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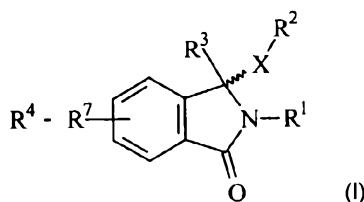
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(54) Title: ISOINDOLIN-1-ONE DERIVATIVES

(57) Abstract: A compound of formula (1) or a prodrug and/or pharmaceutically acceptable salt thereof, wherein X is selected from O, N or S; R¹ is selected from hydrogen, halo, hydroxy, substituted or unsubstituted alkyl, substituted or unsubstituted hydroxyalkyl, substituted or unsubstituted alkylamine, alkoxy, substituted or unsubstituted aryl or heteroaryl, and substituted or unsubstituted aralkyl or heteroaralkyl; R² is selected from hydrogen, halo, hydroxy, substituted or unsubstituted alkyl, substituted or unsubstituted hydroxyalkyl substituted or unsubstituted alkylamine, alkoxy, substituted or unsubstituted aryl or heteroaryl, and substituted or unsubstituted aralkyl or heteroalkyl; R³ is selected from hydrogen, halo, hydroxy, substituted or unsubstituted alkyl substituted or unsubstituted hydroxyalkyl, substituted or unsubstituted alkylamine alkoxy, substituted or unsubstituted aryl or heteroaryl, and substituted or unsubstituted aralkyl or heteroalkyl; and R⁴, R⁵, R⁶ and R⁷ which are independently selected from H, OH, alkyl, alkoxy, alkylamine, hydroxyalkyl, halo, CF₃, NH₂, NO₂, COOH, C=O.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Isoindolin-1-one derivatives

The present invention relates to a series of isoindolin-1-one derivatives which find particular utility in the treatment of cancer.

Under conditions of stress such as hypoxia and DNA damage it is known the cellular
5 level of the protein p53 increases. P53 is known to initiate transcription of a number of genes which govern progression through the cell cycle, the initiation of DNA repair and programmed cell death^{1,2}. Thus, p53 is a tumour suppressor.

The activity of p53 is tightly regulated by the MDM2 protein, the transcription of which is itself regulated by p53. P53 is inactivated when it becomes bound to the p53
10 transactivation domain of the MDM2 protein. Once inactivated the activities of p53 are repressed and the p53-MDM2 complex becomes a target for ubiquitylation.

In normal cells the balance between active p53 and inactive MDM2-bound p53 is maintained in an autoregulatory negative feed back loop^{3,4}. That is to say that p53 can activate MDM2 expression, which in turn leads to the repression of p53.

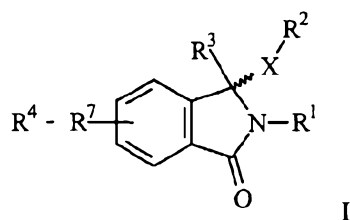
15 It has been found that inactivation of p53 by mutation is common in around half of all tumours. Furthermore, in around 7% of tumours, over expression of MDM2 results in the loss of functional p53, thereby allowing malignant transformation and uncontrolled tumour growth⁵.

X-ray crystal studies of the MDM2-p53 complex have been conducted and have
20 revealed a hydrophobic pocket on the surface of MDM2 into which the side chains of Phe 19, Trp 23 and Leu 26 on p53 bind⁶. Therefore, inhibition of the MDM2-p53 binding interaction is an attractive target for researchers developing treatments for cancer as a means of restoring normal p53 activity in cells overexpressing MDM2 and thereby exerting an anti-tumour effect⁷.

A number of inhibitors of the MDM2-p53 interaction have been discovered including peptide inhibitors, the natural product chlorofusion, and small molecules such as the imidazolines described in WO 03/051359⁸⁻¹¹.

The present invention describes a novel series of compounds which inhibit the
5 MDM2-p53 interaction and which have exciting *in vitro* activity.

According to a first aspect of the present invention there is provided a compound of formula I



10 or a prodrug and/or pharmaceutically acceptable salt thereof, wherein

X is selected from O, N or S;

R¹ is selected from hydrogen, halo, hydroxy, substituted or unsubstituted alkyl,
substituted or unsubstituted hydroxyalkyl, substituted or unsubstituted
alkylamine, alkoxy, substituted or unsubstituted aryl or heteroaryl, and
15 substituted or unsubstituted aralkyl or heteroaralkyl;

R² is selected from hydrogen, halo, hydroxy, substituted or unsubstituted alkyl,
substituted or unsubstituted hydroxyalkyl substituted or unsubstituted
alkylamine, alkoxy, substituted or unsubstituted aryl or heteroaryl, and
substituted or unsubstituted aralkyl or heteroaralkyl;

20 R³ is selected from hydrogen, halo, hydroxy, substituted or unsubstituted alloy
substituted or unsubstituted hydroxyalkyl, substituted or unsubstituted

alkylamine alkoxy, substituted or unsubstituted aryl or heteroaryl, and substituted or unsubstituted aralkyl or heteroalkyl; and

R^4 - R^7 , is used to represent groups R^4 , R^5 , R^6 and R^7 which are independently selected from H, OH, alkyl, alkoxy, alkylamine, hydroxyalkyl, halo, CF_3 , NH_2 , NO_2 , $COOH$,
5 C=O.

Advantageously, the compounds of the present invention have been shown to be good inhibitors of the formation of the MDM2-p53 complex.

The term "halo" is used herein to denote a halogen atom which is selected from fluorine, chlorine, bromine or iodine.

- 10 The term "alkyl" is used herein to denote a lower alkyl group i.e a cyclic, branched or straight chain hydrocarbon having one to eight carbon atoms.

The term "aryl" is used herein to denote a carbocyclic group or structure having at least one aromatic ring. The said ring may form part of a multiple condensed ring structure, for example phenyl, naphthalene, anthracene.

- 15 The term "aralkyl" is used herein to denote an alkyl, as hereinbefore defined, in which there is an aryl group, as hereinbefore defined, for example benzyl.

The term "heteroaryl" is used herein to denote an aryl group, as hereinbefore defined in which said group comprises at least one heteroatom, selected from, for example N, O or S, in said at least one aromatic ring. Suitable examples include, but are not

- 20 limited to pyridine, pyrrole, furan, thiophene and imidazole.

The term "heteroaralkyl" is used herein to denote an aralkyl substituents, as hereinbefore defined, in which said at least one aromatic ring comprises at least one heteroatom selected from, for example N, O or S. Suitable examples include, but are not limited to methyl pyridine and methylfuran.

The term "substituted alkyl" is used herein to denote an alkyl substituents, as hereinbefore defined, which is substituted with one or more functional groups. Suitable examples include, but are not limited to, propanoic acid, butanal and butanone, phenyl amino ethane and ethane sulfonic acid.

- 5 The term "substituted aryl" is used herein to denote an aryl substituent, as hereinbefore defined, which is substituted with one or more functional groups. Suitable examples include, but are not limited to, benzoic acid and nitrobenzene.

The term "substituted heteroaryl" is used herein to denote a heteroaryl substituent, as hereinbefore defined, which is substituted with one or more functional groups.

- 10 The term "substituted aralkyl" is used herein to denote an aralkyl substituents, as hereinbefore defined, which is substituted with one or more functional groups.

The term "substituted heteroaralkyl" is used herein to denote a heteroaralkyl substituent, as hereinbefore defined, which is substituted with one or more functional groups.

- 15 The term "alkoxy" is used herein to denote an alkyl group, as hereinbefore defined, which is linked to a second chemical structure, which may be any of the foregoing, by way of an oxygen atom. The carbon chain of the alkyl group may be substituted with one or more functional groups to provide a "substituted alkoxy". Suitable examples include, but are not limited to, ethoxy, methoxy and propoxy.

- 20 The term "alkylamine" is used herein to denote an alkyl group, as hereinbefore defined, comprising at least one amine function. The carbon chain of the alkyl group may be substituted with one or more functional groups. The amine function may be primary, secondary or tertiary. Suitable examples include, but are not limited to, ethyl

amine and diethyl amine. The amine function may form part of a cyclic or heteroaromatic structure or another functionality for example amide.

As referred to herein suitable functional groups include, but are not limited to, any of the following which may be used alone or in combination: hydroxyl, hydroxyalkyl, acyl, acetamide, carboxyl, cyano, carboxamide (carbamoyl), sulfonamide, sulfone, sulfoxide, amino, alkoxy or silico ligand.

Compounds of particular interest are those in which R^1 is a substituted or unsubstituted alkyl group or a substituted or unsubstituted aryl group; R^2 is hydroxyalkyl, a substituted or unsubstituted heteroalkyl group; R^3 is substituted or unsubstituted aryl group; and R^4 , R^5 and R^6 are hydrogen atoms.

Preferably, R^1 is an alkyl group comprising 1 to 4 carbon atoms, a phenyl group or an alkyl group substituted with an acetamide functional group.

Preferably, R^2 is an aryl group having one or more functional groups, said functional groups being independently selected from alkoxy, hydroxyl and alkyl, hydroxyalkyl, or a heteroalkyl group.

Most preferably, the alkoxy group is methoxy, the alkyl group is 'butyl, the hydroxyalkyl group is ethyl alcohol, and the heteroalkyl group comprises a pyridine moiety.

Preferably, R^3 is a substituted or unsubstituted aryl group. Most preferably R^3 is selected from phenyl, 4-chlorophenyl or silylethoxymethoxyphenyl.

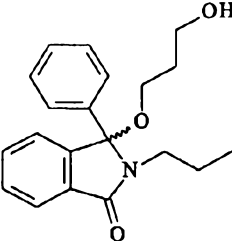
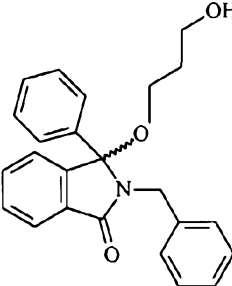
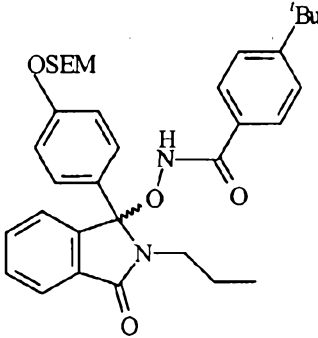
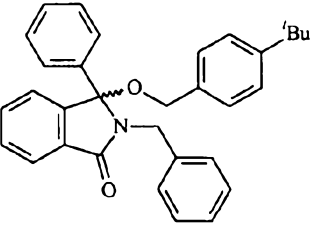
It will be understood that where reference is made in this specification to compounds of formula I such reference should be construed as extending also to their pharmaceutically acceptable salts and to other pharmaceutically acceptable bio precursors (prodrug forms) where relevant. The term "prodrug" is used in the present

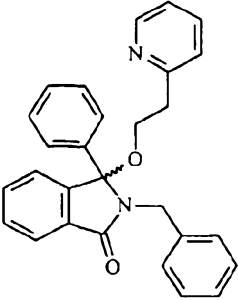
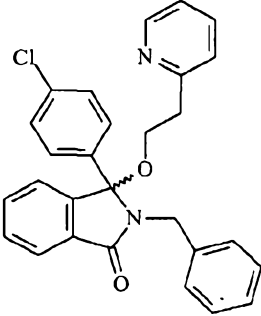
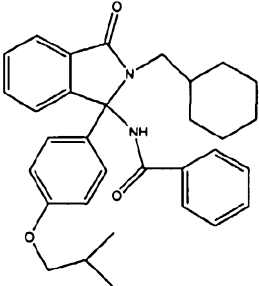
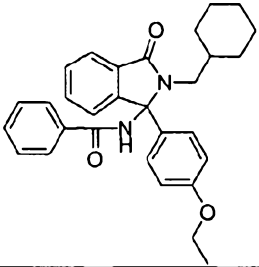
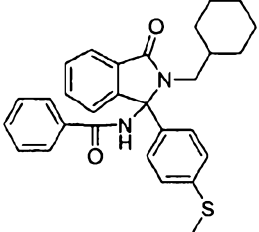
specification to denote modified forms or derivatives of a pharmacologically active compound which biodegrade or are modified *in vivo* so as to become converted into said active compound after administration, especially intravenous administration, in the course of therapeutic treatment of a mammal. Such prodrugs are commonly
5 chosen because of an enhanced solubility of aqueous media which helps to overcome formulation problems, and also in some cases to give a relatively slow or controlled release of the active agent.

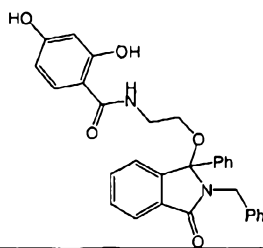
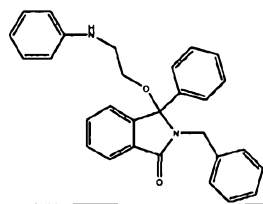
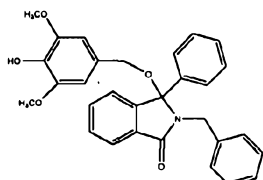
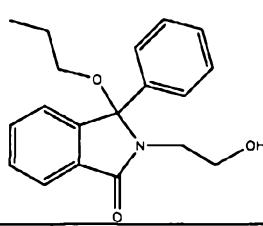
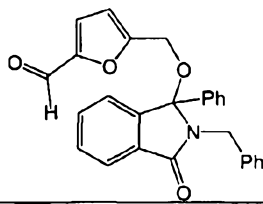
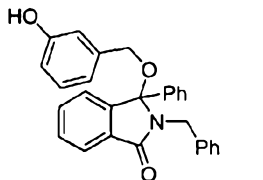
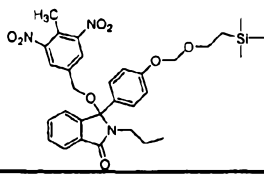
It should also be understood that where any of the compounds referred to can exist in more than one enantiomeric and/or diastereomeric form, all such forms, mixtures
10 thereof, and their preparation and uses are within the scope of the invention. It should be noted, however, that stereo chemical considerations are likely to be important and there may be considerable selectivity such that different enantiomers or diastereoisomers have significantly different inhibitory activity.

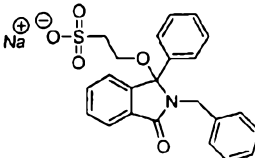
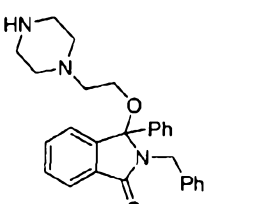
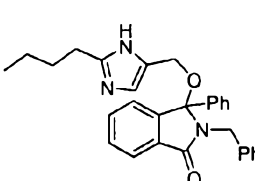
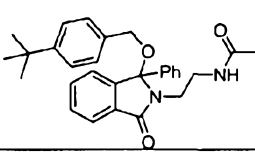
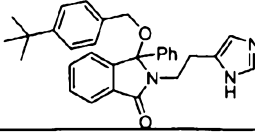
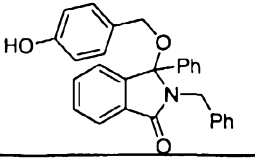
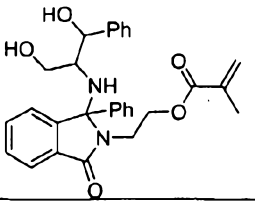
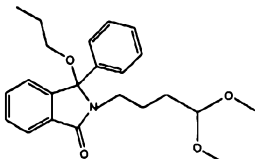
In some compounds, one or more of R^4 to R^7 is H with two of the remaining R groups
15 linked so as to form a 5 to 7 membered ring structure. The ring structure is preferably saturated and may comprise at least one heteroatom selected from N, O or S.

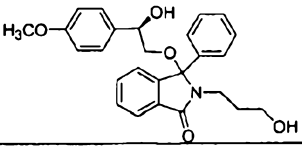
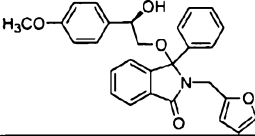
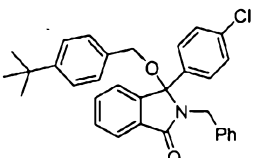
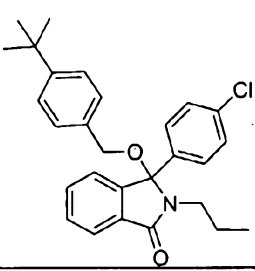
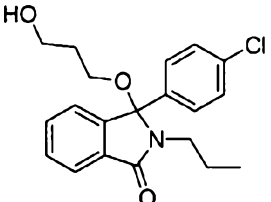
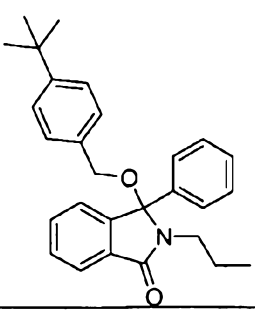
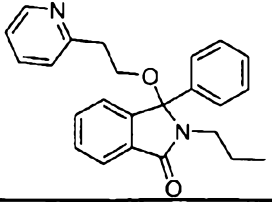
Examples of compounds which are at present of especial interest or preferred for use in carrying out the invention comprise the following:

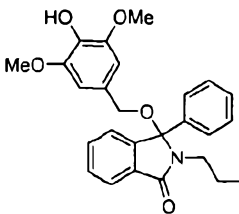
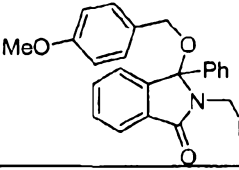
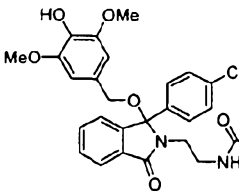
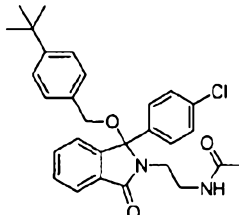
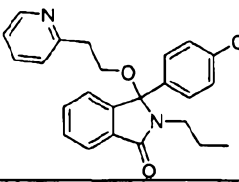
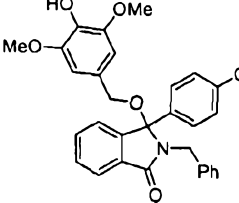
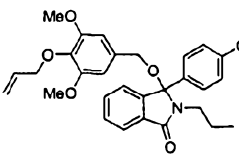
Number	Compound Descriptions	Structure	ELISA IC ₅₀ (μM)
NU8033	3-(3-hydroxy-propoxy)-3-phenyl-2-propyl-2,3-dihydro-1H-isoindolin-1-one		> 500μM
NU8034	2-benzyl-3-(3-hydroxy-propoxy)-3-phenyl-2,3-dihydro-1H-isoindolin-1-one		245 ± 11
NU8104	4- ^t butyl-N-[(2-propyl-3-oxo-1-(4-silylethoxymethoxyphenyl)-2,3-dihydro-1H-isoindolin-1-yl)oxy]benzamide		27
NU8113	2-benzyl-3-(4- ^t butylbenzyloxy)-3-phenyl-2,3-dihydro-isoindolin-1-one		92 ± 11

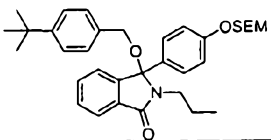
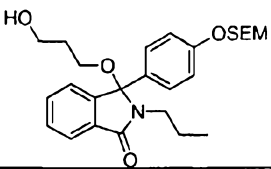
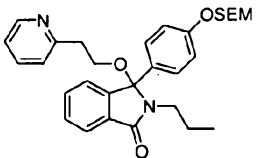
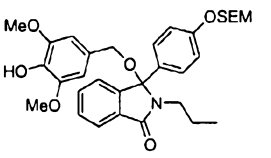
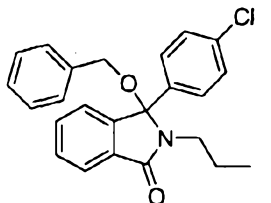
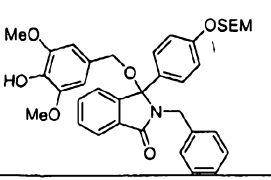
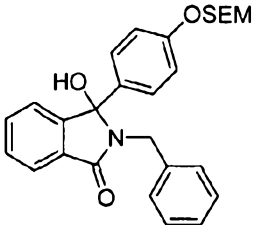
NU8133	2-benzyl-3-phenyl-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydro-isoindolin-1-one		206 ± 130
NU8170	2-benzyl-3-(4-chlorophenyl)-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydroisoindolin-1-one		26.2 ± 4.2
NU8200	N-[2-Cyclohexylmethyl-1-(4-isobutoxy-phenyl)-3-oxo-2,3-dihydro-1H-isoindolin-1-yl]-benzamide 496.64 $C_{32}H_{36}N_2O_3$		123 ± 30
NU8201	N-[2-cyclohexylmethyl 1-(4-ethoxy-phenyl)-3-oxo-2,3-dihydro-1H-isoindolin-1-yl]-benzamide 468.59 $C_{30}H_{32}N_2O_3$		209 ± 28
NU8202	N-[2-cylohexylmethyl-1-(4-methylsulfanyl-phenyl)-3-oxo-2,3-dihydro-1H-isoindolin-1-yl]-benzamide 470.63 $C_{29}H_{30}N_2O_2S$		82 ± 16

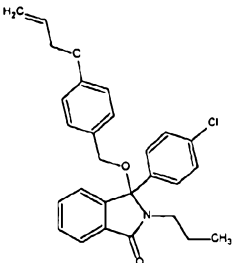
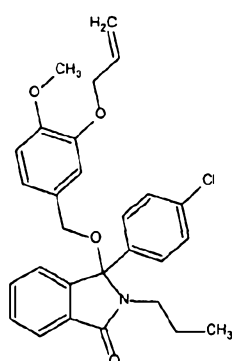
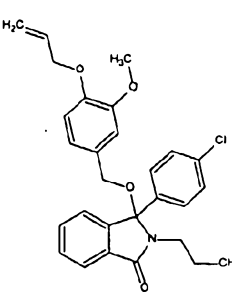
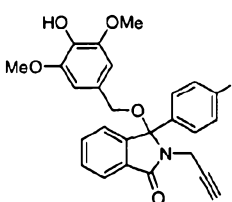
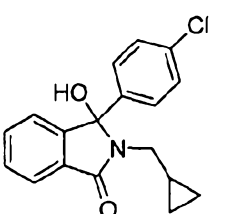
NU8203	N-[2-(2-Benzyl-3-oxo-1-phenyl-2,3-dihydro-1H-isoindolin-1-yloxy)-ethyl]-2,4-dihydroxy-benzamide 494.54 $C_{30}H_{26}N_2O_5$		96 ± 30
NU8204	2-Benzyl-3-phenyl-3-(2-phenylaminoethoxy)-2,3-dihydro-isoindolin-1-one 434.53 $C_{29}H_{26}N_2O_2$		116 ± 20
NU8205	2-Benzyl-3-(4-hydroxy-3,5-dimethoxybenzyloxy)-3-phenyl-2,3-dihydro-isoindolin-1-one 481.54 $C_{30}H_{27}NO_5$		17.9 ± 0.3
NU8206	2-(2-Hydroxy-ethyl)-3-phenyl-3-propoxy-2,3-dihydro-isoindolin-1-one 311.37 $C_{19}H_{21}NO_3$		>500
NU8207	5-(2-Benzyl-3-oxo-1-phenyl-2,3-dihydro-1H-isoindolin-1-yloxymethyl)-furan-2-carbaldehyde 423.26 $C_{27}H_{21}NO_4$		97 ± 30
NU8208	2-Benzyl-3-(3-hydroxy-benzyloxy)-3-phenyl-2,3-dihydro-isoindolin-1-one 421.29 $C_{28}H_{23}NO_3$		58 ± 14
NU8209	3-(4-Methyl-3,5-dinitro-benzyloxy)-2-propyl-3-[4-(2-trimethylsilanyloxyethoxy)-phenyl]-2,3-dihydro-isoindolin-1-one 607.73 $C_{31}H_{37}N_3O_8Si$		103 ± 44

NU8210	Sodium; 2-(2-benzyl-3-oxo-1-phenyl-2,3-dihydro-1 <i>H</i> -isoindolin-1-yloxy)-ethanesulfonate 445.46 $C_{23}H_{20}NNaO_5S$		345 ± 55
NU8211	2-Benzyl-3-phenyl-3-(2-piperazin-1-ylethoxy)-2,3-dihydro-isoindolin-1-one 427.54 $C_{27}H_{29}N_3O_2$		315 ± 72
NU8212	2-Benzyl-3-(2-butyl-3H-imidazol-4-ylmethoxy)-3-phenyl-2,3-dihydro-isoindolin-1-one 451.23 $C_{29}H_{29}N_3O_2$		78 ± 16
NU8213	N-{2-[1-(4-tert-Butyl-benzyloxy)-3-oxo-1-phenyl-1,3-dihydro-isoindolin-2-yl]-ethyl}-acetamide 456.58 $C_{29}H_{32}N_2O_3$		14.4 ± 0.3
NU8214	3-(4-tert-Butyl-benzyloxy)-2-[2-(3H-imidazol-4-yl)-ethyl]-3-phenyl-2,3-dihydro-isoindolin-1-one 465.24 $C_{30}H_{31}N_2O_3$		214 ± 56
NU8215	2-Benzyl-3-(4-hydroxy-benzyloxy)-3-phenyl-2,3-dihydro-isoindolin-1-one 421.29 $C_{28}H_{23}NO_3$		79 ± 11
NU8216	2-Methyl-acrylic acid 2-[1-(2-hydroxy-1-hydroxymethyl-2-phenyl-ethylamino)-3-oxo-1-phenyl-1,3-dihydro-isoindolin-2-yl]-ethyl ester 486.56 $C_{29}H_{30}N_2O_5$		103 ± 43
NU8217	2-(4,4-Dimethoxy-butyl)-3-phenyl-3-propoxy-2,3-dihydro-isoindolin-1-one 383.48 $C_{23}H_{29}NO_4$		70 ± 6

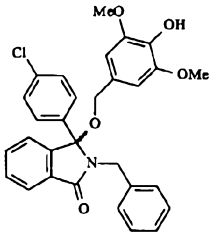
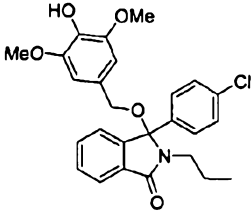
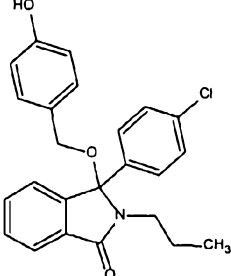
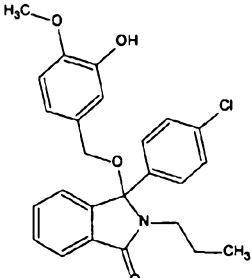
NU8218	3-[2-Hydroxy-2-(4-methoxyphenyl)-ethoxy]-2-(3-hydroxypropyl)-3-phenyl-2,3-dihydroisoindolin-1-one 433.50 $C_{26}H_{27}NO_5$		326 ± 64
NU8219	2-Furan-2-ylmethyl-3-[2-hydroxy-2-(4-methoxyphenyl)-ethoxy]-3-phenyl-2,3-dihydroisoindolin-1-one 455.50 $C_{28}H_{25}NO_5$		181 ± 46
NU8220	2-Benzyl-3-(4-tert-butylbenzyloxy)-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one 496.04 $C_{32}H_{30}ClNO_2$		99 ± 18
NU8221	3-(4-tert-Butylbenzyloxy)-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one 448.00 $C_{28}H_{30}ClNO_2$		187 ± 38
NU8222	3-(4-Chlorophenyl)-3-(3-hydroxypropoxy)-2-propyl-2,3-dihydroisoindolin-1-one 359.85 $C_{20}H_{22}ClNO_3$		16.4 ± 1.6
NU8223	3-(4-tert-Butylbenzyloxy)-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one 413.55 $C_{28}H_{31}NO_2$		> 500
NU8224	3-Phenyl-2-propyl-3-(2-pyridin-2-ylethoxy)-2,3-dihydroisoindolin-1-one 372.46 $C_{24}H_{24}N_2O_2$		100 ± 14

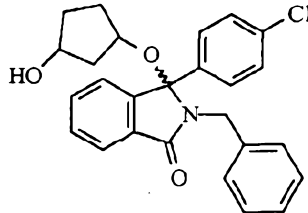
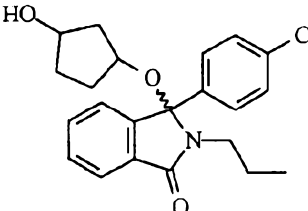
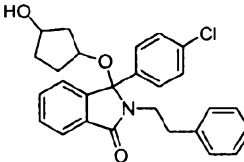
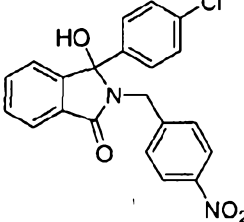
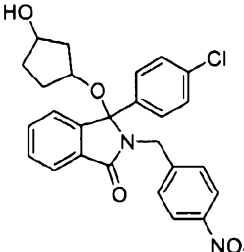
NU8225	3-(4-Hydroxy-3,5-dimethoxybenzyloxy)-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one 433.50 $C_{26}H_{27}NO_5$		82 ± 8
NU8226	2-Benzyl-3-(4-methoxybenzyloxy)-3-phenyl-2,3-dihydroisoindolin-1-one 435.51 $C_{29}H_{25}NO_3$		456 ± 44
NU8227	N-{2-[1-(4-Chlorophenyl)-1-(4-hydroxy-3,5-dimethoxybenzyloxy)-3-oxo-1,3-dihydro-isoindolin-2-yl]-ethyl}acetamide 510.97 $C_{27}H_{27}ClN_2O_6$		76 ± 4
NU8228	N-{2-[1-(4-tert-Butyl-benzyloxy)-1-(4-chlorophenyl)-3-oxo-1,3-dihydro-isoindolin-2-yl]-ethyl}-acetamide 491.02 $C_{23}H_{31}ClN_2O_3$		91.4 ± 0.4
NU8229	3-(4-Chloro-phenyl)-2-propyl-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydro-isoindolin-1-one 406.90 $C_{24}H_{23}ClN_2O_2$		56.8 ± 5.5
NU8230	2-Benzyl-3-(4-chloro-phenyl)-3-(4-hydroxy-3,5-dimethoxy-benzyloxy)-2,3-dihydro-isoindolin-1-one 515.98 $C_{30}H_{26}ClNO_5$		41.6 ± 7.8
NU8232	3-(4-Allyloxy-3,5-dimethoxybenzyloxy)-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one 508.00 $C_{29}H_{30}ClNO_5$		264 ± 38

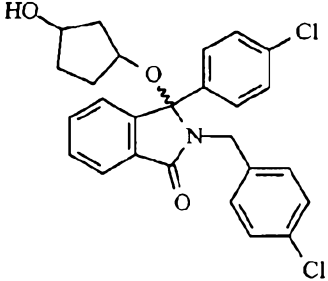
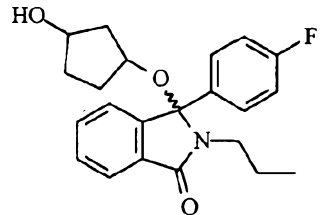
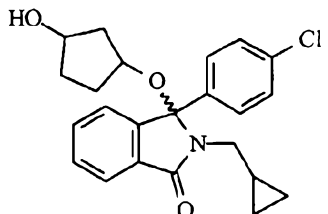
NU8233	3-(4-tert-Butylbenzyloxy)-2-propyl-3-[4-(2-trimethylsilanylethoxymethoxy)-phenyl]-2,3-dihydroisoindolin-1-one 559.81 $C_{34}H_{45}NO_4Si$		464 ± 31
NU8234	3-(3-Hydroxy-propoxy)-2-propyl-3-[4-(2-trimethylsilyl-ethoxymethoxy)-phenyl]-2,3-dihydro-isoindolin-1-one 471.66 $C_{26}H_{37}NO_5Si$		476 ± 24
NU8235	2-Propyl-3-(2-pyridin-2-yl-ethoxy)-3-[4-(2-trimethylsilyl-ethoxymethoxy)-phenyl]-2,3-dihydro-isoindolin-1-one 518.2 $C_{30}H_{38}N_2O_4Si$		312 ± 22
NU8236	3-(4-Hydroxy-3,5-dimethoxybenzyloxy)-2-propyl-3-[4-(2-trimethylsilyl-ethoxymethoxy)phenyl]-2,3-dihydroisoindolin-1-one 579.76 $C_{32}H_{31}NO_7Si$		118 ± 24
NU8237	3-Benzyloxy-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one 391.89 $C_{24}H_{22}ClNO_2$		409 ± 43
NU8238	2-Benzyl-3-(4-hydroxy-3,5-dimethoxybenzyloxy)-3-[4-(2-trimethylsilyl-ethoxymethoxy)phenyl]-2,3-dihydroisoindolin-1-one 627.80 $C_{36}H_{41}NO_7Si$		257 ± 34
NU8239	2-Benzyl-3-hydroxy-3-[4-(2-trimethylsilyl-ethoxymethoxy)phenyl]-2,3-dihydroisoindolin-1-one 461.62 $C_{27}H_{31}NO_4Si$		366 ± 61

NU8240	3-(4-chlorophenyl)-3-(4-allyloxybenzyl)-2-propyl-dihydroisoindolin-1-one 447.95 $C_{27}H_{26}ClNO_3$	2,3- 	304 ± 42
NU8241	3-(4-chlorophenyl)-3-(3-allyloxy-4-methoxy-benzyl)-2-propyl-2,3-dihydroisoindolin-1-one 477.97 $C_{28}H_{28}ClNO_4$		83 ± 5
NU8242	3-(4-chlorophenyl)-3-(4-allyloxy-3-methoxy-benzyl)-2-propyl-2,3-dihydroisoindolin-1-one 477.97 $C_{28}H_{28}ClNO_4$		272 ± 5
NU8245	3-(4-Chlorophenyl)-3-(4-hydroxy-3,5-dimethoxybenzyl)-2-prop-2-ynyl-2,3-dihydroisoindolin-1-one 463.9 $C_{26}H_{22}ClNO_5$		23 ± 4
NU8265	3-(4-Chloro-phenyl)-2-cyclopropylmethyl-3-hydroxy-2,3-dihydro-isoindol-1-one 313.77 $C_{18}H_{16}ClNO_2$		>20

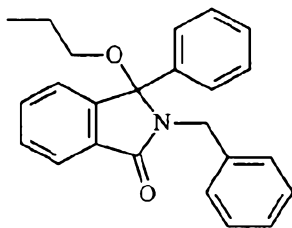
Particularly, preferred examples of compounds for use in carrying out the invention and which have been found to have particularly potent activity comprise the following:

Number	Compound Descriptions	Structure	ELISA IC ₅₀ (□M)
NU8165	2-benzyl-3-(4-chlorophenyl)-3-(3-hydroxy-propoxy)-2,3-dihydroisoindolin-1-one		15.9 ± 0.8
NU8231	3-(4-Chloro-phenyl)-3-(4-hydroxy-3,5-dimethoxy-benzyloxy)-2-propyl-2,3-dihydro-isoindolin-1-one 467.94 C ₂₆ H ₂₆ ClNO ₅		5.3 ± 0.9
NU8243	3-(4-chlorophenyl)-3-(4-hydroxy-benzyl)-2-propyl-2,3-dihydroisoindolin-1-one 407.88 C ₂₄ H ₂₂ ClNO ₃		7.7 ± 0.3
NU8244	3-(4-chlorophenyl)-3-(3-hydroxy-4-methoxy benzyloxy)-2-propyl-2,3-dihydroisoindolin-1-one 437.91 C ₂₅ H ₂₄ ClNO ₄		9.5 ± 1.9

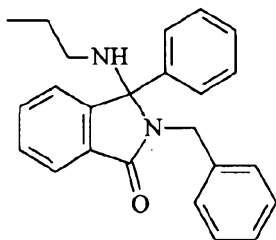
NU8249	2-Benzyl-3-(4-chlorophenyl)-3-(3-hydroxycyclopentyloxy)-2,3-dihydroisoindolin-1-one		3 ± 1
NU8253	3-(4-Chlorophenyl)-3-(3-hydroxy-cyclopentyloxy)-2-propyl-2,3-dihydro-isoindolin-1-one		3.0 ± 0.7
NU8257	3-(4-Chlorophenyl)-3-(3-hydroxy-cyclopentyloxy)-2-phenethyl-2,3-dihydroisoindolin-1-one 447.95 $C_{27}H_{26}ClNO_3$		5.5 ± 1.7
NU8260	SK149 3-(4-Chloro-phenyl)-3-hydroxy-2-(4-nitro-benzyl)-2,3-dihydro-isoindol-1-one 394.8 $C_{21}H_{15}ClN_2O_4$		$670nM \pm 150$
NU8261	3-(4-Chloro-phenyl)-3-(3-hydroxy-cyclopentyloxy)-2-(4-nitro-benzyl)-2,3-dihydro-isoindolin-1-one 478.9 $C_{26}H_{23}ClN_2O_5$		700 ± 160 nM

NU8274	2-(4-chlorobenzyl)-3-(4-chlorophenyl)-3-(3-hydroxycyclopentyloxy)-2,3-dihydroisoindolinin-1-one		2.4 ± 0.7
NU8279	3-(4-fluorophenyl)-3-(3-hydroxycyclopentyloxy)-2-propyl-2,3-dihydroisoindolinin-1-one		>20
NU8280	3-(4-chlorophenyl)-2-(cyclopropylmethyl)-3-(3-hydroxycyclopentyloxy)-2,3-dihydroisoindolinin-1-one		15.4 ± 2.3

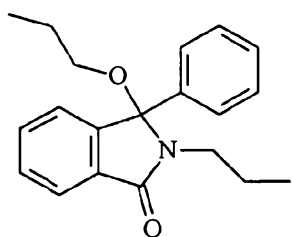
Studies of the p53 binding pocket on the MDM2 protein guided the nature of the molecules synthesised. Thus the present invention provides small molecule inhibitors of MDM2-p53 interaction based on an isoindolinone scaffold. Preliminary screening studies, using an *in vitro* MDM2-p53 binding assay identified compounds NU8001, NU8006 and NU8009 as modest inhibitors of MDM2-p53 interaction having an IC_{50} of around 200 μM (IC_{50} is the concentration of a particular compound required to inhibit 50% of a specific measured activity, in this case inhibition of the MDM2-p53 interaction).



2-benzyl-3-phenyl-3-propoxy isoindolin-1-one (NU8001)



5 2-benzyl-3-phenyl-3-(propylamino)isoindolin-1-one (NU8006)



2-propyl-3-phenyl-3-propoxy isoindolin-1-one (NU8009)

- 10 These compounds also displayed growth inhibitory activity in the NCI 60 cell line screen, and importantly were rated COMPARE negative with respect to any known classes of antitumour agents. The studies carried out fully support the theory that MDM2 – p53 interaction inhibitory characteristics of compounds tested reflect an ability of these characteristics to act as effective antitumour drugs.

The inhibitory efficacies of the compounds of the present invention have been determined using the ELISA assay which for the avoidance of doubt is described below.

5 ELISA assay

Streptavidin-coated 96-well plates are used to immobilise a biotin-tagged IP3 p53-derived peptide (MPRFMDYWEGLN). This is a peptide analogue derived from the p53 binding site for MDM2 (QETFSDLWKLLP). IP3 has a higher affinity for MDM2 than the native peptide and has been used elsewhere to identify antagonists of the binding between MDM2 and p53 (Stoll *et al* 2001). Aliquots of MDM2 generated by *in vitro* translation are pre-incubated for 20 minutes at room temperature (i.e. 20-25°C) with test compounds and controls, before transfer into the IP3-coated 96-well plates. Following a further incubation period of 90 minutes at 4°C, the plates are washed to remove unbound MDM2 and the residual bound MDM2 is detected using a primary monoclonal antibody (MDM2 Ab-1, clone IF2, Oncogene Research Products) and HRP-conjugated secondary antibody (Goat anti-mouse, Dako PO447). The HRP (horseradish peroxidase) is measured by a chemiluminescence reaction using standard reagents (Amersham Pharmacia TM RPN 2106) and an automatic injection 96-well plate illuminometer (EG & G Berthold Microplate LB 96V).

For validation and subsequently as positive controls, IP3 & AP peptides are used, together with the isoindolin-1-one lead compound that at the time shows the highest degree of antagonistic activity. Compound NU8231 is currently included as a standard “lead compound” positive control. AP is an octomer synthetic peptide that inhibits the p53-MDM2 interaction with high potency ($IC_{50} = 5.0nM$) and has been

reported to stimulate p53 and downstream apoptotic pathways in intact tumour cell lines (Chene *et al* 2000). The AP peptide is included as a positive control for biological evaluation of the isoindolinones in the cell free binding assays.

All compounds are dissolved in DMSO and tested at three standard concentrations
5 (initially 20 μ M, 100 μ M and 500 μ M) in the presence of a fixed final concentration of 5% DMSO. The percentage inhibition of complex formation is expressed relative to a DMSO only control and an IC₅₀, defined as the concentration required for 50% inhibition of MDM2-p53 complex formation, determined by interpolation.

The ELISA assay shows a standard error for n=3 independent IC₅₀ determinations that
10 is typically 10-15% of the mean value. Thus, the variation in the IC₅₀ determination for an individual compound is much smaller than the range of values for the compounds evaluated thus far is (26.7 > 500 μ M).

Proposed Whole Cell

15 Compounds showing evidence of interference with p53-MDM2 binding in cell-free assays will be tested in intact cell systems for activation of p53 transcriptional function, growth inhibition and cytotoxicity. These tests will be carried out on cells of established p53 and MDM2 status. Cells will be challenged either with the compounds alone or in combination with a DNA damaging agent.

20 Functional endpoints for p53 activity will include a luciferase based reporter gene assay and transactivation of endogenous p53-regulated genes (WAF1 and MDM2) assayed by Western blotting and immunocytochemistry. Where appropriate, further characterisation of the cellular response to compounds of interest will include cell

cycle checkpoint arrest measured by flow cytometry, and immunoprecipitation of p53-MDM2 complexes from intact cells.

