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INTRODUCTION OF A CARBOXYMETHYLAMINO(or OXY or THIO) GROUP IN THE 3 POSITION OF 2-ARYL(or ARYLMETHYL) ISOINDOL-1-ONES FROM α HYDROXYLACTAMS

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Abstract: The preparation of 3-carboxymethylamino (or oxy or thio)-2-aryl (or arylmethyl)-isoindol-1-ones are described from hydroxylactams according to three different pathways.

Tetracyclic systems as **1** incorporating an isoindole moiety with its nitrogen atom as one of the two junction atoms are widely expanded. The isoindolo[1,2-b] [3]benzazepine **1** (n=2, m=0, X=CH_2, ring D=benzene) belonging to the aporhoeadane alkaloid serie[1,2] is one example. Compounds with a second heteroatom (X=N, O, S) in the C ring are few reported. Structures with a second nitrogen atom ([1,3] or [2,4]benzodiazepines, X=N, n=0,1, m=1,2) are described[3-8] but we have found one report[9] concerning compounds with an oxygen atom ([3,1]benzoxazepine, X=O, n=0, m=2) and no report with a sulfur atom. Similarly,

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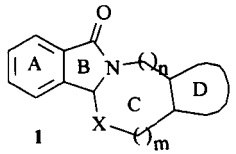
isoindolobenzodiazocine (X=NH, n+m=3), oxazocine (X=O, n+m=3) or thiazocine (X=S, n+m=3) are just now unknown.



1

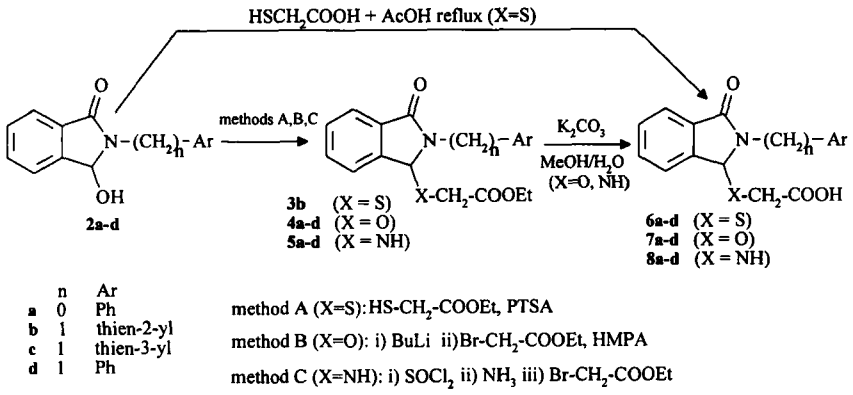
n = 0, 1, 2 m = 0, 1, 2
X = O, S, NH, CH_2
ring D = benzene, thiophene

As a further development of our search on tetracyclic systems we hope to synthesize polycyclic systems as **1** (X=O, S, NH, n=1, m=2). For this purpose, substituted isoindolones **6**, **7** or **8** could be the precursors and we wish describe herein their synthesis.

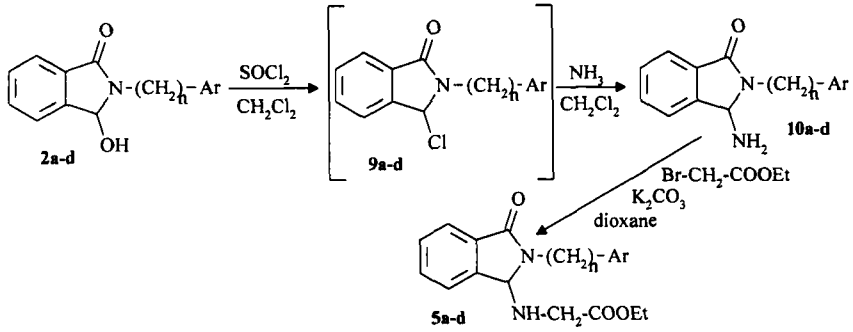
Since it is well known that hydroxylactam can give a substitution product[10] under an acidic catalyze in the presence of a nucleophile *via* a *N*-acyliminium ion, we tried three nucleophiles: glycine, glycolic acid and thioglycolic acid and their ethyl esters. Thus (Scheme 1), only the thioglycolic acid (or its ethyl ester) have reacted with the previously reported hydroxylactams **2a-d**[11,12] (n=0,1, Ar=Ph, thien-2(3)-yl) under these conditions of reaction. The substitution products **3b** or **6a-d** were obtained in excellent yields (81 to 94%). Glycolic acid, glycine and their corresponding esters did not react or degradation products were observed. A related compound substituted with a furfuryl group had been prepared from methyl 2-formylbenzoate, furfurylamine and methyl thioglycolate[13]. Nevertheless other aminolactams or thioalkyl(aryl)lactams could be obtained using aniline, *p*-methylaniline or isopropanethiol, thiophenol as nucleophiles[14].

