Solid Phase Synthesis of 3,4-Disubstituted-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-ones

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The solid phase synthesis of 3,4-disubstituted-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-ones **8** is described. 4-Fluoro-3-nitrobenzoic acid is tethered to a solid support via the acid group. Aromatic substitution of the resin-bound aryl fluoride with an α-amino ester is carried out in the presence of DIEA in DMF. The reduction of the aryl nitro group with $SnCl_2 \cdot H_2O$ and subsequent intramolecular cyclization result in the formation of the core quinoxalinone. Selective alkylation at the N-4 position of the quinoxalinone is accomplished with alkyl halides in the presence of K_2CO_3. The desired products are cleaved from solid supports and obtained in from 32 to 93% isolated yields.

Introduction

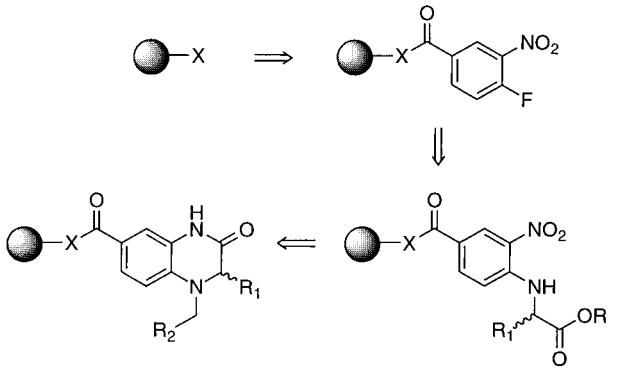
Due to the recent adaptation of organic chemistry to solid phase synthesis, there has been a tremendous growth in the number of compounds generated for biological screening.[1] The types of compounds synthesized have progressed from simple peptide libraries[2] to small heterocyclic libraries, such as benzodiazepines,[3] hydantoins,[4] pyrrolidines,[5] and 1,4-dihydropyridines.[6] The numeric growth of chemical compounds available has led to the establishment of high-throughput screening programs in many major pharmaceutical companies. Solid phase synthetic methods have been used to optimize leads as well as to generate them. Since solid phase synthesis tends to use a rather large excess of reagents, the development of methods for generating small molecules from inexpensive and readily available starting materials is an important key feature in the synthesis.

Quinoxalinones **1** have been shown to be inhibitors of aldose reductase,[7] and partial agonists of the γ-aminobutyric acid (GABA)/benzodiazepine receptor complex.[8]

1

The corresponding *N*-oxides have also been shown to be potent angiotensin II receptor antagonists.[9] Therefore, developing a solid phase synthesis of the quinoxalinone merits investigation. To this end, we report the first solid phase synthesis of 3,4-disubstituted-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-ones **8**. To test the feasibility of preparing the quinoxalinones on a solid support, we targeted the preparation of 25 (5 × 5) compounds using solid phase synthesis.

Scheme 1



Results and Discussion

Our synthetic strategy involves a route similar to the one reported by TenBrink et al[8] and is shown in Scheme 1.

We initially decided to attach the phenyl ring of quinoxalinone to a solid support, and then build the heterocyclic ring on the support. The attachment of the phenyl ring to the support is accomplished through the acid function of 4-fluoro-3-nitrobenzoic acid.[10] The attachment via the carboxylate gives us the flexibility for obtaining either acids, esters, or amides as final products, depending on the choice of linkers. Aromatic substitution of the aryl fluoride with a readily available α-amino ester sets the stage for the formation of the heterocyclic ring

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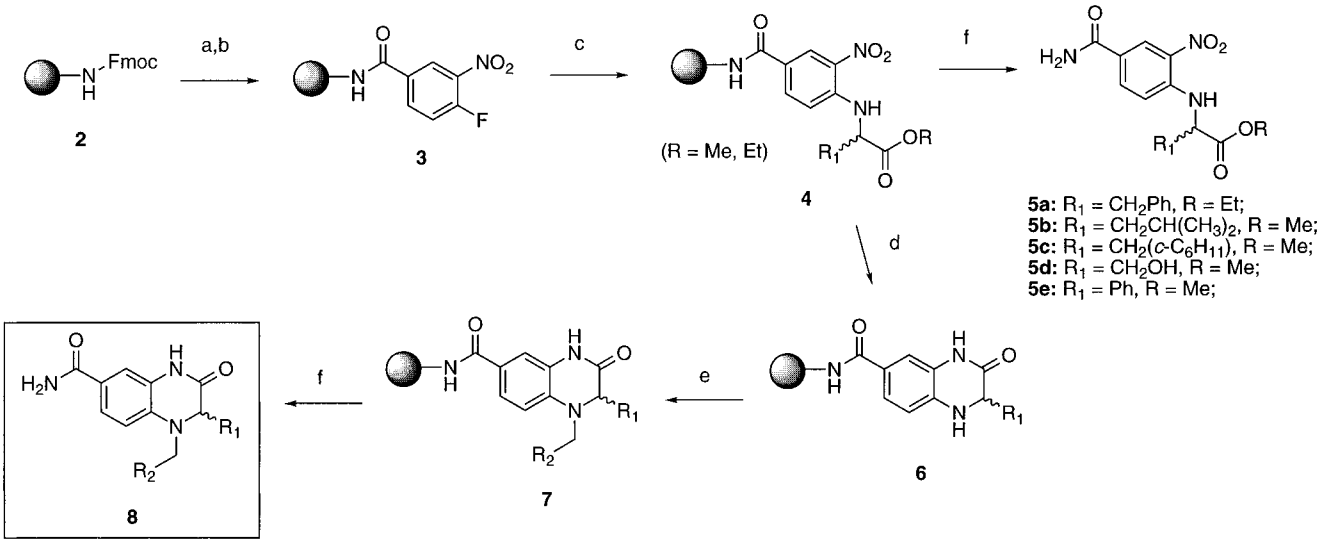
Scheme 2