Western blot method

- 5 Osteosarcoma cell line SJSA-1 was plated out in 55mm dishes at a density of 2.5×10^5 cells in 3 mL of RPMI 1640 medium (Sigma) supplemented with 10% foetal bovine serum (FBS, Gibco), 1% (v/v) HEPES (Gibco), 1% (v/v) sodium pyruvate (Gibco) and 1.25g/500ml glucose (Sigma) for 48 hours in a 37°C humidified incubator (Sanyo, MCO 20AIC) at a CO₂ concentration of 5%.
- 10 The dishes were treated with NU8231 at a final concentration of 5, 10, and 20µM (at 1% DMSO) together with a 1% DMSO and an untreated control sample for 6 hours. The medium was then aspirated and the dishes were washed with 3 mL of cold PBS. The cells were then lysed in 40µL of Sodium Dodecyl Sulphate (SDS, Sigma) lysis buffer, boiled at 100°C for 10 minutes before sonication for 3 x 5 seconds at 20
15 microns (Soniprep 150, MSE).
The protein concentration for each of the samples was then determined using BCA Protein Assay Kit (Pierce), and 1:1 loading buffer consisting of β-mercaptoethanol (Sigma) and 0.5% bromophenol-blue (Sigma) were added to 40µg of protein and made up to a final volume of 30µL and boiled for 5 minutes at 100°C
- 20 The samples were then loaded onto a precast 4-20% gradient polyacrylamide Tris-Glycine gels (15 wells, 1.5 mm thickness, Invitrogen Life Technologies), along with a pre-stained marker protein (SeeBlue, Invitrogen). The Gels were processed in Novex XCell (Invitrogen) at 180V and blotted onto a High Bond C membrane (Amersham Life Science) overnight at 30V.

The membrane was then blocked for one hour at room temperature in TBS-Tween containing 5% non-fat milk (TBST-M) followed by incubation with primary antibodies for MDM2 (MDM2-Ab1, 1:500, Oncogene), p53 (p53-D07, 1:1000, Novacastra), p21 (p21 Ab1, 1:100, Oncogene) and Actin (Actin AC40, 1:1000, Sigma) in PBST-M for 1 hour.

The membrane was then washed three times in TBST (15 minutes per wash) and then incubated for an additional 1 hour with a anti mouse or a rabbit horseradish peroxidase (HRP) secondary antibody (Dako, 1:1000) in PBST-M followed by a final wash consisting of six washes with TBST at 5 minutes per wash. Enhanced chemiluminescence (ECL, Amersham) detection reagents were then added onto the membrane which was exposed to a blue light sensitive X-ray film (Fuji Photo Film Co Ltd) and developed in an automated X-ray film processor, (Mediphot 937).

The present invention also relates to the therapeutic utility of isoindolin-1-one compounds described herein.

Thus, according to a further aspect of the present invention there is provided an isoindolin-1-one compound as hereinbefore defined for use in therapy. More specifically, the present invention also provides an isoindolin-1-one compound as hereinbefore defined for use as an active pharmaceutical substance for the treatment of cancer.

In a further aspect of the present invention there is provided the use of isoindolin-1-one compounds as hereinbefore defined in the manufacture of a medicament.

In a still further aspect of the present invention there is provided the use of isoindolinone compounds as hereinbefore defined in the manufacture of a medicament for the treatment of cancer.

As referred to herein "cancer" or "tumour" includes, but is not limited to, cancer of the lung, colon, pancreas, stomach, ovary, cervix, breast, prostate, bone, brain or skin. Compounds of the present invention have been shown to inhibit the interaction of p53 with MDM2. Such inhibition leads to cell arrest and apoptosis.

- 5 Accordingly, the compounds of the present invention are of particular interest for the treatment of a range of selected cancer tumours, and the invention further provides a method for the treatment of a patient suffering from cancer. Thus, a therapeutically effective non-toxic amount of a compound of formula I as hereinbefore defined, may be suitably administered orally, parenterally (including subcutaneously, 10 intramuscularly, and intravenously or topically. The administration will generally be carried out repetitively at intervals, for example once or several times a day.

The amount of the compound of formula I, which is required in order to be effective as an antitumour agent for treating mammals will of course vary and is ultimately at the discretion of the medical or veterinary practitioner treating the mammal in each 15 particular case. The factors to be considered by such a practitioner e.g. a physician, include the route of administration and pharmaceutical formulation; the mammal's body weight, surface area, age and general condition; and the chemical form of the compound to be administered. However, a suitable effective antitumour dose may be in the range of about 1.0 to about 75mg/kg bodyweight, preferably in the range of 20 about 5 to 40mg/kg with most suitable doses being for example in the range of 10 to 30mg/kg. In daily treatment for example, the total daily dose may be given as a single dose, multiple doses, e.g. two to six times per day, or by intravenous infusion for any selected duration. For example, in the case of a 75kg mammal, the dose range could be about 75 to 500mg per day and it is expected that a typical dose would commonly

be about 100mg per day. If discrete multiple doses are indicated, treatment might typically be 50mg of the compound of formula given 4 times per day in the form of a tablet capsule, liquid (e.g. syrup) or injection.

While it may be possible for the compounds of formula I to be administered alone as
5 the raw chemical, it is preferable to present the compound in a pharmaceutical composition. Thus, the invention also provides pharmaceutical compositions comprising an effective amount of an isoindolinone compound as hereinbefore defined which forms the active therapeutic ingredient. Such pharmaceutical compositions for medical use will be formulated in accordance with any of the
10 methods well known in the art of pharmacy for administration in any convenient manner. The isoindolin-1-one compounds will usually be admixed with at least one other ingredient providing a compatible pharmaceutically acceptable additive carrier, diluent or excipient, and may be presented in unit dosage form.

The carrier(s) must be pharmaceutically acceptable in the sense of being compatible
15 with the other ingredients of the formulation and not deleterious to the recipient thereof.

The possible formulations include those suitable for oral, rectal, topical and parenteral (including subcutaneous intramuscular and intravenous) administration or for administration to the lung or other absorptive site such as the nasal passages.

20 All methods of formulation in making up such pharmaceutical compositions will generally include the step of bringing the compound of formula I into association with a carrier which constitutes one or more accessory ingredients. Usually, the formulations are prepared by uniformly and intimately bringing the compound of

formula I into association with a liquid carrier or with a finely divided solid carrier or with both and then, if necessary, shaping the product into desired formulations.

Formulations of the present invention suitable for oral administration may be presented as discrete units such as capsules, cachets, tablets or lozenges, each
5 containing a predetermined amount of the compound of formula I; as a powder or granules; or a suspension in an aqueous liquid or non-aqueous liquid such as a syrup, an elixir, an emulsion or a draught. The compound of formula I may also be presented as bolus, electuary or paste.

A tablet may be made by compression or moulding, optionally with one or more
10 accessory ingredients. Compressed tablets may be prepared by compressing, in a suitable machine, the compound of formula I in a free-flowing form such as a powder or granules, optionally mixed with a binder, lubricant, inert diluent, surface active or dispersing agent. Moulded tablets may be made by moulding, in a suitable machine, a mixture of the powdered compound of formula I with any suitable carrier.

15 A syrup may be made by adding the compound of formula I to a concentrated, aqueous solution of a sugar, for example sucrose, to which may be added any desired accessory ingredients. Such accessory ingredient(s) may include flavourings, an agent to retard crystallisation of the sugar or an agent to increase the solubility of any other ingredient, such as a polyhydric alcohol, for example glycerol or sorbitol.

20 Formulations for rectal administration may be presented as a suppository with a usual carrier such as cocoa butter.

Formulations suitable for parental administration convenient comprise a sterile aqueous preparation of the compound of formula I, which is preferably isotonic with the blood of the recipient.

In addition to the aforementioned ingredients, formulations of this invention, for example ointments, creams and such like, may include one or more accessory ingredients, for example a diluent, buffer, flavouring agent, binder, surface active agent, thickener, lubricant and/or a preservative (including an antioxidant) or other
5 pharmaceutically inert excipient.

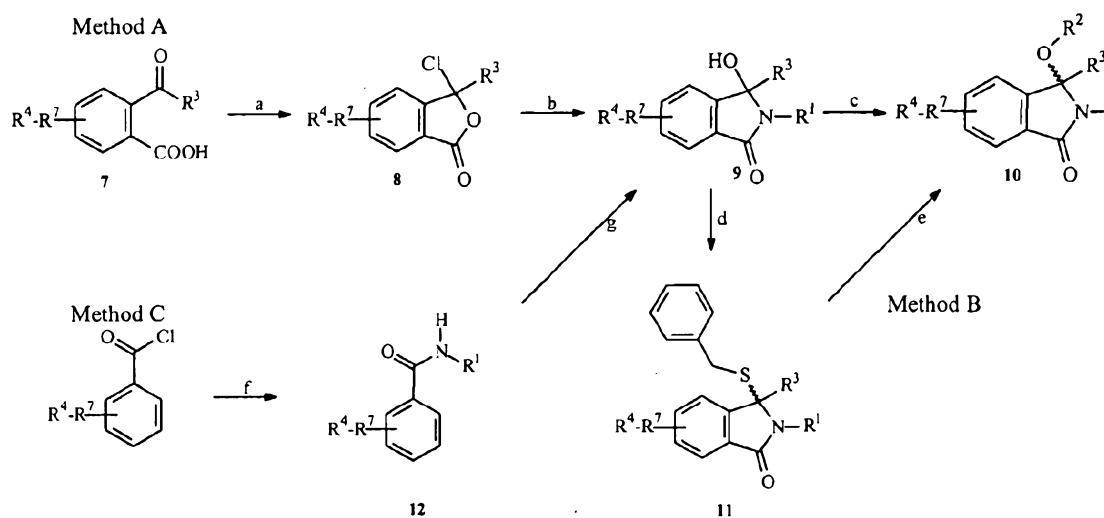
The compounds of the present invention may also be made up for administration in liposomal formulations, which can be prepared by methods well-known in the art.

Therefore, the invention also includes the use of the isoindolinone compounds hereinbefore defined for the manufacture of medicaments or pharmaceutical
10 compositions for treating cancer, wherein the isoindolinone itself provides an effective antitumour agent.

The isoindolinone compounds of the present invention may be administered alone or as a combination therapy along with conventional radiotherapy or chemotherapy treatments.

15 The present invention will now be described further by way of example only. The following examples and description of stages in synthetic routes of preparation of various compounds of interest serve further to illustrate the present invention.

General methods for the preparation of isoindolin-1-ones where x is O.



5 Scheme 1

a) SOCl_2 , DMF, THF; b) R^1NH_2 , THF; c) SOCl_2 , DMF, THF; ii) ROH , THF.; d) THF, mercaptam; e) NIS, CIS, R^2OH ; f) $\text{R}^1\text{-NH}_2$; and g) $s\text{-BuLi}$, R^3COOEt , THF, c) i) SOCl_2 , THF, ii) R^2OH , d) $\text{R}^2\text{COC1}$, THF, base.

The final compounds (10) were isolated as racemic mixtures.

- 10 The compounds of the present invention were synthesised using one of the general procedures below. The general procedures are described with respect to isoindolin-1-ones falling into the general classes specified.

General Procedure A: 3-Hydroxy-3-aryl-2,3-dihydroisoindolin-1-ones.

- Distilled THF (20 mL) was added to 3-chloro-3-aryl-3H-isobenzofuran-1-one (1 mol. equiv.) followed by an excess of the appropriate amine (unless otherwise stated) and an excess of triethylamine, resulting in the formation a creamy white/yellow precipitate. The system was stirred at room temperature under nitrogen for 4 h (unless
- 15

otherwise stated) and monitored by TLC. On completion the solvent was removed under vacuum, the residue was taken up in ethyl acetate (30 mL), washed with water (3 x 20 mL), brine (10 mL) and dried with MgSO₄. The solvent was removed under vacuum and the resulting creamy white/yellow solid (unless otherwise stated) was
5 recrystallised in the minimum amount of boiling ethyl acetate (unless otherwise stated).

General Procedure B: 3-Chloro-3-aryl-2,3-dihydroisoindolin-1-ones.

Distilled THF (10 mL) was added to the appropriate 3-hydroxy-3-aryl-2,3-
10 dihydroisoindolin-1-one (1 mol. equiv.) followed by thionyl chloride (2 mol equiv.) (unless otherwise stated) and a catalytic amount of DMF (3 drops). The system was stirred at room temperature under nitrogen for 4 h (unless otherwise stated) and monitored by TLC. Removal of the solvent under vacuum gave the 3-chloro-3-phenyl-2,3-dihydroisoindolin-1-one as a yellow/colourless oil that was used
15 immediately without further purification.

General Procedure C: 3-Alkoxy-3-aryl-2,3-dihydroisoindolin-1-ones.

Distilled THF (10 mL) was added to the appropriate 3-chloro-3-aryl-2,3-
dihydroisoindolin-1-one (1 mol. equiv.) followed by an excess of the appropriate
20 alcohol (unless otherwise stated) and an excess of the appropriate base (unless otherwise stated). The system was stirred at room temperature under nitrogen for 4 h (unless otherwise stated) and monitored by TLC. On completion the solvent was removed under vacuum, the residue was taken up in ethyl acetate (30 mL), washed

with water (3 x 20 mL), brine (10 mL) and dried with MgSO₄. The solvent was removed to give the crude 3-alkoxy-3-phenyl-2,3-dihydroisoindolin-1-one.

General procedure D: Synthesis of 3-hydroxyisoindolin-1-ones (10).

- 5 To a solution of the appropriate 2-benzoylbenzoic acid (1.0 equiv.) in THF was added thionyl chloride (2.2 equiv.) and DMF (3 drops). The mixture was stirred at room temperature 16 h, then concentrated *in vacuo* to give a clear oil. The residues were dissolved in THF (10 mL), the appropriate primary amine (1.0 equiv.), and triethylamine (2.2 equiv.) were added, and the mixture stirred at rt for 16 h. The
- 10 mixture was either filtered and submitted to extraction with EtOAc (15 mL), sodium bicarbonate (20 mL) and water (15 mL) or treated immediately with EtOAc (15 mL), saturated sodium bicarbonate (15 mL) and water (15 mL). The organic layers were combined, dried (Na₂SO₄) and concentrated *in vacuo*. Chromatography (EtOAc, petrol 1:4) or by crystallisation with a minimum of EtOAc and an excess of petrol
- 15 gave the desired product.

General Procedure E: 3-Chloro-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-ones

- Distilled THF (10 mL) was added to the appropriate 3-(4-chlorophenyl)-3-hydroxy-2,3-dihydroisoindolin-1-one (1 mol. equiv.) followed by thionyl chloride (2 mol
- 20 equiv.) (unless otherwise stated) and a catalytic amount of DMF (3 drops). The system was stirred at room temperature under nitrogen for 4 h (unless otherwise stated) and monitored by TLC. Removal of the solvent under vacuum gave the 3-chloro-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one as a yellow/colourless oil that was used immediately without further purification.

General Procedure F: 3-Alkoxy-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-ones

Distilled THF (10 mL) was added to the appropriate 3-chloro-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one (1 mol. equiv.) followed by an excess of the appropriate
5 alcohol (unless otherwise stated) and an excess of the appropriate base (unless otherwise stated). The system was stirred at room temperature under nitrogen for 4 h (unless otherwise stated) and monitored by TLC. On completion the solvent was removed under vacuum, the residue was taken up in ethyl acetate (30 mL), washed with water (3 x 20 mL), brine (10 mL) and dried with MgSO₄. The solvent was
10 removed to give the crude 3-alkoxy-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one.

General Procedure G: 3-Chloro-3-[4-(2-trimethylsilanylethoxy-methoxy)-phenyl]-2,3-dihydroisoindolin-1-one

Distilled THF (10 mL) was added to the appropriate 3-hydroxy-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroisoindolin-1-one (1 mol. equiv.)
15 followed by thionyl chloride (1.4 mol equiv.) (unless otherwise stated) and a catalytic amount of DMF (3 drops). The system was stirred at room temperature under nitrogen for 2 h (unless otherwise stated) and monitored by TLC. Removal of the solvent under vacuum gave the 3-chloro-3-[4-(2-trimethylsilanylethoxymethoxy)-
20 phenyl]-2,3-dihydroisoindolin-1-one as a yellow/colourless oil that was used immediately without further purification.

General procedure H: 3-Alkoxy-2,3-dihydroisoindolin-1-ones.

To a solution of **11a** (0.51 g, 1.50 mmol) in THF (7 mL), was added the appropriate alcohol (3.0 or 4.0 mol. eq.). The reactions were stirred at room temperature for 72 h, unless stated otherwise, then concentrated *in vacuo*. The residue was dissolved in
5 EtOAc (20 mL) and washed with water (3 × 10 mL). The organic layer was dried (MgSO₄) and concentrated *in vacuo* to give the crude 3-alkoxy-2,3-dihydroisoindolin-1-one.

General procedure I: Synthesis of isoindolinin-1-ones derivatives with R⁴ alkoxy substitution
10

A solution of the appropriate 3-hydroxyisoindolinone **10** (1.0 equivalent) in THF (10 mL) was treated with a solution of thionyl chloride (2.2 equivalents), and a catalytic amount of DMF. After 16 h, the mixture was concentrated *in vacuo*. The residues were dissolved in either DMF (5-10 ml) or THF (5-10 mL) as appropriate
15 and treated with the appropriate primary alcohol (1.1 equivalent or 2.2 equivalents) with or without triethylamine (2.2 equivalents). The reaction mixture was stirred at rt 20 h reaction. The mixture was stirred at room temperature under a nitrogen atmosphere, (EtOAc / petrol: 3: 2). After 20 h, the solvent was removed *in vacuo*. The crude product was extracted with EtOAc (15 mL) and water (20 mL). The
20 organic layers were combined and dried (Na₂SO₄), and concentrated *in vacuo*. Purification by flash chromatography (EtOAc, petrol; 1:4) and by recrystallisation from suitable solvents.

General Procedure J: 3-Alkoxy-2,3-dihydro-isoindolin-1-ones

25 The appropriate 3-aryl-2-benzyl-3-benzylsulphanyl-2,3-dihydro-isoindolin-1-one (1 mol. equiv.) in THF (4 mL) was added to a solution of NIS (1.1 mol. equiv.), CSA

(0.1 mol. equiv.) and the appropriate alcohol (2.2 mol. equiv.) in THF (3 mL). The reaction was stirred in the dark at room temperature for 4 h before removal of the solvent under vacuum. The brown residue was taken up into ethyl acetate (30 mL) and washed with aqueous sodium thiosulphate (2×30 mL). The organic layer was collected and dried (Na_2SO_4) and the solvent removed under vacuum to give the 3-alkoxy-2,3-dihydro-isoindolin-1-one.

N-Cyclohexylmethylbenzamide

Cyclohexylmethylamine (4.37 mL, 33.6 mmol) was added to a solution of benzoyl chloride (2.47 mL, 21 mmol) in THF (20 mL) at 0°C , and stirring continued 16 h. The mixture was filtered, diluted with water (10 mL) and extracted with EtOAc (3×10 mL). The combined organic layers were washed with brine (10 mL), dried (Na_2SO_4), and concentrated *in vacuo*. The product crystallised (2.1 g, 45%) ^1H -NMR (300MHz, CDCl_3) δ_{H} 7.76 (1H, m, Ar); 7.29 (8H, m, Ar); 1.04 (2H, m, CH_2); 1.14 (2H, m, CH_2); 1.61 (7H, m, $3 \times \text{CH}_2$); 3.23 (2H, t, $J = 6.78$ Hz, N- CH_2); 6.15 (1H, s, NH); 7.37 (3H, m, ArH), 7.70 (2H, m, ArH);. LCMS (ESI+) 218 $[\text{M}+\text{H}]^+$.

General Procedure K. To a solution of n-cyclohexylmethylbenzamide (250 mg, 1.14 mmol) in THF (5 mL) was added dropwise *sec*-butyl lithium (1.4 M in hexanes; 1.79 mL, 2.51 mmol) at -78°C and stirring continued 30 min. A solution of the appropriate benzonitrile (0.17 g, 1.3 mmol) in THF (1 mL) was added dropwise and stirring continued for a further 30 min at -78°C . The reaction was quenched (sat NH_4Cl) and extracted with DCM (4×50 mL). The combined organic extracts were washed with brine (50 mL), dried (MgSO_4), and concentrated *in vacuo* to give the product as a fine white solid.

General Procedure L.

To the appropriate 3-aminoisoindolinone (200 mg, 0.57 mmol) and triethylamine
5 (0.24 mL, 1.71 mmol) in DCM (2 mL) was added benzoyl chloride (0.13 mL, 1.14 mmol). The solution was stirred 20h, then concentrated *in vacuo*. Chromatography gave the product.

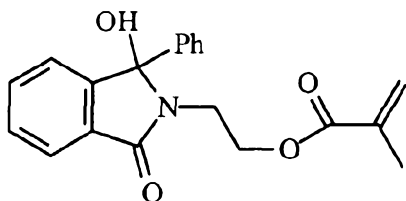
The following specific examples as hereinbefore described were prepared using the
10 general procedures described above. The preparation of some precursor compounds is also described:

2-Benzyl-3-chloro-3-phenyl-2,3-dihydroisoindolin-1-one (11a).

15 A solution of 2-benzyl-3-hydroxy-3-phenyl-2,3-dihydroisoindolin-1-one **10a** (0.25 g, 0.79 mmol) in THF (20 mL) was reacted with thionyl chloride (0.07 mL, 0.87 mmol) and DMF (3 drops), the mixture was stirred for 16 h, and concentrated *in vacuo* giving **11a** as an orange solid (0.27 g, 0.79 mmol) which was used without further purification.

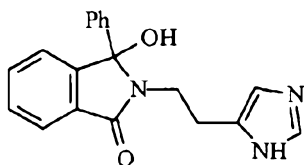
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2-Methylacrylic acid 2-(1-hydroxy-3-oxo-1-phenyl-1,3-dihydroisoindolin-2-yl)ethyl ester (10d).



General procedure D: 2-benzoyl benzoic acid (0.75 g, 3.3 mmol), 2-aminoethyl methacrylate hydrochloride (0.60 g, 3.65 mmol), and triethylamine (1.01 mL, 7.26 mmol) in THF (10 mL. Chromatography (silica; EtOAc, petrol; 3: 7) gave 10d as a clear oil (1.04 g, 3.08 mmol) FTIR ν (cm^{-1}): 3326 (OH), 2930 (CH-Ar), 1679 (very strong C=O absorption). ^1H NMR (300 MHz, CDCl_3) δ_{H} (ppm) 1.90 (3H, s, CH_3), 3.13 (1H, m, CH_2), 4.12 (2H, m, OCH_2), 4.67 (1H, m, NCH_2), 5.58 (1H, s, CH), 6.09 (1H, s, CH), 7.28–7.80 (13H, m, Ar-H), 7.81 (1H, m, Ar-H₄). ^{13}C NMR (75 MHz, CDCl_3) δ_{C} (ppm) 14.6 (CH₃), 18.7 (CH₂), 38.9 (CH₂), 63.5 (CH₂), 91.8 (O-C-N), 123–149.5 (C-Ar), 168.3 (C=O), 168.5 (C=O). LCMS (ESI+) m/z = 360, $[\text{M}+\text{Na}]^+$.

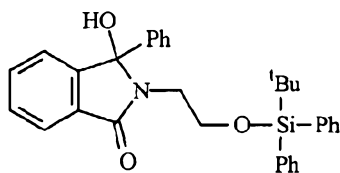
3-Hydroxy-2-[2-(3H-imidazol-4-yl)ethyl]-3-phenyl-2,3-dihydroisindolin-1-one (10e).



General procedure D: 2-benzoylbenzoic acid (0.75 g, 3.3 mmol), histamine dihydrochloride (0.67 g, 3.63 mmol), and triethylamine (1.51 mL, 10.9 mmol). Chromatography (silica; MeOH, DCM; 5:95) gave 10e as a white powder (0.34 g, 1.07 mmol, 33%) mp 190 °C. FTIR ν (cm^{-1}): 1782 (NC=C), 1693 (C=O). ^1H NMR (300 MHz, CDCl_3) δ_{H} (ppm): 2.87 (1H, m, CH_2), 3.11 (2H, m, CH_2), 4.03 (1H, m,

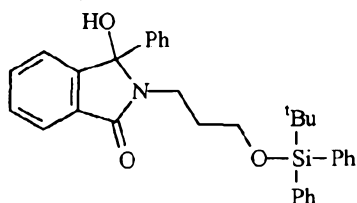
CH₂), 6.67 (1H, s, CH), 7.28 (1H, s, CH), 7.40 (8H, m, Ar-H), 7.93 (1H, m, H₇). ¹³C NMR (75 MHz, CDCl₃) δ_C (ppm): 26 (CH₂), 39.1 (CH₂), 53.8 (C=CH), 92.6 (N-C-O), 115.4-139.7 (C-Ar), 150.7 (C=C-N), 169 (C=O). LCMS (ESI⁺): m/z = 320 [M+H]⁺. Anal. Calc for C₁₉H₁₇N₃O₂: C, 71.46; H, 5.37; N, 13.16%; Found C, 70.99; H, 4.27; N, 7.54%.

2-[2-(*tert*-Butyldiphenylsilanyloxy)ethyl]-3-hydroxy-3-phenyl-2,3-dihydroisoindolin-1-one (10q).

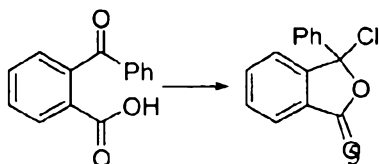


- 10 General procedure D: 2-benzoylbenzoic acid (460 mg, 2 mmol), thionyl chloride (483 mg, 4.0 mmol), 2-(*tert*-butyldiphenylsilanyloxy)ethylamine³⁴ (720 mg, 2.4 mmol), triethylamine (600 mg, 6.0 mmol). Chromatography (silica; 20% EtOAc, petroleum ether) gave 10q as a white solid (860 mg, 83%) IR ν (cm⁻¹): 2936, 2859, 1683, 1470, 1421, 1398, 1312, 1195, 1170, 1107, 1051, 935, 822. ¹H-NMR (300MHz, CDCl₃) δ_H 7.74 (1H, m, Ar), 7.46 (4H, m, Ar) ; 7.28 (14H, m, Ar). 5.65 (1H, s, OH) ; 3.90 (2H, m, OCH₂) ; 3.58 (1H, dt, J = 3.09 & 6.34 Hz, NCH₂); 2.89 (1H, dt, J = 3.42 & 4.79 Hz, -NCH₂) ; 0.98 (9H, s, 'Bu). ¹³C-NMR (75 MHz, CDCl₃) δ_C 19.46, 27.21, 42.14, 64.08, 90.98, 123.08, 123.77, 126.76, 128.27, 128.31, 128.80, 129.13, 129.50, 130.21, 130.45, 130.48, 132.26, 132.53, 133.13, 135.92, 140.11,
- 15 149.60, 168.56.
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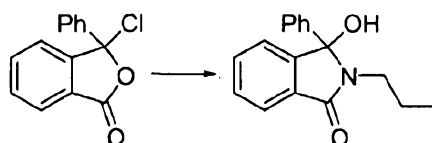
2-[4-(*tert*-Butyldiphenylsilanyloxy)propyl]-3-hydroxy-3-phenyl-2,3-dihydroisoindolin-1-one (10s).



- General procedure D: 2-benzoylbenzoic acid (230 mg, 1.0 mmol), thionyl chloride (240 mg, 2.0 mmol), 2-(tert-butyldiphenylsilyloxy)propylamine (383 mg, 1.2 mmol) triethylamine (310 mg, 3.0 mmol). Chromatography (silica; 40% EtOAc, petroleum ether) gave 10s as a white solid (375 mg, 71%). $^1\text{H-NMR}$ (300MHz, CDCl_3) δ_{H} 7.99 (1H, d, $J = 7.53$ Hz, Ar); 7.50 (8H, m, Ar); 7.24 (10H, m, Ar); 3.63 (3H, m, OCH_2 and NCH_2); 2.79 (1H, q, $J = 7.01$ Hz, NCH_2); 1.87 (1H, m, CH_2); 1.58 (1H, m, CH_2); 0.81 (9H, s, 'Bu). $^{13}\text{C-NMR}$ (75MHz, CDCl_3) δ_{C} 19.37, 27.05, 30.98, 37.83, 63.22, 92.08, 123.04, 123.65, 126.55, 128.10, 128.81, 128.99, 129.70, 129.90, 130.13, 120.85, 131.19, 132.96, 133.38, 133.55, 135.88, 135.97, 137.45, 139.40, 142.87, 149.64, 168.70, 170.00. LCMS (ESI+) 522 $[\text{M}+\text{H}]^+$.
- 2-Furan-2-ylmethyl-3-hydroxy-3-phenyl-2,3-dihydro-isoindolin-1-one (10t). 2-benzoylbenzoic acid (460 mg, 2 mmol), thionyl chloride (482 mg, 4.0 mmol), furfurylamine (236 mg, 2.4 mmol) triethylamine (610 mg, 6.0 mmol). Chromatography (silica; 40% EtOAc, petroleum ether) gave 10t as a white solid (360 mg, 58%). $^1\text{H-NMR}$ (300MHz, CDCl_3) δ_{H} 7.62 (1H, m, Ar); 7.35 (2H, m, Ar); 7.19 (6H, m, Ar); 7.06 (1H, s, OH); 6.01 (1H, m, CH_2); 5.84 (1H, m, Ar); 4.43 (1H, d, $J = 15.76$ Hz, CH); 4.03 (2H, t, $J = 15.75$ Hz, NCH_2). $^{13}\text{C-NMR}$ (125MHz, CDCl_3) δ_{C} 35.57, 91.57, 108.63, 110.70, 123.25, 123.80, 126.44, 128.66, 128.74, 129.81, 130.23, 133.29, 138.56, 141.97, 149.49, 150.86, 168.16. LCMS (ESI+) 306 $[\text{M}+\text{H}]^+$.

3-Chloro-3-phenyl-3H-isobenzofuran-1-one

Dry THF (20 mL) was added to 2-benzoylbenzoic acid (0.51 g, 2.25 mmol) followed by thionyl chloride (0.18 mL, 2.48 mmol) and DMF (3 drops). The reaction mixture was stirred at room temperature overnight and monitored by TLC. Removal of the solvent *in vacuo* yielded a clear oil (0.55 g, 2.26 mmol, 100%); R_f 0.68 (40:60 ethyl acetate: petrol).

3-Hydroxy-3-phenyl-2-propyl-2,3-dihydro-isoindolin-1-one

15

3-Chloro-3-phenyl-3H-isobenzofuran-1-one (0.56 g, 2.21 mmol) was reacted with redistilled propylamine (0.40 mL, 2.43 mmol) as for **General Procedure A** giving 3-hydroxy-3-phenyl-2-propyl-2,3-dihydro-isoindolin-1-one as an off-white solid. This was dissolved in the minimum of boiling ethyl acetate and recrystallised by dropwise addition of petrol to give a white solid (0.51 g, 1.92 mmol, 87%); R_f 0.48 (40:60 ethyl acetate: petrol); mp 179-183 °C. Lit. 184-185 °C.²²⁹

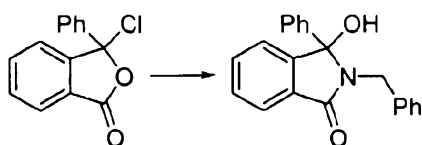
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Anal. Calcd for $C_{17}H_{17}NO_2$: C, 76.40; H, 6.41; N, 5.24%. Found: C, 76.00; H, 6.11; N, 5.06%. IR (KBr) ν_{max} (cm^{-1}): 3180 (OH), 1678 (CO), 1059, 771, 702. 1H NMR

(200 MHz, d_6 -DMSO) δ 0.83-0.90 (3H, t, $J = 7.5$ Hz, $-NCH_2CH_2CH_3$), 1.74-1.61 (2H, m, $-NCH_2CH_2CH_3$), 2.90-3.05 (2H, m, $-NCH_2CH_2CH_3$), 7.19 (1H, s, $-OH$, exchangeable with D_2O), 7.34-7.51 (6H, m, aromatic- H), 7.58-7.69 (2H, m, isoindolinone- H), 7.80-7.84 (1H, m, isoindolinone- H). ^{13}C NMR (50 MHz, d_6 -DMSO) δ 11.92 ($-CH_3$), 22.01 ($-CH_2CH_3$), 41.07 ($-NCH_2-$), 90.87 (C-3), 122.70, 123.05, 126.16, 128.37, 128.78, 129.46, 130.97, 132.70 (C8), 140.64 (C9), 149.97, 166.96 (C-1). MS (EI) m/z 267 [M^+].

2-Benzyl-3-hydroxy-3-phenyl-2,3-dihydro-isoindolin-1-one

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3-Chloro-3-phenyl-3*H*-isobenzofuran-1-one

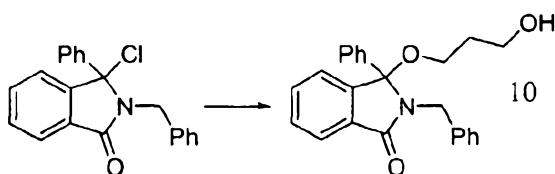
(0.55 g, 2.23 mmol) was reacted with redistilled benzylamine (0.53 mL, 2.45 mmol) as for **General Procedure A** giving 2-benzyl-3-hydroxy-3-phenyl-2,3-dihydro-isoindolin-1-one as an oily white solid. This was dissolved in the minimum of boiling ethyl acetate and recrystallised by dropwise addition of petrol to give a white crystalline solid (0.58 g, 1.84 mmol, 83%); R_f 0.53 (40:60 ethyl acetate: petrol); mp 151-155 °C. Lit 151-152 °C.²³²

Anal. Calcd for $C_{21}H_{17}NO_2$: C, 80.00; H, 5.43; N, 4.44%. Found: C, 79.65; H, 5.33; N, 4.54%. IR (KBr) ν_{max} (cm^{-1}): 3287 (OH), 1678 (CO), 1061, 768, 706. 1H NMR (200 MHz, d_6 -DMSO) δ 4.23-4.31 (1H, d, $J = 15.5$ Hz, $-NCH_2C_6H_5$), 4.55-4.63 (1H, d, $J = 15.5$ Hz, $-NCH_2C_6H_5$), 7.26-7.29 (5H, m, $-NCH_2C_6H_5$), 7.31 (1H, s, $-OH$, exchangeable with D_2O), 7.36-7.58 (6H, m, aromatic- H), 7.61-7.70 (2H, m, aromatic-

H), 7.82-7.86 (1H, m, isoindolinone-*H*). ^{13}C NMR (50 MHz, d_6 -DMSO) δ 42.91 ($\text{NCH}_2\text{C}_6\text{H}_5$), 91.05 (*C*-3), 122.85, 123.25, 126.32, 126.78, 128.09, 128.16, 128.30, 128.66, 129.57, 130.78, 132.92 (*C*8), 138.47, 140.27 (*C*-9), 149.93, 167.22 (*C*-1). MS (EI) m/z 315 [M^+].

5

2-Benzyl-3-(3-Hydroxy-propoxy)-3-phenyl-2,3-dihydro-1H-isoindolin-1-one
(*NU8034*)



2-Benzyl-3-chloro-3-phenyl-2,3-dihydro-isoindolin-1-one (0.53 g, 1.60 mmol) in THF (5 mL) was added dropwise to 1,3-propanediol (10 mL) and stirred at room temperature for 20 h. The solvent was removed under vacuum and the crude reaction mixture was taken up into DCM (2×20 mL) and washed with water (2×20 mL). The organic layer was collected and dried (Na_2SO_4). Removal of the solvent *in vacuo* yielded 2-benzyl-3-(3-hydroxy-propoxy)-3-phenyl-2,3-dihydro-1H-isoindolin-1-one as a yellow oil. This was dissolved in the minimum amount of diethyl ether and recrystallised by dropwise addition of petrol to give a white solid (0.21 g, 0.56 mmol, 35%); R_f 0.23 (40:60 ethyl acetate:petrol); mp 89-92 °C.

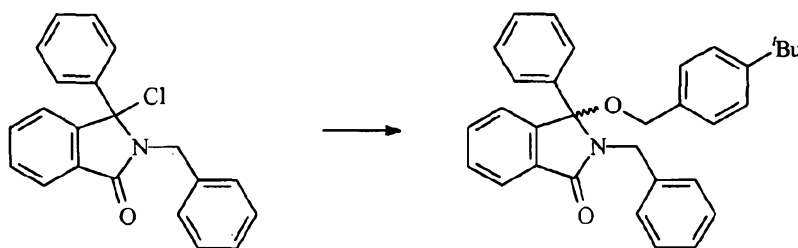
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Anal. Calcd* for $\text{C}_{24}\text{H}_{23}\text{NO}_3$: C, 77.19; H, 6.21; N, 3.75%. Found: C, 76.76; H, 6.01; N, 3.62%. IR (KBr) ν_{max} (cm^{-1}): 3428 (OH), 1690 (CO). ^1H NMR (200 MHz, d_6 -

DMSO) δ 1.20-1.53 (2H, m, $-\text{OCH}_2\text{CH}_2\text{CH}_2\text{OH}$), 2.77-2.94 (2H, m, $-\text{OCH}_2\text{CH}_2\text{CH}_2\text{OH}$), 3.29-3.44 (2H, m, $-\text{OCH}_2\text{CH}_2\text{CH}_2\text{OH}$), 4.04-4.11 (1H, d, $J = 15.0$ Hz, $-\text{NCH}_2\text{C}_6\text{H}_5$), 4.39-4.44 (1H, t, $-\text{OCH}_2\text{CH}_2\text{CH}_2\text{OH}$, exchangeable with D_2O), 4.71-4.79 (1H, d, $J = 15.0$ Hz, $-\text{NCH}_2\text{C}_6\text{H}_5$), 7.29-7.41 (11H, m, aromatic- H), 7.65-7.75 (2H, m, aromatic- H), 7.93-7.97 (1H, m, isoindolinone- H). ^{13}C NMR (50 MHz, d_6 -DMSO) δ 32.20 ($-\text{OCH}_2\text{CH}_2\text{CH}_2\text{OH}$), 42.82 ($-\text{NCH}_2\text{C}_6\text{H}_5$), 57.87 and 57.99 ($-\text{OCH}_2\text{CH}_2\text{CH}_2\text{OH}$), 60.05 ($-\text{OCH}_2\text{CH}_2\text{CH}_2\text{OH}$), 95.12 ($C-3$), 123.38, 123.49, 126.39, 127.28, 128.34, 128.70, 128.85, 130.22, 131.37, 133.26, 137.89, 139.05, 145.73, 167.68 ($C-1$). MS (EI) m/z 373 [M^+].

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2-Benzyl-3-(4-*tert*-butyl-benzyloxy)-3-phenyl-2,3-dihydro-isoindolin-1-one (NU8113)



2-Benzyl-3-chloro-3-phenyl-2,3-dihydro-isoindolin-1-one (0.51 g, 1.50 mmol) was reacted with 4-*tert*-butyl-benzyl alcohol (1.06 mL, 5.99 mmol) as for **General Procedure G** yielding 2-benzyl-3-(4-*tert*-butyl-benzyloxy)-3-phenyl-2,3-dihydro-isoindolin-1-one as a clear oil. The crude product was purified by flash column chromatography (silica gel, 10:90 ethyl acetate:petrol) to give a cloudy white oil.

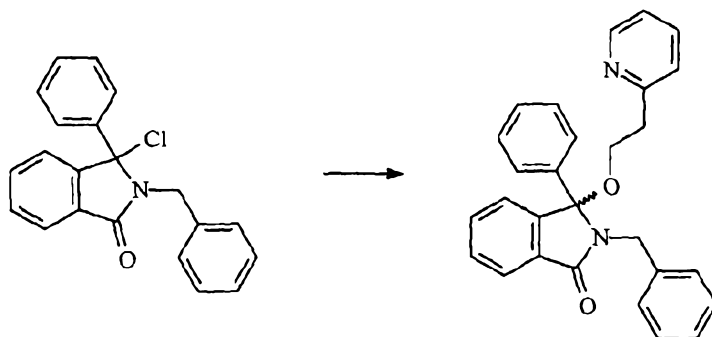
* Figures given are not within 0.4% of theoretical values

Trituration in petrol yielded a white powder (0.30g, 0.64 mmol, 43%); R_f 0.25 (10:90 ethyl acetate:petrol); mp 107-108 °C.

Anal. Calcd for $C_{32}H_{31}NO_2$: C, 83.27; H, 6.77; N, 3.03%. Found: C, 83.29; H, 6.63; N, 2.83%. IR (Diamond ATR) ν_{max} (cm^{-1}): 1698 (CO), 1383, 1356, 1050, 760, 699.

- 5 1H NMR (200 MHz, $CDCl_3$) δ 1.23 (9H, s, $-OCH_2C_6H_4C(CH_3)_3$), 3.59-3.72 (2H, tented dd, $-OCH_2C_6H_4C(CH_3)_3$), 3.97-4.04 (1H, d, $J = 14.5$ Hz, $-NCH_2C_6H_5$), 4.68-4.75 (1H, d, $J = 14.5$ Hz, $-NCH_2C_6H_5$), 6.81-6.85 (2H, d, $J = 8.0$ Hz, $-OCH_2C_6H_4C(CH_3)_3$), 7.08-7.29 (13H, m, aromatic- H), 7.39-7.43 (2H, m, aromatic- H), 7.86 (1H, m, isoindolinone- H). ^{13}C NMR (50 MHz, $CDCl_3$) δ 31.57 ($-OCH_2C_6H_4C(CH_3)_3$), 43.63 ($-NCH_2C_6H_5$), 64.88 ($-OCH_2C_6H_4C(CH_3)_3$), 95.89 (C-3), 123.35, 123.75, 125.23, 126.80, 127.35, 127.55, 128.38, 128.60, 129.67, 129.85, 132.02, 132.82, 134.59, 137.75, 138.82, 146.06, 150.65, 168.82 (C-1). MS (LC) m/z 147, 209, 298, 462 [MH^+], 484 [MNa^+].
- 10

2-Benzyl-3-phenyl-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydro-isoindolin-1-one (NU8133)



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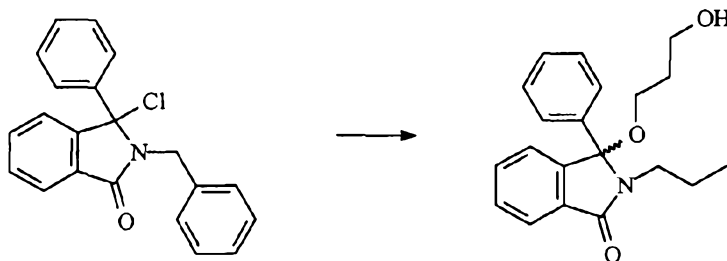
2-Benzyl-3-chloro-3-phenyl-2,3-dihydro-isoindolin-1-one (0.51 g, 1.50 mmol) was reacted with 2-(2-hydroxyethyl)pyridine (0.67 mL, 5.97 mmol) as for **General Procedure G** yielding 2-benzyl-3-phenyl-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydro-isoindolin-1-one as a pink-orange oil. The crude product was purified by flash

column chromatography (silica gel, 40:60 ethyl acetate:petrol) yielding 2-benzyl-3-phenyl-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydro-isoindolin-1-one as a cloudy oil. This was dissolved in the minimum amount of boiling ethyl acetate and recrystallised by dropwise addition of petrol to give large white crystals (0.11 g, 0.26 mmol, 18%); R_f 0.19 (40:60 ethyl acetate:petrol); mp 115-118 °C.