The requisite carboxymethyloxy esters derivatives **4a-d** (X=O) were prepared by an alkylation of the hydroxylactam. Actually, compound **2a-d** treated with butyllithium in tetrahydrofuran followed by the action of ethyl bromoacetate dissolved in hexamethylphosphotriamide (without HMPA, the reaction did not occur) afforded the expected ether derivatives **4a-d**.

The amino derivatives **5a-d** (X=NH) were synthesized according to Scheme 2. First we prepared 3-amino-2-alkyl(aryl)isoindol-1-ones **10a-d** *via* the chlorolactams **9a-d**.



Scheme 1



Scheme 2

The hydroxylactams **2a-d** were treated with thionyl chloride in dichloromethane and the resulting chlorolactams **9a-d** submitted to the action of ammonia in dichloromethane led to the 3-amino derivatives **10a-d** in good yield (72% to 81%). Alkylation of the latter using ethyl bromoacetate gave the expected alkylated products **5a-d**. It is noteworthy that the direct amination using ethyl glycinate upon the chlorolactams **9a-d** did not occur. On the other hand amine **5d** could be prepared by the reaction of 2-cyanobenzaldehyde with ammonia

followed by a selective *N*-alkylation of the resulting amide in the presence of a phase transfer catalyst[15].

All the esters **3, 4, 5a-d** are viscous oils and their saponification was accomplished using potassium carbonate in aqueous methanol giving the corresponding carboxylic acids **6, 7, 8a-d** as crystalline products.

The microanalysis and spectroscopic data (IR, ^{1}H and ^{13}C NMR) confirmed the assigned structures for the various compounds obtained (details are reported in the experimental part).

These results indicate that direct conversion of hydroxylactams **2a-d** to thio derivatives **3a-d** was very efficient *via* a *N*-acyliminium ion, while an alkylation was necessary to obtain the oxy derivatives **4a-d**, and an alkylation of the amino compounds **10a-d**, *via* a chlorolactam intermediate, was essential to get the alkylamino derivatives **5a-d**. All of these compounds are possible precursors of polycyclic structures and cyclization reactions are under investigation.

EXPERIMENTAL

Melting points are uncorrected. The infrared spectra of solids (potassium bromide) were recorded on a Perkin Elmer FTIR paragon 1000 spectrometer. The ^{1}H and ^{13}C NMR spectra were recorded on a Bruker AC-200 (200 MHz) instrument in deuteriochloroform solution and chemical shift (δ) are expressed in ppm relative to internal TMS. Ascending thin layer chromatography was performed on precoated plates of silica gel 60 F 254 (Merck) and the spots visualized using an ultraviolet lamp or iodine vapor. E. Merck silica gel 60 F (70-300 mesh) was used for column chromatography. The elemental analyses were carried out by the microanalysis laboratory of INSA at Rouen, F 76130 M^{t}. S^{t}. Aignan, France.

Preparation of acids 6a-d : general procedure.

Hydroxylactams **2a-d** (10 mmol) and thioglycolic acid (0.83 ml, 1.1 g, 12 mmol) were refluxed overnight in acetic acid. The solvent was evaporated and the solid was triturated with ether, filtered, then recrystallized from acetone.