a. DMF/Piperidine (1:1); b. (4-F-3-NO_2)$PhCO_2H$, HATU, DIEA; c. $H_2NCH(R_1)CO_2R$, DIEA, DMF; d. $SnCl_2 \cdot H_2O$, DMF; e. R_2CH_2Br, K_2CO_3, CH_3COCH_3, 55°C; f. TFA/H_2O (95 :5)

of the quinoxalinone. The reduction of the aryl nitro group and subsequent intramolecular cyclization of the resulting amine with the ester give the quinoxalinone. Alkylation at the N-4 position of the scaffold with aryl or alkyl halides results in the introduction of a second diversity element in the core structure.

The synthesis began with removal of the Fmoc-protecting group from Rink-Amide resin with DMF:piperidine (1:1), as shown in Scheme 2. 4-Fluoro-3-nitrobenzoic acid was then attached to the resultant amino-resin using *O*-(7-azabenzotriazol-1-yl)-*N*,*N*,*N*′,*N*′-tetramethyluronium hexafluorophosphate (HATU) and *N*,*N*-diisopropylethylamine (DIEA). The product **3** from the coupling reaction was divided into five equal portions. Each portion of resin was then allowed to react with five different α-amino esters (L-phenylalanine ethyl ester, L-leucine methyl ester, L-cyclohexylalanine methyl ester, D-serine(OtBu) methyl ester, and L-phenylglycine methyl ester). A hindered α-amino ester, such as L-phenylglycine methyl ester, was chosen to observe the effects of any steric hindrance during the course of the synthesis. Aromatic substitution of the activated aryl fluoride with an α-amino ester was accomplished in the presence of DIEA in DMF for 3 days. To verify the extent of aromatic substitution, small portions of the resins **4** were treated with 95% TFA for a period of 50 min. The cleaved products **5a**−**e** were separated from the resins and concentrated. The concentrated products were analyzed by LC, MS, and ^{1}H NMR. In all five cases, no starting material was observed, and the purity of the products was greater than 95% by LC and ^{1}H NMR. Attempts to alkylate the resin bound secondary amine **4** by reaction with alkyl halides or reductive alkylation with aldehydes were unsuccessful. The electron-withdrawing character of the phenyl ring due to the *o*-nitro group probably prevented the alkylation.

The aryl nitro group was then reduced with $SnCl_2 \cdot H_2O$.[11] To verify the completion of the reduction, samples of the resins **6** were subjected to the same TFA treatments as before. The crude products were analyzed by LC, MS, and ^{1}H NMR. The analysis of the products indicated complete reduction of the nitro group. Furthermore, the analysis indicated that the intramolecular cyclization had already occurred to form the heterocyclic ring. In all five cases, complete cyclizations were observed. The cyclization was spontaneous under the reduction conditions on the solid support. No traces of the uncyclized compounds were observed by MS or ^{1}H NMR. The only side products observed were oxidized compounds (Scheme 3).[12] In some cases, the final products contained up to 25% of the oxidation byproducts. Maeba and co-workers have reported that acidic treatment of quinoxalinones lacking substitution at the N-4 position results in oxidation of the 3, 4 carbon−nitrogen bond of the quinoxalinone.[13] Assuming that the oxidation was due to the TFA cleavage conditions, the resins **6** were again divided into five equal portions. Five resins were subjected to alkylation conditions with five different alkyl halides (benzyl bromide, methyl 4-(bromomethyl)benzoate, 1-(bromomethyl)-3-methoxybenzene, 2-(bromomethyl)naphthalene, 4-nitrobenzyl bromide). The optimal conditions were achieved when the resins were treated with the alkyl halides in the presence of K_2CO_3 in refluxing acetone for 24 h.

The products were cleaved from the resins using the standard cleavage conditions. The crude products were concentrated and then analyzed by LC and MS. In all samples, no trace of the oxidation products could be detected by LC and MS analysis. When neutral and electron-donating benzylic halides (benzyl bromide, 1-(bromomethyl)-3-methoxybenzene) were used, no starting materials were observed except the phenylglycine cases. On the other hand, when benzylic halides with electron-withdrawing groups (specifically 4-nitrobenzyl bromide) were used, some starting materials were observed. The results indicated that alkylation at the N-4 position of the ring with benzylic halides containing electron-

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(12) The oxidation is most prominant when R_1 = cyclohexylmethyl, isobutyl, and benzyl. It is not observed when R_1 = phenyl and hydroxymethyl. When trityl resins, which require a diluted TFA solution to cleave products off resins, were used to prepare quinoxalinones, the oxidized products were also observed.