Anal. Calcd for $C_{28}H_{24}N_2O_2$: C, 79.98; H, 5.75; N, 6.66%. Found: C, 79.66; H, 5.74; N, 6.71%. IR (Diamond ATR) ν_{max} (cm^{-1}): 1697 (CO), 1385, 1059, 758, 696. 1H NMR (200 MHz, $CDCl_3$) δ 1.98-2.65 (2H, m, $-OCH_2CH_2-$), 2.86-3.10 (2H, m, $-OCH_2CH_2-$), 3.84-3.91 (1H, d, $J = 14.5$ Hz, $-NCH_2C_6H_5$), 4.61-4.68 (1H, d, $J = 14.5$ Hz, $-NCH_2C_6H_5$), 6.85-6.90 (2H, m, pyridine- $H_5 + H_3$), 6.99-7.24 (11H, m, aromatic- H), 7.28-7.42 (2H, m, aromatic- H), 7.45-7.54 (1H, m, pyridine- H_4), 7.79-7.83 (1H, m, isoindolinone- H), 8.37-8.39 (1H, m, pyridine- H_6). ^{13}C NMR (50 MHz, $CDCl_3$) δ 37.87 ($-OCH_2CH_2-$), 43.11 ($-NCH_2C_6H_5$), 62.37 ($-OCH_2CH_2-$), 95.45 (C-3), 121.36, 123.12, 123.57, 126.44, 127.17, 128.20, 128.35, 128.42, 129.37, 129.56, 131.59, 132.57, 136.10, 137.94, 138.75, 145.58, 149.26, 158.92, 168.35 (C-1). MS (LC) m/z 298, 421 [MH^+].

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3-(3-Hydroxy-propoxy)-3-phenyl-2-propyl-2,3-dihydro-1H-isoindolin-1-one
(NU8033)

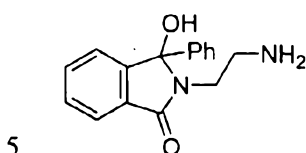


3-Chloro-3-phenyl-2-propyl-2,3-dihydro-isoindolin-1-one (0.53 g, 1.87 mmol) in THF (5 mL) was added dropwise to 1,3-propanediol (10 mL) and stirred at room temperature for 20 h. The solvent was removed under vacuum and the crude reaction mixture was taken up into ethyl acetate (2 × 20 mL) and washed with water (2 × 20 mL). The organic layer was collected and dried (Na₂SO₄). Removal of the solvent *in vacuo* yielded 3-(3-hydroxy-propoxy)-3-phenyl-2-propyl-2,3-dihydro-1H-isoindolin-1-one as a yellow oil. This was dissolved in the minimum amount of THF and recrystallised by dropwise addition of water to give a white solid (0.12 g, 0.37 mmol, 20%); R_f 0.24 (40:60 ethyl acetate:petrol); mp 114-117 °C.

Anal. Calcd for C₂₀H₂₃NO₃: C, 73.82 H, 7.12 N, 4.30%. Found: C, 73.60 H, 6.91 N, 4.08%. IR (KBr) ν_{\max} (cm⁻¹): 3482 (OH), 1695 (CO). ¹H NMR (200 MHz, d₆-DMSO) δ 0.78-0.93 (3H, t, *J* = 7.5 Hz, -NCH₂CH₂CH₃), 1.28-1.60 (2H, m, -NCH₂CH₂CH₃), 1.71-1.91 (2H, m, -OCH₂CH₂CH₂OH), 2.91-3.14 (2H, m, -NCH₂CH₂CH₃), 3.17-3.37 (2H, m, -OCH₂CH₂CH₂OH), 3.53-3.70 (2H, m, -OCH₂CH₂CH₂OH), 4.55 (1H, s, -OCH₂CH₂CH₂OH, exchangeable with D₂O), 7.25-7.59 (6H, m, aromatic-*H*), 7.62-7.79 (2H, m, aromatic-*H*), 7.84-7.96 (1H, m, isoindolinone-*H*). ¹³C NMR (50 MHz, d₆-DMSO) δ 11.94 (-NCH₂CH₂CH₃), 21.42 (-NCH₂CH₂CH₃), 32.72 (-OCH₂CH₂CH₂OH), 38.61 (-NCH₂CH₂CH₃), 57.99 (-OCH₂CH₂CH₂OH), 59.81 (-OCH₂CH₂CH₂OH), 93.68 (C-3), 123.09, 123.41,

126.23, 128.74, 128.85, 130.15, 131.70, 133.03, 139.50, 145.67, 167.55 (C-1). MS (EI) m/z 325 [M^+].

2-(2-Amino-ethyl)-3-hydroxy-3-phenyl-2,3-dihydro-isoindolin-1-one

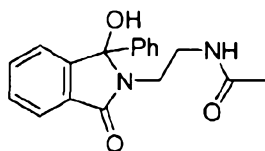


The title compound was prepared from 2-benzoyl benzoic acid **8** (0.75 g, 3.3 mmol), and redistilled ethylenediamine (2.21 mL, 33 mmol), according to **general procedure A**. The crude compound was crystallised from petrol to afford a white powder (0.71 g, 2.64 mmol) in 80% yield. Mp: 145-147 °C.

- 10 Anal. Calc for $C_{16}H_{16}N_2O_2$: C, 71.62; H, 6.01; N, 10.44%; Found C, 71.06; H, 5.70; N, 9.56%. FT-IR ν (cm^{-1}): 3321 (NH_2), 1684 ($C=O$). 1H NMR (300 MHz, $CDCl_3$) δ_H (ppm): 2.58 (1H, td, $J_{H-H} = 12.23$ and 11.89 Hz, CH_2), 2.79 (1H, td, $J_{H-H} = 13.05$ and 11.62 Hz, CH_2), 2.95 (1H, dd, $J_{H-H} = 12.91$ and 10.17 Hz, CH_2), 4.10 (1H, dd, $J_{H-H} = 14.67$ and 7.14 Hz, CH_2), 6.95 (1H, bs, NH_2), 7.17-7.47 (8H, m, Ar-H), 7.76 (1H, dd, $J_{H-H} = 6.6$ Hz, H_4).
- 15 ^{13}C NMR (75 MHz, $CDCl_3$) δ_C (ppm): 40.7 (CH_2), 42 (CH_2), 90.3 (N-C-O), 122.9-150.3 (C-Ar), 168.7 ($C=O$). LC-MS (ES^+ , MeOH): $m/e = 269$ (MH^+), 251, 208, $R_t = 3.0$ min.

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N-[2-(1-Hydroxy-3-oxo-1-phenyl-1,3-dihydro-isoindolin-2-yl)-ethyl]-acetamide

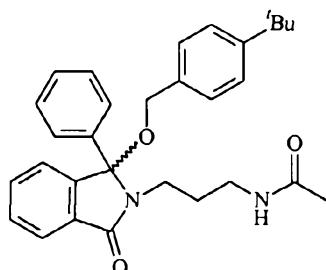


2-(2-Amino-ethyl)-3-hydroxy-3-phenyl-2,3-dihydro-isoindolin-1-one (0.20 g, 0.75 mmol) was suspended in acetic anhydride (1.2 mL), the mixture was heated at reflux
 5 for 15 min. When the reaction was complete by TLC (MeOH / DCM 1: 9), the mixture was cooled to room temperature, where water was added (12 mL). The white suspension was re-heated at reflux. After 15 more minutes, the suspension was filtered. Then extracted with DCM (3 x 10 mL) and water (10 mL). The organic layers were combined, dried over sodium sulphate, filtered and solvent removed in
 10 vacuo. The crude product was purified by crystallisation from petrol and DCM, affording quantitatively the desired product (0.24 g, 0.77 mmol) as a white solid. Rf: 0.38 (MeOH / DCM 1: 9). Mp: 165 °C.

Anal. Calc for $C_{18}H_{18}N_2O_3$: C, 70.35; H, 6.21; N, 8.64%; Found C, 67.01; H, 5.60; N, 8.46%. FT-IR ν (cm^{-1}): 3379 (NH), 1697 (C=O). 1H NMR (300MHz, $CDCl_3$)
 15 δ_H (ppm): 1.87 (3H, s, CH_3), 2.97 (2H, m, CH_2), 3.98 (1H, m, CH_2), 4.22 (1H, m, CH_2), 6.34 (1H, bs, NH), 7.28-7.50 (8H, m, Ar-H), 7.74 (1H, dd, $J_{H-H} = 0.91$ Hz, H_4).
 ^{13}C NMR (75 MHz, $CDCl_3$) δ_C (ppm): 23 (CH_3), 39.2 (CH_2), 40.8 (CH_2), 92.3 (OCN), 123.3-150.3 (C-Ar), 169.2 (C=O), 173.2 (C=O). LC-MS (ES^+ , MeOH): m/e = 333 (MH+23), 293, 208, Rt = 5.67 min

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N-{2-[1-(4-*t*-Butyl-benzyloxy)-3-oxo-1-phenyl-1,3-dihydro-isoindolin-2-yl]-ethyl}-acetamide (NU8213)

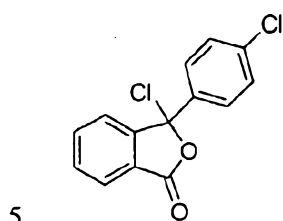


A solution of N-[2-(1-Hydroxy-3-oxo-1-phenyl-1,3-dihydro-isoindolin-2-yl)-ethyl]-acetamide (0.13g, 0.42 mmol) in THF (10 mL) was treated with thionyl chloride (2.2 equivalent), and a catalytic amount of DMF. After 16 h, the reaction mixture was evaporated *in vacuo*. The crude chloro product was dissolved in THF (8 mL), then were successively added 4-*t*-butylbenzyl alcohol (0.08 mL, 0.46 mmol), and triethylamine (0.13 mL, 0.92 mmol) in THF (6 mL). The mixture was stirred under a nitrogen atmosphere, and monitored by TLC (MeOH / DCM 1: 9). After completion, the solvent was removed *in vacuo*. The crude product was extracted with ethyl acetate and water. The combined organic layer was washed with saturated aqueous sodium bicarbonate. The organic layer was dried over sodium sulphate, filtered, and the solvent removed. The crude product (0.02 g, 0.04 mmol) was purified by column chromatography (DCM 100%) affording **NU8213** as a green oil in 8%. R_f: 0.45 (MeOH/ DCM 1: 9). UV λ_{max} = 231 nm. M_p: 187-188 °C.

Anal. Calc. for C₃₀H₃₁N₂O₃: C: 76.29% H: 7.06% N: 6.14%. Found C: 71.41% H: 6.49% N: 5.17%. FT-IR ν (cm⁻¹): 3309 (NH), 1685 (C=O amide). ¹H NMR (300 MHz, CDCl₃) δH (ppm): 1.25 (9H, s, *t*-Bu), 1.8 (3H, s, CH₃), 3 (1H, m, CH_{2 dia}), 3.3 (2H, m, NCH_{2 dia}), 3.45 (1H, m, NCH_{2 dia}), 3.9 (1H, d, J_{H-H} = 10.72 Hz, OCH_{2 dia}), 4 (1H, d, J_{H-H} = 11.13 Hz, OCH_{2 dia}), 6.7 (1H, bs, NH), 7.12- 7.48 (12H, m, Ar-H), 7.87 (1H, m, Ar-H₄). ¹³C NMR (125 MHz, CDCl₃) δC (ppm): 22.6 (CH₃), 31.31 (3xCH₃), 38.78

(CH₂), 39.2 (CH₂), 64.9 (CH₂), 95.4 (NCO), 122.8– 151 (CH-Ar), 170 (C=O), 170.2 (C=O). LC-MS (ES⁺, MeOH): m/e = 479, (MH+23), 294, 209, 149, 91 R_t = 7.50 min.

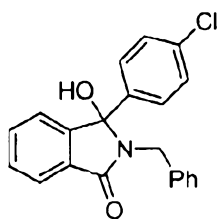
3-Chloro-3-(4-chlorophenyl)-3H-isobenzofuran-1-one



Distilled THF (25 mL) was added to 2-(4-chlorobenzoyl)benzoic acid (1 g, 3.8 mmol) followed by thionyl chloride (0.55 mL, 7.6 mmol) and a catalytic amount of DMF (3 drops). The system was stirred under nitrogen for 4 h at room temperature and monitored by TLC. Removal of the solvent gave 3-chloro-3-(4-chlorophenyl)-3H-isobenzofuran-1-one as a colourless oil (1.06 g, 3.8 mmol, 100%).

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2-Benzyl-3-(4-chlorophenyl)-3-hydroxy-2,3-dihydroisoindolin-1-one

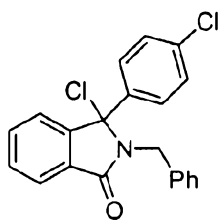


Distilled THF (25 mL) was added to 3-chloro-3-(4-chlorophenyl)-3H-isobenzofuran-1-one (1.06 g, 3.8 mmol) followed by benzylamine (0.62 mL, 5.7 mmol) and triethylamine (1.06 mL, 7.6 mmol) as for general procedure D. The crude product was recrystallised in the minimum amount of boiling ethyl acetate to give 2-benzyl-3-(4-chlorophenyl)-3-hydroxy-2,3-dihydroisoindolin-1-one² as a white solid (965 mg, 2.76 mmol, 72%); R_f 0.62 (40:60 EtOAc:petrol). mp 187.9-189.7 °C. ¹H NMR: (300 MHz,

15

CDCl₃) δ 3.65 (s, 1H, OH), 4.03 (d, 1H, J = 14.9 Hz, N-CH₂), 4.44 (d, 1H, J = 14.9 Hz, N-CH₂), 7.01-7.18 (m, NU8224, Ar-H), 7.31 (m, 2H, Ar-H), 7.66 (m, 1H, Ar-H).
¹³C NMR: (75 MHz, CDCl₃) δ 43.2, 91.5, 123, 123.9, 127.4, 128.2, 128.5, 128.8, 129, 130.1, 130.4, 133.3, 134.7, 137.1, 138.1, 149, 168.2. LC/MS-ES⁺ m/z 332, 350.1
5 [MH⁺], 372.1 [MNa⁺].

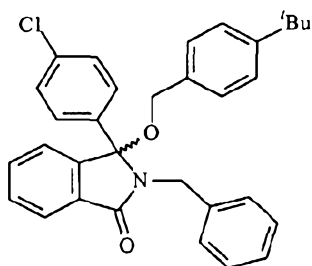
2-Benzyl-3-chloro-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one



2-Benzyl-3-(4-chlorophenyl)-3-hydroxy-2,3-dihydroisoindolin-1-one (200 mg, 0.57 mmol) was reacted with thionyl chloride (0.13 mL, 1.14 mmol) and a catalytic
10 amount of DMF (3 drops) as for general procedure B. Removal of the solvent gave 2-benzyl-3-chloro-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one as a colourless oil (209 mg, 0.57 mmol, 100%).

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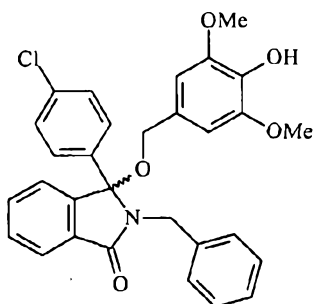
2-Benzyl-3-(4-tert-butylbenzyloxy)-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one
(NU8220).



- 10 2-Benzyl-3-chloro-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one (209 mg, 0.57 mmol) was reacted with 4-*tert*-butylbenzyl alcohol (0.1 mL, 0.57 mmol) and potassium carbonate (86 mg, 0.63 mmol) as for **general procedure F**. The crude product was purified by flash column chromatography (10:90 EtOAc:petrol) to give 2-benzyl-3-(4-*tert*-butylbenzyloxy)-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one
- 15 as a colourless oil (201 mg, 0.4 mmol, 71%); R_f 0.4 (15:85 EtOAc:petrol). λ_{max} (CH₃OH)/nm 213.5, Abs 0.914. IR: 2947, 1692, 1465, 1357 cm⁻¹. ¹H NMR: (300

MHz, CDCl₃) δ 1.22 (s, 9H, t-Bu), 3.63 (d, 1H, J = 10.8 Hz, O-CH₂), 3.68 (d, 1H, J = 10.9 Hz, O-CH₂), 4.08 (d, 1H, J = 14.6 Hz, N-CH₂), 4.62 (d, 1H, J = 14.6 Hz, N-CH₂), 6.83 (d, 2H, J = 8.3 Hz, Ar-H), 7.07 (m, 6H, Ar-H), 7.20 (m, 6H, Ar-H), 7.42 (m, 2H, Ar-H), 7.88 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 31.7, 34.9, 43.6, 65.1, 95.5, 123.4, 124.1, 125.4, 127.6, 127.7, 128.5, 128.6, 128.8, 129.7, 130.2, 132.1, 133.1, 134.4, 134.7, 137.6, 137.7, 145.7, 151.0, 168.6. LC/MS-ES⁺ m/z 332, 334, 496.2, 498.2. Anal. Calcd. for C₃₂H₃₀ClNO₂: C, 77.48; H, 6.10; N, 2.82%. Found C, 77.29; H, 6.07; N, 2.36%.

2-Benzyl-3-(4-chlorophenyl)-3-(4-hydroxy-3,5-dimethoxybenzyloxy)-2,3-dihydroisoindolin-1-one (NU8230).



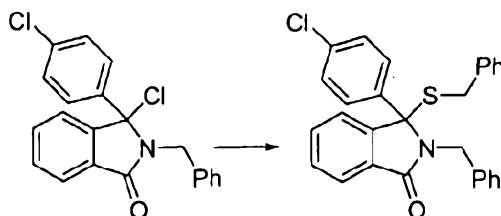
2-Benzyl-3-(4-chlorophenyl)-3-hydroxy-2,3-dihydroisoindolin-1-one (250 mg, 0.72 mmol) was reacted with thionyl chloride (0.0625 mL, 0.85 mmol) and a catalytic amount of DMF (3 drops) as for **general procedure B**. Removal of the solvent gave 2-benzyl-3-chloro-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one as a colourless oil (262 mg, 0.72 mmol, 100%).

2-Benzyl-3-chloro-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one (262 mg, 0.72 mmol) was reacted with syringic alcohol (289 mg, 1.57 mmol) as for **general**

procedure F. The crude product was purified by flash column chromatography (45:55 EtOAc:petrol) to give 2-benzyl-3-(4-chlorophenyl)-3-(4-hydroxy-3,5-dimethoxybenzyloxy)-2,3-dihydroisoindolin-1-one as a light pink oil (277 mg, 0.53 mmol, 75%); R_f 0.54 (45:55 EtOAc:petrol). λ_{\max} (CH₃OH)/nm 210.5, Abs 0.652. IR: 3391, 2936, 1689, 1610, 1354 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ 3.57 (d, 1H, J = 10.7 Hz, O-CH₂), 3.62 (d, 1H, J = 10.7 Hz, O-CH₂), 3.74 (s, 6H, OMe), 4.07 (d, 1H, J = 14.7 Hz, N-CH₂), 4.68 (d, 1H, J = 14.7 Hz, N-CH₂), 5.50 (s, 1H, OH), 6.05 (s, 2H, Ar-H), 7.00-7.24 (m, NU8224, Ar-H), 7.43 (m, 2H, Ar-H), 7.88 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 43.6, 56.8, 65.8, 95.6, 105.2, 123.4, 124.1, 127.5, 128.2, 128.4, 128.5, 128.7, 129, 129.7, 130.2, 132, 133.1, 134.7, 134.8, 137.5, 145.7, 147.1, 168.6. LC/MS-ES⁺ m/z 350, 371.9, 515.9 [M⁺], 517.9, 538 [MNa⁺], 539.9. Anal. Calcd. for C₃₀H₂₆ClNO₅: C, 69.83; H, 5.08; N, 2.71%. Found C, 69.43; H, 5.12; N, 2.25%.

2-Benzyl-3-benzylsulphanyl-3-(4-chlorophenyl)-2,3-dihydro-isoindolin-1-one

15 (NU8160)

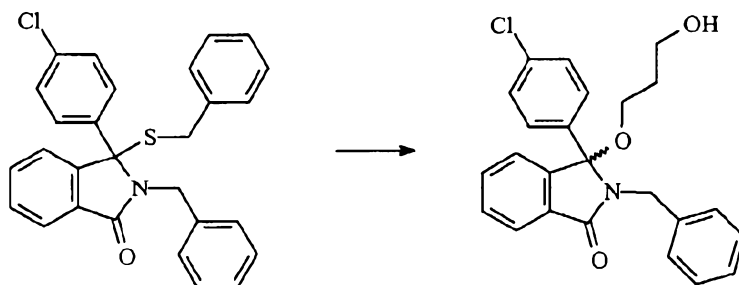


20 Dry THF (20 mL) was added to 2-benzyl-3-chloro-3-(4-chlorophenyl)-2,3-dihydro-isoindolin-1-one (3.22 g, 9.10 mmol) followed by benzyl mercaptan (2.36 mL, 20.02 mmol). The reaction mixture was stirred at room temperature for 48 h. Removal of the solvent under vacuum yielded a white oil. This was taken up into ethyl acetate (50

mL) and washed with water (2×30 mL). The organic layer was collected and dried (Na_2SO_4). Removal of the solvent *in vacuo* yielded 2-benzyl-3-benzylsulphanyl-3-(4-chlorophenyl)-2,3-dihydro-isoindolin-1-one as a white oil. The crude product was purified by flash column chromatography (silica gel, 10:90 ethyl acetate:petrol) to give a cream solid. This was dissolved in the minimum amount of boiling ethyl acetate and recrystallised by dropwise addition of petrol to yield a white crystalline solid (2.42 g, 5.30 mmol, 58%); R_f 0.21 (10:90 ethyl acetate:petrol); mp 132-135 °C.

Anal. Calcd for $\text{C}_{28}\text{H}_{22}\text{ClNOS}$: C, 73.75; H, 4.86; N, 3.07%. Found: C, 73.91; H, 4.89; N, 2.73%. ^1H NMR (300 MHz, CDCl_3) δ 2.61-2.65 (1H, d, $J = 11.5$ Hz, $-\text{SCH}_2\text{C}_6\text{H}_5$), 2.76-2.80 (1H, d, $J = 11.5$ Hz, $-\text{SCH}_2\text{C}_6\text{H}_5$), 4.33-4.38 (1H, d, $J = 15.0$ Hz, $-\text{NCH}_2\text{C}_6\text{H}_5$), 4.69-4.74 (1H, d, $J = 15.0$ Hz, $-\text{NCH}_2\text{C}_6\text{H}_5$), 6.66-6.69 (2H, m, $-\text{C}_6\text{H}_4\text{Cl}$), 7.04-7.38 (13H, m, aromatic- H), 7.40-7.48 (2H, m, aromatic- H), 7.84-7.87 (1H, m, isoindolinone- H). ^{13}C NMR (300 MHz, CDCl_3) δ 33.33 ($-\text{SCH}_2\text{C}_6\text{H}_5$), 43.99 ($-\text{NCH}_2\text{C}_6\text{H}_5$), 78.47 (C-3), 123.24, 123.53, 127.24, 128.04, 128.16, 128.42, 128.75, 129.03, 129.52, 130.58, 133.08, 134.73, 135.45, 136.58, 137.61, 148.69, 168.49 (C-1). MS (LC) m/z 456 [M^+].

2-Benzyl-3-(4-chlorophenyl)-3-(3-hydroxy-propoxy)-2,3-dihydro-isoindolin-1-one
(NU8165)



2-Benzyl-3-benzylsulphanyl-3-(4-chlorophenyl)-2,3-dihydro-isoindolin-1-one (0.50 g, 1.10 mmol) in THF (4 mL) was added to a solution of NIS (0.27 g, 1.21 mmol), CSA (0.03 g) and propane-1,3-diol (0.17 mL, 2.35 mmol) in THF (3 mL) as for

5 **General Procedure J** yielding 2-benzyl-3-(4-chloro- phenyl)-3-(3-hydroxy-propoxy)-2,3-dihydro-isoindolin-1-one as an orange oil. The crude product was purified by flash column chromatography (silica gel, 40:60 ethyl acetate:petrol) to give a yellow oil. This was dissolved in the minimum amount of boiling ethyl acetate and recrystallised by dropwise addition of petrol giving a fluffy white solid (0.17 g,

10 0.42 mmol, 39%); R_f 0.32 (40:60 ethyl acetate:petrol); mp 149-151 °C.

Anal. Calcd for $C_{24}H_{22}ClNO_3$: C, 70.67; H, 5.44; N, 3.43%. Found: C, 70.34; H, 5.33; N, 3.45%. IR (Diamond ATR) ν_{max} (cm^{-1}): 3431 (OH), 1669 (CO), 1426, 1399, 1359, 1066, 1012, 818, 766, 700. 1H NMR (300 MHz, $CDCl_3$) δ 1.21-1.43 (2H, m, $-OCH_2CH_2CH_2OH$), 1.53 (broad s, $-OCH_2CH_2CH_2OH$, exchangeable with D_2O),

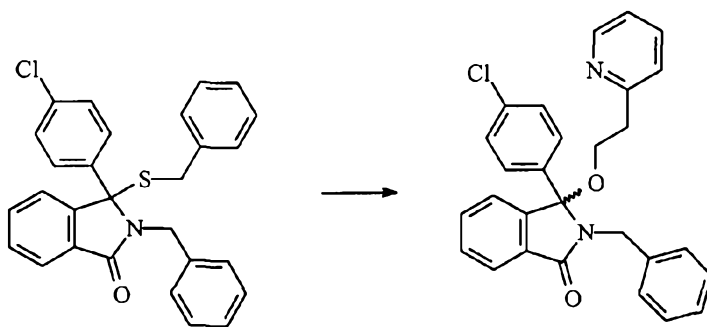
15 2.69-2.74 (2H, m, $-OCH_2CH_2CH_2OH$), 3.40-3.44 (2H, m, $-OCH_2CH_2CH_2OH$), 3.89-3.94 (1H, d, $J = 14.5$ Hz, $-NCH_2C_6H_5$), 4.69-4.74 (1H, d, $J = 14.5$ Hz, $-NCH_2C_6H_5$), 7.01-7.10 (1H, m, aromatic- H), 7.12-7.23 (9H, m, aromatic- H), 7.40-7.46 (2H, m, aromatic- H), 7.82-7.88 (1H, m, isoindolinone- H). ^{13}C NMR (300 MHz, $CDCl_3$) δ 32.02 ($-OCH_2CH_2CH_2OH$), 43.35 ($-NCH_2C_6H_5$), 60.70 and 60.83 ($-OCH_2CH_2CH_2OH$), 95.38 (C-3), 123.11, 124.04, 127.58, 128.16, 128.53, 128.96,

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129.55, 130.15, 131.81, 133.08, 134.73, 137.50, 137.89, 145.51, 165.76 (C-1). MS (LC) m/z 332, 334, 408 [M^+].

2-Benzyl-3-(4-chlorophenyl)-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydro-1H-isoindolin-1-one (NU8170)

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2-Benzyl-3-benzylsulphanyl-3-(4-chlorophenyl)-2,3-dihydro-isoindolin-1-one (0.50 g, 1.10 mmol) in THF (4 mL) was added to a solution of NIS (0.27 g, 1.21 mmol), CSA (0.03 g) and 2-(2-hydroxy-ethyl)-pyridine (0.27 mL, 2.41 mmol) in THF (3 mL) as for **General Procedure J** yielding 2-benzyl-3-(4-chlorophenyl)-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydro-1H-isoindolin-1-one as an orange oil. The crude product was purified by flash column chromatography (silica gel, 45:55 ethyl acetate:petrol) to give a yellow oil. This was dissolved in the minimum amount of boiling ethyl acetate and recrystallised by dropwise addition of petrol yielding an off-white solid (0.16 g, 0.36 mmol, 32%); R_f 0.27 (45:55 ethyl acetate:petrol); mp 130-132 °C.

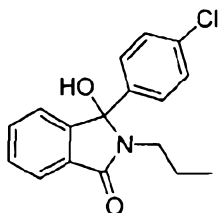
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Anal. Calcd for $C_{28}H_{23}ClN_2O_2$: C, 73.92; H, 5.10; N, 6.16%. Found: C, 73.78; H, 5.10; N, 5.97%. IR (Diamond ATR) ν_{max} (cm^{-1}): 1694 (CO), 1591, 1468, 1380, 1353, 1263, 1068, 1012, 823, 761, 701. 1H NMR (300 MHz, $CDCl_3$) δ 2.40-2.49 (1H, m, $-OCH_2CH_2$ -pyr), 2.56-2.65 (1H, m, $-OCH_2CH_2$ -pyr), 2.92-3.08 (2H, m, -

OCH₂CH₂-pyr), 3.91-3.98 (1H, d, *J* = 14.5 Hz, -CH₂C₆H₅), 4.49-4.54 (1H, d, *J* = 14.5 Hz, -CH₂C₆H₅), 6.82-6.90 (2H, m, aromatic-*H*), 7.01-7.19 (NU8224, m, aromatic-*H*), 7.32-7.42 (2H, m, aromatic-*H*), 7.47-7.53 (1H, m, aromatic-*H*), 7.79-7.83 (1H, m, isoindolinone-*H*), 8.38-8.40 (1H, m, pyridine-*H*₆). ¹³C NMR (300 MHz, CDCl₃) δ

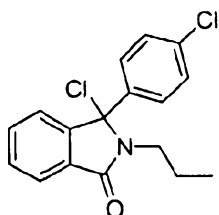
5 38.17 (-OCH₂CH₂-pyr), 43.31 (-NCH₂C₆H₅), 62.77 (-OCH₂CH₂-pyr), 95.24 (C-3), 121.79, 123.34, 123.92, 124.03, 127.59, 128.30, 128.58, 128.87, 129.65, 130.15, 131.84, 133.05, 134.62, 136.51, 137.71, 138.08, 145.48, 149.63, 159.12 (pyridine-C₂), 168.53 (C-1). MS (LC) *m/z* 332, 333, 334.

3-(4-Chlorophenyl)-3-hydroxy-2-propyl-2,3-dihydroisoindolin-1-one



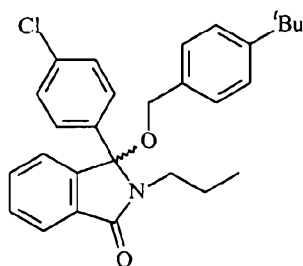
Distilled THF (25 mL) was added to 3-chloro-3-(4-chlorophenyl)-3*H*-isobenzofuran-1-one (1.6 g, 5.75 mmol) followed by *n*-propylamine (0.52 mL, 6.33 mmol) and triethylamine (0.96 mL, 6.9 mmol) as for **general procedure A**. The crude product was recrystallised in the minimum amount of boiling ethyl acetate to give 3-(4-Chlorophenyl)-3-hydroxy-2-propyl-2,3-dihydroisoindolin-1-one as a white solid ² (1.32 g, 4.37 mmol, 76%); *R*_f 0.72 (70:30 EtOAc:petrol). mp 201.6-202.8 °C. ¹H NMR: (300 MHz, CDCl₃) δ 0.72 (t, 3H, *J* = 7.3 Hz, CH₂-CH₂-CH₃), 1.28 (m, 1H, N-CH₂-CH₂), 1.39 (m, 1H, N-CH₂-CH₂), 2.79 (m, 1H, N-CH₂), 3.25 (m, 1H, N-CH₂), 3.61 (s, 1H, OH), 7.17 (m, 1H, Ar-H), 7.24 (m, 4H, Ar-H), 7.37 (m, 2H, Ar-H), 7.58 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12, 22.4, 41.6, 91.3, 122.9, 123.7, 128.1, 129, 130, 130.8, 133, 134.8, 137.7, 148.9, 168. LC/MS-ES⁺ *m/z* 242.9, 302.1 [MH⁺].

3-Chloro-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one



3-(4-Chlorophenyl)-3-hydroxy-2-propyl-2,3-dihydroisoindolin-1-one (250 mg, 0.82 mmol) was reacted with thionyl chloride (0.12 mL, 1.65 mmol) and a catalytic amount of DMF (3 drops) as for **general procedure B**. Removal of the solvent gave 3-chloro-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one as a colourless oil
5 (262 mg, 0.82 mmol, 100%).

3-(4-tert-Butyl-benzyloxy)-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one (NU8221).

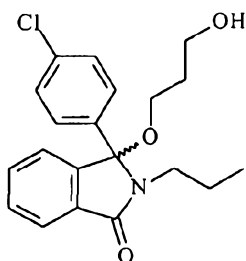


3-Chloro-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one (262 mg, 0.82 mmol) was reacted with 4-tert-butylbenzyl alcohol (0.15 mL, 0.82 mmol) and potassium carbonate (124 mg, 0.9 mmol) as for **general procedure F**. The crude product was purified by flash column chromatography (20:80 EtOAc:petrol) to give 3-(4-tert-butyl-benzyloxy)-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one as a white solid (325 mg, 0.72 mmol, 88%); R_f 0.48 (20:80 EtOAc:petrol). mp 116.5-
10 117.6 °C. λ_{max} (CH₃OH)/nm 219.5, Abs 0.804. IR: 2947, 1689, 1467, 1372 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ 0.73 (t, 3H, J = 7.4 Hz, CH₂-CH₂-CH₃), 1.25 (s, 9H, t-Bu), 1.30 (m, 1H, N-CH₂-CH₂), 1.45 (m, 1H, N-CH₂-CH₂), 3.03 (m, 1H, N-CH₂), 3.22 (m, 1H, N-CH₂), 3.87 (d, 1H, J = 11.1 Hz, O-CH₂), 4.13 (d, 1H, J = 11.1 Hz, O-CH₂), 7.06 (m, 1H, Ar-H), 7.19 (m, 4H, Ar-H), 7.29 (m, 4H, Ar-H), 7.42 (m, 2H, Ar-
15 H), 7.83 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12.2, 21.9, 31.7, 34.9, 41.8,
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64.9, 95.1, 123.4, 123.8, 125.7, 127.5, 128.3, 128.9, 130.2, 132.3, 132.9, 134.6, 134.7, 138.145.6, 151.1, 168.6. LC/MS-ES⁺ m/z 284, 448.1, 470.2, 507.2. Anal. Calcd. for C₂₈H₃₀ClNO₂: C, 75.07; H, 6.75; N, 3.13%. Found C, 75.29; H, 6.97; N, 2.89%.

3-(4-Chlorophenyl)-3-(3-hydroxypropoxy)-2-propyl-2,3-dihydroisoindolin-1-one

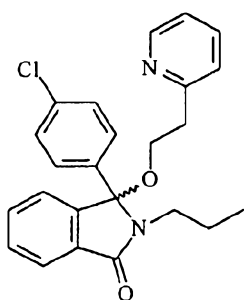
5 (NU8222).



3-Chloro-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one (262 mg, 0.82 mmol) was reacted with 1,3-propanediol (0.41 mL, 5.74 mmol) as for general procedure F. The crude product was purified by flash column chromatography (40:60 EtOAc:petrol) to give 3-(4-chlorophenyl)-3-(3-hydroxypropoxy)-2-propyl-2,3-dihydroisoindolin-1-one as a colourless oil (241 mg, 0.66 mmol, 81%); R_f 0.3 (40:60 EtOAc:petrol). λ_{max} (CH₃OH)/nm 223, Abs 0.818. IR: 3403, 2933, 1684, 1458 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ 0.77 (t, 3H, J = 7.4 Hz, CH₂-CH₂-CH₃), 1.27 (m, 1H, N-CH₂-CH₂), 1.42 (m, 1H, N-CH₂-CH₂), 1.78 (m, 2H, O-CH₂-CH₂-CH₂-OH), 2.95 (m, 1H, O-CH₂), 3.01 (m, 1H, N-CH₂), 3.16 (m, 1H, N-CH₂), 3.23 (m, 1H, O-CH₂), 3.72 (t, 2H, J = 6.1 Hz, O-CH₂-CH₂-CH₂-OH), 7.05 (m, 1H, Ar-H), 7.21 (m, 4H, Ar-H), 7.43 (m, 2H, Ar-H), 7.79 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12.1, 21.9, 32.5, 41.7, 53.8, 60.8, 61, 95, 123.2, 123.8, 128.1, 129.1, 130.2, 132.3, 132.9, 134.8, 138.1, 145.5, 168.6. LC/MS-ES⁺ m/z 284.1, 316.1, 360.1 [MH⁺], 382.1

[MNa⁺]. Anal. Calcd. for C₂₀H₂₂ClNO₃: C, 66.75; H, 6.16; N, 3.89%. Found C, 66.45; H, 6.43; N, 3.75%.

3-(4-Chlorophenyl)-2-propyl-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydroisoindolin-1-one
(NU8229).



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3-Chloro-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one (262 mg, 0.82 mmol) was reacted with 2-(2-hydroxyethyl)pyridine (0.09 mL, 0.82 mmol) and potassium carbonate (124 mg, 0.9 mmol) as for general procedure F. The crude product was purified by flash column chromatography (40:60 EtOAc:petrol) to give

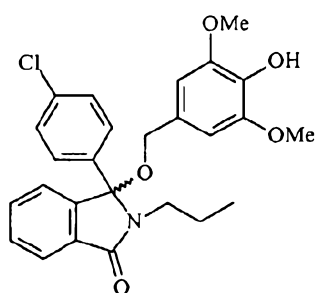
10 3-(4-chlorophenyl)-2-propyl-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydroisoindolin-1-one as a clear yellow oil (187 mg, 0.45 mmol, 56%); *R*_f 0.35 (40:60 EtOAc:petrol). λ_{max} (CH₃OH)/nm 228, Abs 0.455. IR: 2931, 1689, 1591, 1458 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ 0.65 (t, 3H, *J* = 7.4 Hz, CH₂-CH₂-CH₃), 1.16 (m, 1H, N-CH₂-CH₂), 1.32 (m, 1H, N-CH₂-CH₂), 2.87 (m, 1H, N-CH₂), 2.92-3.03 (m, 2H, Pyr-CH₂, and m, 1H, N-CH₂), 3.20 (m, 1H, O-CH₂), 3.44 (m, 1H, O-CH₂), 6.84 (m, 1H, Ar-H), 7.05 (m, 1H, Ar-H), 7.11-7.20 (m, 5H, Ar-H), 7.35 (m, 2H, Ar-H), 7.53 (td, 1H, *J* = 7.7, 1.8 Hz, Ar-H), 7.75 (m, 1H, Ar-H), 8.42 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12.1, 21.8, 38.7, 41.6, 62.7, 94.8, 121.8, 123.2, 123.7, 124, 128.1, 128.8, 130.1, 132.2, 132.7, 134.6, 136.5, 138.2, 145.4, 149.7, 159.1, 168.5. LC/MS-ES⁺ *m/z* 284.1, 286,

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407 [MH⁺]. Anal. Calcd. for C₂₄H₂₃ClN₂O₂·0.25EtOAc: C, 70.00; H, 5.87; N, 6.88%.

Found C, 69.48; H, 5.66; N, 6.86%.

3-(4-Chlorophenyl)-3-(4-hydroxy-3,5-dimethoxybenzyloxy)-2-propyl-2,3-dihydroisoindolin-1-one (NU8231).



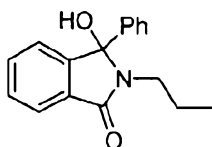
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3-(4-Chlorophenyl)-3-hydroxy-2-propyl-2,3-dihydroisoindolin-1-one (250 mg, 0.82 mmol) was reacted with thionyl chloride (0.072 mL, 0.06 mmol) and a catalytic amount of DMF (3 drops) as for general procedure B. Removal of the solvent gave 3-chloro-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one as a colourless oil
10 (262 mg, 0.82 mmol, 100%).

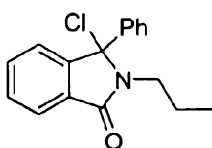
3-Chloro-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one (262 mg, 0.82 mmol) was reacted with syringic alcohol (331 mg, 1.80 mmol) as for general procedure F1. The crude product was purified by flash column chromatography (45:55 EtOAc:petrol) and HPLC (H₂O:CH₃CN, 270 nm) to give 3-(4-chlorophenyl)-
15 3-(4-hydroxy-3,5-dimethoxybenzyloxy)-2-propyl-2,3-dihydroisoindolin-1-one as an opaque light red oil (180 mg, 0.38 mmol, 46%); R_f 0.36 (45:55 EtOAc:petrol). λ_{max} (CH₃OH)/nm 209, Abs 0.550. IR: 3360, 2933, 1692, 1604, 1504, 1450 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ 0.74 (t, 3H, J = 7.4 Hz, CH₂-CH₂-CH₃), 1.31 (m, 1H, N-CH₂-CH₂), 1.44 (m, 1H, N-CH₂-CH₂), 3.03 (m, 1H, N-CH₂), 3.23, (m, 1H, N-CH₂), 3.79

(s, 6H, OMe), 3.84 (d, 1H, $J = 11.1$ Hz, O-CH₂), 4.08 (d, 1H, $J = 11.2$ Hz, O-CH₂), 5.45 (s, 1H, OH), 6.38 (s, 2H, Ar-H), 7.05 (m, 1H, Ar-H), 7.22 (d, 2H, $J = 8.9$ Hz, Ar-H), 7.28 (d, 2H, $J = 8.7$ Hz, Ar-H), 7.42 (m, 2H, Ar-H), 7.83 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12.1, 22.1, 41.9, 56.7, 65.6, 95.1, 104.8, 123.5, 123.8, 128.2, 128.7, 129.1, 130.2, 132.3, 132.8, 134.7, 134.8, 138, 145.5, 147.3, 168.6. LC/MS-ES⁺ m/z 302.1, 489.9, 500. Anal. Calcd. for C₂₆H₂₆ClNO₅·0.1EtOAc: C, 66.45; H, 5.68; N, 2.92%. Found C, 66.58; H, 5.38; N, 2.42.