3-(Carboxymethylthio)-2,3-dihydro-2-phenyl-1*H*-isoindol-1-one (6a). Yield 81%; mp 188°C; IR: 3064 (OH), 1732 (C=O), 1668 (C=O) cm^{-1}; ^1H NMR: δ 2.75 (s, 2H, SCH_2), 4.80 (s, 1H, OH), 6.25 (s, 1H, CH), 7.24-7.34 (m, 1H, H_{arom}), 7.39-7.60 (m, 5H, H_{Ph}), 7.63-7.73 (m, 2H, H_{arom}), 7.90 (d, 1H, H_{arom}, J = 7.5 Hz). Anal. Calcd. for $C_{16}H_{13}NO_3S$: C, 64.20; H, 4.38; N, 4.68. Found: C, 63.97; H, 4.26; N, 4.55.

3-(Carboxymethylthio)-2,3-dihydro-2-(thien-2'-ylmethyl)-1*H*-isoindol-1-one (6b). Yield 94%; mp 201°C; IR: 3071 (OH), 1732 (C=O), 1670 (C=O) cm^{-1}; ^1H NMR (DMSO-d_6) : δ 2.61 (d, 1H, SCH_2, J = 15.3 Hz), 2.84 (d, 1H, SCH_2, J = 15.3 Hz), 3.65 (s, 1H, OH), 4.64 (d, 1H, NCH_2, J = 15.6 Hz), 5.12 (d, 1H, NCH_2, J = 15.6 Hz), 5.74 (s, 1H, CH), 6.97 (dd, 1H, $H_{4'}$, J = 4.4, 3.1 Hz), 7.08 (d, 1H, $H_{3'}$, J = 3.1 Hz), 7.43 (d, 1H, $H_{5'}$, J = 4.4 Hz), 7.45-7.80 (m, 4H, H_{arom}). Anal. Calcd. for $C_{15}H_{13}NO_3S_2$: C, 56.41; H, 4.10; N, 4.39. Found: C, 56.27; H, 4.06; N, 4.31.

3-(Carboxymethylthio)-2,3-dihydro-2-(thien-3'-ylmethyl)-1*H*-isoindol-1-one (6c). Yield 87%; mp 159°C; IR: 3100 (OH), 1730 (C=O), 1669 (C=O) cm^{-1}; ^1H NMR (DMSO-d_6) : δ 2.59 (d, 1H, SCH_2, J = 15.5 Hz), 2.82 (d, 1H, SCH_2, J = 15.5 Hz), 3.67 (s, 1H, OH), 4.48 (d, 1H, NCH_2, J = 15.3 Hz), 4.99 (d, 1H, NCH_2, J = 15.3 Hz), 5.66 (s, 1H, CH), 7.01 (d, 1H, $H_{4'}$, J = 4.6 Hz), 7.30-7.80 (m, 6H, $4H_{arom}$+$H_{2',5'}$). Anal. Calcd. for $C_{15}H_{13}NO_3S_2$: C, 56.41; H, 4.10; N, 4.39. Found: C, 56.22; H, 4.04; N, 4.35.

3-(Carboxymethylthio)-2,3-dihydro-2-(phenylmethyl)-1*H*-isoindol-1-one (6d). Yield 93%; mp 202°C; IR: 3063 (OH), 1732 (C=O), 1674 (C=O) cm^{-1}; ^1H NMR: δ 2.60 (d, 1H, SCH_2, J = 15.6 Hz), 2.75 (d, 1H, SCH_2, J = 15.6 Hz), 3.46 (s, 1H, OH), 4.39 (d, 1H, NCH_2, J = 15.1 Hz), 5.32 (d, 1H, NCH_2, J = 15.1 Hz), 5.34 (s, 1H, CH), 7.29 (s, 5H, H_{Ph}), 7.40-7.64 (m, 3H, H_{arom}), 7.87 (d, 1H, H_{arom}, J = 7.0 Hz). Anal. Calcd. for $C_{17}H_{15}NO_3S$: C, 65.16; H, 4.82; N, 4.47. Found: C, 64.88; H, 4.64; N, 4.35.