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Scheme 3

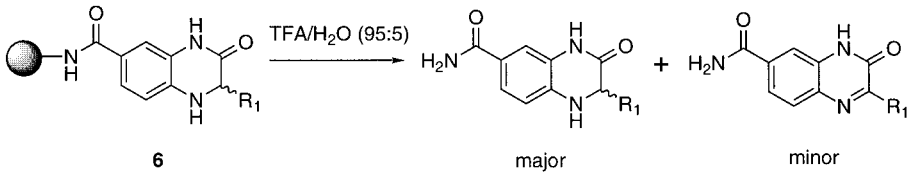

Table 1. 3,4-Disubstituted-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-ones

	R_1	R_2	isolated yield (%)[a]	$[\alpha]^{22.5}_D$[b]
8a	CH_2Ph	Ph	51	+158.3
8b	CH_2Ph	(4-CO_2Me)-Ph	58	+147.1
8c	CH_2Ph	(3-OMe)-Ph	69	+138.1
8d	CH_2Ph	2-naphthyl	56	+117.0
8e	CH_2Ph	(4-NO_2)-Ph	93	+72.3
8f	$CH_2CH(CH_3)_2$	Ph	56	+169.5
8g	$CH_2CH(CH_3)_2$	(4-CO_2Me)-Ph	79	+192.0
8h	$CH_2CH(CH_3)_2$	(3-OMe)-Ph	78	+232.6
8i	$CH_2CH(CH_3)_2$	2-naphthyl	61	+154.2
8j	$CH_2CH(CH_3)_2$	(4-NO_2)-Ph	72	+198.9
8k	CH_2(c-C_6H_{11})	Ph	46	+216.2
8l	CH_2(c-C_6H_{11})	(4-CO_2Me)-Ph	43	+184.6
8m	CH_2(c-C_6H_{11})	(3-OMe)-Ph	52	+167.8
8n	CH_2(c-C_6H_{11})	2-naphthyl	53	+255.3
8o	CH_2(c-C_6H_{11})	(4-NO_2)-Ph	41	+212.7
8p	CH_2OH	Ph	60	−284.9
8q	CH_2OH	(4-CO_2Me)-Ph	44	−240.6
8r	CH_2OH	(3-OMe)-Ph	70	−241.5
8s	CH_2OH	2-naphthyl	66	−193.5
8t	CH_2OH	(4-NO_2)-Ph	69	−240.9
8u	Ph	Ph	39	−0.6
8v	Ph	(4-CO_2Me)-Ph	39	+0.6
8w	Ph	(3-OMe)-Ph	32	+0.1
8x	Ph	2-naphthyl	44	+1.0
8y	Ph	(4-NO_2)-Ph	45	−0.1

[a] Yields are based on support bound starting material **2**. [b] The enantiomeric purity of the products have not been determined. The enantiomeric excess of the product will be reported later.

withdrawing groups was slower than the one with benzylic halides containing electron-donating groups. The crude products were subsequently purified by flash chromatography. The chromatographed products were again analyzed by LC and ^{1}H NMR to confirm structure and purity. The isolated yields of the quinoxalinones **8** are shown in Table 1 along with the optical rotation values of the products.

The desired quinoxalinones **8** were obtained in from 32% to 93% yields. The low yields in the phenylglycine cases are probably caused by incomplete alkylation due to the steric hinderance of the phenyl group. Furthermore, complete racemization was observed in the products derived from phenylglycine.[14] The enantiomeric purity of the final products will be addressed in a future publication.

In summary, we have demonstrated that 3,4-disubstituted-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-ones **8** can be prepared on a solid support from common building blocks such as α-amino esters and alkyl halides. Since the final products obtained are single compounds rather than mixtures of compounds, the identification and optimization of biological hits would be a facile process. The quinoxalinones prepared have two points of diversity, but additional diversity could be introduced on the nitrogen of the carboxamide and N-1 position of the ring. These efforts are currently in progress and will be reported in due course.

(14) A preliminary finding indicates that the possible loss of optical purity occurs during the aromatic substitution. The optical rotation value of **5e** was $[\alpha]^{21}_D = -1.4$, and the value of the product with the D-phenylglycine methyl ester was $[\alpha]^{21}_D = +1.6$.

Experimental Section

Reagents were purchased from Aldrich, Lancaster, Novabiochem, and Bachem Biosciences and used without further purification. ^{1}H NMR chemical shifts are reported in ppm downfield from a tetramethylsilane (TMS). ^{13}C NMR chemical shifts are reported in ppm downfield from TMS in either CD_3OD, DMSO, or $CDCl_3$. Mass spectral analyses were performed on a Fisons instrument (Hewlett-Packard HPLC driven electrospray MS instrument). Analytical HPLC analyses were performed on a Hewlett-Packard liquid chromatography system (YMC column, 4 mm × 50 mm, 4 μm C_{18}, 1.0 mL/min, 8 min gradient from 95% aqueous media (0.1% TFA) to 95% CH_3CN (0.1% TFA), 220 and 260 nm).

