2 x 100 mL) and dried over Na_2SO_4. The solvent was removed in vacuo to afford a yellow powder. The crude solid was further purified by recrystallization from MeOH/$CHCl_3$ to yield a light yellow powder in 60% yield (6.06 g). ^{1}H NMR ($CDCl_3$): 7.58 (s, 1H), 6.72 (s, 1H), 4.12 (t, J=6.5 Hz, 2H), 3.92 (s, 3H), 2.50 (t, J = 7.0 Hz, 2H), 2.46(s, 3H), 2.14 (quintet, J = 6.5 Hz, 2H). ^{13}C NMR ($CDCl_3$+ 10 % CD_3OD): 200.88, 175.46, 154.40, 148.96, 138.29, 132.66, 108.75, 108.12, 68.50, 56.58, 30.29, 30.13, 24.10. HRMS (M+Na): calc'd: 320.0741; found: 320.0732.

***tert*-Butyl 4-(4-acetyl-2-methoxy-5-nitrophenoxy)butanoate (VI)**. The product was synthesized using the *tert*-butyl esterification technique of Takeda.[6] To a suspension of **V** (6.00 g, 20.1 mmol) in 160 mL tBuOH/THF solution (3:1 v/v) was added DMAP (739 mg, 6.0 mmol). Boc_2O (7.95 g, 60.1 mmol) was added portionwise over 1.5 h. Bubbling was observed, and the flask was capped with a septum pierced with a needle. After overnight stirring, TLC (10% MeOH in CH_2Cl_2) showed complete conversion. The solvent was removed in vacuo to yield an orange powder. The residue was taken up in CH_2Cl_2 (100 mL) then washed with 0.2 N HCl (2 x 50 mL), sat. aq. $NaHCO_3$ (3 x 50 mL) and brine (50 mL). The CH_2Cl_2 layer was then dried over Na_2SO_4. The solvent was removed in vacuo to afford a sticky, orange solid, which was further purified through a plug of silica, eluting with 2% MeOH in CH_2Cl_2, to afford a light yellow powder in 69% yield (4.92 g) ^{1}H NMR ($CDCl_3$): 7.56 (s, 1H), 6.73 (s, 1H), 4.10 (t, J = 6.5 Hz, 2H), 3.92 (s, 3H), 2.44 (s, 3H), 2.42 (t, J = 7.5 Hz, 2H), 2.11 (t, J = 6.5 Hz, 2H), 1.41 (s, 9H). ^{13}C NMR($CDCl_3$): 200.21, 172.21, 154.41, 149.00, 138.42, 132.88, 108.83, 108.10, 80.70, 68.72, 56.71, 31.78, 30.48, 28.19, 24.41. HRMS (M+Na): calc'd: 376.1367; found: 376.1367.

***tert*-Butyl 4-(4-(1-hydroxyethyl)-2-methoxy-5-nitrophenoxy)butanoate (VII)**. Reduction was carried out by adding $NaBH_4$ (1.03 g, 27.2 mmol) to a suspension of **VI** (4.74 g, 13.4 mmol) in EtOH (75 mL). After 5 h, the reaction was quenched by addition of citric acid solution (600 mg/mL) until bubbling ceased and the pH reached 4. The solution was then diluted with CH_2Cl_2 (100 mL) and water (50 mL). The water layer was removed and discarded. The organic layer was washed with brine and dried over Na_2SO_4. The solvent was removed in vacuo to yield a viscous orange oil in 90% yield (4.27 g). ^{1}H NMR ($CDCl_3$): 7.53 (s, 1H), 7.28 (s, 1H), 5.52 (q, J = 7.0 Hz, 1H), 4.07 (td, J = 6.5, 1.5 Hz, 2H), 3.95 (s, 3H), 2.43 (t, J = 7.0 Hz, 2H), 2.11 (t, J = 7.0

Hz, 2H), 1.52 (d, J = 6.5 Hz, 3H), 1.43 (s, 9H). ^{13}C NMR ($CDCl_3$): 172.46, 154.25, 147.05, 139.58, 137.25, 109.18, 108.82, 80.75, 68.56, 65.82, 56.48, 31.97, 28.23, 24.56, 24.48. HRMS (M+Na): calc'd: 378.1523; found: 378.1527.