3-(Ethoxycarbonylmethylthio)-2,3-dihydro-2-(thien-2'-ylmethyl)-1*H*-isoindol-1-one (3b).

Hydroxylactam **2b** (2.45 g, 10 mmol), ethyl thioglycolate (1.44 g, 12 mmol) and a catalytic amount of paratoluenesulfonic acid were stirred overnight in dry dichloromethane. The solvent was evaporated to dryness and the residue was dissolved in dichloromethane. The organic layer was washed with a saturated solution of sodium hydrogenocarbonate, then dried and evaporated. The ester was recrystallized from ethanol. Yield 93%; mp 77°C; IR: 1746 (C=O), 1703 (C=O) cm^{-1}; ^1H NMR: δ 1.13 (t, 3H, CH_3, J = 7.1 Hz), 2.59 (d, 1H, SCH_2, J = 15.3 Hz), 2.71 (d, 1H, SCH_2, J = 15.3 Hz), 4.04 (q, 2H, OCH_2, J = 7.1 Hz), 4.60 (d, 1H, NCH_2, J = 15.3 Hz), 5.38 (d, 1H, NCH_2, J = 15.3 Hz), 5.45 (s, 1H, CH), 6.92 (dd, 1H, $H_{4'}$, J = 5.1, 3.5 Hz), 7.05 (d, 1H, $H_{3'}$, J = 3.5 Hz), 7.19 (d, 1H, $H_{5'}$, J = 5.1 Hz), 7.40-7.63 (m, 3H, H_{arom}), 7.84 (d, 1H, H_{arom}, J = 7.0 Hz).

Preparation of aminolactams 10a-d : general procedure.

A solution of ammonia in dichloromethane was prepared by extraction of 400 ml of concentrated aqueous ammonia solution with 400 ml of dichloromethane. The aqueous layer was kept in the separatory funnel for later use and the solution of ammonia in dichloromethane was dried over magnesium sulfate then filtered.

Hydroxylactams **2a-d** (10 mmol) and thionyl chloride (1.5 ml, 21 mmol) were stirred in dry dichloromethane until all solid had disappeared, then reaction was continued for 30 minutes. This solution was poured into the previous solution of ammonia in dichloromethane and the mixture was stirred for 10 min. The solution was transferred into the separatory funnel containing the previous aqueous ammonia, then the mixture was made more basic with addition of sodium hydroxide solution. The organic layer was decanted then extracted twice with 5% HCl solution. The aqueous solutions were combined, washed with dichloromethane, made basic with sodium hydroxide solution then extracted twice with dichloromethane. The combination of organic layers was dried and evaporated. The solid was recrystallized from ethanol.

3-Amino-2,3-dihydro-2-phenyl-1*H*-isoindol-1-one (10a). Yield 78%; mp 112°C; IR: 3396 (NH_2), 1686 (C=O) cm^{-1}; ^1H NMR: δ 1.90 (s, 2H, NH_2), 5.94 (s, 1H, CH), 7.17-7.30 (m, 1H, H_{arom}), 7.38-7.73 (m, 7H, $5H_{Ph}+2H_{arom}$), 7.88 (d, 1H, H_{arom}, J = 7.0 Hz). Anal. Calcd. for $C_{14}H_{12}N_2O$: C, 74.98; H, 5.39; N, 12.49. Found: C, 74.57; H, 5.31; N, 12.25.

3-Amino-2,3-dihydro-2-(thien-2'-ylmethyl)-1*H*-isoindol-1-one (10b). Yield 76%; mp 113°C; IR: 3373 (NH_2), 1667 (C=O) cm^{-1}; ^1H NMR: δ 2.54 (s, 2H, NH_2), 4.63 (d, 1H, NCH_2, J = 15.5 Hz), 5.21 (s, 1H, CH), 5.26 (d, 1H, NCH_2, J = 15.5 Hz), 6.92 (dd, 1H, $H_{4'}$, J = 5.1, 3.4 Hz), 7.02 (d, 1H, $H_{3'}$, J = 3.4 Hz), 7.18 (dd, 1H, $H_{5'}$, J = 5.1, 1.3 Hz), 7.40-7.60 (m, 3H, H_{arom}) , 7.80 (d, 1H, H_{arom}, J = 7.0 Hz). Anal. Calcd. for $C_{13}H_{12}N_2OS$: C, 63.91; H, 4.95; N, 11.47. Found: C, 63.67; H, 4.86; N, 11.31.