Attachment of 4-Fluoro-3-nitrobenzoic Acid to Rink-Amide Resin. To 20 g of the Rink-Amide resin (Novabiochem, 0.5 mmol/g) was added a solution containing 60 mL each of DMF and piperidine at room temperature. The suspension was allowed to mix at room temperature for 50 min. After 50 min, the supernatant was removed. The resin was washed with DMF, MeOH, CH_2Cl_2, and Et_2O and then dried in vacuo. To the dried resin were added 5.55 g (30 mmol) of 4-fluoro-3-nitrobenzoic acid, 11.41 g (30 mmol) of HATU, 10.5 mL (60 mmol) of DIEA, and 100 mL of dry DMF at room temperature. The suspension was allowed to mix at room temperature for 24 h. After 24 h, the supernatant was removed. The resin was washed with DMF, MeOH, CH_2Cl_2, and Et_2O and then dried in vacuo.

General Procedure for Aromatic Substitution of the Aryl fluoride with α-Amino Esters. To 1 g each (approximately 0.5 mmol) of the above resin were added 10 equiv of α-amino ester hydrochloride (L-phenylalanine ethyl ester, L-leucine methyl ester, L-cyclohexylalanine methyl ester, D-serine(OtBu) methyl ester, and L-phenylglycine methyl ester), 20 equiv of DIEA, and 5 mL of DMF at room temperature. The suspensions were allowed to mix at room temperature for 3 days. After 3 days, supernatants were removed. The resins were washed with DMF, MeOH, CH_2Cl_2, and Et_2O and dried in vacuo. From each of the five resins, 100 mg was removed to analyze the intermediates. To each 100 mg of the resin was added 1 mL of a solution containing 950 μL of TFA and 50 μL of H_2O at ice-bath temperature. The mixtures were slowly warmed to room temperature and allowed to mix for 50 min. After 50 min, the supernatants were removed, and the resins were washed with MeOH (3 × 2 mL). The combined supernatants were concentrated under a stream of nitrogen. The concentrated samples were further dried in vacuo. The dried samples were weighed and analyzed by LC, MS, and ^{1}H NMR.

***N*-(2-Nitro-4-carbamoylphenyl)-L-phenylalanine Ethyl Ester (5a).** From 100 mg of the resin (before the cleavage of the product) was obtained 12 mg (67% yield) of the crude product. ^{1}H NMR (300 MHz, CD_3OD) δ 8.74 (1H, d, J = 2 Hz), 7.94 (1H, dd, J = 2, 9 Hz), 7.30−7.19 (5H, m), 6.95 (1H, d, J = 9 Hz), 4.81 (1H, t, J = 6.0 Hz), 4.20 (2H, q), 3.30 (2H, m), 1.24 (3H, t, J = 7.1 Hz); mass spectrum (ESI) m/z 358 (M + H$^+$).

***N*-(2-Nitro-4-carbamoylphenyl)-L-leucine Methyl Ester (5b).** From 100 mg of the resin (before the cleavage of the product) was obtained 10 mg (65% yield) of the crude product. ^{1}H NMR (300 MHz, CD_3OD) δ 8.78 (1H, d, J = 2 Hz), 7.99 (1H, dd, J = 2, 9 Hz), 6.97 (1H, d, J = 9 Hz), 4.52 (1H, t, J =

4.9 Hz), 3.77 (3H, s), 1.89−1.73 (3H, m), 1.02 (3H, d, J = 6.3 Hz), 0.96 (3H, d, J = 6.3 Hz); mass spectrum (ESI) m/z 310 ($M + H^+$).

***N*-(2-Nitro-4-carbamoylphenyl)-L-cyclohexylalanine Methyl Ester (5c).** From 100 mg of the resin (before the cleavage of the product) was obtained 11 mg (63% yield) of the crude product. ^{1}H NMR (300 MHz, CD_3OD) δ 8.78 (1H, d, J = 2 Hz), 7.99 (1H, dd, J = 2, 9 Hz), 6.95 (1H, d, J = 9 Hz), 4.55 (1H, t, J = 7.1 Hz), 3.76 (3H, s), 1.92 - 0.97 (13H, m); mass spectrum (ESI) m/z 350 ($M + H^+$).

***N*-(2-Nitro-4-carbamoylphenyl)-D-serine Methyl Ester (5d).** From 100 mg of the resin (before the cleavage of the product) was obtained 13 mg (92% yield) of the crude product. ^{1}H NMR (300 MHz, CD_3OD) δ 8.78 (1H, d, J = 2 Hz), 7.97 (1H, dd, J = 2, 9 Hz), 6.99 (1H, d, J = 9 Hz), 4.64 (1H, t, J = 3.1 Hz), 4.13−3.96 (2H, m), 3.80 (3H, s); mass spectrum (ESI) m/z 284 ($M + H^+$).

***N*-(2-Nitro-4-carbamoylphenyl)-L-phenylglycine Methyl Ester (5e).** From 100 mg of the resin (before the cleavage of the product) was obtained 10 mg (61% yield) of the crude product. ^{1}H NMR (300 MHz, CD_3OD) δ 8.77 (1H, d, J = 2 Hz), 7.83 (1H, dd, J = 2, 9 Hz), 7.51−7.31 (5H, m), 6.77 (1H, d, J = 9 Hz), 5.56 (1H, s), 3.76 (3H, s); mass spectrum (ESI) m/z 330 ($M + H^+$).