***tert*-Butyl 4-(4-(1-(2-(Fmoc-amino)acetoxy)ethyl)-2-methoxy-5-nitrophenoxy)butanoate (VIII)**. To a suspenstion of Fmoc-Gly-OH (3.90 g, 13.1 mmol) in CH_2Cl_2 (25 mL) was added EDC (2.93 g, 15.3 mmol) and DPTS (245 mg, 0.8 mmol). After 5 min, benzyl alcohol **VII** (3.00 g, 8.44 mmol) in CH_2Cl_2 (15 mL) was added. After stirring for 90 min at room temperature, the reaction mixture was washed with water (2 x 50 mL), sat. aq. $NaHCO_3$ (50 mL) and brine (50 mL). The organic layer was dried over Na_2SO_4. The solvent was removed in vacuo to afford a yellow powder that was further purified on a silica gel plug, eluting with 2% MeOH in CH_2Cl_2, yielding a light yellow powder in 82% yield (4.41 g). ^{1}H NMR($CDCl_3$): 7.74 (d, J = 7.5 Hz, 2H), ^{13}C NMR($CDCl_3$): 172.33, 169.18, 156.48, 154.32, 147.55, 143.85, 143.82, 141.37, 141.36, 139.73, 132.58, 127.87, 127.20, 125.16, 120.12, 109.10, 108.18, 80.69, 69.86, 68.52, 67.35, 56.52, 47.14, 43.07, 31.91, 28.23, 24.52, 22.08. ^{1}H NMR($CDCl_3$): 7.58 (s, 1H), 7.56 (s, 2H), 7.39 (t, J = 7.5 Hz, 2H), 7.27-7.31 (m, 2H), 7.00 (s, 1H), 6.56 (q, J = 5.0 Hz, 1H), 4.35-4.42 (m, 2H), 4.20 (t, J = 7.0 Hz, 1H), 4.08 (t, J = 6.5 Hz, 2H), 4.03 (d, J = 6.0 Hz, 1H), 4.01 (d, J = 6.0 Hz, 1H), 3.95 (s, 3H), 2.44 (t, J = 7.0Hz, 2H), 2.13 (quintet, J = 7.0 Hz, 2H), 1.65 (d, J = 6.5 Hz, 3H), 1.45 (s, 9H). HRMS (M+Na): calc'd: 657.2419; found: 657.2412.

4-(4-(1-(2-(Fmoc-amino)acetoxy)ethyl)-2-methoxy-5-nitrophenoxy)butanoic acid (I). *tert*-Butyl ester **VIII** (4.40 g, 6.93 mmol) was dissolved in 15% TFA in CH_2Cl_2 (40 mL). After 4 h the solvent was removed by rotary evaporation, chasing the TFA with several additions and evaporations of CH_2Cl_2. The residue was taken up in CH_2Cl_2 (30 mL) and washed with 0.5 N HCl (2 x 40 mL) and brine (40 mL). The organic layer was then dried over Na_2SO_4. The solvent was removed in vacuo to yield a yellow powder in 96% yield (3.84 g), including approximately 5% of an impurity that could not be easily removed. Product **VII** was used in solid-phase peptide synthesis without further purification. ^{1}H NMR($CDCl_3$): 7.74 (d, J= 7.5 Hz, 2H), 7.56-7.59 (m, 3H), 7.38 (t, J = 7.5 Hz, 2H), 7.26-7.30 (m, 2H), 7.01 (s, 1H), 6.55 (q, J = 6.5 Hz, 1H), 5.58 (t, J = 5H, 1H), 4.34-4.42 (m, 2H), 4.19 (t, J = 7.0 Hz, 1H), 4.09 (t, J = 7.0 Hz, 2H), 4.04 (t, J = 6.5 Hz, 2H), 3.94 (s, 3H), 2.59 (t, J = 7.0 Hz, 2H), 2.17 (t, J = 7.0 Hz, 2H), 1.65 (d, J = 6.5 Hz, 3H). ^{13}C NMR($CDCl_3$): 178.59, 169.33, 156.57, 154.26, 147.32, 143.78, 143.74, 141.28, 139.60, 132.63, 127.81, 127.14, 125.10, 120.05, 109.01, 108.15, 69.83, 68.05, 67.33, 56.43, 47.05, 43.01, 30.32, 23.99, 21.98. HRMS (M+Na): calc'd: 601.1793; found: 601.1796.