3-Amino-2,3-dihydro-2-(thien-3'-ylmethyl)-1*H*-isoindol-1-one (10c). Yield 81%; mp 118°C; IR: 3372 (NH_2), 1665 (C=O) cm^{-1}; ^1H NMR: δ 1.74 (s, 2H, NH_2), 4.48 (d, 1H, NCH_2, J = 15.2 Hz), 5.09 (d, 1H, NCH_2, J = 15.2 Hz), 5.15 (s, 1H, CH), 7.03 (d, 1H, $H_{4'}$, J = 4.9 Hz), 7.13-7.33 (m, 2H, $H_{2',5'}$).7.41-7.62 (m, 3H, H_{arom}), 7.82 (d, 1H, H_{arom}, J = 6.7 Hz). Anal. Calcd. for $C_{13}H_{12}N_2OS$: C, 63.91; H, 4.95; N, 11.47. Found: C, 63.61; H, 4.89; N, 11.52.

3-Amino-2,3-dihydro-2-(phenylmethyl)-1*H*-isoindol-1-one (10d). Yield 72%; mp 124°C; IR: 3378 (NH_2), 1676 (C=O) cm^{-1}; ^1H NMR: δ 1.70 (s, 2H, NH_2), 4.36 (d, 1H, NCH_2, J = 15.3 Hz), 5.07 (s, 1H, CH), 5.10 (d, 1H, NCH_2, J = 15.3 Hz), 7.22 (s, 5H, H_{Ph}), 7.36-7.52 (m, 3H, H_{arom}), 7.78 (d, 1H, H_{arom}, J = 6.7 Hz). Anal. Calcd. for $C_{15}H_{14}N_2O$: C, 75.61; H, 5.92; N, 11.76. Found: C, 75.65; H, 5.90; N, 11.68.

Preparation of glycine derivatives 8a-d

Aminolactams **10a-d** (10 mmol), potassium carbonate (6.4 g, 20 mmol), ethyle bromoacetate (2.2 ml, 20 mmol) and 20 ml of dry 1,4 dioxane were refluxed for 5 days. After removal of the solvent, water and dichloromethane were added to the residue. The organic layer was washed with 5% aqueous hydrochloric solution (no extraction of desired product), washed with water, dried, then evaporated. The residue was chromatographied with dichloromethane to afford esters **5a-d** as an oil. These crude esters, potassium carbonate (2.4 g), water (6 ml) and methanol (24 ml) were stirred under reflux for 2 hours, then the solution was concentrated under reduced pressure. Water and dichloromethane were added and the organic layer was discarded. The aqueous layer was washed with dichloromethane and acidified with hydrochloric acid (10%) to pH=2. Compounds **8a-d** were rapidly extracted with dichloromethane before crystallization occurs. After removal of the solvent, the residue was recrystallized from acetone to give pure **8a-d**.

3-(Carboxymethylamino)-2,3-dihydro-2-phenyl-1*H*-isoindol-1-one (8a). Yield: 55%; mp 162°C; IR: 3365 (NH), 2914 (OH), 1727 (C=O), 1651 (C=O) cm^{-1}; ^1H NMR: δ 1.83 (m, 2H, OH+NH), 2.86 (d, 1H, CH_2COO, J = 17.7 Hz), 3.04 (d, 1H, CH_2COO, J = 17.7 Hz), 6.14 (s, 1H, CH), 7.22-7.69 (m, 8H, $3H_{arom}$+$5H_{Ph}$), 7.92 (d, 1H, H_{arom}, J = 7.0 Hz). Anal. Calcd. for $C_{16}H_{14}N_2O_3$: C, 68.08; H, 5.00; N, 9.92. Found: C, 67.75; H, 5.12; N, 10.07.