General Procedure for Reduction for the Aryl Nitro Group and Cyclization. To 900 mg each (approximately 0.45 mmol) of the nitro ester resins were added 1.78 g (9.4 mmol) of $SnCl_2 \cdot H_2O$ and 5.0 mL of DMF at room temperature. The suspensions were allowed to mix at room temperature for 24 h. After 24 h, supernatants were removed. The resins were washed with DMF, MeOH, CH_2Cl_2, and Et_2O and dried in vacuo. From each of the five resins was removed 100 mg to analyze the intermediates. To 100 mg each of the resin was added 1 mL of a solution containing 950 μL of TFA and 50 μL of H_2O at ice-bath temperature. The mixtures were slowly warmed to room temperature and allowed to mix 50 min at room temperature. After 50 min, supernatants were removed, and the resins were washed with MeOH (3 × 2 mL). The combined supernatants were concentrated under a stream of nitrogen, and the concentrated samples were further dried in vacuo. The dried samples were weighed and analyzed by LC, MS, and ^{1}H NMR.

General Procedure for Alkylation at N-4 position of the Quinoxalinone with Alkyl Halides. To each 160 mg (approximately 80 μmol) of the cyclized resins were added 25 equiv (2 mmol) of alkyl halides (benzyl bromide, methyl 4-(bromomethyl)benzoate, 1-(bromomethyl)-3-methoxybenzene, 2-(bromomethyl)naphthalene, 4-nitrobenzyl bromide), 276 mg (2 mmol) of K_2CO_3, and 2 mL of acetone at room temperature. The mixtures were then heated at 55 °C for 24 h. After 24 h, the mixtures were cooled to room temperature. Supernatants were separated from the resins. The resins were washed with acetone, H_2O, DMF, CH_2Cl_2, and Et_2O and then dried in vacuo. To each resin was then added 2 mL of a solution containing 1.9 mL of TFA and 0.1 mL of H_2O at ice-bath temperature. The mixtures were slowly warmed to room temperature and allowed to mix 50 min at room temperature. After 50 min, supernatants were separated and the resins were washed with MeOH (3 × 2 mL). The combined supernatants were concentrated under a stream of nitrogen. The concentrated samples were further dried in vacuo. The crude products were initially analyzed by LC and MS and then purified by flash chromatography. The purified products were weighed and analyzed by LC, MS, and ^{1}H and ^{13}C NMR.

3,4-Dibenzyl-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8a). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 15 mg (51% yield) of a light yellow solid: mp 117−118 °C; $[\alpha]^{22.5}_D$ = +158.3 (c = 1.00; MeOH); HPLC t_R 5.9 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.47−7.12 (12H, m), 6.94 (1H, d, J = 7.4 Hz), 4.59 (1H, d, J = 15.4 Hz), 4.19 (1H, dd, J = 7.1, 5.3 Hz), 4.04 (1H, d, J = 15.4 Hz), 2.98−2.83 (2H, m); ^{13}C NMR (75 MHz, CD_3OD) δ 171.9, 168.9, 138.5, 137.9, 130.9, 130.1, 129.7, 129.4, 128.6, 127.9, 127., 124.8, 124.4, 116.0, 113.5, 64.6, 53.7, 37.5; mass spectrum (ESI) m/z 372 ($M + H^+$).

3-Benzyl-4-[4-carboxymethyl)benzyl]-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8b). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 20 mg (58% yield) of a light yellow solid: mp 125−126 °C; $[\alpha]^{22.5}_D$ = +147.1 (c = 1.00; MeOH); HPLC t_R 5.8 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.90 (2H, d, J = 8.1 Hz), 7.40−7.08 (9H, m), 6.61 (1H, d, J = 8.5 Hz), 4.65 (1H, d, J = 6.2 Hz), 4.25 (1H, dd, J = 5.1, 7.1 Hz), 4.15 (1H, d, J = 7.0 Hz), 3.85 (3H, s), 3.01−2.87 (2H, m); ^{13}C NMR (75 MHz, CD_3OD) δ 171.9, 168.9, 168.2, 143.9, 138.1, 137.9, 130.9, 130.6, 129.5, 128.5, 128.0, 127.4, 124.8, 116.1, 113.6, 65.4, 53.6, 52.6, 37.7; mass spectrum (ESI) m/z 430 ($M + H^+$).

3-Benzyl-4-(3-methoxybenzyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8c). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 22 mg (69% yield) of a light yellow solid: mp 103−104 °C; $[\alpha]^{22.5}_D$ = +138.1 (c = 1.00; MeOH); HPLC t_R 5.9 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.45−6.67 (12H, m), 4.56 (1H, d, J = 15.4 Hz), 4.19 (1H, dd, J = 5.4, 6.9 Hz), 3.98 (1H, d, J = 15.4 Hz), 3.70 (3H, s), 2.96−2.83 (2H, m); ^{13}C NMR (75 MHz, CD_3OD) δ 172.0, 169.0, 161.6, 139.5, 138.6, 138.0, 130.9, 130.8, 129.4, 128.0, 127.3, 124.9, 124.5, 120.8, 116.0, 114.1, 114.0, 113.6, 64.6, 55.6, 53.7, 37.5, 18.4; mass spectrum (ESI) m/z 402 ($M + H^+$).