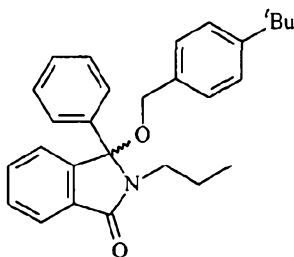
3-Hydroxy-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one



- Distilled THF (25 mL) was added to 3-chloro-3-phenylisobenzofuranone (1.6 g, 6.62 mmol) followed by n-propylamine (0.59 mL, 7.28 mmol) and triethylamine (1.1 mL, 7.94 mmol) as for general procedure A. The crude product was recrystallised in the minimum amount of boiling ethyl acetate to give 3-hydroxy-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one as a white solid (1.25 g, 4.67 mmol, 71%); R_f 0.69 (70:30 EtOAc:petrol). mp 181.9-183.1 °C. Lit. 184-185 °C.³ ¹H NMR: (300 MHz, CDCl₃) δ 0.72 (t, 3H, $J = 7.3$ Hz, CH₂-CH₂-CH₃), 1.34 (m, 1H, N-CH₂-CH₂), 1.42 (m, 1H, N-CH₂-CH₂), 2.84 (m, 1H, N-CH₂), 3.21 (s, 1H, OH), 3.34 (m, 1H, N-CH₂), 7.19 (m, 2H, Ar-H), 7.26 (m, 2H, Ar-H), 7.31 (m, 2H, Ar-H), 7.38 (m, 2H, Ar-H), 7.66 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12, 22.5, 41.7, 91.8, 122.9, 123.6, 126.5, 128.8, 128.88, 129.9, 130.9, 132.9, 138.9, 149.2, 168.1. LC/MS-ES⁺ m/z 250, 268 [MH⁺].

5, *3-Chloro-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one*

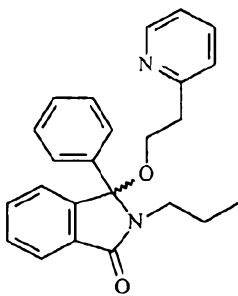
3-Hydroxy-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one (200 mg, 0.74 mmol) was reacted with thionyl chloride (0.11 mL, 1.49 mmol) and a catalytic amount of DMF (3 drops) as for general procedure B. Removal of the solvent gave 3-chloro-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one as a colourless oil (211 mg, 0.74 mmol, 100%).

3-(4-tert-Butylbenzyloxy)-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one (NU8223).

3-Chloro-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one (211 mg, 0.74 mmol) was reacted with 4-tert-butylbenzyl alcohol (0.13 mL, 0.74 mmol) and potassium carbonate (112 mg, 0.81 mmol) as for general procedure C. The crude product was purified by flash column chromatography (15:85 EtOAc:petrol) to give 3-(4-tert-Butylbenzyloxy)-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one as a white solid (153

mg, 0.36 mmol, 50%); R_f 0.3 (15:85 EtOAc:petrol). mp 118.7-119.9 °C. λ_{\max} (CH₃OH)/nm 217, Abs 0.834. IR: 2927, 1681, 1442, 1357 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ 0.70 (t, 3H, J = 7.3 Hz, CH₂-CH₂-CH₃), 1.23 (s, 9H, t-Bu), 1.30 (m, 1H, N-CH₂-CH₂), 1.42 (m, 1H, N-CH₂-CH₂), 3.03 (m, 1H, N-CH₂), 3.24 (m, 1H, N-CH₂),
 5 3.88 (d, 1H, J = 11.3 Hz, O-CH₂), 4.15 (d, 1H, J = 11.3 Hz, O-CH₂), 7.07 (m, 1H, Ar-H), 7.15-7.31 (m, 9H, Ar-H), 7.37 (m, 2H, Ar-H), 7.81 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12.2, 21.9, 31.7, 34.9, 41.9, 64.8, 95.6, 123.5, 123.7, 125.3, 126.4, 127.4, 128.7, 128.8, 130.1, 132.5, 135.0, 139.4, 146.0, 151.0, 168.8. LC/MS-ES⁺ m/z 368.1, 414.1 [MH⁺], 436.1 [MNa⁺]. Anal. Calcd. for C₂₈H₃₁NO₂·0.1EtOAc: C, 80.76;
 10 H, 7.59; N, 3.32%. Found C, 80.75; H, 7.30; N, 3.02%.

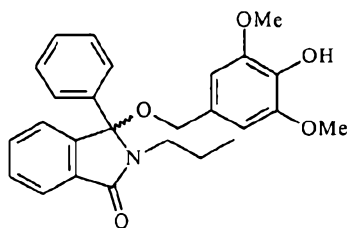
3-Phenyl-2-propyl-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydroisoindolin-1-one (NU8224).



3-Chloro-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one (211 mg, 0.74 mmol) was reacted with 2-(2-hydroxyethyl)pyridine (0.08 mL, 0.74 mmol) and potassium carbonate (112 mg, 0.81 mmol) as for general procedure C. The crude product was
 15 purified by flash column chromatography (40:60 EtOAc:petrol) and recrystallised in the minimum amount of boiling ethyl acetate to give 3-phenyl-2-propyl-3-(2-pyridin-2-yl-ethoxy)-2,3-dihydroisoindolin-1-one as a white solid (105 mg, 0.28 mmol, 38%); R_f 0.29 (40:60 EtOAc:petrol). mp 122.3-124.1 °C. λ_{\max} (CH₃OH)/nm 208, Abs 0.335.

IR: 2926, 1674, 1440, 1374 cm^{-1} . ^1H NMR: (300 MHz, CDCl_3) δ 0.66 (t, 3H, $J = 7.3$ Hz, $\text{CH}_2\text{-CH}_2\text{-CH}_3$), 1.18 (m, 1H, $\text{N-CH}_2\text{-CH}_2$), 1.34 (m, 1H, $\text{N-CH}_2\text{-CH}_2$), 2.88 (m, 1H, N-CH_2), 3.00 (m, 2H, Pyr-CH_2), 3.04 (m, 1H, N-CH_2), 3.22 (m, 1H, O-CH_2), 3.47 (m, 1H, O-CH_2), 6.89 (m, 1H, Ar-H), 7.06 (m, 1H, Ar-H), 7.19 (m, 6H, Ar-H), 7.36 (m, 2H, Ar-H), 7.55 (td, 1H, $J = 7.6, 1.8$ Hz, Ar-H), 7.77 (m, 1H, Ar-H), 8.43 (m, 1H, Ar-H). ^{13}C NMR: (75 MHz, CDCl_3) δ 12.1, 21.7, 38.8, 41.7, 62.6, 95.3, 121.8, 123.3, 123.6, 124.1, 128.6, 129.8, 132.4, 132.6, 136.5, 139.5, 145.8, 149.7, 159.3, 168.6. LC/MS-ES $^+$ m/z 251.1, 373.1 $[\text{MH}^+]$. Anal. Calcd. for $\text{C}_{24}\text{H}_{24}\text{N}_2\text{O}_2$: C, 77.39; H, 6.49; N, 7.52%. Found C, 77.55; H, 6.68; N, 7.53%.

10 *3-(4-Hydroxy-3,5-dimethoxybenzyloxy)-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one (NU8225).*

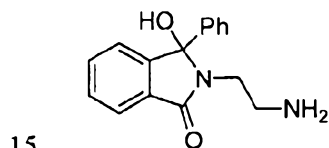


3-Hydroxy-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one (120 mg, 0.44 mmol) was reacted with thionyl chloride (0.039 mL, 0.53 mmol) and a catalytic amount of DMF (3 drops) as for general procedure B1. Removal of the solvent gave 3-chloro-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one as a colourless oil (128 mg, 0.44 mmol, 100%).

3-Chloro-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one (128 mg, 0.44 mmol) was reacted with syringic alcohol (120 mg, 0.65 mmol) as for general procedure C1. The crude product was purified by flash column chromatography (40:60 EtOAc:petrol) to

give 3-(4-hydroxy-3,5-dimethoxybenzyloxy)-3-phenyl-2-propyl-2,3-dihydroisoindolin-1-one as a light orange oil (90 mg, 0.20 mmol, 46%); R_f 0.18 (40:60 EtOAc:petrol). λ_{\max} (CH₃OH)/nm 211, Abs 0.975. IR: 3360, 2935, 1681, 1609, 1325 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ 0.72 (t, 3H, J = 7.3 Hz, CH₂-CH₂-CH₃), 1.32 (m, 1H, N-CH₂-CH₂), 1.44 (m, 1H, N-CH₂-CH₂), 3.03 (m, 1H, N-CH₂), 3.26 (m, 1H, N-CH₂), 3.79 (s, 6H, OMe), 3.88 (d, 1H, J = 11.2 Hz, O-CH₂), 4.10 (d, 1H, J = 11.2, O-CH₂), 6.41 (s, 2H, Ar-H), 7.07 (m, 1H, Ar-H), 7.06 (m, 1H, Ar-H), 7.24 (m, 3H, Ar-H), 7.38 (m, 4H, Ar-H), 7.82 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12.1, 21.9, 41.9, 56.6, 65.5, 95.6, 104.7, 123.6, 123.7, 126.7, 128.8, 128.9, 129, 130, 132.4, 132.7, 134.6, 139.3, 145.9, 147.3, 168.8. LC/MS-ES⁺ m/z 250.1, 287.1, 434.1 [MH⁺], 456.1 [MNa⁺]. Anal. Calcd. for C₂₆H₂₇NO₅·0.3EtOAc: C, 70.93; H, 6.46; N, 3.03%. Found C, 70.48; H, 6.46; N, 2.83%.

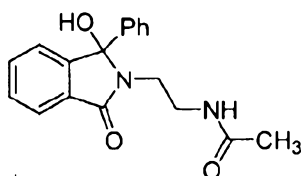
2-(2-Aminoethyl)-3-hydroxy-3-phenyl-2,3-dihydroisoindolin-1-one



Distilled THF (20 mL) was added to ethylenediamine (2.93 mL, 44 mmol) followed by the inverse addition of 3-chloro-3-phenyl-3H-isobenzofuran-1-one (1.07 g, 4.4 mmol) as for general procedure A. The crude product was purified by flash column chromatography (5:95 MeOH:DCM) to give a yellow oily solid, this was triturated in petrol to produce 2-(2-aminoethyl)-3-hydroxy-3-phenyl-2,3-dihydroisoindolin-1-one as a light yellow solid (766 mg, 2.85 mmol, 65%); R_f 0.2 (5:95 MeOH:DCM). mp

175.5-177 °C. Lit. 175-176 °C.⁶ ¹H NMR: (300 MHz, CDCl₃) δ 2.57 (m, 1H, N-CH₂-CH₂-NH₂), 2.77 (m, 1H, N-CH₂-CH₂-NH₂), 2.93 (m, 1H, N-CH₂-CH₂-NH₂), 3.94 (bs, 2H, NH₂), 4.10 (m, 1H, N-CH₂-CH₂-NH₂), 7.16-7.47 (m, 8H, Ar-H), 7.74 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 40.7, 41.9, 90.3, 122.9, 123.6, 126.8, 128.5, 129, 129.1, 130.1, 133, 141, 150.3, 168.7. LC/MS-ES⁺ m/z 251, 269 [MH⁺], 270.1.

N-[2-(1-Hydroxy-3-oxo-1-phenyl-1,3-dihydroisoindolin-2-yl)ethyl]acetamide

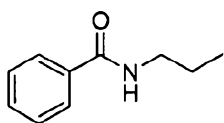


Pyridine (10 mL) was added to 2-(2-aminoethyl)-3-hydroxy-3-phenyl-2,3-dihydroisoindolin-1-one (500 mg, 1.86 mmol), followed by the dropwise addition of acetic anhydride (0.87 mL, 9.3 mmol), over a 5 min period. The system was stirred at room temperature under nitrogen for 16 h and monitored by TLC. Removal of the solvent gave a clear oil that was taken up into ethyl acetate (20 mL), washed with water (3 x 15 mL), saturated NaHCO₃ solution (15 mL), brine (10 mL) and dried with MgSO₄. The solvent was removed and the crude product was purified by flash column chromatography (10:90 MeOH:DCM) and recrystallised in the minimum amount of boiling ethyl acetate to give *N*-[2-(1-hydroxy-3-oxo-1-phenyl-1,3-dihydroisoindolin-2-yl)ethyl]acetamide as a white solid (434 mg, 1.39 mmol, 75%); R_f 0.35 (10:90 MeOH:DCM). mp 181.2-183 °C. Lit. 184-188 °C.⁶ ¹H NMR: (300 MHz, CDCl₃) δ 1.77(s, 3H, NHCOCH₃), 2.82-2.94 (m, 2H, N-CH₂-CH₂-NHCOCH₃), 3.87 (m, 1H, N-CH₂-CH₂-NHCOCH₃), 4.11 (m, 1H, N-CH₂-CH₂-NHCOCH₃), 6.33 (m, 1H, NH), 6.41 (s, 1H, OH), 7.22-7.41 (m, 8H, Ar-H), 7.65 (m, 1H, Ar-H). ¹³C

NMR: (75 MHz, CDCl_3) δ 23.5, 39.1, 40.7, 92.2, 122.2, 123.2, 126.3, 128.7, 128.9, 129.4, 129.9, 133.3, 139.4, 150.2, 169.1, 173.1. LC/MS-ES⁺ m/z 293.1, 311.1 [MH^+].

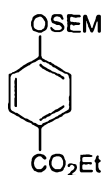
n-Propylbenzamide

5



Dry DCM (30 mL) was added to benzoyl chloride (2.06 mL, 17.7 mmol) followed by the dropwise addition of propylamine (3.19 mL, 38.9 mmol) over 5 min at 0 °C. The system was stirred at 0 °C under nitrogen for 1 h and monitored by TLC. After 1 h
10 the system was washed with 1M HCl (20 mL), brine (10 mL) and dried with MgSO_4 . The solvent was removed to give N-Propylbenzamide as a white solid (2.6 g, 15.9 mmol, 90%); R_f 0.38 (40:60 EtOAc:petrol). mp 87.6-88.9 °C. Lit. 83-84 °C.⁷ ^1H NMR: (300 MHz, CDCl_3) δ 0.90 (t, 3H, $J = 7.4$ Hz, $\text{CH}_2\text{-CH}_2\text{-CH}_3$), 1.56 (sex, 2H, $J = 7.2$ Hz, N- $\text{CH}_2\text{-CH}_2$), 3.33 (m, 2H, N- CH_2), 6.21 (bs, 1H, NH), 7.31-7.43 (m, 3H, Ar-H), 7.69 (m, 2H, Ar-H). ^{13}C NMR: (75 MHz, CDCl_3) δ 11.8, 23.3, 42.1, 127.2,
15 128.8, 131.6, 135.2, 167.9. LC/MS-ES⁺ m/z 164.2 [MH^+], 327.1, 328.1.

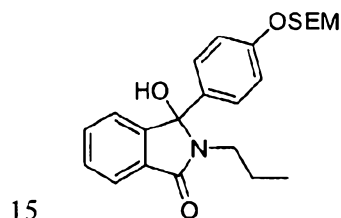
4-(2-Trimethylsilanyloxyethoxy)benzoic acid ethyl ester



Dry CH_3CN (35 mL) was added to 4-Hydroxybenzoic acid ethyl ester (2.5 g, 15
20 mmol) followed by the addition of cesium carbonate (5.37 g, 16.5 mmol)

trimethylsilylethoxymethylchloride (2.92 mL, 16.5 mmol). The system was stirred at room temperature under nitrogen for 24 h and monitored by TLC. Removal of the solvent gave a clear oil that was taken up into ethyl acetate (50 mL), washed with water (3 x 25 mL), brine (20 mL) and dried with MgSO₄. The solvent was removed
5 and the crude product was purified by flash column chromatography (5:95 EtOAc:petrol) to give 4-(2-trimethylsilanylethoxymethoxy)benzoic acid ethyl ester as a clear oil (3.87 g, 13 mmol, 87%); R_f 0.54 (10:90 EtOAc:petrol). ¹H NMR: (300 MHz, CDCl₃) δ 0.00 (s, 9H, Si-(CH₃)₃), 0.95 (m, 2H, R-O-CH₂-CH₂-Si), 1.26 (t, 3H, J = 7.1 Hz, O-CH₂-CH₃), 3.75 (m, 2H, O-CH₂-CH₂-Si), 4.35 (q, 2H, J = 7.14 Hz, O-
10 CH₂-CH₃) 5.27 (s, 2H, O-CH₂-O), 7.05 (m, 2H, Ar-H), 7.99 (m, 2H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ -1.2, 14.7, 18.4, 61, 66.9, 92.9, 115.9, 124.1, 131.8, 161.4, 166.7. LC/MS-ES⁺ m/z 118.9, 268, 297.1 [MH⁺], 298.1.

3-Hydroxy-2-propyl-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydro-isoindolin-1-one



To a solution of distilled THF (15 mL) and n-propylbenzamide (650 mg, 3.98 mmol) cooled to -78 °C under nitrogen, a 1.4 M solution of sec-butyl lithium (6.25 mL, 8.76 mmol) was added dropwise over a 10 min period. On completion of addition the deep yellow solution was stirred at -78 °C for a further 30 min. 4-(2-
20 trimethylsilanylethoxymethoxy)benzoic acid ethyl ester (1.41 g, 4.77 mmol) was dissolved up in THF (7 mL) and added dropwise to the system over a 5 min period,

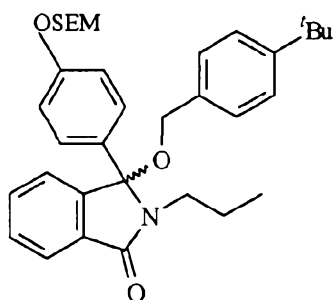
the resulting green solution was stirred for a further 30 min at -78°C . On completion the reaction was quenched with a saturated ammonium chloride solution, extracted with DCM (4 x 50 mL). The organic extracts were then combined, washed with brine (50 mL) dried with MgSO_4 , the solvent was removed to give a yellow solid that was

5 washed with excess petrol to give 3-hydroxy-2-propyl-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydro-isoindolin-1-one as a fine white solid (1.24 g, 2.99 mmol, 75%); R_f 0.58 (40:60 EtOAc:petrol). mp $112.9\text{--}114.1^{\circ}\text{C}$. λ_{max} (CH₃OH)/nm 227.5, Abs 0.970. IR: 3286, 2962, 1683, 1606, 1469, 1508 cm^{-1} . ^1H NMR ^1H NMR: (300 MHz, CDCl_3) δ 0.00 (s, 9H, Si-(CH₃)₃), 0.79 (t, 3H, $J = 7.4$

10 Hz, CH₂-CH₂-CH₃), 0.95 (m, 2H, O-CH₂-CH₂-Si), 1.38 (m, 1H, N-CH₂-CH₂), 1.51 (m, 1H, N-CH₂-CH₂), 2.91 (m, 1H, N-CH₂), 3.36, (m, 1H, N-CH₂), 3.75 (m, 2H, O-CH₂-CH₂-Si), 4.82 (bs, 1H, OH), 5.21 (s, 2H, O-CH₂-O), 6.98 (d, 2H, $J = 8.9$ Hz, Ar-H), 7.26 (m, 1H, Ar-H), 7.30 (d, 2H, $J = 8.8$ Hz, Ar-H), 7.38-7.50 (dtd, 2H, $J = 20.2$, 7.3, 1.1 Hz, Ar-H), 7.66 (m, 1H, Ar-H). ^{13}C NMR: (75 MHz, CDCl_3) δ -3.6, 9.6,

15 15.9, 20.1, 39.2, 64.2, 89.2, 90.7, 114, 120.5, 121.1, 125.4, 127.3, 128.5, 129.5, 130.4, 146.9, 155.4, 165.6. LC/MS-ES⁺ m/z 297.1, 355, 396.1, 397.1, 414.1 [MH^+].

3-(4-*tert*-Butylbenzyloxy)-2-propyl-3-[4-(2-trimethylsilanylethoxymethoxy)-phenyl]-
2,3-dihydroisoindolin-1-one (NU8233)

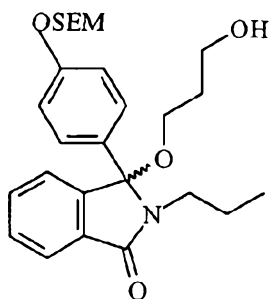


5

3-Chloro-2-propyl-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroiso-
indol-1-one (155 mg, 0.36 mmol) was reacted with 4-*tert*-butylbenzyl alcohol (0.07
mL, 0.39 mmol) and triethylamine (0.11 mL, 0.79 mmol) as for general procedure H.
The crude product was purified by flash column chromatography (30:70
10 EtOAc:petrol) and C18 reverse phase column chromatography (graduated 20:80
H₂O:MeOH, 100 MeOH) to give to give 3-(4-*tert*-butylbenzyloxy)-2-propyl-3-[4-(2-
trimethylsilanylethoxymethoxy)-phenyl]-2,3-dihydroisoindolin-1-one as a colourless
oil (60 mg, 0.11 mmol, 30%); *R*_f 0.67 (30:70 EtOAc:petrol). λ_{\max} (CH₃OH)/nm 222,
Abs 0.632. IR: 2957, 1703, 1604, 1465, 1370 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ
15 0.00 (s, 9H, Si-(CH₃)₃), 0.82 (t, 3H, *J* = 7.4 Hz, CH₂-CH₂-CH₃), 0.95 (m, 2H, O-CH₂-
CH₂-Si), 1.34 (s, 9H, *t*-Bu), 1.41 (m, 1H, N-CH₂-CH₂), 1.55 (m, 1H, N-CH₂-CH₂),
3.13 (m, 1H, N-CH₂), 3.33, (m, 1H, N-CH₂), 3.75 (m, 2H, O-CH₂-CH₂-Si), 3.96 (d,
1H, *J* = 11.2 Hz, O-CH₂), 4.23 (d, 1H, *J* = 11.3 Hz, O-CH₂), 5.22 (s, 2H, O-CH₂-O),
6.98 (d, 2H, *J* = 8.9 Hz, Ar-H), 7.18 (m, 1H, Ar-H), 7.25 (d, 2H, *J* = 8.2 Hz, Ar-H),
20 7.37 (m, 4H, Ar-H), 7.49 (m, 2H, Ar-H), 7.91 (m, 1H, Ar-H). ¹³C NMR: (75 MHz,

CDCl_3) δ -1.4, 11.8, 17.9, 21.5, 31.3, 34.5, 41.4, 64.3, 66.2, 92.7, 95.1, 115.9, 123.1, 123.2, 125.2, 126.9, 127.6, 129.5, 131.9, 132, 132.3, 134.6, 145.7, 150.5, 157.4, 168.2. LC/MS-ES⁺ m/z 396.1, 397.1. Anal. Calcd. for $\text{C}_{34}\text{H}_{45}\text{NO}_4\text{Si}$: C, 72.95; H, 8.10; N, 2.50%. Found C, 73.61; H, 8.23; N, 2.43%.

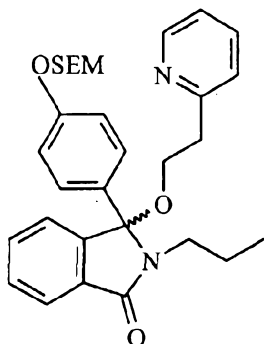
- 5 *3-(3-Hydroxypropoxy)-2-propyl-3-[4-(2-trimethylsilanylethoxymethoxy)-phenyl]-2,3-dihydroisoindolin-1-one (NU8234)*



- 3-Chloro-2-propyl-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroisoindol-1-one (189 mg, 0.44 mmol) was reacted with 1,3-propanediol (0.22 mL, 3.1 mmol) and triethylamine (0.14 mL, 0.96 mmol) as for general procedure H. The crude product was purified by flash column chromatography (50:50 EtOAc:petrol) and C18 reverse phase column chromatography (graduated 20:80 H_2O :MeOH, 100 MeOH) to give 3-(3-hydroxypropoxy)-2-propyl-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroisoindolin-1-one as a colourless oil (108 mg, 0.22 mmol, 52%); R_f 0.3 (50:50 EtOAc:petrol). λ_{max} (CH_3OH)/nm 229, Abs 0.455. IR: 3429, 2952, 2877, 1684, 1608, 1508, 1467 cm^{-1} . ^1H NMR: (300 MHz, CDCl_3) δ -0.03 (s, 9H, $\text{Si}(\text{CH}_3)_3$), 0.82 (t, 3H, $J = 7.4$ Hz, $\text{CH}_2\text{-CH}_2\text{-CH}_3$), 0.95 (m, 2H, $\text{R-O-CH}_2\text{-CH}_2\text{-Si}$), 1.38 (m, 1H, $\text{N-CH}_2\text{-CH}_2$), 1.54 (m, 1H, $\text{N-CH}_2\text{-CH}_2$), 1.85 (m, 2H, $\text{O-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$), 2.32 (bs, 1H, OH), 3.06 (m, 2H, N-CH_2 , O-CH_2), 3.28, (m, 2H, N-CH_2 , O-CH_2), 3.78 (m,
- 10
- 15

4H, O-CH₂-CH₂-Si, R-O-CH₂-CH₂-CH₂-OH), 5.21 (s, 2H, O-CH₂-O), 6.98 (d, 2H, *J* = 9 Hz, Ar-H), 7.17 (m, 1H, Ar-H), 7.27 (d, 2H, *J* = 8.8 Hz, Ar-H), 7.47 (m, 2H, Ar-H), 7.85 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ -0.3, 0, 0.3, 13.2, 19.4, 22.9, 33.6, 42.7, 61.8, 62, 67.7, 94.1, 96.4, 117.4, 124.3, 124.6, 128.8, 130.9, 133.2, 133.3, 133.8, 147.1, 158.9, 169.7. LC/MS-ES⁺ *m/z* 338.1, 366.1, 396.1, 397.2. Anal. Calcd. for C₂₆H₃₇NO₅Si: C, 66.21; H, 7.91; N, 2.97%. Found C, 66.05; H, 8.06; N, 2.84%.

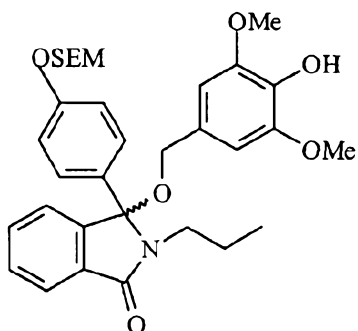
2-Propyl-3-(2-pyridin-2-yl-ethoxy)-3-[4-(2-trimethylsilanylethoxymethoxy)-phenyl]-2,3-dihydroisoindolin-1-one (NU8235)



10 3-Chloro-2-propyl-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroisoindol-1-one (189 mg, 0.44 mmol) was reacted with 2-(2-hydroxyethyl)pyridine (0.05 mL, 0.48 mmol) and triethylamine (0.14 mL, 0.96 mmol) as for general procedure H. The crude product was purified by flash column chromatography (45:55 EtOAc:petrol) and C18 reverse phase column chromatography (graduated 20:80 H₂O:MeOH, 100 MeOH) to give 2-propyl-3-(2-pyridin-2-yl-ethoxy)-3-[4-(2-trimethylsilanylethoxymethoxy)-phenyl]-2,3-dihydroisoindolin-1-one as a colourless oil (109 mg, 0.21 mmol, 47%); *R*_f 0.37 (50:50 EtOAc:petrol). λ_{max} (CH₃OH)/nm 230, Abs 0.925. IR: 2947, 1700, 1594, 1468, 1435, 1373 cm⁻¹. ¹H NMR: (300 MHz,

CDCl₃) δ 0.00 (s, 9H, Si(CH₃)₃), 0.76 (t, 3H, J = 7.3 Hz, CH₂-CH₂-CH₃), 0.95 (m, 2H, R-O-CH₂-CH₂-Si), 1.30 (m, 1H, N-CH₂-CH₂), 1.44 (m, 1H, N-CH₂-CH₂), 2.97-3.17 (m, 4H, N-CH₂, O-CH₂-CH₂-pyr), 3.29 (m, 1H, O-CH₂), 3.53 (m, 1H, O-CH₂), 3.74 (m, 2H, O-CH₂-CH₂-Si), 5.20 (s, 2H, O-CH₂-O), 6.97 (m, 3H, Ar-H), 7.13-7.25 (m, 4H, Ar-H), 7.45 (m, 2H, Ar-H), 7.64 (dt, 1H, J = 7.6, 1.7 Hz, Ar-H), 7.84 (m, 1H, Ar-H), 8.53 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 0.00, 13.2, 19.4, 22.8, 39.9, 42.6, 63.6, 67.7, 94.2, 96.2, 117.3, 122.8, 124.3, 124.6, 125.1, 128.9, 130.8, 133.4, 133.5, 133.6, 137.6, 147.1, 150.7, 158.8, 160.3, 169.6. LC/MS-ES⁺ m/z 266, 338.1, 339, 366, 396.1, 397.2, 428.1. Anal. Calcd. for C₃₀H₃₈N₂O₄Si: C, 69.46; H, 7.38; N, 5.40%. Found C, 69.02; H, 8.09; N, 5.57%.

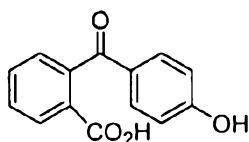
3-(4-Hydroxy-3,5-dimethoxybenzyloxy)-2-propyl-3-[4-(2-trimethylsilanylethoxymethoxy)-phenyl]-2,3-dihydroisoindolin-1-one (NU8236)



3-Chloro-2-propyl-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroisoindol-1-one (135 mg, 0.31 mmol) was reacted with syringic alcohol (127 mg, 0.69 mmol) as for general procedure H. The crude product was purified by flash column chromatography (35:65 EtOAc:petrol), C18 reverse phase column chromatography (graduated 20:80 H₂O:MeOH, 100 MeOH) and HPLC (H₂O:CH₃CN, 270 nm) to give 3-(4-hydroxy-3,5-dimethoxybenzyloxy)-2-propyl-3-[4-(2-trimethylsilanylethoxy-

methoxy)-phenyl]-2,3-dihydroisoinolin-1-one as a colourless oil (38 mg, 0.065 mmol, 2%); R_f 0.35 (40:60 EtOAc:petrol). λ_{\max} (CH₃OH)/nm 210, Abs 0.336. IR: 3371, 2947, 1689, 1604, 1460, 1427, 1372 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ -0.02 (s, 9H, Si-(CH₃)₃), 0.83 (t, 3H, J = 7.4 Hz, CH₂-CH₂-CH₃), 0.95 (m, 2H, R-O-CH₂-CH₂-Si), 1.43 (m, 1H, N-CH₂-CH₂), 1.55 (m, 1H, N-CH₂-CH₂), 3.12 (m, 1H, N-CH₂), 3.34 (m, 1H, N-CH₂), 3.75 (m, 2H, O-CH₂-CH₂-Si), 3.89 (s, 6H, OMe), 3.94 (d, 1H, J = 11.2 Hz, O-CH₂), 4.17 (d, 1H, J = 11.3 Hz, O-CH₂), 5.22 (s, 2H, O-CH₂-O), 5.55 (s, 1H, OH), 6.49 (s, 2H, Ar-H), 7.00 (d, 2H, J = 9.1 Hz, Ar-H), 7.17 (m, 1H, Ar-H), 7.34 (d, 2H, J = 8.8 Hz, Ar-H), 7.49 (m, 2H, Ar-H), 7.90 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ -3.3, 9.8, 16, 19.6, 39.5, 54.3, 63.1, 64.3, 90.8, 93.1, 102.2, 114, 121.2, 121.3, 125.6, 126.7, 127.6, 129.8, 130, 130.3, 132.2, 143.7, 144.9, 155.5, 160.3, 166.3. LC/MS-ES⁺ m/z 355, 396.1, 397.1, 414.1, 602 [MNa⁺]. Anal. Calcd. for C₃₂H₄₁NO₇Si: C, 66.29; H, 7.13; N, 2.42%. Found C, 67.26; H, 7.22; N, 1.65%; HRMS (EI) m/z Calcd. for C₃₂H₄₁NO₇Si: 579.2652. Found 579.2673.

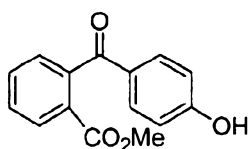
15 *2-(4-Hydroxy)benzoylbenzoic acid*



Phenolphthalein (7 g, 22 mmol) was dissolved in aqueous potassium hydroxide solution (7 g in 70 mL) giving a vivid purple solution. Hydroxylamine hydrochloride (1.71 g, 24 mmol) was added and the solution heated to 80°C. The reaction was monitored by acidifying a sample of the mixture with acetic acid, filtering off the precipitate and adding potassium hydroxide. When no pink colour was observed on the addition of potassium hydroxide the reaction was left stirring for another 5 min.

Ethanol (14 mL) was added, and acetic acid was added dropwise until the solution was slightly acidic. A sulphur yellow precipitate formed and was washed with water and dissolved in hot sulphuric acid (10%, 140 mL) giving a bright yellow solution that was refluxed for 2 h. On cooling a deep yellow solid was obtained filtered and
5 washed with ice cold water yielding 2-(4-Hydroxy)benzoylbenzoic acid as a light yellow solid (4.04 g, 16.6 mmol, 76%); R_f 0.06 (40:60 EtOAc:petrol). mp 228.4-230.6°C. Lit. 231°C.⁸ IR: 3232, 3163, 1688, 1644, 1577, 1381 cm^{-1} . ^1H NMR: (300 MHz, d_6 -DMSO) δ 6.83 (m, 2H, Ar-H), 7.34 (dd, 1H, $J = 7.4, 1.3$ Hz, Ar-H), 7.50 (m, 2H, Ar-H), 7.58-7.71 (dtd, 2H, $J = 22.4, 7.4, 1.3$ Hz, Ar-H), 7.95 (dd, 1H, $J = 7.6,$
10 1.3 Hz, Ar-H), 10.30 (bs, 1H, COOH). ^{13}C NMR: (75 MHz, d_6 -DMSO) δ 115.5, 127.7, 128.6, 129.6, 130, 130.1, 131.9, 132.4, 142.2, 162.4, 167.3, 195.1. LC/MS-ES⁺ m/z 129.3, 225.1, 264.9, 506.8.

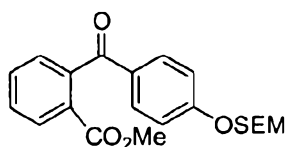
2-(4-Hydroxybenzoyl)benzoic acid methyl ester



15 Acetyl chloride (2.67 mL, 37.5 mmol), was added dropwise to ice cold methanol (40 mL) whilst stirring. 2-(4-Hydroxy)benzoylbenzoic acid (3.9 g, 16.1 mmol) was added and the mixture was allowed to warm to room temperature. After 16 h the solvent was removed leaving a light green oil which was triturated with water, washed with ice cold petrol and dried in vacuo giving 2-(4-hydroxybenzoyl)benzoic acid methyl
20 ester as a light green solid (3.8 g, 14.8 mmol, 92%); R_f 0.43 (40:60 EtOAc:petrol). mp 147.1-149.3 °C. Lit. 149-150 °C.⁹ IR: 3338, 1719, 1644, 1569, 1511, 1432 cm^{-1} . ^1H NMR: (300 MHz, d_6 -DMSO) δ 3.58 (s, 3H, COOCH₃), 6.84 (d, 2H, $J = 8.6$ Hz, Ar-

H), 7.41 (d, 1H, $J = 7.3$ Hz, Ar-H), 7.51 (d, 2H, $J = 8.6$, Ar-H), 7.61-7.74 (dt, 2H, $J = 24.2, 6.5$ Hz, Ar-H), 7.95 (d, 1H, $J = 7.4$ Hz, Ar-H), 10.47 (bs, 1H, COOH). ^{13}C NMR: (75 MHz, $\text{d}_6\text{-DMSO}$) δ 52.4, 115.7, 127.7, 128.5, 129.6, 129.9, 130.1, 131.9, 132.4, 141.9, 162.5, 166.3, 194.7. LC/MS-ES $^+$ m/z 225, 256.9 [M^+], 278.9.

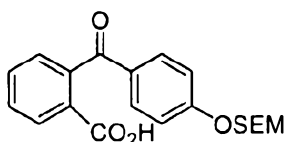
5 2-[4-(2-Trimethylsilanylethoxymethoxy)benzoyl]benzoic acid methyl ester



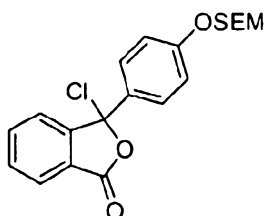
Dry CH_3CN (50 mL) was added to 2-(4-hydroxybenzoyl)benzoic acid methyl ester (3.65 g, 15 mmol) followed by cesium carbonate (5.4 g, 16.5 mmol) and trimethylsilylethoxymethylchloride (2.9 mL, 16.5 mmol). The system was stirred at
 10 room temperature under nitrogen for 24 h and monitored by TLC. Removal of the solvent gave a light yellow oil that was taken up into ethyl acetate (100 mL), washed with water (3 x 50 mL), brine (40 mL) and dried with MgSO_4 . The solvent was removed and the crude product was purified by flash column chromatography (5:95 EtOAc:petrol) to give 2-[4-(2-trimethylsilanylethoxymethoxy)benzoyl]benzoic acid
 15 methyl ester as a yellow oil (3.94 g, 10.2 mmol, 67%); R_f 0.79 (40:60 EtOAc:petrol). λ_{max} (CH_3OH)/nm 282, Abs 1.072. IR: 2939, 1720, 1666, 1589, 1489 cm^{-1} . ^1H NMR: (300 MHz, CDCl_3) δ 0.00 (s, 9H, $\text{Si}(\text{CH}_3)_3$), 0.94 (m, 2H, $\text{R-O-CH}_2\text{-CH}_2\text{-Si}$), 3.66 (s, 3H, COOCH_3), 3.75 (m, 2H, $\text{O-CH}_2\text{-CH}_2\text{-Si}$), 5.27 (s, 2H, $\text{O-CH}_2\text{-O}$), 7.05 (m, 2H, Ar-H), 7.37 (m, 1H, Ar-H), 7.53-7.66 (dtd, 2H, $J = 22.6, 7.4, 1.4$ Hz, Ar-H), 7.72 (m, 2H, Ar-H), 8.05 (m, 1H, Ar-H). ^{13}C NMR: (75 MHz, $\text{d}_6\text{-DMSO}$) δ -2, 16.8, 51.5, 65.3, 91.5, 115.1, 127, 128, 129, 129.2, 129.6, 130.4, 132, 140.7, 160.2, 165.2, 194.
 20

LC/MS-ES⁺ m/z 163.2, 297.1, 387.1 [MH⁺], 409 [MNa⁺]. HRMS (EI) m/z Calcd. for C₂₁H₂₆O₅Si: 386.1549. Found 386.1562.

2-[4-(2-Trimethylsilanylethoxymethoxy)benzoyl]benzoic acid.



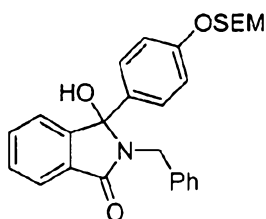
- 5 Dry DCM (25 mL) was added to 2-[4-(2-trimethylsilanylethoxymethoxy)benzoyl]-benzoic acid methyl ester (3.8 g, 9.8 mmol) followed by potassium trimethylsilanolate (1.53 g, 10.8 mmol). The system was stirred at room temperature under nitrogen for 16 h and monitored by TLC. Removal of the solvent gave a light yellow oil that was taken up into ethyl acetate (100 mL), washed with 5% HCl solution (3 x 30 mL),
10 brine (30 mL) and dried with MgSO₄. The solvent was removed to give 2-[4-(2-trimethylsilanylethoxymethoxy)benzoyl]benzoic acid as a yellow oil (3.66 g, 9.8 mmol, 99%); R_f 0.1 (40:60 EtOAc:petrol). λ_{max} (CH₃OH)/nm 276, 217, Abs 1.799, 2.108 respectively. IR: 3215, 3177, 1666, 1593 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ 0.00 (s, 9H, Si-(CH₃)₃), 0.96 (m, 2H, R-O-CH₂-CH₂-Si), 3.76 (m, 2H, O-CH₂-CH₂-Si), 5.27 (s, 2H, O-CH₂-O), 7.04 (m, 2H, Ar-H), 7.34 (m, 1H, Ar-H), 7.52-7.68 (dtd, 2H, J = 30.2, 7.6, 1.3 Hz, Ar-H), 7.69 (m, 2H, Ar-H), 8.07 (m, 1H, Ar-H), 10.31 (bs, 1H, COOH). ¹³C NMR: (75 MHz, CDCl₃) δ -3.2, 16.1, 64.8, 90.7, 113.8, 125.7, 126, 127.4, 128.8, 129.1, 129.9, 131.2, 140.9, 159.6, 168.8, 194. LC/MS-ES⁺ m/z 297.1, 373.1 [MH⁺]. HRMS (EI) m/z Calcd. for C₂₀H₂₄O₅Si: 372.1393. Found 372.1387
15

3-Chloro-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-3H-isobenzofuran-1-one

Distilled THF (10 mL) was added to 2-[4-(2-trimethylsilanylethoxymethoxy)-benzoyl]benzoic acid (1.86 g, 5 mmol) followed by thionyl chloride (0.43 mL, 6
5 mmol) and 3 drops of DMF. The system was stirred at room temperature under nitrogen for 2 h and monitored by TLC. The solvent was removed to give 3-chloro-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-3H-isobenzofuran-1-one as a clear oil.

2-Benzyl-3-hydroxy-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydro-isoindolin-1-one

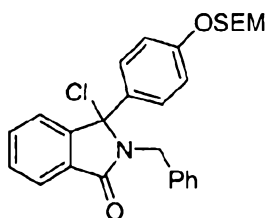
10



Distilled THF (10 mL) was added to 3-chloro-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-3H-isobenzofuran-1-one (2.39 g, 5 mmol), followed by benzylamine (1.1 mL, 10 mmol), and triethylamine (1.39 mL, 10 mmol)
15 resulting in the formation a creamy white/yellow precipitate. The reaction system was stirred at room temperature under nitrogen for 2 h and monitored by TLC. On completion the solvent was removed under vacuum and the residue was taken up into ethyl acetate (30 mL), washed with water (3 x 25 mL), brine (20 mL) and dried with

MgSO₄, the solvent was removed under vacuum. The crude product was purified by flash column chromatography (20:80 EtOAc:petrol) and C18 reverse phase column chromatography (graduated 20:80 H₂O:MeOH, 100 MeOH) to give 2-benzyl-3-hydroxy-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroisoindolin-1-one as a clear yellow oil (140 mg, 0.3 mmol, 0.6%); R_f 0.51 (40:60 EtOAc:petrol). λ_{\max} (CH₃OH)/nm 213, Abs 1.161. IR: 3306, 2953, 1677, 1609, 1508, 1469 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ 0.00 (s, 9H, Si-(CH₃)₃), 0.95 (m, 2H, R-O-CH₂-CH₂-Si), 2.90 (bs, 1H, OH), 3.74 (m, 2H, O-CH₂-CH₂-Si), 4.06 (d, 1H, *J* = 14.9 Hz, N-CH₂), 4.77 (d, 1H, *J* = 14.9 Hz, N-CH₂), 5.19 (s, 2H, O-CH₂-O), 6.92 (m, 2H, Ar-H), 7.12-7.29 (m, 8H, Ar-H), 7.45 (m, 2H, Ar-H), 7.80 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ -1.9, 17.4, 42.3, 65.7, 91, 92.2, 115.5, 122, 122.8, 126.4, 127, 127.6, 128.1, 128.9, 129.6, 130.5, 132.1, 137.6, 148.4, 156.9, 167. LC/MS-ES⁺ *m/z* 297.1, 386.1, 444.1, 445.1, 484 [MNa⁺]. HRMS (EI) *m/z* Calcd. for C₂₇H₃₁NO₄Si: 461.2022. Found 461.2017.