3-(Carboxymethylamino)-2,3-dihydro-2-(thien-2'-ylmethyl)-1*H*-isoindol-1-one (8b). Yield: 54%; mp 125°C; IR: 3422 (NH), 2943 (OH), 1718 (C=O, C=O) cm^{-1}; ^1H NMR: δ 2.93 (m, 2H, OH+NH), 2.97 (s, 2H, CH_2COO), 4.56 (d, 1H, NCH_2, J = 15.3 Hz), 5.20 (d, 1H, NCH_2, J = 15.3 Hz), 5.42 (s, 1H, CH), 7.92 (dd, 1H, $H_{4'}$, J = 3.8, 5.0 Hz), 7.04 (d, 1H, $H_{3'}$, J = 3.0 Hz), 7.21 (d, 1H, $H_{5'}$, J = 5.0 Hz), 7.43-7.62 (m, 3H, $3H_{arom}$), 7.84 (d, 1H, H_{arom}, J = 7.0 Hz). Anal. Calcd. for $C_{15}H_{14}N_2O_3S$: C, 59.59; H, 4.67; N, 9.27. Found: C, 59.34; H, 4.32; N, 9.12.

3-(Carboxymethylamino)-2,3-dihydro-2-(thien-3'-ylmethyl)-1*H*-isoindol-1-one (8c). Yield: 73%; mp 112°C; IR: 3386 (OH+NH), 1686 (C=O, C=O) cm^{-1}; ^1H NMR: δ 2.90 (s, 2H, CH_2COO), 4.38 (d, 1H, NCH_2, J = 15.1 Hz), 5.01 (d, 1H, NCH_2, J = 15.1 Hz), 5.35 (s, 1H, CH), 7.07 (dd, 1H, $H_{4'}$, J = 1.6, 4.5 Hz), 7.15-7.31 (m, 2H, $H_{2',5'}$), 7.39-7.59 (m, 3H, H_{arom}), 7.69 (d, 1H, H_{arom}, J = 7.0 Hz). Anal. Calcd. for $C_{15}H_{14}N_2O_3S$: C, 59.59; H, 4.67; N, 9.27. Found: C, 59.41; H, 4.55; N, 9.13.

3-(Carboxymethylamino)-2,3-dihydro-2-(phenylmethyl)-1*H*-isoindol-1-one (8d). Yield: 54%; mp 170°C; IR: 2903 (OH+NH), 1614 (C=O, C=O) cm^{-1}; ^1H NMR: δ 2.92 (s, 2H, CH_2COO), 4.27 (d, 1H, NCH_2, J = 15.0 Hz), 5.10 (d, 1H, NCH_2, J = 15.0 Hz), 5.32 (s, 1H, CH), 6.02 (s, 2H, OH+NH), 6.89-7.68 (m, 8H, $3H_{arom}$+$5H_{Ph}$), 7.74-7.88 (m, 1H, H_{arom}). Anal. Calcd. for $C_{17}H_{16}N_2O_3$: C, 68.91; H, 5.44; N, 9.45. Found: C, 68.69; H, 5.64; N, 9.77.

Preparation of glycolic derivatives 7a-d

Hydroxylactams **2a-d** (10 mmol) were dissolved in 50 ml of dry tetrahydrofuran and BuLi (7 ml, 1.6 M, 1.1 eq) was added with stirring. Then a solution of 1.7 ml (15 mmol) of ethyl bromoacetate in 10 ml of dry hexamethylphosphoramide was added. Stirring was continued overnight, then the solution was poured into water then extracted with dichloromethane. The organic layer was washed with water then evaporated. The oil was triturated several times with water and decanted. The oil was dried under reduced pressure then chromatographied with dichloromethane. The ester **4a-d** was obtained as an oil. Saponification of esters **4a-d** was performed in a similar manner as above and led to acids **7a-d** which were recrystallized from acetone.