3-Benzyl-4-(2-naphthylmethyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8d). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 19 mg (56% yield) of a light yellow solid: mp 164−165 °C; $[\alpha]^{22.5}_D$ = +117.0 (c = 1.00; MeOH); HPLC t_R 6.5 min; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.80−7.10 (14H, m), 6.71 (1H, d, J = 8.6 Hz), 4.59 (1H, d, J = 15.2 Hz), 4.22 (1H, dd, J = 4.5, 8.3 Hz), 3.97 (1H, d, J = 15.2 Hz), 3.00−2.86 (2H, m); ^{13}C NMR (75 MHz, $CDCl_3$) δ 169.9, 167.3, 137.0, 136.5, 133.0, 132.7, 129.4, 128.8, 128.5, 128.4, 127.4, 126.8, 126.4, 126.1, 125.8, 124.9, 123.8, 122.5, 114.6, 112.4, 63.2, 53.1, 36.6; mass spectrum (ESI) m/z 422 ($M + H^+$).

3-Benzyl-4-(4-nitrobenzyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8e). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 31 mg (93% yield) of a light yellow solid: mp 260−261 °C; $[\alpha]^{22.5}_D$ = +72.3 (c = 1.00; MeOH); HPLC t_R 5.9 min; ^{1}H NMR (300 MHz, CD_3OD) δ 8.12 (2H, d, J = 8.7 Hz), 7.37 (2H, d, J = 8.6 Hz), 7.26−7.10 (7H, m), 6.57 (1H, d, J = 8.6 Hz), 4.69 (1H, d, J = 16.6 Hz), 4.30 (1H, dd, J = 5.1, 7.2 Hz), 4.23 (1H, d, J = 16.7 Hz), 3.04−2.89 (2H, m); ^{13}C NMR (75 MHz, CD_3OD) δ 171.8, 168.9, 148.7, 146.3, 137.8, 137.7, 130.9, 129.5, 129.3, 128.1, 127.6, 125.1, 124.8, 116.1, 113.7, 65.9, 53.3, 37.8; mass spectrum (ESI) m/z 417 ($M + H^+$).

3-Isobutyl-4-benzyl-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8f). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 15 mg (56% yield) of a light yellow solid: mp 123−125 °C; $[\alpha]^{21}_D$ = +169.5 (c = 1.00; DMSO); HPLC t_R 6.0 min; ^{1}H NMR (300 MHz, DMSO) δ 7.37−7.14 (7H, m), 6.68 (1H, d, J = 8.3 Hz), 4.73 (1H, d, J = 15.2 Hz), 4.34 (1H, d, J = 15.2 Hz), 3.94 (1H, dd, J = 5.7, 8.6 Hz), 1.58 (1H, m), 1.34 (2H, m), 0.86 (3H, d, J = 6.5 Hz), 0.82 (3H, d, J = 6.5 Hz); ^{13}C NMR (75 MHz, CD_3OD) δ 167.7, 166.6, 137.3, 136.3, 128.5, 127.6, 127.3, 126.6, 124.3, 122.5, 114.6, 112.0, 59.6, 51.4, 37.3, 24.2, 23.1, 21.8; mass spectrum (ESI) m/z 338 ($M + H^+$).

3-Isobutyl-4-[4-(carboxymethyl)benzyl]-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8g). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 25 mg (79% yield) of a light yellow solid: mp 132−133 °C; $[\alpha]^{22.5}_D$ = +192.0 (c = 1.00; MeOH); HPLC t_R 5.9 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.97 (2H, d, J = 8.3 Hz), 7.45 - 7.38 (4H, m), 6.71 (1H, d, J = 8.4 Hz), 4.85 (1H, d, J = 15.8 Hz), 4.44 (1H, d, J = 15.8 Hz), 3.94 (1H, t, J = 7.6 Hz), 1.69 (1H, m), 1.44 (2H, t, J = 6.8 Hz), 0.90−0.86 (6H, m);^{13} C NMR (75 MHz, CD_3OD) δ 172.0, 169.5, 168.2, 144.2, 138.4, 131.0, 130.7, 128.7, 127.9, 125.3, 124.8, 116.1, 114.1, 62.1, 53.4, 52.6, 39.2, 25.9, 23.6, 22.5; mass spectrum (ESI) m/z 396 ($M + H^+$).

3-Isobutyl-4-(3-methoxybenzyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8h). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 23 mg (78% yield) of a light yellow solid: mp 107−108 °C;

$[\alpha]^{22.5}_D = +232.6$ ($c = 1.00$; MeOH); HPLC t_R 6.0 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.46 (1H, dd, J = 2, 8 Hz), 7.38 (1H, d, J = 2 Hz), 7.23 (1H, t, J = 8 Hz), 6.91−6.78 (4H, m), 4.75 (1H, d, J = 15 Hz), 4.30 (1H, d, J = 15 Hz), 3.89 (1H, t, J = 7.2 Hz), 3.74 (3H, s), 1.67 (1H, m), 1.41 (2H, m), 0.86 (6H, d, J = 6.6 Hz); ^{13}C NMR (75 MHz, CD_3OD) δ 172.1, 169.6, 161.6, 139.7, 138.9, 130.9, 127.8, 125.0, 124.9, 121.0, 116.1, 114.3, 114.1, 114.0, 98.4, 61.1, 55.6, 53.5, 39.0, 25.8, 23.6, 22.5; mass spectrum (ESI) m/z 368 (M + H$^+$).