15 *2-Benzyl-3-chloro-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroisoindol-1-one*

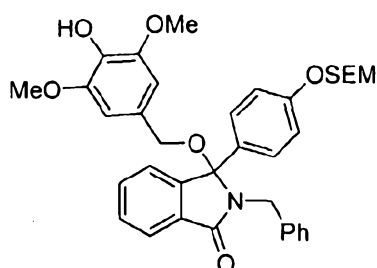


2-Benzyl-3-hydroxy-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroisoindol-1-one (125 mg, 0.27 mmol) was reacted with thionyl chloride (0.019 mL, 0.27 mmol) and a catalytic amount of DMF (3 drops) as for general procedure G. Removal of the solvent gave 2-benzyl-3-chloro-3-[4-(2-

trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroiso-indol-1-one as a colourless oil (129 mg, 0.27 mmol, 100%).

2-Benzyl-3-(4-hydroxy-3,5-dimethoxybenzyloxy)-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroisoindolin-1-one (NU8238)

5

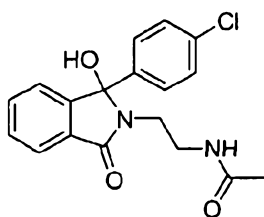


2-Benzyl-3-chloro-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroiso-indol-1-one (129 mg, 0.27 mmol) was reacted with syringic alcohol (109 mg, 0.59 mmol) as for general procedure H1. The crude product was purified by flash column chromatography (40:60 EtOAc:petrol) and HPLC (H₂O:MeOH, 270 nm) to give 2-benzyl-3-(4-hydroxy-3,5-dimethoxybenzyloxy)-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroisoindolin-1-one as a colourless oil (19 mg, 0.03 mmol, 11%); *R*_f 0.23 (40:60 EtOAc:petrol). ¹H NMR: (300 MHz, CDCl₃) δ 0.00 (s, 9H, Si-(CH₃)₃), 0.96 (m, 2H, R-O-CH₂-CH₂-Si), 3.60 (d, 1H, *J* = 10.8 Hz, O-CH₂), 3.67 (d, 1H, *J* = 10.8 Hz, O-CH₂), 3.75 (m, 2H, O-CH₂-CH₂-Si), 3.82 (s, 6H, OMe), 4.03 (d, 1H, *J* = 14.7 Hz, N-CH₂), 4.83 (d, 1H, *J* = 14.7 Hz, N-CH₂), 5.20 (s, 2H, O-CH₂-O), 5.46 (s, 1H, OH), 6.13 (s, 2H, Ar-H), 6.95 (d, 2H, *J* = 9 Hz, Ar-H), 7.13-7.22 (m, 4H, Ar-H), 7.28 (d, 2H, *J* = 8.9 Hz, Ar-H), 7.34 (m, 2H, Ar-H), 7.49 (m, 2H, Ar-H), 7.94 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ -1, 18.4, 43.6, 56.6, 65.6, 66.7, 93.2, 96, 104.9, 116.4, 123.5, 123.9, 127.4, 128.1, 128.5, 128.9,

129.8, 129.9, 131.8, 132, 132.9, 134.4, 138.1, 146.3, 147, 157.9, 168.6. LC/MS-ES⁺
m/z 354.9, 443.9, 461.9, 627.9 [M⁺]. HRMS (EI) m/z Calcd. for C₃₆H₄₁NO₇Si:
627.2652. Found 627.2622.

N-{2-[1-(4-Chlorophenyl)-1-hydroxy-3-oxo-1,3-dihydroisoindolin-2-yl]-

5 *ethyl*}acetamide



To a stirred solution of 4-chloro-2-benzoyl benzoic acid (400mg, 1.53mmol) in dry
THF (10ml), thionyl chloride (0.22ml, 3.06mmol) was added followed by three drops
of dry DMF at room temperature under nitrogen atmosphere. After stirring for
10 overnight, the solvent was evaporated to dryness under reduced pressure. The residue
was dissolved in THF (10ml) and N-acetyl ethylenediamine (0.17ml, 1.84mmol) was
added followed by triethylamine (0.25ml, 1.84mmol) at room temperature. The
progress of the reaction was monitored by TLC. After 30min. the TLC confirmed the
completion of the reaction. The solvent was evaporated and the residue was dissolved
15 in ethylacetate (100ml). The organic layer was washed with water (2x100ml), brine
(1x100ml), dried (Na₂SO₄) and concentrated. The crude product was triturated with
petrol ether to give the product as white solid.

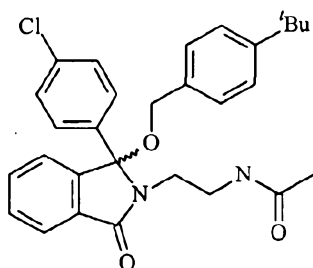
Yield : 500mg (94%). R_f : 0.25 (70% ethylacetate in petrol). M.pt. 180° C. IR ν (cm⁻¹):

20 3294, 3235, 2927, 1697, 1615, 1570, 1373, 1358, 1274, 1188, 1041, 935, 816, 756.

¹H-NMR Spectrum: δ_H (300MHz, CDCl₃) 7.60 (1H, d, J = 6.7 Hz, Ar), 7.37 (2H, m,

Ar), 7.23 (5H, m, Ar), 6.63(1H, br, -OH), 6.74 (1H, br, -NH), 3.99 (1H, m, -N-CH₂), 3.82 (1H, dt, J = 3.3 & 11.3 Hz, -N-CH₂), 2.93 (1H, m, -N-CH₂), 2.80 (1H, dt, J = 2.8 & 14.0 Hz, -N-CH₂), 1.73 (3H, s, -CH₃). ¹³C-NMR Spectrum: δ_C (75MHz, CDCl₃) 23.37, 39.21, 40.72, 91.91, 123.18, 123.29, 123.54, 127.94, 129.18, 129.69, 129.87, 133.47, 134.77, 138.13, 149.87, 169.14, 173.08. LC-MS (in MeOH) : 6.32min. M⁺ Na : 367.05. M⁺ -OH 327.02.

N-{2-[1-(4-*tert*-Butylbenzyloxy)-1-(4-chlorophenyl)-3-oxo-1,3-dihydroisoindolin-2-yl]-ethyl}-acetamide (NU8228)

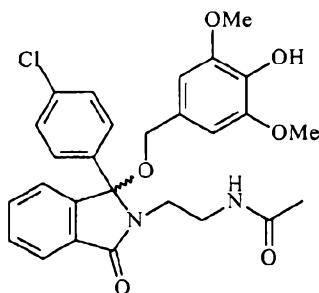


- 10 To a stirred solution of *N*-{2-[1-(4-chlorophenyl)-1-hydroxy-3-oxo-1,3-dihydroisoindolin-2-yl]-ethyl}acetamide (150mg, 0.435mmol) in 10ml of dry THF, thionyl chloride (77mg, 0.652mmol) was added followed by three drops of dry DMF at room temperature under nitrogen atmosphere. The progress of the reaction was monitored by TLC. After 30 min. the TLC showed the completion of the reaction.
- 15 The solvent was evaporated to dryness under reduced pressure and the residue was dissolved in THF (10ml). 4-*tert*-butyl alcohol (85mg, 0.522mmol) was added at room temperature followed by triethylamine (88mg, 0.87mmol). After 30 min. the solvent was evaporated and the residue was dissolved in ethylacetate (100ml). The organic layer was washed with water (2x100ml), brine (1x100ml), dried (Na₂SO₄) and

concentrated. The crude product was purified by column chromatography using 50-100% ethylacetate in petrol.

White solid. M. Pt: 72° C. R_f : 0.25 (80% ethylacetate/petrol). IR : ν (cm^{-1}): 3294(b), 2954(m), 2871(m), 1697(s), 1657(s), 1543(s), 1466(m), 1368(s), 1276(m),
 5 1048(m), 1011(m), 817(s), 763(s). $^1\text{H-NMR}$ Spectrum: δ_{H} (300MHz, CDCl_3) 7.87-7.82 (1H, m, Ar), 7.51-7.42 (2H, m, Ar), 7.31-7.18 (6H, m, Ar), 7.15-7.07 (3H, m, Ar), 6.74 (1H, br, -NH), 4.06 (1H, d, $J = 9.0\text{Hz}$, $-\text{OCH}_2-$), 3.90 (1H, d, $J = 9.0\text{Hz}$, $-\text{OCH}_2-$), 3.46 (1H, m, $-\text{N-CH}_2-$), 3.28 (2H, m, $-\text{N-CH}_2-$), 3.05 (1H, m, $-\text{N-CH}_2-$), 1.82 (3H, s, $-\text{CH}_3$), 1.23 (9H, s, tBu). $^{13}\text{C-NMR}$ Spectrum: δ_{C} (75MHz, CDCl_3) : 23.58,
 10 31.71, 34.97, 39.53, 40.53, 65.45, 95.37, 123.73, 124.09, 125.88, 127.75, 128.16, 129.10, 129.33, 130.58, 131.52, 133.45, 133.57, 134.04, 135.29, 137.23, 145.59, 151.48, 170.30, 170.69. LC/MS (in MeOH): Tr = 7.82min, $\text{M}+\text{Na} = 513.19, 515.19$. Analysis calculated for C, 70.94; H, 6.36; N, 5.71; Found: C, 69.48, H, 6.23, N, 5.55.

N-{2-[1-(4-Chlorophenyl)-1-(4-hydroxy-3,5-dimethoxybenzyloxy)-3-oxo-1,3-dihydroisoindolin-2-yl]-ethyl}acetamide (NU8227)
 15



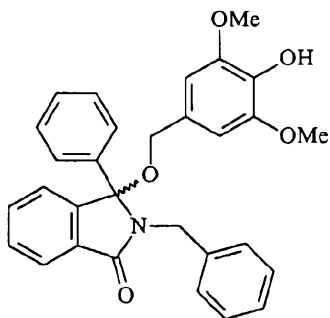
To a stirred solution of SA149 (150mg, 0.435mmol) in 10Ml of dry THF, thionyl chloride (77mg, 0.652mmol) was added followed by three drops of dry DMF at room

temperature under nitrogen atmosphere. The progress of the reaction was monitored by TLC. After 30 min. the TLC showed the completion of the reaction. The solvent was evaporated to dryness under reduced pressure and the residue was dissolved in THF (10ml). Syringic alcohol (176mg, 0.957mmol) was added at 0° C. After 30 min. the solvent was evaporated and the residue was dissolved in ethylacetate (100ml). The organic layer was washed with water (2x100ml), brine (1x100ml), dried (Na₂SO₄) and concentrated. The crude product was purified by column chromatography using 50-100% ethylacetate in petrol.

Light pink powder. M. Pt: 84° C. R_f : 0.21 (80% ethylacetate/petrol). IR : ν (cm⁻¹) : 3300(b), 2938(m), 1674(s), 1517(s), 1450(s), 1372(s), 1211(s), 1087(s), 816(s), 690(s).

¹H-NMR Spectrum: δ_H (300MHz, CDCl₃) : 7.87-7.82 (1H, Ar), 7.49-7.46 (2H, Ar), 7.28-7.19 (4H, Ar), 7.11-7.06 (1H, Ar), 6.71(1h, -NH), 6.39(2H, s, Ar), 5.60 (1H, br, -OH), 4.02 (1H, d, J = 10.8 Hz, -OCH₂), 3.86 (1H,d, J = 10.8Hz, -OCH₂), 3.47 (1H, m, -N-CH₂-), 3.27 (2H, m, -N-CH₂-), 3.07 (1H, m, -N-CH₂-), 1.84 (3H, s, -CH₃). ¹³C-NMR Spectrum: δ_C (75MHz, CDCl₃) : 23.59, 39.42, 40.54, 56.78, 66.22, 95.44, 105.30, 123.83, 124.07, 127.94, 128.09, 129.14, 129.37, 130.58, 131.52, 133.52, 135.05, 135.34, 137.17, 145.61, 147.44, 170.26, 170.74. LC/MS (in MeOH): Tr = 6.44 min, M+Na = 533.21, 535.22. Analysis calculated for C, 63.47; H, 5.33; N, 5.48; Found: C, 62.60, H, 5.89, N, 5.06.

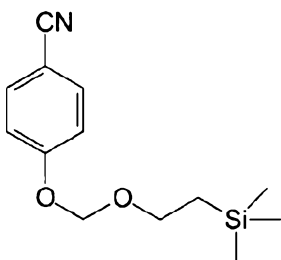
2-Benzyl-3-(4-hydroxy-3,5-dimethoxybenzyloxy)-3-phenyl-2,3-dihydro-isoinдолin-1-one (NU8205)



To a stirred solution of 2-benzyl-3-hydroxy-3-phenyl-2,3-dihydro-isoinдолin-1-one
5 (200mg, 0.635mmol) in 10ml of THF, thionyl chloride was added followed by three
drops of dry DMF at room temp. under nitrogen atmosphere. The progress of the
reaction was monitored by TLC using the aliquot of the reaction mixture in methanol.
After completion of the reaction, the solvent was evaporated to dryness under reduced
pressure and the residue was dissolved in THF (10ml). The reaction mixture was
10 cooled to 0° C using ice bath. After 15 min. syringic alcohol (258mg, 1.40mmol) was
added at once and stirred for overnight. The solvent was evaporated and the crude
product was purified by column chromatography using 30-60% ethylacetate in petrol.
White solid. M. Pt : 55° C. Rf : 0.28 (40% ethylacetate/petrol). IR : ν (cm⁻¹): 3506 (m),
2936 (m), 1693 (s), 1608 (m), 1516 (m), 1458 (s), 1427 (m), 1381 (s), 1327 (s), 1210
15 (s), 1107 (s), 760 (s). ¹H-NMR Spectrum: δ_H (500MHz, CDCl₃) : 7.86 (1H, d, J = 7.3
Hz, Ar), 7.38 (2H, m, Ar), 7.28 (2H, m, Ar), 7.23 (2H, d, J = 6.1 Hz, Ar), 7.18 (3H,
m, Ar), 7.06 (4H, m, Ar), 6.06 (2H, s, Ar), 5.48 (1H, bs, -OH), 4.74 (1H, d, J = 7.4
Hz, -CH₂-Ph), 3.95 (1H, d, J = 7.4 Hz, -CH₂-Ph), 3.72 (6H, s, -OCH₃), 3.58 (2H, q, J
= 10.6 Hz & 30.9 Hz, -O-CH₂-). ¹³C-NMR Spectrum: δ_C (125MHz, CDCl₃) : 168.25,

146.64, 145.74, 138.44, 137.52, 134.19, 132.45, 131.61, 129.53, 129.29, 128.36, 128.05, 126.98, 126.38, 123.45, 123.09, 104.69, 95.62, 65.18, 56.21, 43.29. LC/MS (in MeOH): Tr = 6.92. M+Na = 504.18, 505.19. Analysis calculated for C, 74.83; H, 5.65; N, 2.91; Found: C, 74.34, H, 5.72, N, 2.68.

5 *4-trimethylsilanylethoxymethoxy-benzonitrile*



To a solution of 1.63ml (9.23mmol) of SEM-Cl in 10ml of dry DCM were added 1.00g (8.39mmol) of 4-hydroxy benzonitrile, 103mg (0.84mmol) of DMAP and 2.34ml (16.8mmol) of Et₃N, stirring at RT under N₂. After stirring overnight, 10ml of
10 ether were added and the solids filtered off. The filtrate was evaporated and the product purified by flash chromatography (20% ethyl acetate in petrol), obtaining 945mg (3.79mmol, 48%) of a colourless oil.

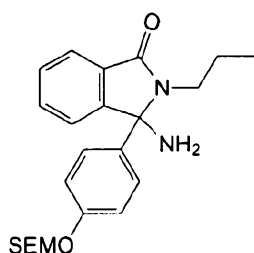
¹H-NMR δ_H (200MHz, CDCl₃) ppm 0.00 (s, 9H, CH₃), 0.95 (m, 2H, CH₂Si), 3.75 (m, 2H, CH₂O), 5.27 (s, 2H, OCH₂O), 7.10 (d, 2H, Ar), 7.59 (d, 2H, Ar).

15 *General procedure for the preparation of isoindolinones from aromatic amides, using the ^tBuLi/TMEDA system.*

In a typical example, 6.13mmol of amide and 1.85ml (12.3mmol) of TMEDA were dissolved in 20ml of dry THF, stirring at -78°C under N₂. Then 9.4ml (12.3mmol) of 1.3M ^tBuLi were added dropwise over 30 min. After stirring at -78°C for 30 min,
20 6.44mmol of the required benzonitrile in 5ml of dry THF were added dropwise. The mixture was then stirred at -78°C for 30 min and at -30°C for 20 min. The resulting

orange-red solution was quenched with a 5% sol. of NH_4Cl and the aqueous layer was extracted twice with ethyl acetate. The combined organic extracts were washed with brine, dried over MgSO_4 and evaporated, to give a residue which was purified by flash chromatography (ethyl acetate in petrol, gradient from 20% to 50%).

5 *2-Propyl-3-amino-3-(4-trimethylsilanylethoxymethoxyphenyl)-isoindolinone*



4-trimethylsilanylethoxymethoxy-benzonitrile was used as the starting benzonitrile.

Colourless oil, 58%. R_f 0.40 (50: 50; ethylacetate:petrol)

IR ν (cm^{-1}): 3307, 1678; ES-MS m/z 413, 396, 296; $^1\text{H-NMR}$ δ_{H} (500MHz, CDCl_3)

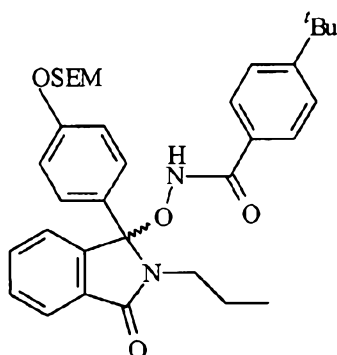
- 10 ppm 0.00 (s, 9H, CH_3), 0.90 (t, 3H, CH_3 ; $J = 7.4\text{Hz}$), 0.96 (m, 2H, CH_2Si), 1.55 (m, 2H, CH_2), 2.14 (bs, 2H, NH_2), 3.00 (ddd, 1H, CH_2N ; $J = 6.1, 10.0, 14.1\text{Hz}$), 3.52 (ddd, 1H, CH_2N ; $J = 5.8, 10.0, 14.1\text{Hz}$), 3.75 (m, 2H, CH_2O), 5.21 (s, 2H, OCH_2O), 6.99 (d, 2H, Ar; $J = 8.8\text{Hz}$), 7.33 (m, 3H, Ar), 7.44 (m, 2H, Ar), 7.83 (m, 1H, Ar);
- $^{13}\text{C-NMR}$ δ_{C} (128MHz, CDCl_3) ppm -1.4, 11.9, 18.0, 22.6, 41.3, 66.3, 79.8, 92.8,
- 15 116.3, 122.4, 123.2, 123.3, 127.5, 128.8, 130.7, 132.15, 132.19, 133.1, 150.7, 157.4, 167.8.

General procedure for the acylation of 3-amino-isoindolinones.

- In a typical example, to 0.75mmol of 3-amino-isoindolinone in 2ml of dry DCM were added, stirring at RT under N_2 , 0.30ml (2.25mmol) of Et_3N and 1.50mmol of the
- 20 required benzoyl chloride. The reaction was followed by TLC, with typical reaction

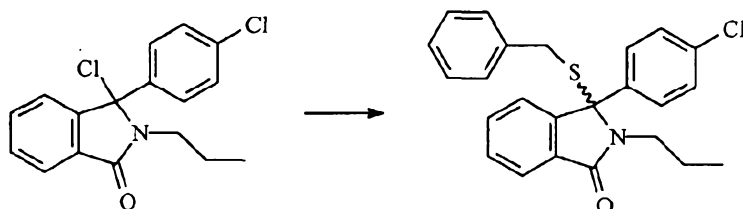
times of 24-48h. When the reaction was judged to be complete, the mixture was diluted with 1 vol. of DCM, washed with 1N HCl, brine, dried over MgSO₄ and evaporated. The residue was then purified by flash chromatography (25% ethyl acetate in petrol). Analytically pure samples were obtained by further recrystallization from ethyl acetate/petrol.

2-Propyl-3-(4-trimethylsilanylethoxymethoxy-phenyl)-3-(4-^tBu-benzamido)-isoindolin-1-one (NU8104).

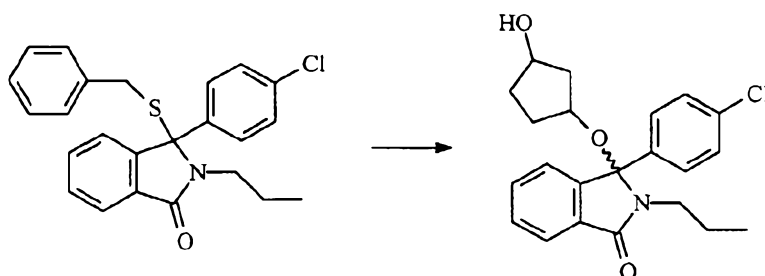


White solid, 65%. R_f 0.70 (40: 60; ethylacetate:petrol)

- 10 Mp: 151°C; IR ν (cm⁻¹): 3281, 1682, 1678; ES-MS m/z 573, 396, 338; ¹H-NMR δ_H (500MHz, CDCl₃) ppm 0.01 (s, 9H, SiMe₃), 0.85 (t, 3H, CH₃; J = 7.3Hz), 0.96 (m, 2H, CH₂Si), 1.34 (s, 9H, ^tBu), 1.50 (m, 1H, CH₂), 1.63 (m, 1H, CH₂), 3.22 (ddd, 1H, CH₂N; J = 5.2, 10.4, 14.0Hz), 3.63 (ddd, 1H, CH₂N; J = 5.8, 10.6, 14.0Hz), 3.74 (m, 2H, CH₂O), 5.21 (s, 2H, OCH₂O), 6.98 (s, NH), 7.06 (m, 2H, Ar), 7.41 (m, 7H, Ar), 7.74 (m, 2H, Ar), 7.84 (m, 1H, Ar); ¹³C-NMR δ_C (128MHz, CDCl₃) ppm -1.3, 11.9, 18.2, 22.0, 31.4, 35.1, 42.6, 66.5, 79.3, 92.9, 117.0, 122.2, 123.6, 125.9, 126.6, 127.0, 128.9, 131.0, 131.3, 131.7, 132.2, 148.1, 155.9, 158.0, 166.3, 168.7. Analysis for C₃₄H₄₄N₂O₄Si: calcd. C 71.29, H 7.74, N 4.89; found C 71.30, H 7.55, N 4.82.
- 15

3-Benzylsulfanyl-3-(4-chlorophenyl)-2-propylisoindolin-1-one

- 5 Distilled THF was added to 3-chloro-3-(4-chlorophenyl)-2-propylisoindolin-1-one (1.06 g, 3.31 mmol) followed by benzyl mercaptan (0.855 mL, 7.29 mmol) as for **general procedure C**. On addition of the benzyl mercaptan, a pale pink precipitate formed which turned white over time. The ethyl acetate was mostly removed under vacuum. On leaving overnight in the fridge, clear crystals formed. The crude product
- 10 was purified by flash column chromatography (20:80, EtOAc:petrol) and recrystallised in the minimum amount of hot ethyl acetate giving large colourless crystals of 3-benzylsulfanyl-3-(4-chlorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one (918 mg, 2.25 mmol, 68%). R_f 0.68 (40:60 EtOAc:petrol). Mp. 131.5-133.4 °C. λ_{max} (CH₃OH)/nm 223.0, Abs 0.964. IR: 3161, 2968, 1665, 1608, 1467, 1435, 1402
- 15 cm^{-1} . 1H NMR (300Hz, CDCl₃); δ 0.72 (t, 3H, $J = 7.5$ Hz, N(CH₂)₂-CH₃), 1.37 (m, 1H, N-CH₂-CH₂-CH₃), 1.57 (m, 1H, N-CH₂-CH₂-CH₃), 2.80 (d, 1H, $J = 12$ Hz, S-CH₂), 3.10 (d, 1H, $J = 12$ Hz, S-CH₂), 3.17 (m, 1H, N-CH₂), 3.36 (m, 1H, N-CH₂), 6.92 - 7.81 (m, 13H, Ar). ^{13}C NMR (75Hz, CDCl₃); δ 11.8 (N-(CH₂)₂-CH₃), 21.5 (N-CH₂-CH₂), 33.4 (S-CH₂), 42.6 (N-CH₂), 78.2 (S-C-N), 123.2, 123.4, 127.3, 128.0, 128.5, 128.9, 128.9, 131.0, 132.8, 134.9, 135.8, 137.1, 148.3 (Ar), 167.9 (C=O).
- 20 LC/MS-ES⁺ m/z 410.6, 408.7, 286.1, 287.1. Anal. Calcd. for C₂₄H₂₂ClNOS: C, 70.66; H, 5.44; N, 3.43%. Found C, 70.60; H, 5.51; N, 3.51%.

3-(4-Chlorophenyl)-3-(3-hydroxycyclopentyloxy)-2-propylisoindolin-1-one (NU8253)

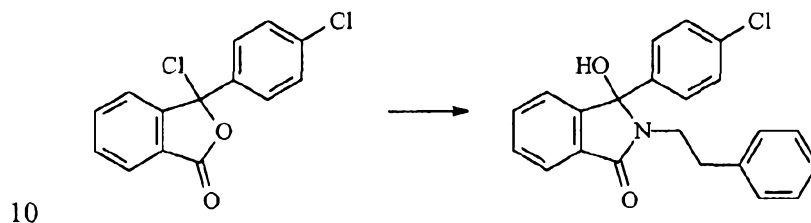
5

3-Benzylsulfanyl-3-(4-chlorophenyl)-2-propylisoindolin-1-one (200 mg, 0.490 mmol.) was reacted with NIS (121 mg, 0.539 mmol.), CSA (11 mg, 0.049 mmol.) and 1,3-cyclopentanediol (0.229 mL, 2.45 mmol.). The reaction was kept in the dark and stirred for 4 hours at room temperature and monitored by TLC. The solvent was then removed under vacuum, and the product taken up into ethyl acetate (30 mL), washed with sodium thiosulfate solution (2 x 20 mL), brine (20 mL) and dried with Na₂SO₄. The solvent was removed to give a pale yellow oil of 3-(4-chlorophenyl)-3-(3-hydroxycyclopentyloxy)-2-propylisoindolin-1-one. This was purified by HPLC to give colourless oil (111 mg, 0.288 mmol, 59%). *R*_f 0.14 (40:60 EtOAc:petrol). λ_{\max} (CH₃OH)/nm 224.0, Abs 0.608. IR: 3400, 2967, 1685, 1601, 1466 cm⁻¹. ¹H NMR (300Hz, CDCl₃); δ 0.70 (t, 3H, *J* = 7.0 Hz, N(CH₂)₂-CH₃), 1.10 – 1.25 (m, 2H, N-CH₂-CH₂-CH₃), 1.35 – 1.44 (m, 2H, cyclopentane C-H), 1.60 – 1.67 (m, 2H, cyclopentane C-H), 1.78 – 1.99 (m, 2H, cyclopentane C-H), 3.02 (m, 1H, N-CH₂), 3.16 (m, 1H, N-CH₂), 3.82 (m, 1H, HO-C-H), 4.31 (m, 1H, C-O-C-H), 7.02 – 7.43 (m, 7H, Ar), 7.79 (d, 1H, *J* = 7.9 Hz, Ar). ¹³C NMR (75Hz, CDCl₃); 12.2 (N-(CH₂)₂-CH₃), 21.8, 21.9, 22.6 (N-CH₂-CH₂), 31.6, 31.8, 32.1, 32.2, 32.7, 33.7, 33.8, 33.9, 34.3, 41.6, 41.8, 41.9, 43.6, 44.1, 45.7 (N-CH₂ and cyclopentane C), 72.2, 72.6, 72.7,

20

72.9, 73.0, 73.2, 73.8, 73.9, 74.4 (cyclopentane C-O), 94.7, 94.8 (quaternary O-C-N),
 122.9, 123.7, 124.0, 124.1, 124.2, 124.3, 128.2, 128.2, 128.3, 128.3, 128.8, 129.1,
 129.9, 130.1, 130.2, 130.2, 132.3, 132.6, 132.7, 132.9, 134.6, 134.7, 138.1, 138.5,
 146.3, 146.4, 146.5, 149.2 (Ar), 168.6, 168.7, 168.7 (C=O). LC/MS-ES⁺ m/z 388.3,
 5 386.3, 284.1, 286.1, 245.0, 243.0. Anal. Calcd. for C₂₂H₂₄ClNO₃: C, 68.48; H, 6.27;
 N, 3.63%. Found C, 68.05; H, 6.26; N, 3.67%. HRMS (EI) m/z: 385.1444. Found
 385.1449.

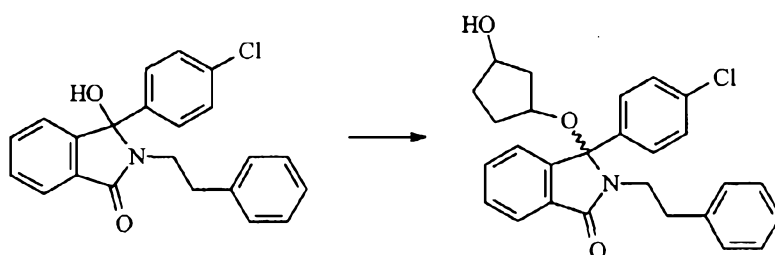
3-(4-Chlorophenyl)-3-hydroxy-2-phenethylisoindolin-1-one



Distilled THF (50 mL) was added to 3-chloro-3-(4-chlorophenyl)isobenzofuran-
 1(3H)-one (5.36 g, 19.2 mmol) followed by phenethylamine (2.65 mL, 21.1 mmol)
 and triethylamine (3.21 mL, 23.0 mmol) as for **general procedure A** and
 15 recrystallised in acetonitrile to give pure white solid 3-(4-chlorophenyl)-3-hydroxy-2-
 phenethylisoindolinin-1-one (4.82 g, 13.3 mmol., 69%). R_f 0.43 (40:60
 EtOAc:petrol). Mp. 165.5 – 167.3 °C. λ_{max} (CH₃OH)/nm 226.5, Abs 0.759. IR:
 3255, 1734, 1680, 1601, 1493, 1470 cm⁻¹. ¹H NMR (300Hz, DMSO); δ 2.64 (dt, 1H,
 J = 11.1 Hz, 5.5 Hz, N-CH₂-CH₂-Ar), 2.82 (dt, 1H, J = 10.1 Hz, 5.1 Hz, N-CH₂-CH₂-
 20 Ar) 3.12 (m, 1H, N-CH₂), 3.53 (m, 1H, N-CH₂), 7.10 (d, 2H, J = 6.8 Hz Ar-H), 7.18-
 7.43 (m, 8H, Ar-H), 7.56 (m, 2H, Ar-H), 7.75 (m, 1H, Ar). ¹³C NMR (75Hz,
 DMSO); δ 34.9 (N-(CH₂-CH₂-Ar), 41.0 (N-CH₂-CH₂), 90.5 (quaternary CO(Ar)N),

122.9, 123.1, 126.6, 128.3, 128.7, 128.8, 128.9, 129.8, 130.8, 133.0, 133.2, 139.4, 139.5, 149.5 (Ar), 166.8 (C=O). LC/MS-ES⁺ m/z 143.0, 111.0. Anal. Calcd. for C₂₂H₁₈ClNO₂: C, 72.62; H, 4.99; N, 3.85%. Found C, 72.42; H, 5.04; N, 3.96%.

5 *3-(4-Chlorophenyl)-3-(3-hydroxycyclopentyloxy)-2-phenethylisoindolin-1-one*
(NU8257)

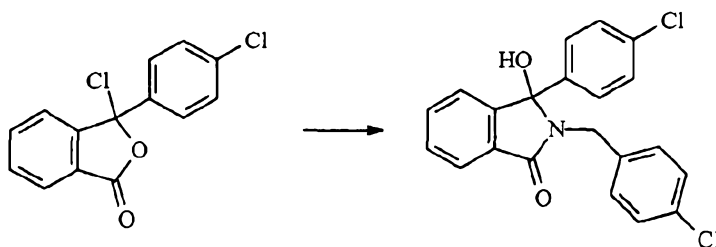


10 *3-(4-Chlorophenyl)-3-hydroxy-2-phenethylisoindolin-1-one* (250 mg, 0.687 mmol.)
was reacted with thionyl chloride (0.055 mL, 0.756 mmol.) and a catalytic amount of
DMF as for general procedure B, and the solvent removed to give a colourless oil of
the crude *3-chloro-3-(4-chlorophenyl)-2-phenethylisoindolin-1-one* (256 mg, 0.687
15 mmol., 100%).

3-Chloro-3-(4-chlorophenyl)-2-phenethylisoindolin-1-one (256 mg, 0.687 mmol) was
reacted with 1,3-cyclopentanediol (0.32 mL, 3.44 mmol.) as for general procedure F
and the solvent evaporated under vacuum to leave a clear oil of *3-(4-chlorophenyl)-3-*
(3-hydroxycyclopentyloxy)-2-phenethylisoindolin-1-one. This was purified by HPLC
20 (76.0 mg, 0.170 mmol., 25%). R_f 0.13 (40:60 EtOAc:petrol). IR: 2359, 1958, 1684,
1601, 1491, 1464 cm⁻¹. ¹H NMR (300Hz, CDCl₃); δ 0.95 – 2.04 (m, 6H,
cyclopentanediol C-H), 2.24 (m, 1H, N-CH₂-CH₂-Ar), 2.81 (m, 1H, N-CH₂-CH₂-Ar),

3.19 (m, 1H, N-CH₂), 3.42 (m, 1H, N-CH₂), 3.70 - 3.83 (m, 1H, HO-C-H), 4.32 (m, 0.5H, C-O-C-H), 4.43 (m, 0.5H, C-O-C-H), 6.95 - 7.23 (m, 11H, Ar), 7.45 (m, 2H, Ar), 7.81(m, 1H, Ar). ¹³C NMR (75Hz, CDCl₃); δ 31.7, 31.9, 32.2, 33.7, 33.9, 34.0, 34.6, 32.7, 35.2 (cyclopentane C), 41.6, 41.7, 41.8, 42.0, 42.1, 43.7, 44.1, 45.7, 50.9 (N-CH₂-CH₂) 72.3, 72.6, 73.0, 73.2, 73.9, 74.0 (cyclopentane C-O), 94.6, 94.7 (quaternary O-C-N), 123.0, 123.8, 123.9, 124.1, 124.2, 126.8, 128.1, 128.3, 128.4, 128.5, 128.9, 129.0, 129.1, 129.2, 129.2, 130.4, 130.4, 130.4, 132.8, 133.1, 134.9, 137.8, 137.8, 138.3, 139.3, 146.3, 146.3, 149.1 (Ar), 168.4, 168.6, 168.7 (C=O). LC/MS-ES⁺ m/z 480.2, 478.1, 458.1, 456.1, 293.0. Anal. Calcd. for C₂₈H₂₂ClNO₃ 0.25 H₂O: C, 73.04; H, 4.93; N, 3.04%. Found C, 73.24; H, 5.00; N, 3.22%. HRMS (EI) m/z: 455.1288. Found 455.1297.

2-(4-Chlorobenzyl)-3-(4-chlorophenyl)-3-hydroxyisoindolin-1-one

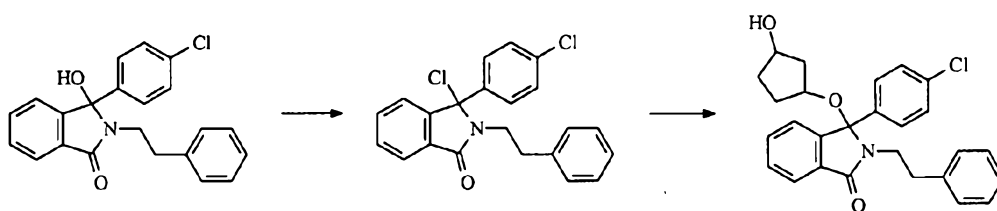


15

Distilled THF (50 mL) was added to 3-chloro-3-(4-chlorophenyl)isobenzofuran-1(3H)-one (1.50 g, 5.76 mmol) followed by 4-chlorobenzylamine (0.77 mL, 6.34 mmol) and triethylamine (0.96 mL, 6.91 mmol) as for general procedure A and recrystallised in acetonitrile to give pure white solid 2-(4-chlorobenzyl)-3-(4-chlorophenyl)-3-hydroxyisoindolin-1-one (945 mg, 2.46 mmol, 43%). R_f 0.54 (40:60

EtOAc:petrol). Mp. 156.5 – 157.4 °C. λ_{\max} (CH₃OH)/nm 221.0, Abs 0.850. IR: 3159, 1659, 1487, 1468 cm⁻¹. ¹H NMR (300Hz, CDCl₃); δ 3.07 (s, br, 1H, OH), 4.01 (d, 1H, J = 15.0 Hz, N-CH₂), 4.52 (d, 1H, J = 15.0 Hz, N-CH₂), 7.05 (m, 4H, Ar-H), 7.16 - 7.21 (m, 5H, Ar-H), 7.42 (m, 2H, Ar-H), 7.73 (m, 1H, Ar-H). ¹³C NMR (75Hz, DMSO); δ 42.6 (N-CH₂), 91.5 (Ar₂(O)CN), 123.1, 124.0, 128.2, 128.7, 129.1, 130.4, 130.6, 133.4, 133.5, 135.0, 136.8, 137.0, 148.8 (Ar), 168.0 (C=O). LC/MS-ES⁺ m/z 406.1, 366.0, 244.9, 242.9, 161.0. Anal. Calcd. for C₂₁H₁₅Cl₂NO₂ .0.2H₂O: C, 65.03; H, 4.00; N, 3.61%. Found C, 65.08; H, 4.06; N, 3.88%. HRMS (EI) m/z: 244.0291. Found 244.0299.

10 2-(4-Chlorobenzyl)-3-(4-chlorophenyl)-3-(3-hydroxycyclopentyloxy)isoindolin-1-one (NU8274)



15

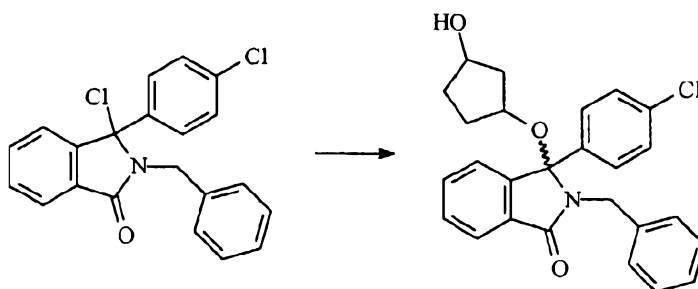
2-(4-Chlorobenzyl)-3-(4-chlorophenyl)-3-hydroxyisoindolinone (150 mg, 0.390 mmol.) was reacted with thionyl chloride (0.031 mL, 0.429 mmol.) and a catalytic amount of DMF as for **general procedure B**, and the solvent removed to give a colourless oil of the crude 3-chloro-2-(4-chlorobenzyl)-3-(4-chlorophenyl)isoindolin-1-one (157 mg, 0.390 mmol., 100%).

20

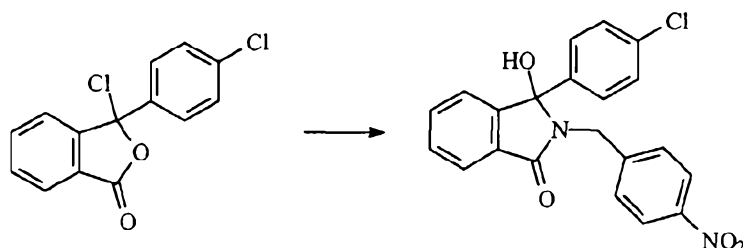
3-Chloro-2-(4-chlorobenzyl)-3-(4-chlorophenyl) isoindolin-1-one (157 mg, 0.390 mmol) was reacted with 1,3-cyclopentanediol (0.18 mL, 1.95 mmol.) as for general procedure C and the solvent evaporated under vacuum to leave a clear oil of crude 2-(4-chlorobenzyl)-3-(4-chlorophenyl)-3-(3-hydroxycyclopentyloxy)isoindolin-1-one.