***tert*-Butylcarbamoyl-2-oxoethyl-2-(4-hydroxyphenethyl)-amine (IX)**. To a suspension of tyramine-HCl (2.00 g, 11.5 mmol) in dry THF (20 mL) and NEt_3 (5 mL) was added Boc-Gly-OH (2.26 g, 12.9 mmol), followed by EDC (2.43 g, 12.7 mmol) and DPTS (338 mg, 1.15 mmol). The cloudy reaction mixture was heated at reflux for 3 h, and then the solvent was removed by rotary evaporation. The residue was dissolved in CH_2Cl_2 (40 mL) and washed with water (3 x 40 mL) and brine (40 mL) then dried over Na_2SO_4. The solvent was removed to yield a viscous oil that was purified on a plug of silica gel, eluting with 4% MeOH in CH_2Cl_2. The combined product-containing fractions were evaporated to yield a white solid in 65% yield (2.20 g). ^{1}H NMR($CDCl_3$ + 10% CD_3OD): 7.02 (d, J = 8.5 Hz, 2H), 6.76 (d, J = 8.5 Hz, 2H), 3.71 (s, 2H), 3.47 (t, J = 7.0 Hz, 2H), 2.72 (t, J = 7.0 Hz, 2H), 1.44 (s, 9H). ^{13}C NMR($CDCl_3$ + 10%

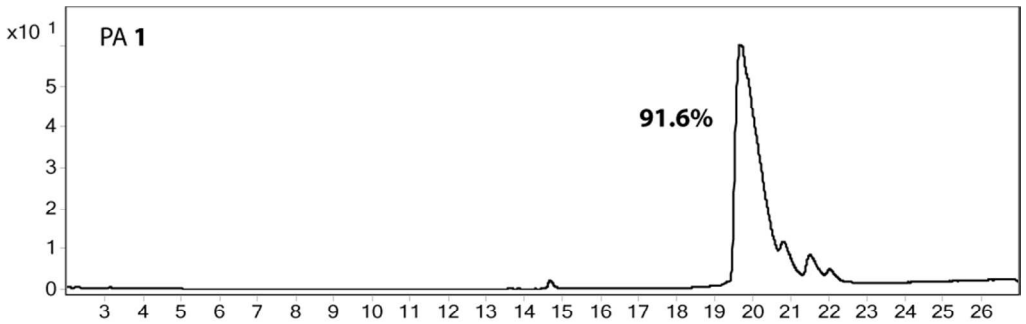
CD_3OD):170.30, 156.30, 155.19, 129.47, 115.25, 115.11, 79.98, 43.52, 40.77, 34.32, 27.89. HRMS (M+Na): calc'd: 317.1472; found: 317.1480.

Tetrahydropyranyl 4-(4-(2-(2-((*tert*-butylcarbamoyl)amino)acetamido)ethyl)phenoxy)butanoate (X). To a solution of phenol **IX** (2.02 g, 6.86 mmol) in acetone (25 mL) was added tetrahydropyranyl 4-bromobutanoate (2.58 g, 10.3 mmol), followed by K_2CO_3 (1.71 g, 12.4 mmol) and KI (225 mg, 1.35 mmol). The reaction mixture was heated at reflux for 48 h, monitoring reaction progress by TLC. Once cool, the reaction mixture was diluted with EtOAc (30 mL) and washed with water (2 x 30 mL) and brine (30 mL). The organic layer was dried over Na_2SO_4 and concentrated to yield a viscous oil that was purified on a plug of silica gel. The combined product-containing fractions were evaporated to yield **X** as a viscous oil in 85% yield (2.71 g). ^{1}H NMR($CDCl_3$): 7.08 (d, J = 7.5 Hz, 2H), 6.83 (d, J = 7.5 Hz, 2H), 6.06 (s, 1H), 5.99 (s, 1H), 5.08 (s, 1H), 4.00 (t, J = 6.0 Hz, 2H), 3.87-3.92 (m, 1H), 3.74 (d, J = 5.5 Hz, 2H), 3.67-3.70 (m, 1H), 3.49 (q, J = 6.0 Hz, 2H), 2.75 (t, J = 7.0 Hz, 2H), 2.57 (t, J = 7.0 Hz, 2H), 2.13 (quintet, J = 7.0 Hz, 2H), 1.57-1.84 (m, 6H), 1.44 (s, 9H). ^{13}C NMR($CDCl_3$+ 10% CD_3OD): 172.11, 169.55, 157.66, 130.93, 129.79, 114.79, 92.77, 66.80, 63.41, 44.44, 40.92, 34.87, 31.12, 29.32, 28.44, 25.05, 24.68, 18.77. HRMS (M+Na): calc'd: 487.2415; found:487.2402.