3-(Carboxymethyloxy)-2,3-dihydro-2-phenyl-1*H*-isoindol-1-one (7a). Yield 56%; mp 163°C; IR: 3069 (OH), 1758 (C=O), 1708 (C=O) cm^{-1}; ^1H NMR: δ 3.60 (d, 1H, OCH_2, J = 16.4 Hz), 3.82 (d, 1H, OCH_2, J = 16.4 Hz), 4.21 (s, 1H, OH), 6.60 (s, 1H, CH), 7.19-7.27 (m, 1H, H_{arom}), 7.38-7.47 (m, 2H, H_{arom}), 7.54-7.78 (m, 5H, H_{Ph}), 7.92 (d, 1H, H_{arom}, J = 7.0 Hz). Anal. Calcd. for $C_{16}H_{13}NO_4$: C, 67.84; H, 4.63; N, 4.85. Found: C, 67.42; H, 4.34; N, 4.85.

2,3-Dihydro-3-(carboxymethyloxy)-2-(thien-2'-ylmethyl)-1*H*-isoindol-1-one (7b). Yield 60%; mp 136°C; IR: 3113 (OH), 1737 (C=O), 1682 (C=O) cm^{-1}; ^1H NMR: δ 3.60 (d, 1H, OCH_2, J = 16.4 Hz), 3.71 (d, 1H, OCH_2, J = 16.4 Hz), 4.60 (d, 1H, NCH_2, J = 15.3 Hz), 5.15 (d, 1H, NCH_2, J = 15.3 Hz), 5.96 (s, 1H, CH), 6.88 (dd, 1H, $H_{4'}$, J = 5.1, 3.3 Hz), 7.06 (d, 1H, $H_{5'}$, J = 3.3 Hz), 7.16 (d, 1H, $H_{5'}$, J = 5.1 Hz), 7.40-7.65 (m, 3H, H_{arom}), 7.84 (d, 1H, H_{arom}, J = 5.4 Hz), 8.69 (s, 1H, OH). Anal. Calcd. for $C_{15}H_{13}NO_4S$: C, 59.40; H, 4.32; N, 4.62. Found: C, 59.25; H, 4.28; N, 4.60.

3-(Carboxymethyloxy)-2,3-dihydro-2-(thien-3'-ylmethyl)-1*H*-isoindol-1-one (7c). Yield 49%; mp 149°C; ^1H NMR: δ 3.53 (d, 1H, OCH_2, J = 16.2 Hz), 3.63 (d, 1H, OCH_2, J = 16.2 Hz), 4.42 (d, 1H, NCH_2, J = 14.9 Hz), 4.95 (d, 1H, NCH_2, J = 14.9 Hz), 5.86 (s, 1H, CH), 7.04 (d, 1H, $H_{4'}$, J = 3.8 Hz), 7.10-7.25 (m, 2H, $H_{2',5'}$), 7.40-7.60 (m, 3H, H_{arom}), 7.81 (d, 1H, H_{arom}, J = 5.4 Hz), 7.93 (s, 1H, OH). Anal. Calcd. for $C_{15}H_{13}NO_4S$: C, 59.40; H, 4.32; N, 4.62. Found: C, 59.34; H, 4.30; N, 4.65.

3-(Carboxymethyloxy)-2,3-dihydro-2-(phenylmethyl)-1*H*-isoindol-1-one (7d). Yield 66%; mp 115°C; IR: 3447 (OH), 1734 (C=O), 1683 (C=O) cm^{-1}; ^1H NMR: δ 3.54 (d, 1H, OCH_2, J = 16.5 Hz), 3.66 (d, 1H, OCH_2, J = 16.5 Hz), 4.37 (d, 1H, NCH_2, J = 14.9 Hz), 5.05 (d, 1H, NCH_2, J = 14.9 Hz), 5.25 (s, 1H, OH), 5.87 (s, 1H, CH), 7.17-7.42 (m, 5H, H_{Ph}), 7.48-7.62 (m, 3H, H_{arom}), 7.82-7.92 (m, 1H, H_{arom}). Anal. Calcd. for $C_{17}H_{15}NO_4$: C, 68.68; H, 5.09; N, 4.71. Found: C, 68.47; H, 5.13; N, 4.77.

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