- 5 This was purified by HPLC to give the pure product which was a clear glass (83 mg, 0.177 mmol., 45%). R_f 0.08 (40:60 EtOAc:petrol). $\lambda_{\max}(\text{CH}_3\text{OH})/\text{nm} = 220.5$ (Abs = 1.333). IR: 3426, 2935, 1696, 1695, 1597, 1489, 1467 cm^{-1} . ^1H NMR (300Hz, DMSO); δ 1.03 – 1.86 (m, 6H, cyclopentanediol C-H), 2.02 (m, 1H, N-CH₂), 3.48 – 3.75 (M, 1H, N-CH₂), 4.00 – 4.50 (m, 2H, cyclopentanediol O-C-H), 6.66 – 7.15 (m, 9H, Ar-H), 7.32 – 7.53 (m, 2H, Ar-H), 7.83 (m, 1H, Ar-H). ^{13}C NMR (75Hz, DMSO); δ 31.4 (N-CH₂), 32.1, 33.8, 34.0, 42.9, 44.1 (cyclopentanediol), 95.0 (Ar₂C(O)-N), 72.1, 73.0 (cyclopentanediol C-OH), 124.0, 124.3, 128.5, 128.6, 130.2, 130.8, 130.8, 132.7 (Ar). LC/MS-ES⁺ m/z 470.3, 468.3, 245.1, 243.1. Anal. Calcd. for C₂₆H₂₃Cl₂NO₃·0.4 H₂O: C, 65.66; H, 5.04; N, 2.95%. Found C, 65.49; H, 4.94; N, 3.02%. HRMS (EI) m/z : 467.1055. Found 467.1055.
- 10
15

2-Benzyl-3-(4-chlorophenyl)-3-(3-hydroxycyclopentyloxy)-2,3-dihydroisoindolin-1-one (NU8249)

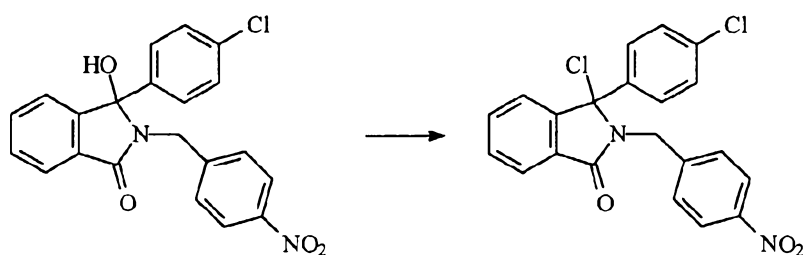


2-Benzyl-3-chloro-3-(4-chlorophenyl)-2,3-dihydroisoindolin-1-one (209 mg, 0.57 mmol) was reacted with 1,3-cyclopentanediol (0.26 mL, 2.85 mmol) as for **general procedure C**. The crude product was purified by HPLC (H₂O:MeOH, 270 nm) to give 2-benzyl-3-(4-chlorophenyl)-3-(3-hydroxycyclopentyloxy)-2,3-dihydroisoindolin-1-one as a clear glass (117 mg, 0.26 mmol, 63%); $R_f = 0.20$ (40:60: EtOAc: petrol). λ_{\max} (CH₃OH)/nm 229, Abs 0.449. IR: 3362, 2934, 1683, 1489, 1464, 1388 cm⁻¹. ¹H NMR: (300 MHz, d₆-DMSO) δ 1.09 (m, 1H, cyclopentane), 1.24 (m, 2H, cyclopentane), 1.49 (m, 2H, cyclopentane), 1.80 (m, 1H, cyclopentane), 3.71 (m, 1H, cyclopentane), 4.18 (m, 1H, cyclopentane), 4.18 (m, 1H, N-CH₂), 4.38 (d, 1H, $J =$ 14.8 Hz, N-CH₂), 7.06 (m, 10H, Ar-H), 7.14 (m, 2H, Ar-H), 7.39 (m, 2H, Ar-H), 7.42 (m, 2H, Ar-H), 7.81 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, d₆-DMSO) δ 30.7, 31, 31.1, 32, 32.1, 32.8, 33.5, 33.7, 33.9, 34.3, 42.9, 43.3, 43.4, 44.1, 45.6, 71.9, 72.6, 72.8, 73, 73.2, 73.3, 73.4, 74, 74.1, 77, 77.4, 77.8, 91.5, 95.1, 123, 123.8, 123.9, 124.3, 124.4, 127.4, 127.5, 128.2, 128.5, 128.6, 128.7, 128.9, 129.1, 129.3, 129.4, 130.1, 130.2, 131.8, 132.7, 132.7, 133.2, 134.5, 137.8, 138, 146.4, 146.5, 146.6, 149, 168, 168.8, 168.9. LC/MS-ES⁺ m/z 242.9, 332.1, 434.1 [MH⁺]. Anal. Calcd. for C₂₆H₂₄ClNO₃: C, 71.97; H, 5.57; N, 3.23%. Found C, 71.39; H, 5.40; N, 3.46%. HRMS (EI) m/z Calcd. for C₂₆H₂₄ClNO₃: 433.1444. Found 433.1436.

3-(4-Chlorophenyl)-3-hydroxy-2-(4-nitrobenzyl)-2,3-dihydroisoindolin-1-one

Distilled THF (25 mL) was added to 3-chloro-3-(4-chlorophenyl)-3*H*-isobenzofuran-
 5 1-one (3.2 g, 11.5 mmol) followed by 4-nitrobenzylamine hydrochloride (2.3 g, 12.6 mmol) and triethylamine (4.8 mL, 34.5 mmol) as for **general procedure A**. The crude product was recrystallised in the minimum amount of boiling ethyl acetate to give 3-(4-chlorophenyl)-3-hydroxy-2-(4-nitrobenzyl)-2,3-dihydroisoindolin-1-one as a light yellow solid (2.95 g, 7.47 mmol, 65%); $R_f = 0.4$ (40:60: EtOAc: petrol). 197.1-
 10 199.7 °C. λ_{\max} (CH₃OH)/nm 220, Abs 0.765. IR: 3215, 1676, 1517, 1395, 1341 cm⁻¹. ¹H NMR: (300 MHz, d₆-DMSO) δ 4.35 (d, 1H, $J = 16.3$ Hz, N-CH₂), 4.61 (d, 1H, $J = 16.3$ Hz, N-CH₂), 7.28 (m, 4H, Ar-H), 7.45 (m, 3H, Ar-H), 7.58 (m, 2H, Ar-H), 7.79 (m, 1H, Ar-H), 8.05 (m, 2H, Ar-H). ¹³C NMR: (75 MHz, d₆-DMSO) δ 42.1, 90.5, 123.1, 123.3, 128.4, 128.7, 129.1, 129.9, 130.3, 133.2, 133.3, 138.9, 146.4, 146.5, 149.4, 167.1. LC/MS-ES⁺ m/z 307.2, 368.2, 377.1. Anal. Calcd. for C₂₁H₁₅ClN₂O₄: C, 63.89; H, 3.83; N, 7.10%. Found C, 63.78; H, 3.92; N, 7.12%. HRMS (EI) m/z Calcd. for C₂₁H₁₅ClN₂O₄: 394.0720. Found 394.0714.

3-Chloro-3-(4-chlorophenyl)-2-(4-nitrobenzyl)-2,3-dihydroisoindolin-1-one

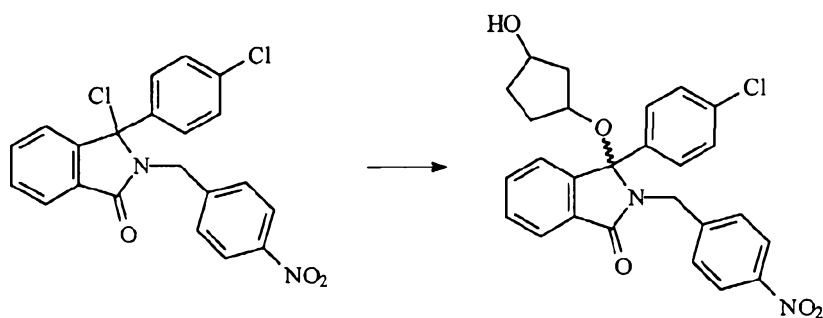


5

3-(4-Chlorophenyl)-3-hydroxy-2-(4-nitrobenzyl)-2,3-dihydroisoindolin-1-one (150 mg, 0.37 mmol) was reacted with thionyl chloride (0.03 mL, 0.45 mmol) and a catalytic amount of DMF (3 drops) as for **general procedure B**. Removal of the solvent gave 3-chloro-3-(4-chlorophenyl)-2-(4-nitrobenzyl)-2,3-dihydroisoindolin-1-one as a colourless oil (156 mg, 0.37 mmol, 100%).

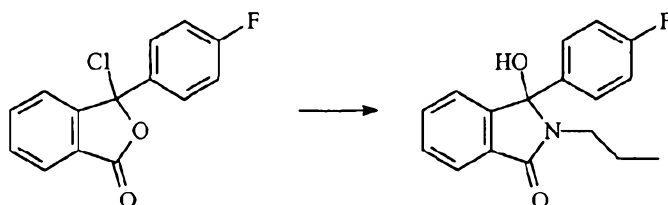
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3-(4-Chlorophenyl)-3-(3-hydroxycyclopentyloxy)-2-(4-nitrobenzyl)-2,3-dihydroisoindolin-1-one (NU8261)



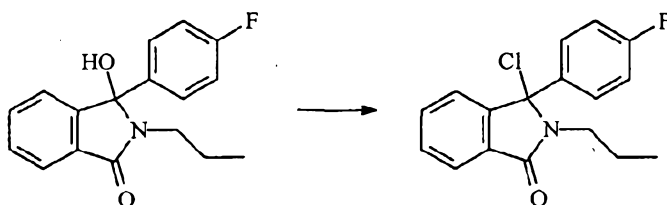
15

3-Chloro-3-(4-chlorophenyl)-2-(4-nitrobenzyl)-2,3-dihydroisoindolin-1-one (156 mg, 0.37 mmol) was reacted with 1,3-cyclopentanediol (0.17 mL, 1.89 mmol) as for **general procedure C**. The crude product was purified by HPLC (H₂O:MeOH, 270 nm) to give 3-(4-chloro-phenyl)-3-(3-hydroxycyclopentyloxy)-2-(4-nitrobenzyl)-2,3-dihydroisoindolin-1-one as a clear glass (94 mg, 0.19 mmol, 52%); *R_f* = 0.1 (40:60: EtOAc: petrol). λ_{max} (CH₃OH)/nm 230, Abs 1.513. IR: 3377, 2941, 4693, 1519, 1340, 1094 cm⁻¹. ¹H NMR: (300 MHz, CDCl₃) δ 1.19 (m, 1H, cyclopentane), 1.35 (m, 2H, cyclopentane), 1.62 (m, 2H, cyclopentane), 1.89 (m, 1H, cyclopentane), 3.75 (m, 1H, cyclopentane), 4.26 (m, 1H, cyclopentane), 4.31 (m, 1H, N-CH₂), 4.50 (d, 1H, *J* = 15.2 Hz, N-CH₂), 7.04 (m, 5H, Ar-H), 7.16 (m, 2H, Ar-H), 7.45 (m, 2H, Ar-H), 7.83 (m, 1H, Ar-H), 7.90 (m, 2H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 29.8, 31.1, 31.2, 31.4, 32, 32.1, 33.6, 33.7, 33.9, 34.3, 42.5, 42.7, 43.1, 44, 45.6, 53.8, 72, 72.5, 72.7, 73, 73.3, 73.4, 74.1, 74.2, 74.4, 91.4, 94.8, 123.6, 123.7, 124, 124.1, 124.1, 124.4, 124.4, 128.3, 128.4, 128.7, 128.8, 129.1, 129.8, 130, 130.1, 130.3, 130.5, 130.5, 131.5, 133.2, 135, 137.4, 145.3, 145.3, 146.2, 147.2, 168.1, 168.7, 168.8, 168.9. LC/MS-ES⁺ *m/z* 243, 377.1, 479.2 [MH⁺], 501.1 [MNa⁺]. Anal. Calcd. for C₂₆H₂₃ClN₂O₅·0.2H₂O: C, 64.72; H, 4.89; N, 5.81%. Found C, 64.49; H, 4.90; N, 5.95%. HRMS (EI) *m/z* Calcd. for C₂₆H₂₃ClN₂O₅: 478.1295. Found 478.1286.

3-(4-Fluorophenyl)-3-hydroxy-2-propyl-2,3-dihydroisoindolin-1-one (NU8275)

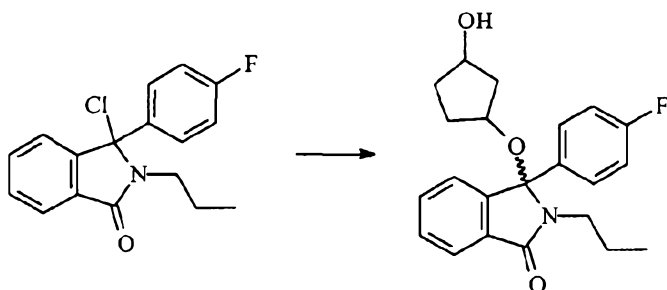
Distilled THF (25 mL) was added to 3-chloro-3-(4-fluorophenyl)-3H-isobenzofuran-
5 1-one (5.35 g, 20.4 mmol) followed by propylamine (1.85 mL, 22.5 mmol) and
triethylamine (2.85 mL, 26.5 mmol) as for **general procedure A**. The crude product
was recrystallised in the minimum amount of boiling ethyl acetate to give 3-(4-
fluorophenyl)-3-hydroxy-2-propyl-2,3-dihydroisoindolin-1-one as a white solid (4.35
g, 15.2 mmol, 75%); $R_f = 0.48$ (40:60: EtOAc: petrol). mp 172.3-174.6 °C. λ_{\max}
10 (CH₃OH)/nm 210, Abs 2.398. IR: 3231, 2965, 1673, 1602, 1504, 1407, 1223 cm⁻¹. ¹H
NMR: (300 MHz, d₆-DMSO) δ 0.75 (t, 3H, $J = 7.4$ Hz, CH₂-CH₂-CH₃), 1.42 (m, 2H,
N-CH₂-CH₂), 2.87 (m, 1H, N-CH₂), 3.14 (m, 1H, N-CH₂), 7.15 (m, 2H, Ar-H), 7.25
(m, 1H, Ar-H), 7.35 (m, 2H, Ar-H), 7.53 (dq, 2H, $J = 7.4, 1.4$ Hz, Ar-H), 7.71 (m,
1H, Ar-H). ¹³C NMR: (75 MHz, d₆-DMSO) δ 11.8, 22, 90.4, 115.4, 115.7, 122.7,
15 123, 128.3, 128.4, 129.5, 130.8, 132.7, 136.8, 136.9, 149.7, 160.5, 162.2, 163.7,
166.8. LC/MS-ES⁺ m/z 161.1, 227.1, 268.1, 286.1 [MH⁺]. Anal. Calcd. for
C₁₇H₁₆FNO₂: C, 71.56; H, 5.65; N, 4.91%. Found C, 71.61; H, 5.70; N, 4.99%.
HRMS (EI) m/z Calcd. for C₁₇H₁₆FNO₂: 285.1165. Found 285.1166.

3-Chloro-3-(4-fluorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one



3-(4-Fluorophenyl)-3-hydroxy-2-propyl-2,3-dihydroisoindolin-1-one (200 mg, 0.7
 5 mmol) was reacted with thionyl chloride (0.06 mL, 0.84 mmol) and a catalytic
 amount of DMF (3 drops) as for **general procedure B**. Removal of the solvent gave
 3-chloro-3-(4-fluorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one as a colourless oil
 (212 mg, 0.69 mmol, 100%).

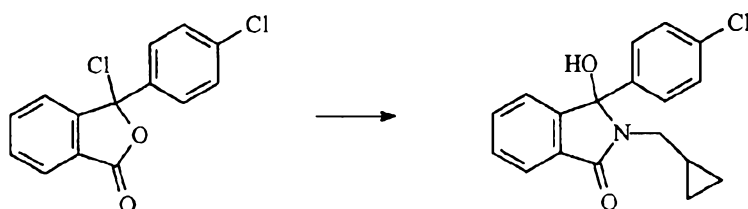
10 *3-(4-Fluorophenyl)-3-(3-hydroxycyclopentyloxy)-2-propyl-2,3-dihydroisoindolin-1-one (NU8279)*



3-Chloro-3-(4-fluorophenyl)-2-propyl-2,3-dihydroisoindolin-1-one (212 mg, 0.69
 mmol) was reacted with 1,3-cyclopentanediol (0.65 mL, 6.9 mmol) as for **general**
 15 **procedure C**. The crude product was purified by HPLC (H₂O:MeOH, 270 nm) to
 give 3-(4-fluorophenyl)-3-(3-hydroxycyclopentyloxy)-2-propyl-2,3-
 dihydroisoindolin-1-one as a clear glass (126 mg, 0.34 mmol, 49%); *R_f* = 0.21 (40:60:

EtOAc: petrol). λ_{\max} (CH₃OH)/nm 220.5, Abs 3.700. IR: 3387, 2936, 1683, 1604, 1505, 1366 cm⁻¹. ¹H NMR: (300 MHz, d₄-MeOH) δ 0.77 (t, 3H, J = 7.4 Hz, CH₂-CH₂-CH₃), 1.15 (m, 1H, N-CH₂-CH₂), 1.32 (m, 1H, N-CH₂-CH₂), 1.40-2.05 (m, 6H, cyclopentane), 3.12 (m, 1H, N-CH₂), 3.29 (m, 1H, N-CH₂), 3.90 (m, 1H, cyclopentane), 4.31 (m, 1H, cyclopentane), 7.07 (t, 2H, J = 9 Hz, Ar-H), 7.23 (m, 1H, Ar-H), 7.39 (m, 2H, Ar-H), 7.60 (m, 2H, Ar-H), 7.87 (m, 1H, Ar-H). ¹³C NMR: (125 MHz, d₄-MeOH) δ 12.2, 22.9, 32.7, 33.1, 34.2, 43.1, 44.3, 44.8, 72.8, 73, 75.7, 96.5, 116.3, 116.6, 124.3, 125.7, 130, 130.1, 131.6, 133.6, 134.1, 137.1, 148.1, 166.2, 170.7. LC/MS-ES⁺ m/z 227.1, 268.1, 370.3 [MH⁺], 392.3 [MNa⁺]. HRMS (EI) m/z Calcd. for C₂₂H₂₄FNO₃: 369.1740. Found 369.1737.

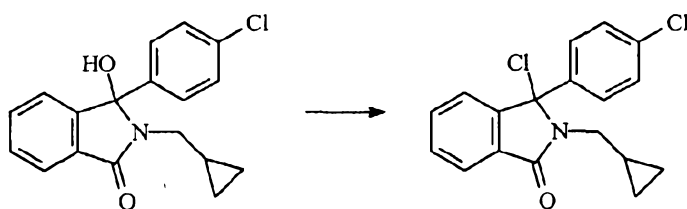
3-(4-Chlorophenyl)-2-cyclopropylmethyl-3-hydroxy-2,3-dihydroisoindolin-1-one
(NU8265)



Distilled THF (25 mL) was added to 3-chloro-3-(4-chlorophenyl)-3H-isobenzofuran-1-one (2.3 g, 8.05 mmol) followed by aminomethylcyclopropane hydrochloride (952 mg, 8.86 mmol) and triethylamine (3.36 mL, 24.1 mmol) as for general procedure A. The crude product was recrystallised in the minimum amount of boiling ethyl acetate to give 3-(4-chlorophenyl)-2-cyclopropylmethyl-3-hydroxy-2,3-dihydroisoindolin-1-one as a white solid (1.62 g, 7.47 mmol, 65%); R_f = 0.5 (40:60: EtOAc: petrol).

194.2-197.1 °C. λ_{\max} (CH₃OH)/nm 220, Abs 2.155. IR: 3269, 1684, 1403 cm⁻¹. ¹H NMR: (300 MHz, d₆-DMSO) δ -0.26 (m, 1H, cyclopropane), 0.00 (m, 3H, cyclopropane), 0.56 (m, 1H, N-CH₂-CH), 2.71 (dd, 1H, J = 14.3, 6.7 Hz, N-CH₂), 2.88 (dd, 1H, J = 14.3, 7.3 Hz, N-CH₂), 6.99 (m, 2H, OH exchangeable with D₂O, Ar-H), 7.10 (d, 2H, J = 8.7 Hz, Ar-H), 7.17 (d, 2H, J = 8.8 Hz, Ar-H), 7.30 (m, 2H, Ar-H), 7.49 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, d₆-DMSO) δ 4.1, 5, 43.6, 90.1, 122.8, 123, 128.3, 128.7, 129.7, 130.7, 132.9, 133, 139.7, 149.4, 167.1. LC/MS-ES⁺ m/z 242.9, 244.9, 296.1, 314.1 [M⁺]. Anal. Calcd. for C₁₈H₁₆ClNO₂: C, 68.90; H, 5.14; N, 4.46%. Found C, 69.04; H, 5.28; N, 4.63%. HRMS (EI) m/z Calcd. for C₁₈H₁₆ClNO₂: 313.0869. Found 313.0878.

3-Chloro-3-(4-chlorophenyl)-2-cyclopropylmethyl-2,3-dihydroisoindolin-1-one



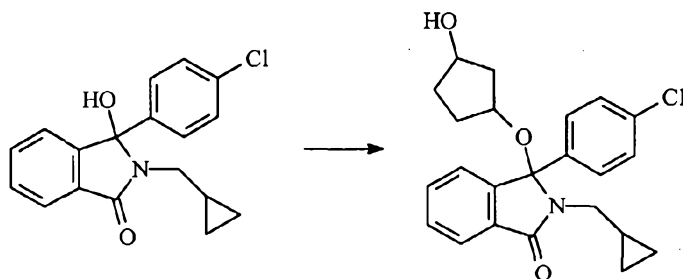
15

3-(4-Chlorophenyl)-2-cyclopropylmethyl-3-hydroxy-2,3-dihydroisoindolin-1-one

(125 mg, 0.39 mmol) was reacted with thionyl chloride (0.03 mL, 0.47 mmol) and a catalytic amount of DMF (3 drops) as for **general procedure B**. Removal of the solvent gave 3-chloro-3-(4-chlorophenyl)-2-cyclopropylmethyl-2,3-

20 dihydroisoindolin-1-one as a colourless oil (129 mg, 0.39 mmol, 100%).

3-(4-Chlorophenyl)-2-cyclopropylmethyl-3-(3-hydroxycyclopentyloxy)-2,3-dihydro-isoindolin-1-one (NU8280)

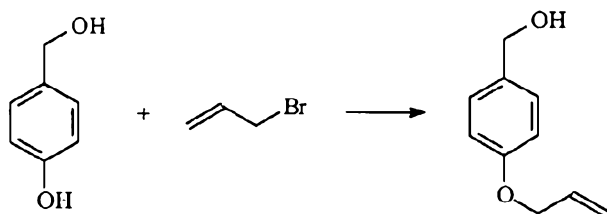


5 3-Chloro-3-(4-chlorophenyl)-2-cyclopropylmethyl-2,3-dihydroisoindolin-1-one (209 mg, 0.63 mmol) was reacted with 1,3-cyclopentanediol (0.3 mL, 3.15 mmol) as for **general procedure C**. The crude product was purified by HPLC (H₂O:MeOH, 270 nm) to give 3-(4-chlorophenyl)-2-cyclopropylmethyl-3-(3-hydroxycyclopentyloxy)-

10 2,3-dihydro-isoindolin-1-one as a clear glass (127 mg, 0.31 mmol, 51%); *R_f* = 0.22 (40:60: EtOAc: petrol). λ_{max} (CH₃OH)/nm 225, Abs 3.823. IR: 3396, 2941, 1683, 1375, 1087 cm⁻¹. ¹H NMR: (300 MHz, d₆-DMSO) δ -0.35 (m, 1H, cyclopropane), 0.05 (m, 3H, cyclopropane), 0.45 (m, 1H, N-CH₂-CH), 1.05-1.75 (m, 6H, cyclopentane), 2.97 (d, 1H, *J* = 9.1 Hz, N-CH₂), 3.02 (d, 1H, *J* = 9 Hz, N-CH₂), 3.62

15 (m, 1H, cyclopentane), 3.94 (m, 1H, cyclopentane), 4.17 (d, 1H, *J* = 6 Hz, OH), 7.05 (m, 1H, Ar-H), 7.20 (m, 4H, Ar-H), 7.42 (m, 2H, Ar-H), 7.62 (m, 1H, Ar-H). ¹³C NMR: (125 MHz, d₆-DMSO) δ 3.9, 4.6, 10.1, 30.8, 31.2, 32.7, 38.9, 39.1, 39.3, 39.5, 39.6, 39.8, 40, 42.5, 43.2, 43.5, 69.6, 70, 73.4, 92.5, 122.7, 124, 128.2, 128.3, 130, 132.5, 132.9, 138.4, 145.9, 167.2, 167.3. LC/MS-ES⁺ *m/z* 243, 245, 295.1, 314.1,

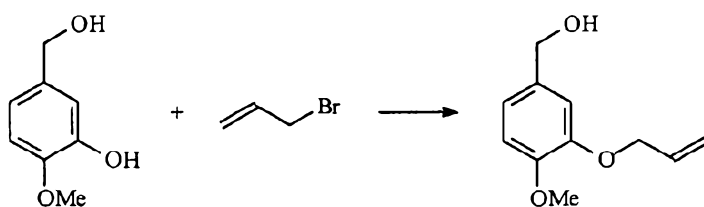
20 316.1, 398.2 [MH⁺]. Anal. Calcd. for C₂₃H₂₄ClNO₃: C, 69.43; H, 6.08; N, 3.52%. Found C, 69.02; H, 6.15; N, 3.47%. HRMS (EI) *m/z* Calcd. for C₂₃H₂₄ClNO₃: 397.1444. Found 397.1432.

4-Allyloxybenzyl alcohol

- 5 A mixture of 4-hydroxybenzylalcohol (1.52g, 12.2 mmol.), allyl bromide (1.1 ml, 12.2 mmol.), acetonitrile(40 ml), and potassium carbonate (2.54 g, 18.4 mmol.) was relaxed for 18 hours, then concentrated *in vacuo*. The residue was dissolved in ethyl acetate and washed with water and brine. The organic layer was dried (MgSO₄) and evaporated to give the product as a yellow oil (0.72 g, 71%). ¹H NMR (300 MHz, CDCl₃) δ 2.1 (s, 1H), 4.55 (m, 2H), 4.6 (s, 2H), 5.3 (d, 1H, J = 11.5 Hz), 5.43 (d, 1H, J = 16.5 Hz), 6.1 (m, 1H), 6.94 (m, 2H), 7.33 (m, 2H); ¹³C NMR (75 MHz, CDCl₃) δ 65.3, 69.2, 115.2, 118.1, 129.0, 129.4, 133.7, 158.6.
- 10

3-Allyloxy-4-methoxybenzyl alcohol

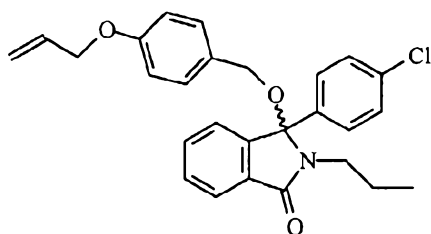
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- A mixture of 3-hydroxy-4-methoxybenzylalcohol (0.80 g, 7.79 mmol.), allyl bromide (0.45 ml, 5.9 mmol.), acetonitrile (20 ml), and potassium carbonate (1.08 g, 7.8 mmol.) was relaxed for 18 hours, then concentrated *in vacuo*. The residue was dissolved in ethyl acetate and washed with water and brine. The organic layer was
- 20

dried (MgSO₄) and evaporated to give the product as a yellow oil (1.14 g, 57%). ¹H NMR (300 MHz, CDCl₃) δ 1.90 (s, 1H), 3.79 (s, 3H), 4.52-4.54 (m, 4H), 5.2 (d, 1H, J = 12Hz), 5.32 (d, 1H, J = 17.25 Hz), 6.0 (m, 1H), 6.77 (s, 2H), 6.85 (s, 1H); ¹³C NMR (75 MHz, CDCl₃) δ 56.3, 65.6, 70.3, 111.2, 113.6, 118.4, 119.7, 133.7, 134.4, 147.8, 149.9.

3-(4-Chlorophenyl)-3-(4-allyloxybenzyl)-2-propyl-2,3-dihydroisoindolinone

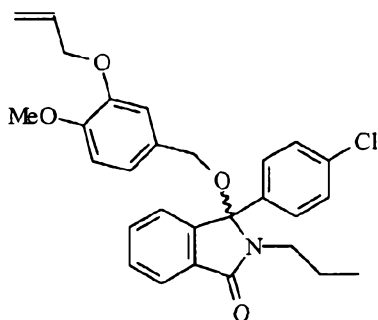


3-(4-Chlorophenyl)-3-hydroxy-2-propyl-2,3-dihydroisoindolinone (0.50 g, 1.66 mmol), THF (10 ml), thionyl chloride (0.15 ml, 2.0 mmol), DMF (3 drops). **General procedure B.**

The product was dissolved in THF (20 ml), and K₂CO₃ (0.28 g, 2 mmol), and 4-allyloxybenzyl alcohol (0.33 g, 2.88 mmol) was added according to **general procedure C** giving the product (0.63 g, 85%). ¹H NMR (300 MHz, CDCl₃) δ 0.74 (t, 3H, J = 7.3 Hz, NCH₂-CH₂-CH₃), 1.31 (m, 2H, N-CH₂-CH₂), 1.47 (m, 2H, N-CH₂-CH₂), 3.04 (m, 1H, N-CH₂), 3.22 (m, 1H, N-CH₂), 3.83 (d, 1H, J = 10.89, O-CH₂), 4.08 (d, 1H, J = 10.92, O-CH₂), 4.47 (s, 2H, O-CH₂-CH-CH₂), 5.22 (d, 1H, J = 8.09, O-CH₂-CH-CH₂), 5.35 (d, 1H, J = 17.22, O-CH₂-CH-CH₂), 5.98 (m, 1H, O-CH₂-CH-CH₂), 6.83 (m, 2H, Ar-H), 7.06-7.44 (m, 9H, Ar-H). 7.85 (s, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12.1, 22.0, 41.9, 65.0, 69.2, 95.1, 115.1, 118.2, 122.9, 123.4,

128.1, 129.1, 129.3, 129.9, 130.2, 132.4, 132.9, 133.6, 134.8, 138.1, 145.6, 158.6,
168.7. LC/MS-ES⁺ m/z 148.8, 285.1, 287.1, 470.5.

3-(4-Chlorophenyl)-3-(3-allyloxy-4-methoxybenzyl)-2-propyl-2,3-
5 dihydroisoindolinone



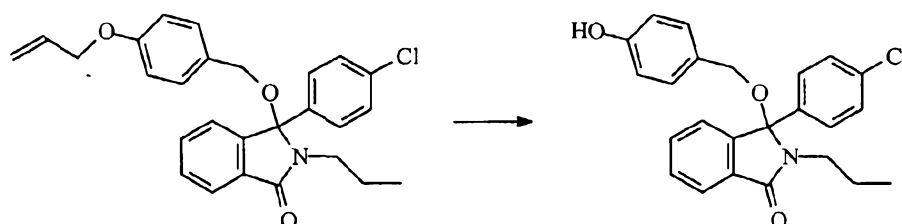
3-(4-Chlorophenyl)-3-hydroxy-2-propyl-2,3-dihydroisoindolinone (0.50 g, 1.66
10 mmol), THF (10 ml), thionyl chloride (0.15 ml, 2.0 mmol), DMF (3 drops). **General
procedure B.**

The product was dissolved in THF (20 ml), and K₂CO₃ (0.28 g, 2 mmol), and 3-
allyloxy-4-methoxybenzyl alcohol (0.38 g, 2.0 mmol) was added according to
general procedure C giving the product (0.42 g, 53%).

15 ¹H NMR: (300 MHz, CDCl₃) δ 0.76 (m, 3H, NCH₂-CH₂-CH₃), 1.19 (m, 2H, N-CH₂-
CH₂), 1.31(m, 2H, N-CH₂-CH₂), 3.01 (m, 1H, N-CH₂), 3.21 (m, 1H, N-CH₂), 3.80 (s,
3H, OCH₃), 3.83 (d, 1H, *J* = 14.26, O-CH₂), 4.07 (d, 1H, *J* = 11.08, O-CH₂), 4.54 (s,
2H, O-CH₂-CH-CH₂), 5.22 (d, 1H, *J* = 10.44, O-CH₂-CH-CH₂), 5.34 (d, 1H, *J* =
17.29, O-CH₂-CH-CH₂), 6.01 (m, 1H, O-CH₂-CH-CH₂), 6.72-7.82 (m, 10H, Ar-H),
20 7.85 (d, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12.2, 22.0, 41.9, 56.4, 65.1, 70.2,
95.1, 111.9, 113.8, 118.4, 120.7, 123.5, 123.9, 128.3, 129.0, 130.1, 131.2, 132.4,

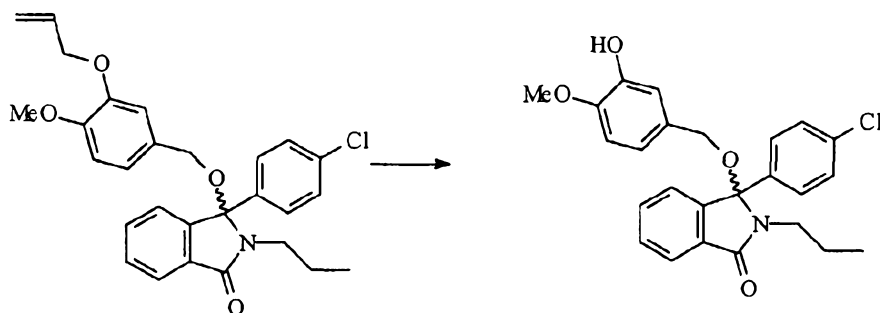
132.9, 133.7, 134.8, 138.1, 145.6, 148.4, 149.5, 168.6. LC/MS-ES⁺ m/z 118.8, 178.5, 285.1, 287.1, 500.4.

5 *3-(4-Chlorophenyl)-3-(4-hydroxybenzyl)-2-propyl-2,3-dihydroisoindolinone*
(NU8243)



A mixture of 3-(4-chlorophenyl)-3-(4-allyloxybenzyl)-2-propyl-2,3-dihydroisoindolinone (0.190 g, 0.43 mmol), Pd(PPh₃)₄ (10 mg, 0.009 mmol), K₂CO₃ (0.19 g, 1.35 mmol) in degassed, anhydrous methanol (10 ml), was stirred 16h, then concentrated *in vacuo*. Chromatography (silica; 35% EtOAc, petrol) gave the product (160 mg, 93%). ¹H NMR: (300 MHz, CDCl₃) δ 0.72 (m, 3H, *J* = 7.3, NCH₂-CH₂-CH₃), 1.28 (m, 2H, N-CH₂-CH₂), 1.46 (m, 2H, N-CH₂-CH₂), 2.1 (s, 1H, OH), 3.05 (m, 1H, N-CH₂), 3.22 (m, 1H, N-CH₂), 3.82 (d, 1H, *J* = 10.8, O-CH₂), 4.04 (d, 1H, *J* = 10.8, O-CH₂), 6.8 (d, 2H, Ar-H), 7.04-7.45 (m, 9H, Ar-H), 7.84 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12.2, 22.0, 41.9, 65.2, 95.3, 115.9, 123.5, 123.7, 128.1, 128.3, 129.0, 129.6, 130.4, 130.9, 133.1, 134.9, 137.9, 145.7, 156.8, 169.1. LC/MS-ES⁺ m/z 244.2, 246.2, 285.1, 430.6.

3-(4-Chlorophenyl)-3-(3-hydroxy-4-methoxybenzyl)-2-propyl-2,3-dihydroisoindolinone (NU8244)



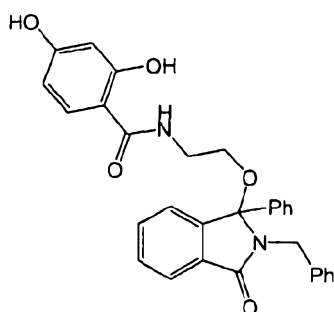
- 5 A mixture of 3-(4-chlorophenyl)-3-(3-allyl-4-methoxybenzyl)-2-propyl-2,3-dihydroisoindolinone (0.210 g, 0.44 mmol), Pd(PPh₃)₄ (10 mg, 0.009 mmol), K₂CO₃ (0.19 g, 1.35 mmol) in degassed, anhydrous methanol (10 ml), was stirred 2h, then concentrated *in vacuo*. Chromatography (silica; 30% EtOAc, petrol) gave the product (130 mg, 68%). ¹H NMR: (300 MHz, CDCl₃) δ 0.74 (m, 3H, *J* = 7.4, NCH₂-CH₂-CH₃), 1.18 (m, 2H, N-CH₂-CH₂), 1.3 (m, 2H, N-CH₂-CH₂), 3.02 (m, 1H, N-CH₂), 3.22 (m, 1H, N-CH₂), 3.81 (s, 3H, OCH₃), 3.80 (d, 1H, *J* = 9.1, O-CH₂), 4.04 (d, 1H, *J* = 10.7, O-CH₂), 5.77 (s, 1H, OH), 6.62-6.9(m, 3H, Ar-H), 7.06-7.46 (m, 7H, Ar-H), 7.81 (m, 1H, Ar-H). ¹³C NMR: (75 MHz, CDCl₃) δ 12.2, 22.0, 41.9, 56.4, 65.0, 95.1, 110.8, 114.4, 119.6, 123.4, 123.9, 128.3, 129.0, 130.3, 131.0, 132.3, 133.0, 134.8, 138.0, 145.6, 146.0, 146.7, 168.7. LC/MS-ES⁺ *m/z* 138.8, 162.7, 244.3, 285.1, 287.1, 438.7.

2-Benzyl-3-chloro-3-phenyl-2,3-dihydroisoindolin-1-one (11a).

- 20 A solution of **10a** (0.25 g, 0.79 mmol) in THF (20 mL) was reacted with thionyl chloride (0.07 mL, 0.87 mmol) and DMF (3 drops), the mixture was stirred for 16 h, and concentrated *in vacuo* giving **10a** as an orange solid (0.27 g, 0.79 mmol) which was used without further purification.

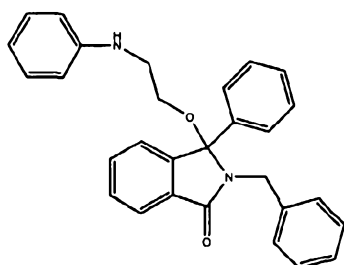
N-[2-(2-Benzyl-3-oxo-1-phenyl-2,3-dihydro-1*H*-isoindolin-1-yl)oxyethyl]-2,4-dihydroxybenzamide (**59**) (NU8203)

5



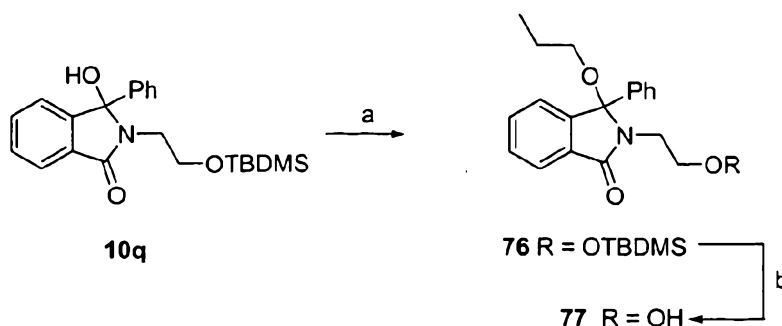
General procedure H: **11a** (316 mg, 0.95 mmol), 2,4-dihydroxy-*N*-(2-hydroxyethyl)benzamide (342 mg, 1.73 mmol). Chromatography (50% EtOAc, petrol), HPLC and recrystallization (EtOAc) gave **59** as an orange oil (240 mg, 0.48 mmol, 61%). λ_{max} (CH₃OH)/nm 208.5, Abs 0.937. IR: 3333, 1678, 1637 cm⁻¹. ¹H NMR (300 MHz, CDCl₃) δ 2.66 (m, 1H, O-CH₂), 2.28 (m, 1H, O-CH₂), 2.95 (m, 1H, O-CH₂-CH₂), 3.05 (m, 1H, O-CH₂-CH₂), 3.82 (d, 1H, *J* = 14.7 Hz, N-CH₂), 4.83 (d, 1H, *J* = 14.7 Hz, N-CH₂), 6.05 (m, 1H, NH), 6.36 (m, 1H, Ar-H), 6.38 (m, 1H, Ar-OH), 7.00 (m, 1H, Ar-H), 7.20 (m, 12H, Ar-H), 7.38 (m, 2H, Ar-H), 7.84 (m, 1H, Ar-H), 12.37 (bs, 1H, Ar-OH). ¹³C NMR (75 MHz, CDCl₃) δ 38.9, 43.6, 61.8, 96.2, 104.5, 107.5, 107.7, 123.3, 124.1, 126.6, 128.7, 129, 129.1, 129.5, 130.3, 131.6, 133.4, 137.8, 138.3, 145.6, 161.9, 163.9, 169, 170.1. LCMS (ESI+) *m/z* 494 [M+H]⁺. Anal. Calcd. for C₃₀H₂₆N₂O₅: C, 72.86; H, 5.30; N, 5.66%. Found C, 72.46; H, 5.55; N, 5.73%.

2-Benzyl-3-phenyl-3-(2-phenylaminoethoxy)-2,3-dihydroisoindolin-1-one (**60**) (NU8204)



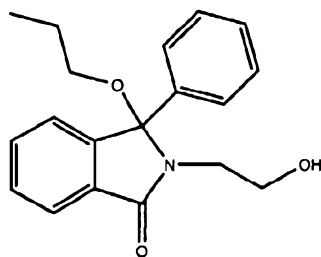
General procedure H: **11a** (635 mg, 1.9 mmol), and 2-anilino ethanol (573mg, 4.18 mmol). Chromatography (silica; 40% EtOAc, petroleum ether) gave **60** as a light yellow solid (550 mg, 66%), mp 50 °C. IR ν (cm^{-1}): 3375, 3028, 2924, 2876, 1691, 1601, 1494, 1466, 1382, 1351, 1323, 1062. $^1\text{H-NMR}$: δ_{H} (300MHz, CDCl_3) : 7.82 (1H, d, $J = 6.5$, Ar), 7.36 (2H, dq, $J = 7.4$ & 1.2 Hz, Ar), 7.22 (7H, s, Ar), 7.13 (3H, m, Ar), 7.04 (2H, t, $J = 7.4$ Hz, Ar), 6.98 (1H, d, $J = 6.5$ Hz, Ar), 6.60 (1H, t, $J = 7.3$ Hz, Ar), 6.39 (2H, d, $J = 7.8$ Hz, Ar), 4.78 (1H, d, $J = 4.7$ Hz, $-\text{CH}_2\text{-Ph}$), 3.81 (1H, d, $J = 4.7$ Hz, $-\text{CH}_2\text{-Ph}$), 3.50 (1H, br, $-\text{NH}$), 2.75 (4H, m, $-\text{O-CH}_2\text{-CH}_2\text{-NH}$). $^{13}\text{C-NMR}$: δ_{C} (75MHz, CDCl_3) : 168.62, 148.29, 145.86, 138.79, 138.19, 133.08, 131.99, 130.10, 129.73, 129.59, 128.93, 128.66, 127.76, 126.82, 124.03, 123.39, 117.95, 113.35, 96.01, 61.81, 43.56, 43.39. LCMS (ESI+) 299 $[\text{M}+\text{Na}]^+$. Anal. Calcd. for $\text{C}_{29}\text{H}_{26}\text{N}_2\text{O}_2$ C, 80.16; H, 6.03, N, 6.45. Found : C, 79.32; H, 6.02, N, 6.12.