4-(4-(2-(2-Aminoacetamido)ethyl)phenoxy)butanoic acid (XI). Deprotection was carried by out dissolving compound **X** (2.63 g, 5.66 mmol) in a mixture of CH_2Cl_2 (40 mL) and TFA (10 mL). The reaction mixture was stirred at room temperature for 80 min, and then the solvent was removed by rotary evaporation. To the residue was added Et_2O (100 mL), and the mixture was stirred and sonicated for several minutes. The product was recovered by filtration, and the solids were taken up in 20% MeOH in CH_2Cl_2, and then dried over Na_2SO_4 and concentrated. Amino acid **XI** was recovered as an off-white powder in quantitative yield (1.59 g). ^{1}H NMR(DMSO-d_6): 12.15 (s, 1H), 8.36 (t, J = 5.0 Hz, 1H), 7.97 (s, 2H), 7.12 (d, J = 8.5 Hz, 2H), 6.85 (d, J = 8.5 Hz, 2H), 3.94 (t, J = 6.0 Hz, 2H), 3.49 (s, 2H), 3.25 (q, J = 6.5 Hz, 2H), 2.66 (t, J = 7.0 Hz, 2H), 2.37 (t, J = 7.0 Hz, 2H), 1.92 (quintet, J = 7.0 Hz, 2H). ^{13}C NMR(DMSO-d_6):174.13, 165.78, 157.06, 131.06, 129.66, 114.36, 66.52, 40.57, 40.12, 34.08, 30.18, 24.32. HRMS (M+H): calc'd: 281.1496; found: 281.1490.

4-(4-(2-(2-Fmoc-aminoacetamido)ethyl)phenoxy)butanoic acid (II). Amino acid **XI** (1.47 g, 5.28 mmol) was dissolved in a mixture of water (12 mL) and triethylamine (1.8 mL). To this solution was added a solution of Fmoc-OSuc (2.20 g, 6.52 mmol) in ACN (12 mL) (gentle heating was required for full dissolution). The reaction mixture was allowed to stir for 4 h at room temperature, and then the reaction mixture was concentrated to 10 mL. To the remaining solution was added 5% citric acid (30 mL). This mixture was extracted with 10% MeOH in CH_2Cl_2 (4 x 50 mL), and the combined extracts were dried over Na_2SO_4 and rotovapped to yield a white solid. Pure Fmoc-amino acid **II** was obtained in 69% yield as a white solid by recrystallization from EtOH (1.82 g) ^{1}H NMR(DMSO-d_6): 12.10 (s, 1H), 7.89 (d, J = 7.5 H, 2H), 7.84 (t, J = 5.5 Hz, 1H), 7.72 (d, J = 8.0 Hz, 2H), 7.49 (t, J = 5.5 Hz, 1H), 7.42 (t, J = 7.5 Hz, 2H), 7.33 (t, J = 7.5 Hz, 2H), 7.09 (d, J = 8.5 Hz, 2H), 6.82 (d, J = 8.5 Hz, 2H), 4.29 (d, J = 6.5 Hz, 2H), 4.19-4.24 (m, 2H), 3.92 (t, J = 6.5 Hz, 2H), 3.56 (d, J = 5.5 Hz, 2H), 3.23 (q, J = 7.0 Hz, 2H), 2.62 (t, J = 7.5 Hz, 2H), 2.36 (t, J = 7.5 Hz, 2H), 1.90 (quintet, J = 7.0 Hz, 2H). ^{13}C NMR(DMSO-d_6): 174.15, 168.94, 156.96, 156.50, 143.89, 140.76, 131.31, 129.59, 127.65,