3-Isobutyl-4-(2-naphthylmethyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8i). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 19 mg (61% yield) of a light yellow solid: mp 253−255 °C; $[\alpha]^{22.5}_D = +154.2$ ($c = 1.00$; MeOH); HPLC t_R 6.6 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.89−7.77 (4H, m), 7.46−7.39 (5H, m), 6.85 (1H, d, J = 8.5 Hz), 4.91 (1H, d, J = 15 Hz), 4.49 (1H, d, J = 15 Hz), 3.93 (1H, dd, J = 6.0, 8.3 Hz), 1.66 (1H, m), 1.45 (2H, m), 0.85 (6H, t, J = 5.9 Hz); ^{13}C NMR (75 MHz, CD_3OD) δ 172.1, 169.6, 138.9, 135.6, 134.9, 134.5, 129.7, 128.8, 127.9, 127.4, 127.1, 126.6, 125.1, 124.9, 116.1, 114.1, 61.2, 53.7, 38.9, 25.9, 23.6, 22.5; mass spectrum (ESI) m/z 388 (M + H$^+$).

3-Isobutyl-4-(4-nitrobenzyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8j). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 22 mg (72% yield) of a light yellow solid: mp 139−140 °C; $[\alpha]^{22.5}_D = +198.9$ ($c = 1.00$; MeOH); HPLC t_R 5.9 min; ^{1}H NMR (300 MHz, CD_3OD) δ 8.18 (2H, d, J = 8.7 Hz), 7.56 (2H, d, J = 8.6 Hz), 7.42 (2H, m), 6.66 (1H, d, J = 8.2 Hz), 4.89 (1H, d, J = 16.4 Hz), 4.53 (1H, d, J = 16.4 Hz), 4.00 (1H, t, J = 6.6 Hz), 1.70 (1H, m), 1.48 (2H, t, J = 6.9 Hz), 0.91 (6H, t, J = 6.9 Hz); ^{13}C NMR (75 MHz, CD_3OD) δ 171.9, 169.4, 148.8, 146.5, 138.0, 129.5, 128.1, 125.5, 124.9, 124.7, 116.2, 114.2, 62.6, 53.2, 39.4, 25.9, 23.5, 22.6; mass spectrum (ESI) m/z 383 (M + H$^+$).

3-(Cyclohexylmethyl)-4-benzyl-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8k). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 14 mg (46% yield) of a light yellow solid: mp 121−122 °C; $[\alpha]^{22.5}_D = +216.2$ ($c = 1.00$; MeOH); HPLC t_R 6.7 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.47−7.32 (7H, m), 6.80 (1H, d, J = 8.6 Hz), 4.77 (1H, d, J = 15 Hz), 4.32 (1H, d, J = 15 Hz), 3.91 (1H, dd, J = 5.5, 8.4 Hz), 1.75−0.78 (13H, m); ^{13}C NMR (75 MHz, CD_3OD) δ 172.1, 169.7, 138.9, 138.2, 129.8, 128.9, 128.8, 127.8, 124.9, 124.9, 116.0, 114.0, 98.4, 60.4, 53.5, 37.6, 35.3, 34.9, 34.0, 27.5, 27.3, 27.1; mass spectrum (ESI) m/z 378 (M + H$^+$).

3-(Cyclohexylmethyl)-4-[4-carboxymethyl)benzyl]-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8l). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 15 mg (43% yield) of a light yellow solid: mp 130−131 °C; $[\alpha]^{22.5}_D = +184.6$ ($c = 1.00$; MeOH); HPLC t_R 6.6 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.96 (2H, d, J = 8.3 Hz), 7.44 - 7.38 (4H, m), 6.72 (1H, d, J = 8.4 Hz), 4.84 (1H, d, J = 16 Hz), 4.43 (1H, d, J = 16 Hz), 3.96 (1H, dd, J = 5.6, 8.3 Hz), 3.89 (3H, s), 1.79−0.82 (13H, m); ^{13}C NMR (75 MHz, CD_3OD) δ 172.0, 169.6, 168.2, 144.2, 138.4, 131.0, 130.7, 128.8, 127.9, 125.3, 124.8, 116.1, 114.1, 61.4, 53.4, 52.6, 37.8, 35.3, 34.9, 34.0, 27.5, 27.3, 27.1; mass spectrum (ESI) m/z 436 (M + H$^+$).

3-(Cyclohexylmethyl)-4-(3-methoxybenzyl-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8m). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 17 mg (52% yield) of a light yellow solid: mp 230−231 °C; $[\alpha]^{22.5}_D = +167.8$ ($c = 1.00$; MeOH); HPLC t_R 6.7 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.46 (1H, dd, J = 2, 9 Hz), 7.37 (1H, d, J = 2 Hz), 7.23 (1H, t, J = 7.8 Hz), 6.91−6.79 (4H, m), 4.74 (1H, d, J = 15 Hz), 4.30 (1H, d, J = 15 Hz), 3.91 (1H, dd, J = 5.6, 8.3 Hz), 3.75 (3H, s), 1.75−0.79 (13H, m); ^{13}C NMR (75 MHz, CD_3OD) δ 172.1, 170.0, 161.6, 139.8, 138.9, 130.9, 127.8, 125.0, 124.9, 121.1, 116.0, 114.4, 114.2, 114.0, 60.4, 55.6, 53.6, 37.6, 35.3, 34.9, 34.1, 27.5, 27.3, 27.2; mass spectrum (ESI) m/z 408 (M + H$^+$).