*2-[2-(*t*-Butyldiphenylsilanyloxy)ethyl]-3-phenyl-3-propoxy-2,3-dihydroisoindolin-1-one (76).*



General procedure I: **10q** (400 mg, 0.79 mmol), thionyl chloride (0.187g, 1.57 mmol), THF (10 mL), *n*-propanol (70 μ L, 1.18 mmol), triethylamine (158 mg, 1.6 mmol). Chromatography (silica; 40% EtOAc, petroleum ether) gave **76** as a white solid (240 mg, 55%) ¹H-NMR (300MHz, CDCl₃) δ_H 7.78 (1H, m, Ar); 7.52 (4H, m, Ar); 7.29 (13H, m, Ar); 7.04 (1H, m, Ar); 3.55 (2H, m, OCH₂); 3.42 (1H, m, OCH₂); 3.24 (1H, m, OCH₂); 2.98 (1H, q, J = 7.05 Hz, NCH₂); 2.69 (1H, q, J = 7.05 Hz, NCH₂); 1.39 (2H, m, CH₂); 0.92 (9H, s, 'Bu) ; 0.77 (3H, t, J = 7.4 Hz, CH₃). ¹³C-NMR (75 MHz, CDCl₃) δ_C 11.13, 19.51, 23.03, 27.13, 41.38, 61.04, 64.41, 95.01, 123.43, 123.64, 126.60, 127.98, 128.72, 129.84, 129.92, 132.20, 132.71, 133.98, 135.84, 135.88, 139.41, 146.28, 168.69.

2-(2-Hydroxyethyl)-3-phenyl-3-propoxy-2,3-dihydroisoindolin-1-one (77) (NU8206)



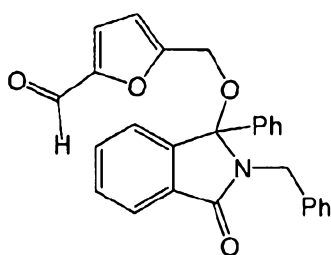
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TBAF (1M solution in THF ; 190 mg, 0.73 mmol) was added dropwise to a solution of **76** (200mg, 0.36 mmol) in THF (10 mL). After 30 min. the solvent was evaporated

to dryness and the residue was partitioned between EtOAc (100ml) and water (50ml). The organic layer was washed with water (2 x 20ml), brine (20ml), dried and concentrated. Chromatography (silica; 60%EtOAc, petroleum ether) gave **67** as a white solid. (110 mg, 98%) mpt 85 °C. IR ν (cm⁻¹): 3456, 2961, 2931, 2877, 1683, 1463, 1443, 1388, 1311, 1251, 1072, 1047, 752, 695. ¹H-NMR (300MHz, CDCl₃) δ _H 7.81 (1H, m, Ar), 7.43 (2H, m, Ar), 7.32 (2H, m, Ar), 7.25 (3H, m, Ar), 7.09 (1H, m, Ar), 3.95 (1H, br, s, -OH), 3.56 (2H, m, -O-CH₂-CH₂-CH₃), 3.42 (1H, ddd, J = 14.8, 6.63 & 3.1 Hz, -O-CH₂-CH₂-N), 3.25 (1H, ddd, J = 14.8, 6.63 & 3.1 Hz, -O-CH₂-CH₂-N), 3.09 (1H, dt, J = 8.84, 6.35 & 2.5 Hz, -O-CH₂-CH₂-N), 2.83 (1H, dt, J = 8.84, 6.35 & 2.5 Hz, -O-CH₂-CH₂-N), 1.56 (2H, q, J = 7.00 Hz, -O-CH₂-CH₂-CH₃), 0.88 (3H, t, J = 7.4 Hz, -O-CH₂-CH₂-CH₃). ¹³C-NMR (75MHz, CDCl₃) δ _C 170.48, 146.25, 138.79, 133.16, 131.65, 130.12, 129.01, 126.53, 123.91, 123.55, 95.61, 64.89, 62.41, 43.83, 23.13, 11.22. LCMS (ESI+) m/z 334 [M+Na]. Anal. Calcd. for C₁₉H₂₁NO₃ : C, 73.29; H, 6.80; N, 4.50. Found : C, 73.05; H, 6.78; N, 4.36.

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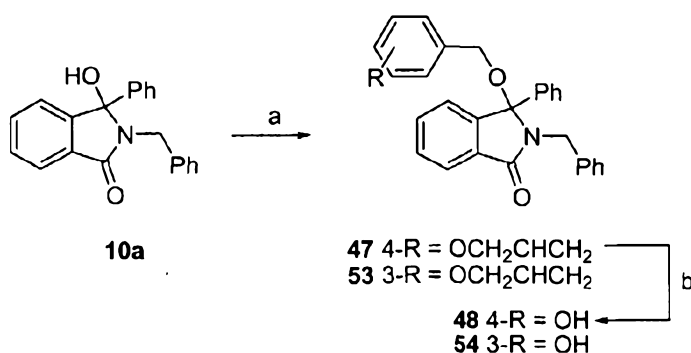
5-(2-Benzyl-3-oxo-1-phenyl-2,3-dihydro-1H-isoindolin-1-ylloxymethyl)-furan-2-carbaldehyde (58) (NU8207)



20

General procedure H: 11a (316 mg, 0.95 mmol), 5-hydroxymethylfuran-2-carbaldehyde (264 mg, 2.1 mmol). Chromatography (40:60 EtOAc:petrol) gave **58** as a grey oil (99 mg, 0.23 mmol, 23%); R_f 0.27 (40:60 EtOAc:petrol). λ_{\max} (CH₃OH)/nm 208.5, Abs 0.301. IR: 2995, 1690, 1676 cm⁻¹. ¹H NMR: (500 MHz, CDCl₃) δ 3.58 (d, 1H, J = 12.5 Hz, O-CH₂), 3.69 (d, 1H, J = 12.8 Hz, O-CH₂), 3.82 (d, 1H, J = 14.6 Hz, N-CH₂), 4.86 (d, 1H, J = 14.7 Hz, N-CH₂), 5.82 (d, 1H, J = 3.6 Hz, Hb), 6.97 (d, 1H, J = 3.4 Hz, Ha), 7.09 (m, 1H, Ar-H), 7.19 (m, 10H, Ar-H), 7.40 (m, 1H, Ar-H), 7.44 (m, 1H, Ar-H), 7.86 (d, 1H, J = 7.3, Ar-H), 9.47 (s, 1H, CHO) ¹³C NMR (75 MHz, CDCl₃) δ 43.6, 61.3, 96.2, 110.3, 112.5, 114.5, 123.5, 123.6, 125.6, 125.8, 128.6, 128.9, 131.2, 152.9, 168.2, 178.1. LCMS (ESI+) m/z 424 [M+H]⁺, 446 [M+Na]⁺. Anal. Calcd. for C₂₇H₂₁NO₄: C, 76.58; H, 5.00; N, 3.31%. Found C, 76.37; H, 5.13; N, 3.00%.

3-(3-Allyloxybenzyloxy)-2-benzyl-3-phenyl-2,3-dihydroisoindolin-1-one (53).

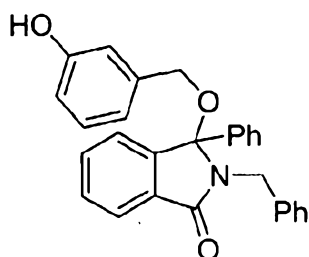


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General procedure H: 11a (632 mg, 1.9 mmol), (3-allyloxyphenyl)methanol (373 mg, 2.28 mmol) and potassium carbonate (393 mg, 2.85 mmol). Chromatography (30% EtOAc, petrol) to gave **53** as a colourless oil (656 mg, 1.4 mmol, 74%); R_f 0.50 (40:60 EtOAc:petrol). λ_{\max} (CH₃OH)/nm 216, Abs 1.066. IR: 3032, 2908, 1700 cm⁻¹.

^1H NMR: (500 MHz, CDCl_3) δ 3.60 (d, 1H, $J = 11.3$ Hz, O- CH_2), 3.67 (d, 1H, $J = 11$ Hz, O- CH_2), 3.97 (1H, $J = 14.6$ Hz, N- CH_2), 4.42 (dt, 2H, $J = 5.4$ vic, 1.3 allylic Hz, O- CH_2 -CH=CH $_2$), 4.73 (1H, $J = 14.7$ Hz, N- CH_2), 5.23 (dq, 1H, $J = 10.4$ cis, 1.5 allylic Hz, CH=CH $_2$), 5.34 (dq, 1H, $J = 17.1$ trans, 1.5 allylic Hz, CH=CH $_2$), 5.99 (m, 1H, CH=CH $_2$),
 5 6.48 (m, 2H, Ar-H), 6.70 (dd, 1H, $J = 8.2, 1.9$ Hz, Ar-H), 7.07 (m, 5H, Ar-H), 7.21 (m, 5H, Ar-H), 7.31 (m, 2H, Ar-H), 7.41 (m, 2H, Ar-H), 7.87 (m, 1H, Ar-H). ^{13}C NMR: (75 MHz, CDCl_3) δ 43.7, 65, 69.1, 96.1, 113.9, 114.3, 118, 120.2, 123.5, 123.9, 126.9, 127.5, 128.5, 128.8, 129.8, 130, 132.1, 133, 133.7, 137.8, 138.8, 139.3, 146, 158.8, 168.7. LCMS (ESI+) m/z 462 $[\text{M}+\text{H}]^+$, 484.1 $[\text{M}+\text{Na}]^+$. Anal. Calcd. for
 10 $\text{C}_{31}\text{H}_{27}\text{NO}_3$: C, 80.67; H, 5.90; N, 3.03%. Found C, 80.23; H, 5.53; N, 2.62%.

15 2-Benzyl-3-(3-hydroxybenzyloxy)-3-phenyl-2,3-dihydroisoindolin-1-one (54)
 (NU8208)



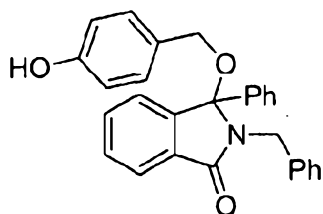
To a degassed solution of **53** (196 mg, 0.42 mmol) in MeOH (12 mL) was added
 20 palladiumtetrakis triphenylphosphine (4.8 mg, 1 mol%) and potassium carbonate (173 mg, 1.26 mmol). The mixture was stirred at rt for 2 h then concentrated *in vacuo*.
 Chromatography (30% EtOAc, petrol) gave **54** as a white solid, (125 mg, 0.29 mmol, 71%); mp 122-123 °C. λ_{max} (CH $_3$ OH)/nm 206, Abs 0.222. IR: 3228, 3031, 1674 cm^{-1} .

^1H NMR (300 MHz, CDCl_3) δ 3.58 (d, 1H, $J = 11.2$ Hz, O- CH_2), 3.67 (d, 1H, $J = 11.2$, O- CH_2), 3.94 (d, 1H, $J = 14.6$ Hz, N- CH_2), 4.75 (d, 1H, $J = 14.6$ Hz, N- CH_2), 4.89 (s, 1H, Ar-OH), 6.30 (m, 1H, Ar-H), 6.45 (d, 1H, $J = 7.6$ Hz, Ar-H), 6.63 (dd, 1H, $J = 8.1, 2.5$ Hz, Ar-H), 7.00-7.31 (m, 12H, Ar-H), 7.42 (m, 2H, Ar-H), 7.88 (m, 1H, Ar-H). ^{13}C NMR (75 MHz, CDCl_3) δ 43.8, 64.9, 96.1, 114.6, 114.7, 120, 123.5, 124, 126.9, 127.5, 128.6, 128.8, 129.6, 129.8, 130.1, 132, 133, 137.9, 138.8, 139.5, 146, 155.7, 168.8). LCMS (ESI+) m/z 422 $[\text{M}+\text{H}]^+$, 444 $[\text{M}+\text{Na}]^+$. Anal. Calcd. for $\text{C}_{28}\text{H}_{23}\text{NO}_3 \cdot 0.33\text{H}_2\text{O}$: C, 78.67; H, 5.58; N, 3.28%. Found C, 78.62; H, 5.29; N, 3.08%.

10 *3-(4-Allyloxybenzyloxy)-2-benzyl-3-phenyl-2,3-dihydroisoindolin-1-one (47).*

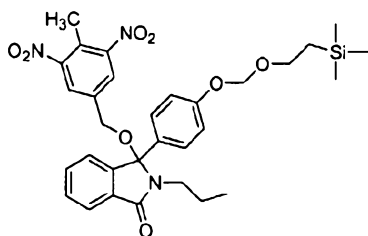
General procedure H: **11a** (316 mg, 0.95 mmol), 4-allyloxyphenylmethanol (186 mg, 1.14 mmol) and potassium carbonate (196 mg, 1.42 mmol). Chromatography (30% EtOAc, petrol) gave **47** as a colourless oil (266 mg, 0.5 mmol, 61%). λ_{max} (CH_3OH)/nm 220, Abs 0.958. IR 3036, 2935, 1703 cm^{-1} . ^1H NMR (500 MHz, CDCl_3) δ 3.55 (d, 1H, $J = 10.7$ Hz, O- CH_2), 3.63 (d, 1H, $J = 10.7$ Hz, O- CH_2), 3.94 (1H, $J = 14.4$ Hz, N- CH_2), 4.42 (d, 2H, $J = 5.4_{\text{vic}}$ Hz, O- CH_2 - $\text{CH}=\text{CH}_2$), 4.73 (1H, $J = 14.7$ Hz, N- CH_2), 5.19 (dd, 1H, $J = 10.4_{\text{cis}}, 1.3_{\text{gem}}$ Hz, $\text{CH}=\text{CH}_2$), 5.31 (dd, 1H, $J = 17.4_{\text{trans}}, 1.6_{\text{gem}}$ Hz, $\text{CH}=\text{CH}_2$), 5.95 (m, 1H, $\text{CH}=\text{CH}_2$), 6.69 (d, 2H, $J = 8.9$ Hz, Ar-H), 6.74 (d, 2H, $J = 8.6$ Hz, Ar-H), 7.08 (m, 4H, Ar-H), 7.16 (m, 5H, Ar-H), 7.31 (m, 2H, Ar-H), 7.39 (m, 2H, Ar-H), 7.87 (m, 1H, Ar-H). ^{13}C NMR (75 MHz, CDCl_3) δ 43.3, 64.5, 68.7, 95.6, 114.2, 117.6, 123, 123.5, 126.5, 127.1, 128.1, 128.3, 128.4, 129, 129.4, 129.5, 129.6, 131.7, 132.5, 133.2, 137.5, 138.5, 145.8, 158, 168.3. LCMS (ESI+) m/z 298.1, 462.2 $[\text{M}+\text{H}]^+$, 484.2 $[\text{M}+\text{Na}]^+$.

2-Benzyl-3-(4-hydroxybenzyloxy)-3-phenyl-2,3-dihydroisoindolin-1-one (48)
(NU8215)



- 5 To a degassed solution of **47** (145 mg, 0.31 mmol) in MeOH (12 mL) was added palladium tetrakis(triphenylphosphine) (3.5 mg, 1 mol%) and potassium carbonate (128 mg, 0.93 mmol). The mixture was stirred at rt for 2 h then concentrated *in vacuo*. Chromatography (30% EtOAc, petrol) gave **48** as a white solid, (104 mg, 0.24 mmol, 80%) mp 119.6-121.3 °C. λ_{max} (CH₃OH)/nm 211, Abs 0.822. IR: 3214, 3031, 1674
- 10 cm^{-1} . ¹H NMR (300 MHz, CDCl₃) δ 3.54 (d, 1H, *J* = 10.5 Hz, O-CH₂), 3.62 (d, 1H, *J* = 10.6, O-CH₂), 3.92 (d, 1H, *J* = 14.6 Hz, N-CH₂), 4.72 (d, 1H, *J* = 14.7 Hz, N-CH₂), 6.69 (s, 1H, Ar-OH), 7.08 (m, 4H, Ar-H), 7.22 (m, 11H, Ar-H), 7.41 (m, 2H, Ar-H), 7.78 (m, 1H, Ar-H). ¹³C NMR (75 MHz, CDCl₃) δ 43.8, 66.1, 96.1, 115.4, 123.5, 124, 124.2, 126.9, 127.6, 128.4, 128.6, 128.8, 129.4, 129.7, 129.8, 130, 131.9, 133.1,
- 15 137.8, 138.8, 146.2, 169). LCMS (ESI+) *m/z* 422.1 [M+H]⁺, 444.1 [M+Na]⁺. Anal. Calcd. for C₂₈H₂₃NO₃: C, 79.79; H, 5.50; N, 3.32%. Found C, 79.65; H, 5.59; N, 3.39%.

- 3-(3,5-Dimethoxy-4-hydroxybenzyloxy)-2-propyl-3-[4-(2-*
- 20 *trimethylsilylethoxymethoxy)phenyl]-2,3-dihydroisoindolin-1-one (110) (NU8209)*

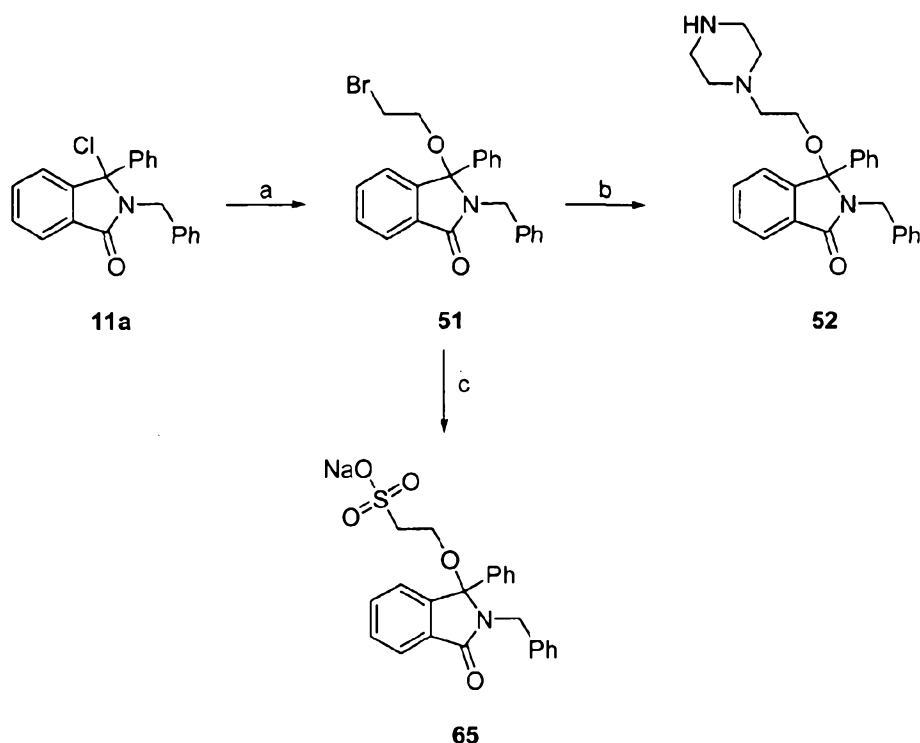


General procedure I: **10j** (0.31 mmol), syringic alcohol (127 mg, 0.69 mmol).

Chromatography (35:65 EtOAc:petrol) and (C18 silica; 20% MeOH, H₂O to 100%

- 5 MeOH gradient) gave **110** as a colourless oil (38 mg, 0.065 mmol, 2%). λ_{\max} (CH₃OH)/nm 210, Abs 0.336. IR: 3371, 2947, 1689, 1604, 1460, 1427, 1372 cm⁻¹. ¹H NMR (300 MHz, CDCl₃) δ -0.02 (s, 9H, Si-(CH₃)₃), 0.83 (t, 3H, J = 7.4 Hz, CH₂-CH₂-CH₃), 0.95 (m, 2H, R-O-CH₂-CH₂-Si), 1.43 (m, 1H, N-CH₂-CH₂), 1.55 (m, 1H, N-CH₂-CH₂), 3.12 (m, 1H, N-CH₂), 3.34 (m, 1H, N-CH₂), 3.75 (m, 2H, O-CH₂-CH₂-Si), 3.89 (s, 6H, OMe), 3.94 (d, 1H, J = 11.2 Hz, O-CH₂), 4.17 (d, 1H, J = 11.3 Hz, O-CH₂), 5.22 (s, 2H, O-CH₂-O), 5.55 (s, 1H, OH), 6.49 (s, 2H, Ar-H), 7.00 (d, 2H, J = 9.1 Hz, Ar-H), 7.17 (m, 1H, Ar-H), 7.34 (d, 2H, J = 8.8 Hz, Ar-H), 7.49 (m, 2H, Ar-H), 7.90 (m, 1H, Ar-H). ¹³C NMR (75 MHz, CDCl₃) δ -3.3, 9.8, 16, 19.6, 39.5, 54.3, 63.1, 64.3, 90.8, 93.1, 102.2, 114, 121.2, 121.3, 125.6, 126.7, 127.6, 129.8, 130, 130.3, 132.2, 143.7, 144.9, 155.5, 160.3, 166.3. LCMS (ESI+) m/z 355, 396.1, 397.1, 15 414.1, 602 [M+Na]⁺. Anal. Calcd. for C₃₂H₄₁NO₇Si: C, 66.29; H, 7.13; N, 2.42%. Found C, 67.26; H, 7.22; N, 1.65%; HRMS (EI) m/z Calcd. for C₃₂H₄₁NO₇Si: 579.2652. Found 579.2673.

- 20 *2-Benzyl-3-(2-bromoethoxy)-3-phenyl-2,3-dihydroisoindolin-1-one (51).*

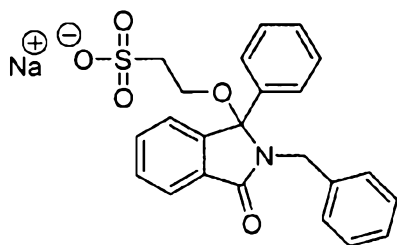


General procedure H: **11a** (316 mg, 0.95 mmol), 2-bromoethanol (0.15 mL, 2.1 mmol). Chromatography (40% EtOAc, petrol) gave **51** as a colourless oil (320 mg, 0.75 mmol, 80%). λ_{\max} (CH₃OH)/nm 218, Abs 0.624. IR 3027, 1689, 1450 cm⁻¹. ¹H

5 NMR (300 MHz, CDCl₃) δ 2.91 (m, 4H, O-CH₂-CH₂-Br), 3.88 (d, 1H, J = 14.6 Hz, N-CH₂), 4.98 (d, 1H, J = 14.6 Hz, N-CH₂), 7.18 (m, 1H, Ar-H), 7.33 (m, 10H, Ar-H), 7.50 (m, 2H, Ar-H), 7.93 (m, 1H, Ar-H). ¹³C NMR (75 MHz, CDCl₃) δ 30.1, 43.5, 63.1, 95.9, 123.6, 124.1, 126.8, 127.7, 128.6, 129, 130.2, 131.7, 133.1, 138.1, 138.5, 145.5, 168.5. LCMS (ESI+) m/z 424 [M+H]⁺.

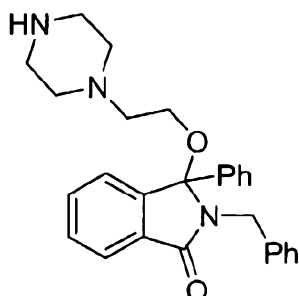
10

Sodium 2-(2-Benzyl-3-oxo-1-phenylisoindolin-1-yl)ethanesulfonate (65) (NU8210)



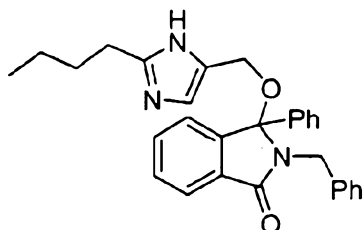
A mixture of **51**, sodium sulfite (200 mg, 1.65 mmol) in DME (10 mL) and water (10 mL) was heated to reflux for 24h, then evaporated to dryness. The residue was
 5 extracted with hot methanol (4 x 15 mL) and the combined extracts concentrated *in vacuo* giving a white solid which was washed with ether (20 mL) and petroleum ether (20 mL), then dissolved in DCM (50 mL) filtered and evaporated to give **65** as a white solid (95 mg, 26%), mpt 56 °C IR ν (cm⁻¹): 3437, 2929, 1689, 1454, 1373, 1175, 1036, 748, 686. ¹H-NMR (300 MHz, CDCl₃) δ_H 7.78 (1H, m, Ar), 7.46 (2H, m, Ar), 7.25-7.00 (11H, m, Ar), 4.69 (1H, d, J = 14.88 Hz, N-CH₂-Ph), 3.95 (1H, d, J = 14.88 Hz, N-CH₂-Ph), 3.12 (1H, m, O-CH₂-CH₂-SO₃Na), 2.99 (1H, m, O-CH₂-CH₂-SO₃Na), 2.62 (1H, m, O-CH₂-CH₂-SO₃Na), 2.31 (1H, m, O-CH₂-CH₂-SO₃Na). ¹³C-NMR (75 MHz, CDCl₃) δ_C 44.50, 51.97, 60.50, 97.54, 124.75, 125.22, 127.89, 128.06, 128.78, 129.77, 129.93, 130.02, 130.28, 130.43, 130.58, 131.53, 132.88, 134.69, 139.20, 139.96, 147.30, 170.69. LCMS (ESI+) 446 [M+1]⁺. Anal. Calcd. for C₂₃H₂₀NNaO₅S : C, 62.01; H, 4.53; N, 3.14. Found : C, 64.48; H, 6.16; N, 2.26.
 10
 15

2-Benzyl-3-phenyl-3-(2-piperazin-1-ylethoxy)-2,3-dihydroisoindolin-1-one (52)
 (NU8211)



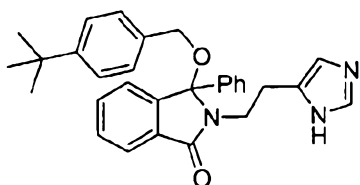
A mixture of **51** (289 mg, 0.6 mmol) and piperazine, (516 mg, 6 mmol) in MeOH (10 mL) was refluxed for 16 h, then concentrated *in vacuo*. The residues were dissolved in EtOAc (40 mL), washed with water (10 x 20 mL), brine (2 x 10 mL), dried (MgSO₄) and concentrated *in vacuo*. The residues were triturated in ether giving **52** as a white solid (80 mg, 0.18 mmol, 31%). mp 137.9-139.5 °C. λ_{\max} (CH₃OH)/nm 206.5, Abs 0.651. IR: 3341, 2927, 1681 cm⁻¹. ¹H NMR (500 MHz, CDCl₃) δ 1.89 (m, 1H, O-CH₂), 2.13 (m, 4H, HN-(CH₂)₂), 2.15 (bs, 1H, NH), 2.72 (m, 6H, CH₂-N-(CH₂)₂), 2.79 (m, 1H, O-CH₂), 3.82 (d, 1H, *J* = 14.9 Hz, N-CH₂), 4.78 (d, 1H, *J* = 14.7 Hz, N-CH₂), 7.06 (m, 1H, Ar-H), 7.17 (m, 10H, Ar-H), 7.40 (m, 2H, Ar-H), 7.83 (m, 1H, Ar-H). ¹³C NMR (125 MHz, CDCl₃) δ 43.1, 45.8, 54.4, 57.2, 60.3, 95.6, 123, 123.6, 126.4, 127.2, 128.2, 128.41, 128.45, 129.3, 129.5, 131.6, 132.5, 137.8, 145.6, 168.3. LCMS (ESI+) *m/z* 298, 428.2 [M+H]⁺. Anal. Calcd. for C₂₇H₂₉N₃O₂: C, 75.85; H, 6.84; N, 9.83%. Found C, 75.61; H, 6.75; N, 9.63%.

2-Benzyl-3-(2-butyl-3H-imidazol-4-ylmethoxy)-3-phenyl-2,3-dihydroisoindolin-1-one (46) (NU8212)



General procedure H: 11a (170 mg, 0.54 mmol), 2-butyl-3H-imidazol-4-yl)methanol (100 mg, 0.65 mmol). Chromatography (80% EtOAc, petrol) gave **46** as a white solid (104 mg, 0.2 mmol, 42%). mp 110-112.2 °C. λ_{\max} (CH₃OH)/nm 213, Abs 0.995. IR 2929, 1689, 1349 cm⁻¹. ¹H NMR (300 MHz, CDCl₃) δ 0.85 (t, 3H, J = 7.3 Hz, CH₃), 1.28 (sext, 2H, J = 7.6 Hz, CH₃-CH₂-CH₂), 1.55 (quint, 2H, J = 7.7 Hz, CH₃-CH₂-CH₂-CH₂), 2.49 (t, 2H, J = 7.6 Hz, CH₃-CH₂-CH₂-CH₂), 3.62 (d, 1H, J = 11.1 Hz, O-CH₂), 3.68 (d, 1H, J = 11.1 Hz, O-CH₂), 3.77 (d, 1H, J = 14.9 Hz, N-CH₂), 4.92 (d, 1H, J = 14.8 Hz, N-CH₂), 6.35 (bs, 1H, NH), 7.11 (m, 1H, Ar-H), 7.23 (m, 11H, Ar-H, + Ha), 7.77 (m, 2H, Ar-H), 7.88 (m, 1H, Ar-H). ¹³C NMR (75 MHz, CDCl₃) δ 14.5, 22.7, 23, 28.6, 43.5, 96.1, 123.7, 124, 126.8, 127.6, 128.8, 129.7, 130, 131.1, 133.1, 138.6, 145.8, 149.4, 168.9. LCMS (ESI+) m/z 453.2 [M+H]⁺. Anal. Calcd. for C₂₉H₂₉N₃O₂: C, 77.13; H, 6.47; N, 9.31%. Found C, 73.30; H, 6.25; N, 8.64%.

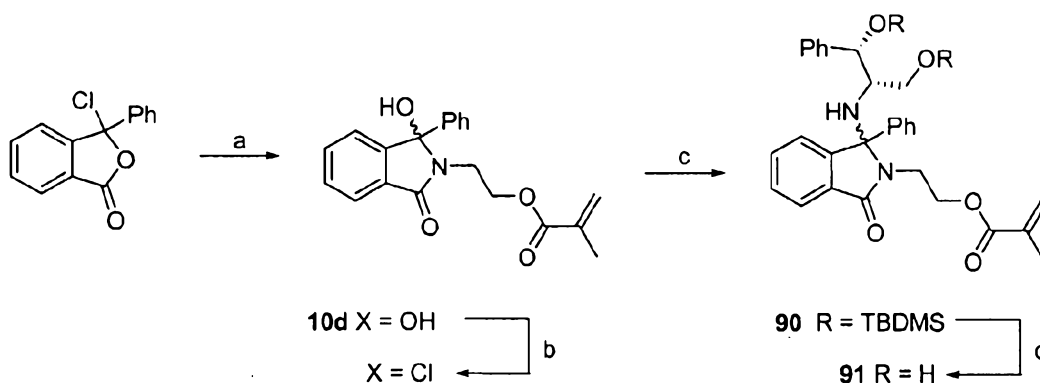
3-(4-*t*-Butylbenzyloxy)-2-[2-(3H-imidazol-4-yl)-ethyl]-3-phenyl-2,3-dihydroisoindolin-1-one (57) (NU8214)



General procedure I: 10e (0.10g, 0.32 mmol), 4-*t*-butylbenzyl alcohol (0.06 mL, 0.35 mmol) in presence of triethylamine (0.10 mL, 0.70 mmol) in THF (8 mL). Trituration from petrol gave **57** as an off-white solid (80%) mp 187-188 °C. UV λ_{\max} = 231 nm. FTIR ν (cm⁻¹): 3387 (NH), 3093-2954 (C-HAr), 1705 (C=O amide); ¹H NMR (300 MHz, CDCl₃) δ_H (ppm) 1.22 (9H, s, *t*-Bu), 2.76 (1H, m, CH₂), 2.99 (1H,

m, CH₂), 3.24 (1H, m, NCH₂), 4.4 (1H, m, NCH₂), 5.71 (2H, s, OCH₂), 6.90 (1H, bs, HNCH=N), 6.99 (1H, dd, J_{H-H} = 2.8 Hz, C=CH), 7.35 (7H, m, Ar-H), 7.59 (1H, t, J_{H-H} = 7.55 Hz, Ar-H), 7.83 (2H, t, 7.84 Hz, Ar-H), 8.5 (1H, d, J_{H-H} = 7.67 Hz, Ar-H); ¹³C NMR (125 MHz, CDCl₃) δ_C (ppm) 19.8 (CH₂), 31.6 (CH₃), 32.7 (CH₂), 35.1 (CH), 53.8 (CH₂), 82 (CNO), 117.5–143.9 (CH-Ar), 153.2 (N=C-N), 167.4 (C=O). LCMS (ESI⁺): m/z = 466, [M+Na]⁺. Anal. Calc. for C₃₀H₃₁N₂O₃: C, 77.39; H, 6.71; N, 9.03%; Found: C, 67.63; H, 5.82; N, 7.73%.

2-Methylacrylic acid 2-{1-[2-(*t*-butyldimethylsilanyloxy)-1-(*t*-butyldimethylsilanyloxymethyl)-2-phenylethylamino]-3-oxo-1-phenyl-1,3-dihydroisoindolin-2-yl}ethyl ester (90)

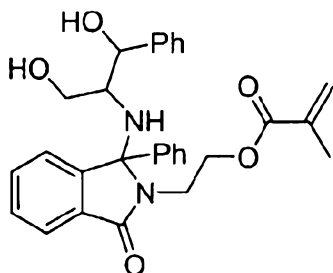


General procedure I: **10d** (0.57 g, 1.7 mmol), 2-(*t*-butyldimethylsilanyloxy)-1-(*t*-butyldimethylsilanyloxymethyl)-2-phenylethylamine (0.74 g, 1.87 mmol), and triethylamine (0.52 mL, 3.74 mmol) in DMF (17 mL). Chromatography (EtOAc, petrol: 3:17) gave **90** as an oil (0.19 g, 0.2 mmol, 12%) as a mixture of diastereoisomers in 1: 1 ratio. FTIR ν (cm⁻¹): 2933 (C-H Ar), 1699 (C=O). ¹H NMR (300 MHz, CDCl₃) δ_H (ppm) 0 (12H, m, 4CH₃), 0.91 (9H, d, *t*-Bu), 1.05 (9H, d, *t*-Bu), 1.70 (3H, s, CH₃), 1.98 (1H, d, CH₂), 2.4 (1H, m, NCH₂), 2.76 (1H, m, OCH₂), 3.03 (1H, m, OCH₂), 3.62 (3H, m, OCH₂ and OCH), 4.23 (1H, m, NCH), 5.06 (1H, s, CH), 5.27

(1H, s, CH), 5.63 (1H, s, CH), 6.16 (1H, s, CH), 7.35 (13H, m, Ar-H), 7.91 (1H, m, H₄); ¹³C NMR (75 MHz, CDCl₃) δ (ppm) -5.6 (CH₃), -5.4 (CH₃), -5.3 (CH₃), -5.1 (CH₃), -4.7 (CH₃), -4.4 (CH₃), 17.9 (CH₃), 25.8 (CH₃), 25.9 (CH₃), 26 (CH₃), 35.8 (CH₂), 37.5 (CH₂), 59.6 (OCH₂), 60 (NCH₂), 61 (OCH), 72.1 (NCH), 82 (OCH₂), 123.2-143.

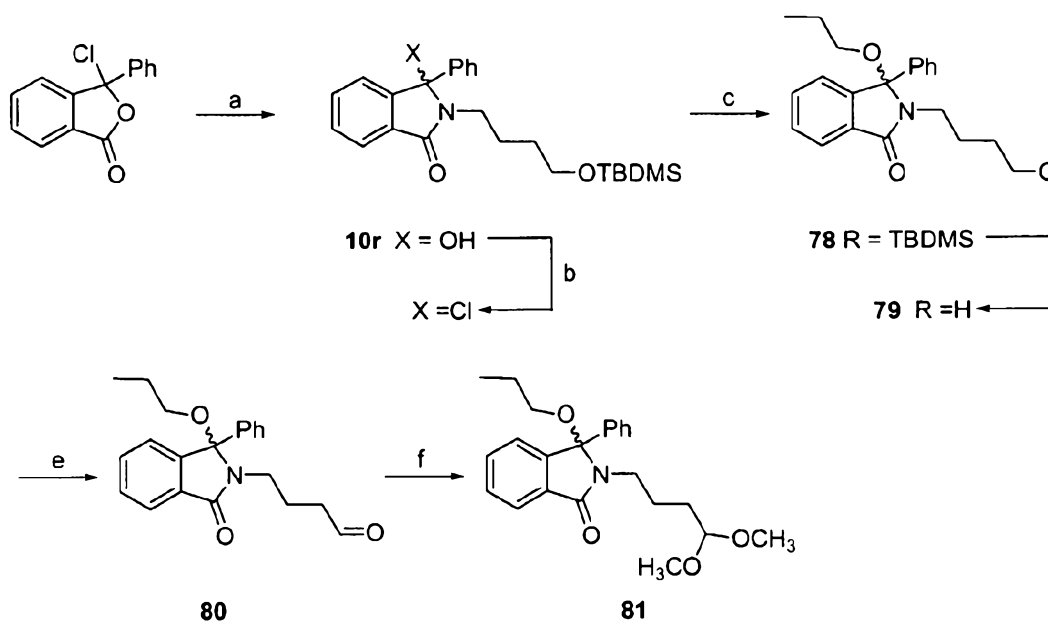
5

2-Methylacrylic acid 2-[1-(2-hydroxy-1-hydroxymethyl-2-phenylethylamino)-3-oxo-1-phenyl-1,3-dihydroisoindolin-2-yl]ethyl ester (91) (NU8216)



- 10 To a solution of **90** in THF (5 mL) was added TBAF (1 M in THF; 0.47 mL, 0.47 mmol). The mixture was stirred 16 h, then diluted with water (5 mL) and extracted with EtOAc (3 x 10 mL). The organic layers were combined and washed with saturated brine (10 mL), dried (MgSO₄), and concentrated *in vacuo*. Chromatography (EtOAc,petrol; 95:5), gave **91** (0.08 g, 0.20 mmol, 76%) as a single diastereoisomer,
- 15 m^p187-188 °C. UV λ_{max} = 237 nm. FTIR ν (cm⁻¹) 3343 (NH, OH), 3032-2932 (C-H Ar), 1672 (C=O); ¹H NMR (300 MHz, CDCl₃) δ (ppm) 1.77 (3H, s, CH₃), 2.14 (1H, dd, CH₂OH), 2.18 (1H, bs, OH), 2.50 (1H, dd, CH_{2dia}OH), 2.45 (1H, bs, OH_{dia}), 3 (1H, q, NCH₂), 3.10 (1H, bs, NH), 3.40 (3H, m, NCH₂, NCH_{dia}), 3.80 (2H, m, OCH₂), 4.74 (1H, dd, J_{H-H} = 5.2 Hz, CHOH), 5.43 (1H, d, J_{H-H} = 1.53 Hz, CH), 5.94 (1H, d, J_{H-H} = 1.04 Hz, CH),
- 20 6.28 (1H, d, J_{H-H} = 7.58 Hz, Ar-H), 7.12-7.37 (13H, m, Ar-H), 7.70 (1H, m, Ar-H₄); ¹³C NMR (75 MHz, CDCl₃) δ (ppm): 18.6 (CH₃), 37.5 (CH₂), 58.2 (NCH₂), 61.4 (OCH₂), 62.9 (CH₂), 76.0 (CH), 82 (C), 123.3-149.5 (C-Ar), 167.3 (C=O), 169.4 (C=O). LCMS (ESI+) m/z = 487, [M+H]⁺.

4-(3-Oxo-1-phenyl-1-propoxy-1,3-dihydro-isoindolin-2-yl)butyraldehyde (**80**).

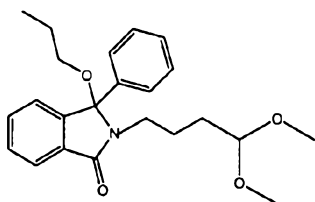


5

TBAF (1M solution in THF ; 230 mg, 0.87 mmol) and **78** (250 mg, 0.43 mmol) in THF (10 mL) gave **79** (140 mg, 100%) which was used without further purification. To a solution of oxalyl chloride (72 μ L, 0.83 mmol) in dry DCM (10 mL), a solution of DMSO (71 mg, 0.91 mmol) in DCM (2 mL) was added dropwise at -78° C under nitrogen atmosphere. After 30 min, a solution of **79** (140 mg, 0.41 mmol) in DCM (10 mL) was added dropwise for 10 min. and stirring was continued at -78° C for 30 min. Triethylamine (0.209mg, 2.06 mmol) was added and the reaction mixture allowed to warm to rt and quenched with water (50 mL). The organic layer was separated and the aqueous layer was extracted with DCM (2 x 50 mL). The combined organic extracts were washed with water (3 x 30 mL), brine (30 mL), dried and concentrated. Chromatography (silica: 40% EtOAc, petroleum ether) gave **80** as colourless oil. (127 mg, 91%). IR ν (cm⁻¹) 2933, 2724, 1697, 1453, 1371, 1182, 1042, 850, 757, 694. ¹H-NMR (300MHz, CDCl₃) δ _H 9.55 (1H, s, CHO) ; 7.78

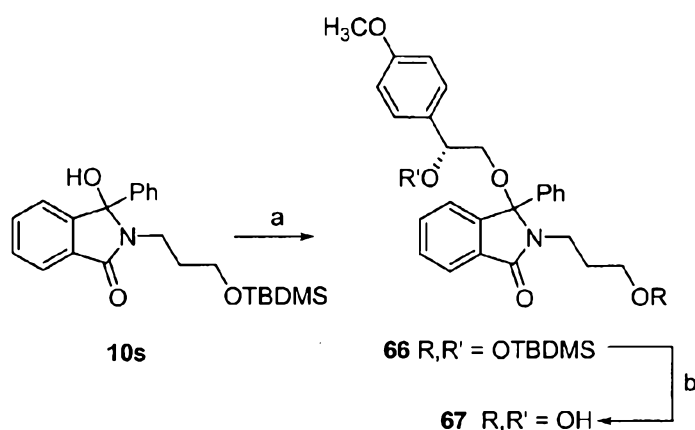
(1H, m, Ar) ; 7.41 (2H, m, Ar) ; 7.29 (2H, m, Ar) ; 7.23 (3H, m, Ar) ; 7.07 (1H, m, Ar); 3.19 (2H, m, OCH₂); 3.00 (1H, m, NCH₂); 2.76 (1H, m, NCH₂); 2.26 (2H, m, CH₂CHO); 1.57 (4H, m, 2 x CH₂); 0.86 (3H, t, J = 7.37 Hz, CH₃). ¹³C-NMR (75MHz, CDCl₃) δ_C 11.21, 21.25, 23.14, 38.89, 41.84, 64.58, 95.13, 123.52, 123.65, 126.66, 128.81, 128.91, 129.97, 132.26, 132.86, 139.51, 146.19, 168.97, 201.83.