127.09, 125.28, 120.11, 114.34, 66.39, 65.75, 46.70, 43.56, 40.50, 34.32, 30.17, 24.32. HRMS (M+H): calc'd: 503.2177; found: 503.2172.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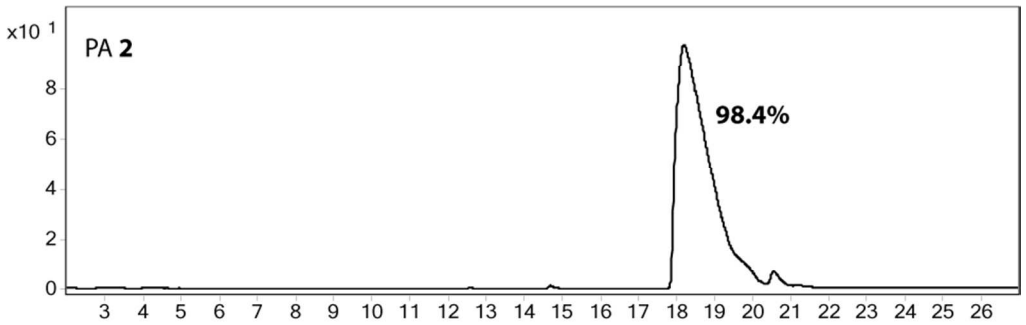
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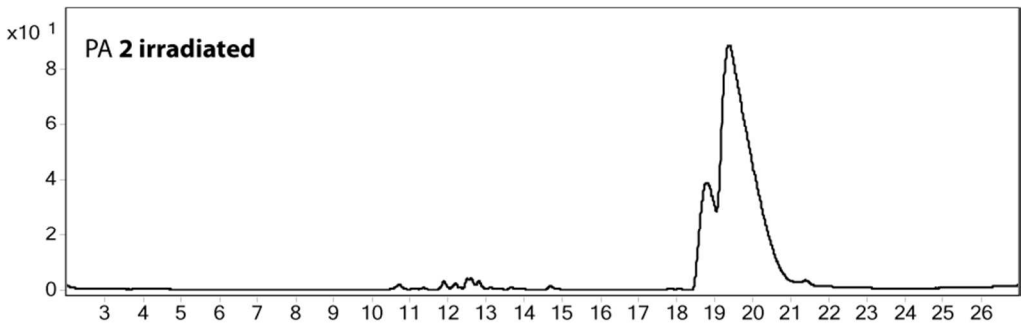
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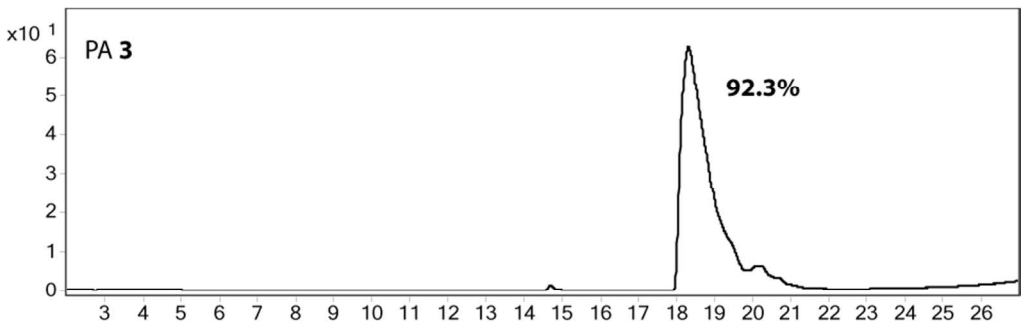
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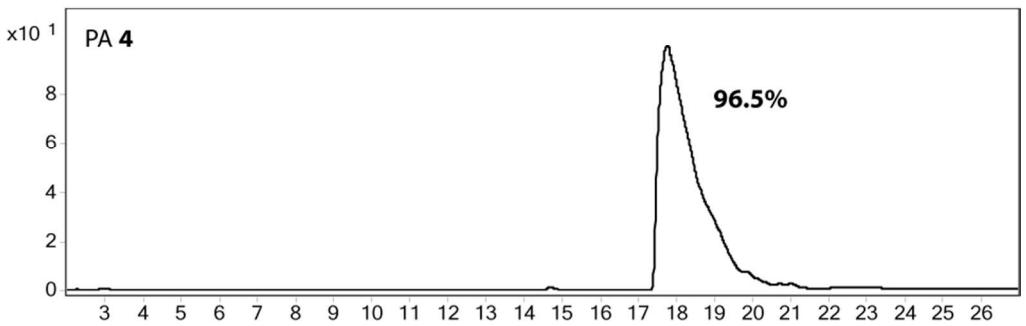
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Figure S5. LCMS traces (total ion count) of PAs **1**-**4** and PA **2** after 5 min UV exposure. Purity is noted for each pure PA, measured according to peak area.

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