Supporting Information for
An Efficient Synthesis of the Nucleus of Atorvastatin Calcium

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S1. General information of experimental

The isolation of compound **4** in the last step reaction

To a mixture of compound **3** (3.50 g, 17.06 mmol) and potassium carbonate (3.54 g, 25.61 mmol) in acetone (20 mL), a solution of compound **5** (5.00 g, 17.06 mmol) in acetone (5 mL) was added dropwise, then the mixture was stirred at room temperature for 5 h. The mixture was filtered and the filter cake was washed with acetone (20 mL). The combined filtrate was evaporated to give the crude product. Isopropyl alcohol (30 mL) was added and the mixture was heated to 85-90°C. Then, the mixture was cooled to 0-5°C and white solid appeared, the solid was filtered, the mother liquor was concentrated and the byproduct was isolated by silica gel column chromatography (petroleum ether : dichloromethane = 1 : 1). This byproduct was confirmed by ¹H NMR, ¹³C NMR and HRMS as compound **4**. ¹H NMR (600 MHz, CDCl₃) δ: 8.06-8.02 (m, 2H), 7.35-7.25 (m, 5H), 7.12 (t, *J* = 8.4 Hz, 2H), 4.26 (s, 2H). ¹³C NMR (150 MHz, CDCl₃) δ: 196.05, 167.03, 164.49, 134.51, 133.05, 131.35, 131.26, 129.45, 128.77, 127.02, 115.87, 115.66, 45.49. HRMS (ESI), calcd: C₁₄H₁₁FO [M+Na]⁺ *m/z*: 237.0794, found: 237.0687.

S2. ^1H and ^{13}C NMR and MS spectra:

Methyl 4-methyl-3-oxopentanoate (2)

^1H NMR (600 MHz, CDCl_3) δ : 3.69 (s, 3H), 3.48 (s, 2H), 2.68 (m, 1H), 1.01 (d, $J = 7.2$ Hz, 6H).

^{13}C NMR (150 MHz, CDCl_3) δ : 205.95, 167.38, 51.44, 46.23, 40.44, 17.26.

Two byproducts of the aldol condensation of methyl isopropyl ketone were confirmed by GC-MS as compound **6** and **7**.

XYZH-141112_141112114804 #638 RT: 7.66 AV: 1 NL: 3.04E5
T: + c Full ms [29.00-300.00]

XYZH-141112_141112114804 #666 RT: 7.82 AV: 1 NL: 2.01E5
T: + c Full ms [29.00-300.00]

N-Phenyl-4-methyl-3-oxo-pentanamide (**3**)

^1H NMR (600 MHz, CDCl_3) δ : 9.23 (s, 1H), 7.09-7.55 (m, 5H), 3.59 (s, 2H), 2.73 (m, 1H), 1.17 (d, $J = 6.6$ Hz, 6H).

^{13}C NMR (150 MHz, CDCl_3) δ : 210.4, 164.5, 137.6, 128.8, 124.5, 120.1, 47.7, 41.5, 17.6.

1-(4-Fluorophenyl)-2-phenylethanone (**4**)

^1H NMR (600 MHz, CDCl_3) δ : 8.06-8.02 (m, 2H), 7.35-7.25 (m, 5H), 7.12 (t, $J = 8.4$ Hz, 2H), 4.26 (s, 2H).

^{13}C NMR (150 MHz, CDCl_3) δ : 196.05, 167.03, 164.49, 134.51, 133.05, 131.35, 131.26, 129.45, 128.77, 127.02, 115.87, 115.66, 45.49.

2-Bromo-1-(4-fluorophenyl)-2-phenylethanone (**5**)

^1H NMR (600 MHz, CDCl_3) δ : 8.01-7.98 (m, 2H), 7.49 (d, $J = 7.2$ Hz, 2H), 7.36-7.30 (m, 3H), 7.07 (t, $J = 8.6$ Hz, 2H), 6.32 (s, 1H).

^{13}C NMR (150 MHz, CDCl_3) δ : 189.33, 166.29, 164.59, 135.52, 131.69, 131.63, 130.04, 128.89, 128.74, 115.71, 115.57, 51.07.

4-Fluoro- α -[2-methyl-1-oxopropyl]- γ -oxo-N, β -diphenylbenzene butyramide (**1**)

^1H NMR (600 MHz, $\text{DMSO}-d_6$) δ : 10.20 (s, 1H), 8.13 (t, $J = 7.2$ Hz, 2H), 7.36-7.01 (m, 12H), 5.42 (d, $J = 11.4$ Hz, 1H), 4.87 (d, $J = 11.4$ Hz, 1H), 2.90 (m, 1H), 1.16 (d, $J = 7.2$ Hz, 3H), 0.93 (d, $J = 3.6$ Hz, 3H).

^{13}C NMR (150 MHz, $\text{DMSO}-d_6$) δ : 208.08, 196.42, 165.82, 165.01, 164.14, 138.11, 135.09, 138.11, 135.09, 132.15, 131.75, 131.69, 128.83, 128.67, 128.61, 127.52, 123.91, 119.63, 115.83, 115.69, 63.02, 51.75, 39.42, 18.80, 17.86.

HRMS (ESI), calcd: $\text{C}_{26}\text{H}_{24}\text{FNO}_3$ $[\text{M}-\text{H}]^-$ m/z : 416.1740, found: 416.1716.

The isolated byproduct in the last step reaction was confirmed by ^1H NMR, ^{13}C NMR and HRMS as compound **4**.

^1H NMR (600 MHz, CDCl_3) δ : 8.06-8.02 (m, 2H), 7.35-7.25 (m, 5H), 7.12 (t, $J = 8.4$ Hz, 2H), 4.26 (s, 2H).

^{13}C NMR (150 MHz, CDCl_3) δ : 196.05, 167.03, 164.49, 134.51, 133.05, 131.35, 131.26, 129.45, 128.77, 127.02, 115.87, 115.66, 45.49.

HRMS (ESI), calcd: $\text{C}_{14}\text{H}_{11}\text{FO}$ $[\text{M}+\text{Na}]^+$ m/z : 237.0794, found: 237.0687.

S3. HPLC purity of the compound 1

HPLC analyses were performed on a Agilent 1100 Series instrument at ambient temperature using Zorbax Eclipse XDB-C₁₈ column (reverse phase, 4.6 mm × 250 mm), mobile phase: methanol and water (70 : 30, V/V).

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU *s	Height [mAU]	Area %
1	5.572	BV	0.2620	48.04749	2.81105	0.1982
2	19.418	BB	0.7484	2.41981e4	500.99088	99.8018

Totals : 2.42462e4 503.80193