2-(4,4-Dimethoxybutyl)-3-phenyl-3-propoxy-2,3-dihydroisoindolin-1-one (81)
(NU8217)

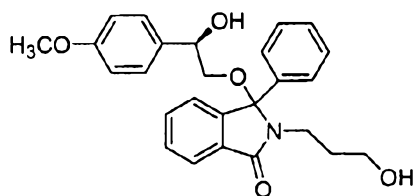


A mixture of **80** (120mg, 0.36 mmol), dry methanol (10 mL) and ammonium chloride (cat) was heated at 50° C for 36h, then concentrated *in vacuo* and extracted with EtOAc (100 mL), washed with water (2 x 50 mL), brine (50 mL), dried and concentrated. Chromatography (silica: 30% EtOAc, petroleum ether) gave **81** as a colorless viscous oil (83 mg, 61%). IR ν (cm⁻¹): 2934, 1697, 1453, 1368, 1180, 1048, 853, 757, 693. ¹H-NMR (300MHz, CDCl₃) δ_H 7.78 (1H, m, Ar), 7.39 (2H, m, Ar), 7.29 (2H, m, Ar), 7.22 (3H, m, Ar), 7.06 (1H, m, Ar), 4.16 (1H, t, J = 5.55 Hz, CH(OMe)₂), 3.2 (1H, m, OCH₂), 3.16 (3H, s, OMe), 3.15 (3H, s, OMe), 3.06 (1H, m, OCH₂ and NCH₂), 2.76 (1H, m, NCH₂), 2.31 (2H, m, OCH₂CH₂CH₃), 1.43 (3H, m, NCH₂CH₂CH₂CH), 1.30 (1H, m, NCH₂CH₂CH₂CH), 0.87 (3H, t, J = 7.46 Hz, OCH₂CH₂CH₃). ¹³C-NMR (75MHz, CDCl₃) δ_C 11.20, 23.14, 23.79, 30.61, 39.63, 52.98, 53.50, 64.50, 95.22, 104.52, 123.42, 123.62, 126.71, 128.73, 129.86, 132.44, 132.68, 139.63, 146.24, 168.77. LCMS (ESI+) 406 [M+1]⁺.

3-((*R*)-2-(*tert*-Butyldiphenylsilyloxy)-2-(4-methoxyphenyl)ethylamino)-2-(3-(*tert*-butyldiphenylsilyloxy)propyl)-3-phenylisoindolin-1-one (66).

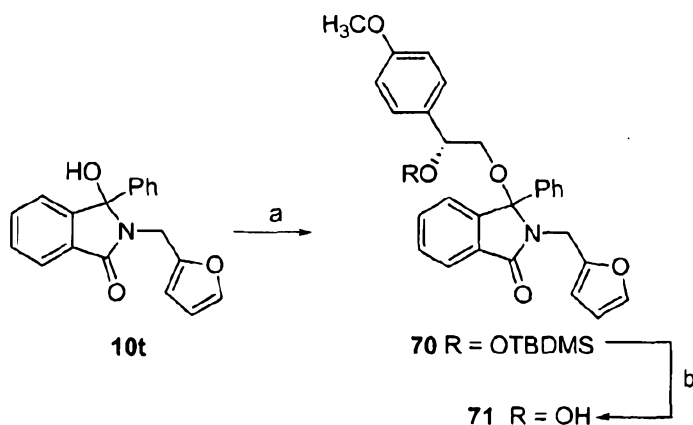


- 5 **General procedure I:** **10s** (370 mg, 0.7 mmol), thionyl chloride (126 mg, 1.1 mmol), THF (10 mL), (*R*)-2-(*tert*-butyldiphenylsilyloxy)-2-(4-methoxyphenyl)ethylamine (344 mg, 0.85 mmol), triethylamine (143 mg, 1.4 mmol), DMF (10 mL).
- Chromatography (20%EtOAc, petrol) gave **66**. $^1\text{H-NMR}$: δ_{H} (300MHz, CDCl_3) : 7.82 (1H, m, Ar); 7.47 – 7.10 (32H, m, Ar); 6.74 (1H, dd, $J = 8.72$ Hz, Ar); 5.03 (1H, m, -CH-OSi); 3.85 – 3.68 (5H, m, $-\text{OCH}_2$, $-\text{OCH}_3$); 3.06 (4H, m, $-\text{NCH}_2$); 2.03 (1H, m, $-\text{CH}_2$); 1.74 (1H, m, $-\text{CH}_2$); 1.05 (9H, s, ^tBu); 0.92 (9H, s, ^tBu). $^{13}\text{C-NMR}$: δ_{C} (75MHz, CDCl_3) : 19.54, 27.06, 27.45, 31.03, 37.81, 48.01, 49.18, 55.59, 60.80, 63.30, 73.39, 74.78, 90.93, 91.43, 91.96, 113.86, 123.56, 126.58, 127.77, 128.09, 128.24, 128.98, 130.13, 135.92, 136.21, 136.58, 139.57, 149.67, 159.26, 168.35.
- 15 3-((*R*)-2-Hydroxy-2-(4-methoxyphenyl)ethylamino)-2-(3-hydroxypropyl)-3-phenylisoindolin-1-one (**67**) (NU8218)



66 (400 mg, 0.44 mmol), tetrabutylammonium fluoride (345 mg, 1.32 mmol; 1M solution in THF), THF (10 mL). Chromatography (40% EtOAc, petrol) gave **67** as a white solid. IR ν (cm⁻¹): 3386, 3047, 2924, 1635, 1446, 1407, 1342, 1219, 1176, 1020, 934, 815, 748, 678. ¹H-NMR : δ_H (300MHz, CD₃OD) : 7.8 (1H, m, Ar); 7.57 (2H, m, Ar); 7.38 (5H, m, Ar); 7.25 (3H, m, Ar); 6.48 (2H, m, Ar), 4.73 (1H, dd, J = 3.45 & 9.13 Hz, -CH-OH); 3.89 (1H, dd, J = 8.0 & 14.4 Hz, -OCH₂-); 3.76 (3H, s, -OCH₃); 3.72 (1H, dd, -OCH₂-); 3.32 (4H, m, -NCH₂-); 3.12 (2H, m, -CH₂-). ¹³C-NMR : δ_C (125MHz, CD₃OD) : 56.05, 73.57, 74.03, 92.79, 93.50, 115.04, 115.15, 124.39, 124.45, 127.69, 127.77, 128.83, 129.96, 130.02, 130.14, 130.98, 131.70, 131.75, 134.57, 134.61, 135.59, 135.78, 140.85, 141.00, 151.35, 151.40, 161.03, 161.14, 170.94, 171.24. Anal. Calcd. for C₂₆H₂₈N₂O₄ : C, 72.20; H, 6.53; N, 6.48. Found : C, 73.11, H, 5.65; N, 3.30.

3-[(*R*)-2-(*tert*-Butyldiphenylsilanyloxy)-2-(4-methoxyphenyl)ethylamino]-2-furan-2-ylmethyl-3-phenyl-2,3-dihydroisoindolin-1-one (**70**).



General procedure I: **10t** (200 mg, 0.65 mmol), thionyl chloride (116 mg, 0.98 mmol), (*R*)-2-(*tert*-butyldiphenylsilanyloxy)-2-(4-methoxyphenyl)ethylamine (317 mg, 0.78 mmol), triethylamine (132 mg, 1.3 mmol), DMF (10 mL). Chromatography

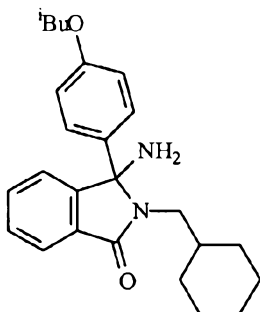
(silica: 40% EtOAc, petroleum ether) gave **70** as a light brown solid (240 mg, 53%)
LCMS (ESI+) 693 [M+H]⁺.

5 *NU8219 2-Furan-2-ylmethyl-3-[2-hydroxy-2-(4-methoxyphenyl)ethylamino]-3-phenyl-2,3-dihydroisoindolin-1-one (71).*

TBAF (1M solution in THF ; 345 mg, 1.3 mmol) and **70** (400 mg, 0.44 mmol) in THF (10 mL) gave **72** as an off white solid (175 mg, 89%). IR ν = 3342, 3064, 2910, 2838, 1658, 1448, 1408, 1404, 1226, 1175, 1031, 833, 748 cm⁻¹. ¹H-NMR (300MHz, CDCl₃) δ_{H} 7.76 (1H, m, Ar); 7.29 (8H, m, Ar); 7.10 (2H, m, Ar); 6.95 (2H, t, J = 8.44
10 Hz, Ar); 6.72 (2H, m, CH and NH); 6.23 (1H, m, furan); 6.17 (1H, m, furan); 4.92 (1H, dd, J = 15.75 Hz, NCH₂); 4.30 (1H, m, CHOH), 3.92 (1H, dd, J = 15.75 Hz, NCH₂); 3.69 (3H, d, J = 3.34 Hz, OCH₃); 2.59 (1H, br, OH); 1.98 (2H, m, NHCH₂).
¹³C-NMR (125MHz, CDCl₃) δ_{C} 35.48, 35.59, 48.99, 49.98, 55.66, 72.92, 84.20, 109.55, 109.77, 111.04, 111.40, 114.02, 114.14, 122.99, 123.16, 124.10, 124.15,
15 126.44, 127.28, 127.36, 128.77, 128.94, 129.34, 129.47, 131.28, 132.91, 133.06, 133.90, 134.69, 139.79, 140.03, 142.24, 142.31, 147.75, 148.20, 151.08, 151.32, 159.47, 168.44, 168.76. LCMS (ESI+) 455 [M+H]⁺. Anal. Calcd. for C₂₈H₂₆N₂O₄ C, 73.99; H, 5.77; N, 6.16. Found : 72.15; H, 5.67; N, 5.49.

20

3-Amino-2-cyclohexylmethyl-3-(4-isobutoxyphenyl)isoindolinone.



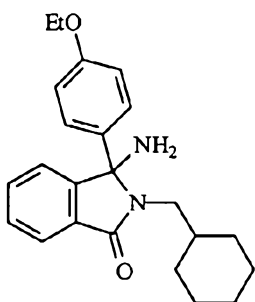
General procedure K. 4-isobutoxybenzonitrile, gave off white crystals (687 mg,

77%). Mpt 87.2-91.6 °C, $^1\text{H-NMR}$: δ_{H} (300MHz, CDCl_3) : 0.87 (2H, m, CH_2); 0.93 (6H, d, $J = 6.7$ Hz, 2 x CH_3); 1.07 (2H, m, CH); 1.55 (7H, m, CH); 1.99 (3H, m, CH,

5 NH_2); 2.66 (1H, m, NCH_2), 3.37 (1H, m, NCH_2); 3.61 (2H, d, $J = 6.53$ Hz, OCH_2) ; 6.67 (2H, d, $J = 8.9$ Hz, ArH); 7.22 (3H, m, ArH); 7.35 (2H, m, ArH); 7.74 (1H, m, ArH). $^{13}\text{C-NMR}$: δ_{C} (125MHz, CDCl_3) : 19.6, 26.3, 26.7, 28.6, 31.5, 31.7, 38.0, 47.1, 74.9, 79.8, 115.6, 122.5, 124.0, 127.0, 127.4, 129.0, 129.2, 130.5, 131.0, 132.5, 134.5, 148.5, 160.1, 166.8, 169.4. Anal. Calcd. for $\text{C}_{25}\text{H}_{32}\text{N}_2\text{O}_2$: C, 76.49; H, 8.22; N, 7.14.

10 Found : C, 76.12, H, 8.27; N, 7.02

3-Amino-2-cyclohexylmethyl-3-(4-ethoxyphenyl)isoindolinone.



General procedure K. 4-ethoxybenzonitrile, gave off white crystals (262 mg, 63%).

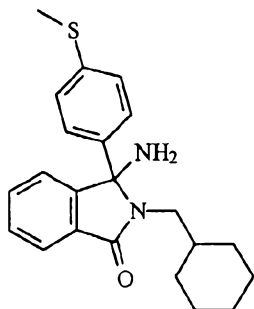
15 Mpt 153-154 °C, $^1\text{H-NMR}$: δ_{H} (300MHz, CDCl_3) : 0.97 (2H, m, CH_2); 1.14 (2H, m,

CH₂); 1.41 (3H, t, J = 6.99 Hz, CH₃); 1.66 (7H, m, CH, CH₂); 2.11 (2H, s, NH₂), 2.76 (1H, m, NCH₂); 3.45 (1H, m, NCH₂); 4.01 (2H, q, J = 7.02 Hz, OCH₂); 6.84 (2H, m, ArH); 7.31 (3H, m, ArH); 7.46 (2H, m, ArH); 7.82 (1H, m, ArH). ¹³C-NMR : δ_C (125MHz, CDCl₃) : 14.9, 26.0, 26.1, 26.5, 31.4, 31.8, 36.6, 37.3, 80.1, 114.7, 122.5, 123.4, 127.6, 128.8, 130.7, 132.1, 132.3, 150.9, 159.0, 168.4. Anal. Calcd. for C₂₃H₂₈N₂O₂: C, 75.79; H, 7.74; N, 7.69. Found : C, 75.39, H, 7.99; N, 7.46.

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15

3-Amino-2-cyclohexylmethyl-3-(4-methanesulphonylphenyl)isoindolinone.



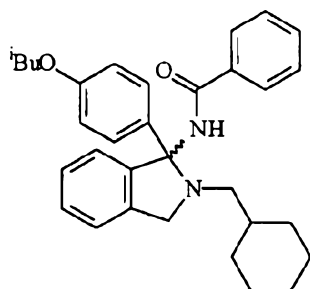
General procedure K. 4-methanesulphonylbenzonitrile, gave off white crystals (499

mg, 60%). Mpt 114-116 °C, ¹H-NMR : δ_H (300MHz, CDCl₃) : 0.87 (2H, m, CH₂);

1.07 (2H, m, CH₂); 1.56 (7H, m, CH); 2.03 (2H, s, NH₂), 2.39 (3H, s, SCH₃); 2.64 (1H, m, NCH₂); 3.39 (1H, m, NCH₂); 7.11 (2H, m, ArH); 7.23 (3H, m, ArH); 7.37 (2H, m, ArH); 7.75 (1H, m, ArH). ¹³C-NMR : δ_C (125MHz, CDCl₃) : 14.9, 26.0, 26.1, 26.5, 31.4, 31.8, 36.6, 37.3, 80.1, 114.7, 122.5, 123.4, 127.6, 128.8, 130.7, 132.1, 132.3, 150.9, 159.0, 168.4. Anal. Calcd. for C₂₂H₂₆N₂OS: C, 72.09; H, 7.31; N, 7.49. Found : C, 72.14, H, 7.31; N, 7.46.

10

15 *N*-[2-Cyclohexylmethyl-1-(4-isobutoxyphenyl)-3-oxo-2,3-dihydro-1H-isoindolin-1-yl]benzamide (NU8200)

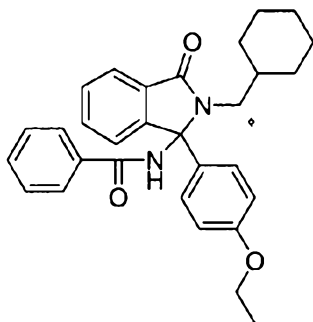


General Procedure L: 3-Amino-2-cyclohexylmethyl-3-(4-

20 isobutoxyphenyl)isoindolininone, gave a white powder (236 mg, 93%). Mpt 138-141

°C, $^1\text{H-NMR}$: δ_{H} (300MHz, CDCl_3) : 0.89 (10H, m, 2 x CH_3 , CH_2); 1.49 (7H, m, CH_2); 1.68 (1H, m, CH); 2.90 (1H, m, NCH_2); 3.63 (2H, d, $J = 6.65$ Hz, OCH_2), 6.83 (3H, m, ArCH, NH); 7.21 (4H, m, ArH); 7.43 (4H, m, ArH); 7.73 (2H, m, ArH); 7.80 (1H, m, ArH). $^{13}\text{C-NMR}$: δ_{C} (125MHz, CDCl_3) : 19.6, 26.3, 26.7, 28.6, 31.5, 31.7, 38.0, 47.1, 74.9, 79.8, 115.6, 122.5, 124.0, 127.0, 127.4, 129.0, 129.2, 130.5, 131.0, 132.5, 134.5, 148.5, 160.1, 166.8, 169.4. Anal. Calcd. for $\text{C}_{32}\text{H}_{36}\text{N}_2\text{O}_3 \cdot 0.4\text{H}_2\text{O}$: C, 77.39; H, 7.31; N, 5.56. Found : C, 77.28, H, 7.36; N, 5.56.

N-[2-Cyclohexylmethyl 1-(4-ethoxyphenyl)- 3-oxo-2,3-dihydro-1*H*-isoindolin-1-yl]benzamide (NU8201)

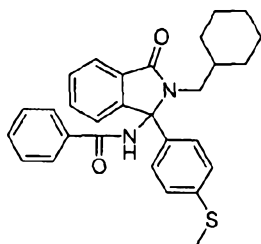


General Procedure L: 3-Amino-2-cyclohexylmethyl-3-(4-ethoxyphenyl)isoindolinone, gave a white powder (81 mg, 78%). Mpt 177-178 °C, $^1\text{H-NMR}$: δ_{H} (300MHz, CDCl_3) : 0.86 (4H, m, 2 x CH_2); 1.33 (3H, t, $J = 6.98$, CH_3); 1.50 (6H, m, CH_2); 1.67 (1H, m, CH_2); 2.90 (2, m, NCH_2), 3.52 (1H, m, NCH_2); 3.95 (2H, q, $J = 6.85$, OCH_2); 6.83 (3H, m, ArH); 7.21 (3H, m, ArH); 7.43 (5H, m, ArH); 7.76 (3H, m, ArH). $^{13}\text{C-NMR}$: δ_{C} (125MHz, CDCl_3) : 14.8, 25.96, 25.97, 26.34, 31.17, 31.36, 37.71, 46.75, 63.66, 79.42, 155.19, 122.19, 123.61, 126.76, 127.05,

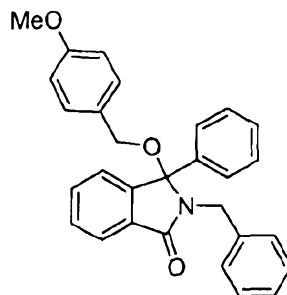
128.68, 128.87, 130.26, 130.66, 132.19, 134.20, 148.11, 159.43, 166.43, 169.08.

Anal. Calcd. for $C_{30}H_{32}N_2O_3$: C, 76.82; H, 6.79; N, 5.92. Found : C, 76.90, H, 6.88; N, 5.98.

5 *N*-[2-Cyclohexylmethyl-1-(4-methylsulfonylphenyl)-3-oxo-2,3-dihydro-1*H*-isoindolin-1-yl]benzamide (NU8202)



2-Benzyl-3-(4-methoxybenzyloxy)-3-phenyl-2,3-dihydroisoindolin-1-one (NU8226)

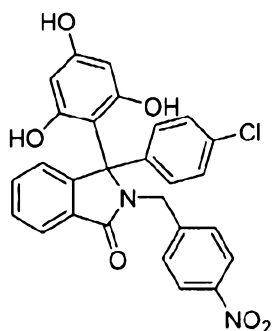


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2-Benzyl-3-chloro-3-phenyl-2,3-dihydroisoindolin-1-one (316 mg, 0.95 mmol) was reacted with para-methoxybenzyl alcohol (0.26 mL, 2.1 mmol) as for general procedure C. The crude product was purified by flash column chromatography (30:70 EtOAc:petrol) to give 2-benzyl-3-(4-methoxybenzyloxy)-3-phenyl-2,3-dihydroisoindol-1-one as a colourless oil (363 mg, 0.8 mmol, 87%); R_f 0.57 (40:60 EtOAc:petrol). λ_{max} (CH₃OH)/nm 205, Abs 0.923. IR: 3024, 2928, 1698, 1489 cm^{-1} .

^1H NMR: (300 MHz, CDCl_3) δ 3.56 (d, 1H, $J = 10.5$ Hz, O- CH_2), 3.64 (d, 1H, $J = 10.6$, O- CH_2), 3.71 (s, 3H, OMe), 3.95 (d, 1H, $J = 14.7$ Hz, N- CH_2), 4.74 (d, 1H, $J = 14.7$ Hz, N- CH_2), 6.68 (d, 2H, $J = 6.5$ Hz, Ar-H), 6.75 (d, 2H, $J = 6.6$ Hz, Ar-H), 7.10 (m, 4H, Ar-H), 7.23 (m, 7H, Ar-H), 7.42 (m, 2H, Ar-H), 7.88 (m, 1H, Ar-H). ^{13}C NMR: (75 MHz, CDCl_3) δ 43.7, 55.5, 64.8, 95.9, 113.8, 123.4, 126.8, 127.4, 128.5, 128.7, 129.4, 129.7, 132, 132.9, 137.9, 138.8, 146.1, 159.3, 168.6. LC/MS-ES $^+$ m/z 298.1, 436 [MH^+], 458.1 [MNa^+]. Anal. Calcd. for $\text{C}_{29}\text{H}_{25}\text{NO}_3 \cdot 0.4\text{H}_2\text{O}$: C, 78.84; H, 5.86; N, 3.17%. Found C, 79.33; H, 5.39; N, 2.71%.

10 *3-(4-Chlorophenyl)-2-(4-nitrobenzyl)-3-(2,4,6-trihydroxyphenyl)-2,3-dihydroisindolin-1-one (NU8262)*



3-Chloro-3-(4-chlorophenyl)-2-(4-nitrobenzyl)-2,3-dihydroisindolin-1-one (156 mg, 0.37 mmol) was reacted with phloroglucinol (479 mg, 3.79 mmol) as for general procedure C. The crude product was purified by HPLC ($\text{H}_2\text{O}:\text{MeOH}$, 270 nm) to give 3-(4-chlorophenyl)-2-(4-nitrobenzyl)-3-(2,4,6-trihydroxyphenyl)-2,3-dihydroisindolin-1-one as a pale yellow solid (115 mg, 0.22 mmol, 61%); $R_f = 0.14$ (40:60: EtOAc: petrol). mp 196.3-198.5 $^\circ\text{C}$. λ_{max} (CH_3OH)/nm 230.5, Abs 0.994. IR: 3218, 1654, 1603, 1515, 1340 cm^{-1} . ^1H NMR: (300 MHz, d_6 -DMSO) δ 4.78 (d, 1H, $J = 16.9$ Hz, N- CH_2), 4.94 (d, 1H, $J = 17$ Hz, N- CH_2), 5.58 (s, 2H, Ar-H), 7.03-7.21 (m, 6H, Ar-H), 7.36 (t, 1H, $J = 6.6$ Hz, Ar-H), 7.48 (m, 2H, Ar-H), 7.65 (d, 1H, $J = 7.4$ Hz, Ar-H), 7.86 (d, 1H, $J = 8.7$ Hz, Ar-H), 9.10 (s, 2H, Ar-OH), 9.27 (bs, 1H, Ar-OH). ^{13}C

NMR: (75 MHz, d_6 -DMSO) δ 44, 71.8, 95.5, 101.1, 122.7, 122.8, 123.9, 125.2, 127.1, 127.7, 128.5, 129.3, 130.7, 132, 144, 145.9, 147, 153.2, 158.4, 158.6, 168.2. LC/MS-ES⁺ m/z 503.1, 504.1, 505.1.. Anal. Calcd. for C₂₇H₁₉ClN₂O₆: C, 64.48; H, 3.81; N, 5.57%. Found C, 63.11; H, 3.97; N, 5.53%. HRMS (EI) m/z Calcd. for
5 C₂₇H₁₉ClN₂O₆: 502.0931. Found 502.0912.

2-(4-Hydroxy)benzoylbenzoic acid.

Phenolphthalein (7 g, 22 mmol) was dissolved in aqueous potassium hydroxide solution (7 g in 70 mL) giving a vivid purple solution. Hydroxylamine hydrochloride
10 (1.71 g, 24 mmol) was added and the solution heated to 80°C. The reaction was monitored by acidifying a sample of the mixture with acetic acid, filtering off the precipitate and adding potassium hydroxide. When no pink colour was observed on the addition of potassium hydroxide the reaction was left stirring for another 5 min. Ethanol (14 mL) was added, and acetic acid was added dropwise until the solution
15 was slightly acidic. A sulphur yellow precipitate formed and was washed with water and dissolved in hot sulphuric acid (10%, 140 mL) giving a bright yellow solution that was refluxed for 2 h. On cooling a deep yellow solid was obtained filtered and washed with ice cold water yielding 2-(4-Hydroxy)benzoylbenzoic acid as a light yellow solid (4.04 g, 16.6 mmol, 76%); R_f 0.06 (40:60 EtOAc:petrol). mp 228.4-
20 230.6°C. Lit. 231°C.⁸ IR: 3232, 3163, 1688, 1644, 1577, 1381 cm⁻¹. ¹H NMR: (300 MHz, d_6 -DMSO) δ 6.83 (m, 2H, Ar-H), 7.34 (dd, 1H, J = 7.4, 1.3 Hz, Ar-H), 7.50 (m, 2H, Ar-H), 7.58-7.71 (dtd, 2H, J = 22.4, 7.4, 1.3 Hz, Ar-H), 7.95 (dd, 1H, J = 7.6, 1.3 Hz, Ar-H), 10.30 (bs, 1H, COOH). ¹³C NMR: (75 MHz, d_6 -DMSO) δ 115.5, 127.7, 128.6, 129.6, 130, 130.1, 131.9, 132.4, 142.2, 162.4, 167.3, 195.1. LC/MS-ES⁺
25 m/z 129.3, 225.1, 264.9, 506.8.

2-(4-Hydroxybenzoyl)benzoic acid methyl ester.

Acetyl chloride (2.67 mL, 37.5 mmol), was added dropwise to ice cold methanol (40 mL) whilst stirring. 2-(4-Hydroxy)benzoylbenzoic acid (3.9 g, 16.1 mmol) was added and the mixture was allowed to warm to room temperature. After 16 h the solvent
5 was removed leaving a light green oil which was triturated with water, washed with ice cold petrol and dried *in vacuo* giving 2-(4-hydroxybenzoyl)benzoic acid methyl ester as a light green solid (3.8 g, 14.8 mmol, 92%); R_f 0.43 (40:60 EtOAc:petrol). mp 147.1-149.3 °C. Lit. 149-150 °C. IR: 3338, 1719, 1644, 1569, 1511, 1432 cm⁻¹.
1H NMR: (300 MHz, d₆-DMSO) δ 3.58 (s, 3H, COOCH₃), 6.84 (d, 2H, J = 8.6 Hz, Ar-H), 7.41 (d, 1H, J = 7.3 Hz, Ar-H), 7.51 (d, 2H, J = 8.6, Ar-H), 7.61-7.74 (dt, 2H, J = 24.2, 6.5 Hz, Ar-H), 7.95 (d, 1H, J = 7.4 Hz, Ar-H), 10.47 (bs, 1H, COOH). 13C
10 NMR: (75 MHz, d₆-DMSO) δ 52.4, 115.7, 127.7, 128.5, 129.6, 129.9, 130.1, 131.9, 132.4, 141.9, 162.5, 166.3, 194.7. LC/MS-ES+ m/z 256.9 [M+H]⁺.

15 *2-[4-(2-Trimethylsilanylethoxymethoxy)benzoyl]benzoic acid methyl ester.*

A mixture of 2-(4-hydroxybenzoyl)benzoic acid methyl ester (3.65 g, 15 mmol), cesium carbonate (5.4 g, 16.5 mmol), and trimethylsilylethoxymethylchloride (2.9 mL, 16.5 mmol), in CH₃CN (50 mL) was stirred at rt 24 h, the concentrated *in vacuo*. The residues were dissolved in ethyl acetate (100 mL), washed with water (3 x
20 50 mL), brine (40 mL), dried (MgSO₄), and concentrated *in vacuo*. Chromatography (EtOAc:petrol; 5:95) to give the product as a yellow oil (3.94 g, 10.2 mmol, 67%). λ_{max} (CH₃OH)/nm 282, Abs 1.072. IR: 2939, 1720, 1666, 1589, 1489 cm⁻¹. 1H NMR: (300 MHz, CDCl₃) δ 0.00 (s, 9H, Si-(CH₃)₃), 0.94 (m, 2H, R-O-CH₂-CH₂-Si), 3.66 (s, 3H, COOCH₃), 3.75 (m, 2H, O-CH₂-CH₂-Si), 5.27 (s, 2H, O-CH₂-O), 7.05 (m, 2H, Ar-H), 7.37 (m, 1H, Ar-H), 7.53-7.66 (dtd, 2H, J = 22.6, 7.4, 1.4 Hz, Ar-H), 7.72 (m,

2H, Ar-H), 8.05 (m, 1H, Ar-H). ^{13}C NMR: (75 MHz, d_6 -DMSO) δ -2, 16.8, 51.5, 65.3, 91.5, 115.1, 127, 128, 129, 129.2, 129.6, 130.4, 132, 140.7, 160.2, 165.2, 194. LCMS (ESI+) m/z 387 $[\text{M}+\text{H}]^+$, 409 $[\text{M}+\text{Na}]^+$. HRMS (EI) m/z Calcd. for $\text{C}_{21}\text{H}_{26}\text{O}_5\text{Si}$: 386.1549. Found 386.1562.

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2-[4-(2-Trimethylsilanylethoxymethoxy)benzoyl]benzoic acid.

To a solution of 2-[4-(2-trimethylsilanylethoxymethoxy)benzoyl]-benzoic acid methyl ester (3.8 g, 9.8 mmol) in DCM (25 mL) was added potassium trimethylsilanolate (1.53 g, 10.8 mmol) and the mixture stirred 16 h, then concentrated *in vacuo*. The residues were dissolved in ethyl acetate (100 mL), washed with 5% HCl solution (3 x 30 mL), brine (30 mL), dried (MgSO_4) and concentrated *in vacuo* to give the product as a yellow oil (3.66 g, 9.8 mmol, 99%). λ_{max} (CH_3OH)/nm 276, 217, Abs 1.799, 2.108 respectively. IR 3215, 3177, 1666, 1593 cm^{-1} . ^1H NMR (300 MHz, CDCl_3) δ 0.00 (s, 9H, $\text{Si}-(\text{CH}_3)_3$), 0.96 (m, 2H, $\text{R}-\text{O}-\text{CH}_2-\text{CH}_2-\text{Si}$), 3.76 (m, 2H, $\text{O}-\text{CH}_2-\text{CH}_2-\text{Si}$), 5.27 (s, 2H, $\text{O}-\text{CH}_2-\text{O}$), 7.04 (m, 2H, Ar-H), 7.34 (m, 1H, Ar-H), 7.52-7.68 (dtd, 2H, $J = 30.2, 7.6, 1.3$ Hz, Ar-H), 7.69 (m, 2H, Ar-H), 8.07 (m, 1H, Ar-H), 10.31 (bs, 1H, COOH). ^{13}C NMR (75 MHz, CDCl_3) δ -3.2, 16.1, 64.8, 90.7, 113.8, 125.7, 126, 127.4, 128.8, 129.1, 129.9, 131.2, 140.9, 159.6, 168.8, 194. LCMS (ESI+) m/z 297.1, 373.1 $[\text{M}+\text{H}]^+$. HRMS (EI) m/z Calcd. for $\text{C}_{20}\text{H}_{24}\text{O}_5\text{Si}$: 372.1393. Found 372.1387.

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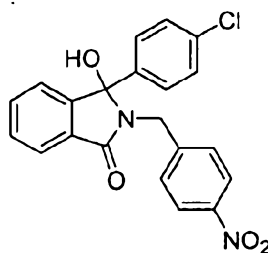
2-Benzyl-3-hydroxy-3-[4-(2-trimethylsilanylethoxymethoxy)phenyl]-2,3-dihydroisoindol-1-one (NU8239).

General procedure A: 2-[4-(2-trimethylsilanylethoxymethoxy)benzoyl]benzoic acid (1.86 g, 5 mmol), thionyl chloride (0.43 mL, 6 mmol) and 3 drops of DMF in THF (10 mL), 2h. Then benzylamine (1.1 mL, 10 mmol), and triethylamine (1.39 mL, 10 mmol), in THF (10 mL), 2 h. Chromatography (20:80 EtOAc:petrol) and (C18

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silica; 20% MeOH, H₂O to 100% MeOH gradient) gave the title compound as a clear yellow oil (140 mg, 0.3 mmol, 0.6%). λ_{\max} (CH₃OH)/nm 213, Abs 1.161. IR: 3306, 2953, 1677, 1609, 1508, 1469 cm⁻¹. ¹H NMR (300 MHz, CDCl₃) δ 0.00 (s, 9H, Si-(CH₃)₃), 0.95 (m, 2H, R-O-CH₂-CH₂-Si), 2.90 (bs, 1H, OH), 3.74 (m, 2H, O-CH₂-CH₂-Si), 4.06 (d, 1H, *J* = 14.9 Hz, N-CH₂), 4.77 (d, 1H, *J* = 14.9 Hz, N-CH₂), 5.19 (s, 2H, O-CH₂-O), 6.92 (m, 2H, Ar-H), 7.12-7.29 (m, 8H, Ar-H), 7.45 (m, 2H, Ar-H), 7.80 (m, 1H, Ar-H). ¹³C NMR (75 MHz, CDCl₃) δ -1.9, 17.4, 42.3, 65.7, 91, 92.2, 115.5, 122, 122.8, 126.4, 127, 127.6, 128.1, 128.9, 129.6, 130.5, 132.1, 137.6, 148.4, 156.9, 167. LCMS (ESI+) *m/z* 484 [M+Na]⁺. HRMS (EI) *m/z* Calcd. for C₂₇H₃₁NO₄Si: 461.2022. Found 461.2017.

3-(4-Chlorophenyl)-3-hydroxy-2-(4-nitrobenzyl)-2,3-dihydroisoindol-1-one (NU8260)



15

Distilled THF (25 mL) was added to 3-chloro-3-(4-chlorophenyl)-3*H*-isobenzofuran-1-one (3.2 g, 11.5 mmol) followed by 4-nitrobenzylamine hydrochloride (2.3 g, 12.6 mmol) and triethylamine (4.8 mL, 34.5 mmol) as for general procedure A. The crude product was recrystallised in the minimum amount of boiling ethyl acetate to give 3-(4-chlorophenyl)-3-hydroxy-2-(4-nitrobenzyl)-2,3-dihydroisoindol-1-one as a light yellow solid (2.95 g, 7.47 mmol, 65%); *R*_f = 0.4 (40:60: EtOAc: petrol). 197.1-199.7 °C. λ_{\max} (CH₃OH)/nm 220, Abs 0.765. IR: 3215, 1676, 1517, 1395, 1341 cm⁻¹. ¹H NMR: (300 MHz, d₆-DMSO) δ 4.35 (d, 1H, *J* = 16.3 Hz, N-CH₂), 4.61 (d, 1H, *J* = 16.3 Hz, N-CH₂), 7.28 (m, 4H, Ar-H), 7.45 (m, 3H, Ar-H), 7.58 (m, 2H, Ar-H), 7.79 (m, 1H, Ar-H), 8.05 (m, 2H, Ar-H). ¹³C NMR: (75 MHz, d₆-DMSO) δ 42.1, 90.5,

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123.1, 123.3, 128.4, 128.7, 129.1, 129.9, 130.3, 133.2, 133.3, 138.9, 146.4, 146.5, 149.4, 167.1. LC/MS-ES⁺ m/z 307.2, 368.2, 377.1. Anal. Calcd. for C₂₁H₁₅ClN₂O₄: C, 63.89; H, 3.83; N, 7.10%. Found C, 63.78; H, 3.92; N, 7.12%. HRMS (EI) m/z Calcd. for C₂₁H₁₅ClN₂O₄: 394.0720. Found 394.0714.

5

General Procedure L: 3-Amino-2-cyclohexylmethyl-3-(4-

methanesulphonylphenyl)isoindolinone, gave a white powder (112 mg, 87%). Mpt

10 195-199 °C, ¹H-NMR : δ_H (300MHz, CDCl₃) : 0.89 (4H, m, 2 x CH₂); 1.49 (6H, m, CH₂); 1.74 (1H, m, CH₂); 1.47 (1H, m, NCH₂) ; 2.40 (1H, m, NCH₂) ; 3.51 (1H, m, NCH₂); 6.81 (1H, s, NH); 7.19 (5H, m, ArH); 7.40 (5H, m, ArH); 7.71 (2H, m, ArH) ; 7.80 (1H, m, ArH). ¹³C-NMR : δ_C (125MHz, CDCl₃): 15.6, 26.1, 26.5, 31.3, 31.5, 37.9, 47.0, 79.7, 122.5, 123.9, 126.1, 127.1, 127.2, 129.0, 130.7, 132.4, 132.5, 135.2,
15 140.1, 147.9, 166.7, 169.2. Anal. Calcd. for C₂₉H₃₀N₂O₂S. 0.2 H₂O : C, 73.45; H, 6.46; N, 5.91. Found : C, 73.48, H, 6.52; N, 5.81.

Compounds NU8001, NU8006 and NU8009 were prepared using method A as referred to herein.

20 The present invention will now be described by way of example only and with reference to the following drawing in which:

Fig. 1 shows a Western blot from SJSA cells treated with a compound of the present invention.

A potent compound from the series NU8231 (IC₅₀ = 5.3 ± 0.µM) was selected for
25 further evaluation. SJSA cells (MDM2 amplified) were treated with increasing concentrations of NU8231 (5, 10 and 20 µM). Cells were lysed at 6 hours and

Western blots run, probing for p53, p21 and actin. The blot clearly shows a dose dependent increase in MDM2 and p21, consistent with p53 activation. No change was observed for p53 levels or the actin controls.

It is of course to be understood that the invention is not intended to be restricted to the

5 details of the above embodiments which is described by way of example only.

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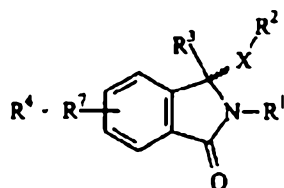
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Claims

1. A compound of formula 1:



5 or a prodrug and/or pharmaceutically acceptable salt thereof, wherein

X is O;

R¹ is selected from substituted or unsubstituted alkyl, substituted aryl or heteroaryl, unsubstituted heteroaryl, and substituted or unsubstituted aralkyl or heteroaralkyl;

10 R² is selected from substituted or unsubstituted alkyl, substituted or unsubstituted hydroxyalkyl, and substituted or unsubstituted aralkyl or heteroalkyl;

R³ is selected from substituted or unsubstituted aryl; and

R⁴-R⁷, is used to represent groups R⁴, R⁵, R⁶ and R⁷ which are independently
15 selected from H, OH, alkyl, alkoxy, hydroxyalkyl, halo, CF₃, NH₂, NO₂, COOH, wherein when R¹ is a substituted or unsubstituted alkyl group having 1 to 6 carbon atoms, R² is not an unsubstituted alkyl group having 1 to 6 carbon atoms; and

20 wherein when R¹ is phenylethyl, benzyl, or substituted aryl, R² is not methoxybenzyl or an unsubstituted alkyl group having 1 to 6 carbon atoms.

2. A compound according to claim 1, wherein R¹ is a substituted or unsubstituted alkyl group or a substituted aryl group; R² is hydroxyalkyl or a substituted or unsubstituted heteroaralkyl group; R³ is a substituted or
25 unsubstituted aryl group; and R⁴, R⁵ and R⁶ are hydrogen atoms.

3. A compound according to claim 1 or claim 2, wherein R¹ is selected from an alkyl group comprising 1 to 4 carbon atoms, a phenyl group or an alkyl group substituted with an acetamide functional group.

4. A compound according to any one of the preceding claims, wherein R² is a substituted or unsubstituted alkyl group.
- 5 5. A compound according to claim 4, wherein R² is a substituted alkyl group.
6. A compound according to any one of the preceding claims, wherein R³ is a substituted or unsubstituted aryl group selected from phenyl, 4-chlorophenyl or silylethoxymethoxyphenyl.
- 10
7. A compound of any one of claims 1 to 6 for use in therapy.
8. A compound of any one of claims 1 to 6, wherein said compound inhibits the interaction of MDM2 protein with p53.
- 15
9. A compound of any one of claims 1 to 6 for use as an active pharmaceutical substance for the treatment of cancer.
- 20 10. The use of a compound of any one of claims 1 to 6 in the manufacture of a medicament.
11. The use of a compound of any one of claims 1 to 6 in the manufacture of a medicament for the treatment of cancer.
- 25
12. A pharmaceutical composition comprising an effective amount of at least one compound of any one of claims 1 to 6.
13. A method of treating a mammal comprising the steps of administering a medicament comprising at least one compound of any one of claims 1 to 6.
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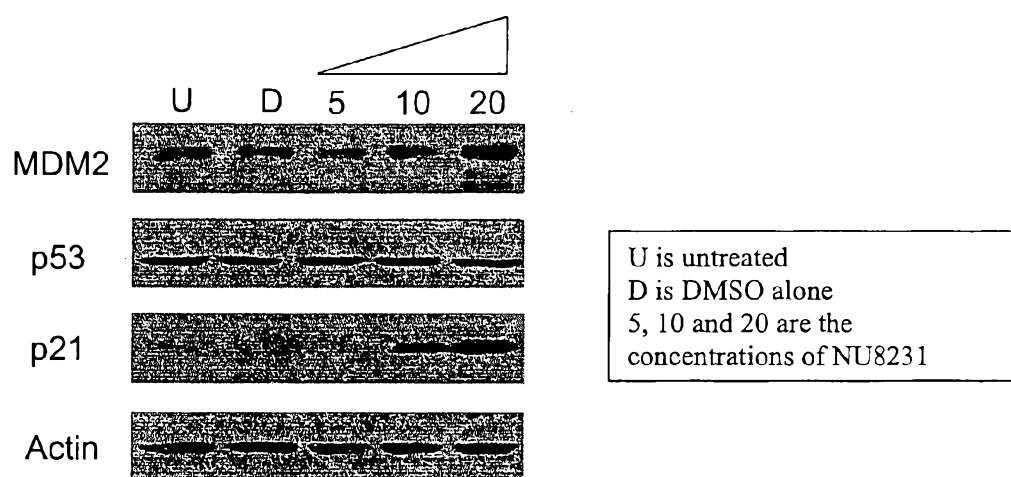


Fig.1