3-(Cyclohexylmethyl)-4-(2-naphthylmethyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8n). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 18 mg (53% yield) of a light yellow solid: mp 167−168 °C; $[\alpha]^{21}_D = +255.3$ ($c = 1.00$; DMSO); HPLC t_R 7.4 min; ^{1}H NMR (300 MHz, DMSO) δ 7.90−7.35 (9H, m), 6.75 (1H, d, J = 9 Hz), 4.88 (1H, d, J = 15 Hz), 4.49 (1H, d, J = 15 Hz), 3.88 (1H, dd, J = 5.5, 8.3 Hz), 1.70−0.77 (13H, m); ^{13}C NMR (75 MHz, CD_3OD) δ 169.4, 168.5, 138.1, 136.7, 134.6, 134.1, 130.0, 129.3, 128.4, 128.3, 128.0, 127.6, 127.6, 126.1, 124.2, 116.4, 113.9, 60.8, 53.4, 37.5, 35.2, 35.0, 33.8, 27.7, 27.4, 27.3; mass spectrum (ESI) m/z 428 (M + H$^+$).

3-(Cyclohexylmethyl)-4-(4-nitrobenzyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8o). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 14 mg (41% yield) of a light yellow solid: mp 136−137 °C; $[\alpha]^{22.5}_D = +212.7$ ($c = 1.00$; MeOH); HPLC t_R 6.6 min; ^{1}H NMR (300 MHz, CD_3OD) δ 8.19 (2H, d, J = 8.5 Hz), 7.56 (2H, d, J = 8.5 Hz), 7.41 (2H, m), 6.67 (1H, d, J = 8.3 Hz), 4.91 (1H, d, J = 16 Hz), 4.51 (1H, d, J = 16 Hz), 4.02 (1H, dd, J = 5.7, 8.4 Hz), 1.83−0.84 (13H, m); ^{13}C NMR (75 MHz, CD_3OD) δ 171.9, 169.5, 148.8, 146.5, 138.1, 129.5, 128.1, 125.5, 124.9, 124.7, 116.2, 114.2, 61.9, 53.2, 38.0, 35.3, 34.9, 34.1, 27.5, 27.3, 27.2; mass spectrum (ESI) m/z 423 (M + H$^+$).

3-(Hydroxymethyl-4-benzyl-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8p). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 4:1) to obtain 15 mg (60% yield) of a white solid: mp 142−143 °C; $[\alpha]^{22.5}_D = -284.9$ ($c = 1.00$; MeOH); HPLC t_R 4.5 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.89−7.22 (7H, m), 6.68 (1H, d, J = 8.4 Hz), 4.83 (1H, d, J = 16 Hz), 4.53 (1H, d, J = 16 Hz), 4.06 (1H, t, J = 3.9 Hz), 3.79 (2H, d, J = 3.9 Hz); ^{13}C NMR (75 MHz, CD_3OD) δ 172.1, 168.3, 139.3, 138.4, 129.8, 128.5, 128.4, 127.0, 124.9, 123.8, 115.8, 112.8, 65.9, 62.7, 53.6; mass spectrum (ESI) m/z 312 (M + H$^+$).

3-(Hydroxymethyl)-4-[4-(carboxymethyl)benzyl]-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8q). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 4:1) to obtain 13 mg (44% yield) of a white solid: mp 147−148 °C; $[\alpha]^{22.5}_D = -240.6$ ($c = 1.00$; MeOH); HPLC t_R 4.5 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.96 (2H, d, J = 8.2 Hz), 7.44 (2H, d, J = 8.2 Hz), 7.37−7.32 (2H, m), 6.59 (1H, d, J = 8.4 Hz), 4.90 (1H, d, J = 17 Hz), 4.65 (1H, d, J = 17 Hz), 4.11 (1H, t, J = 3.9 Hz), 3.87 (3H, s), 3.81 (2H, m); ^{13}C NMR (75 MHz, CD_3OD) δ 172.1, 168.3, 168.2, 144.5, 138.8, 131.0, 130.5, 128.3, 127.1, 124.8, 124.2, 115.9, 112.9, 66.6, 62.9, 53.6, 52.6; mass spectrum (ESI) m/z 370 (M + H$^+$).

3-(Hydroxymethyl)-4-(3-methoxybenzyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8r). The crude product was purified by flash chromatography ($CHCl_3$:EtOH 4:1) to obtain 19 mg (70% yield) of a white solid: mp 136−137 °C; $[\alpha]^{22.5}_D = -241.5$ ($c = 1.00$; MeOH); HPLC t_R 4.6 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.39 (1H, dd, J = 2, 8.5 Hz), 7.31 (1H, d, J = 2 Hz), 7.22 (1H, t, J = 8.3 Hz), 6.89 (2H, m), 6.80 (1H, d, J = 9.1 Hz), 6.68 (1H, d, J = 8.5 Hz), 4.80 (1H, d, J = 16 Hz), 4.51 (1H, d, J = 16 Hz), 4.07 (1H, t, J = 3.9 Hz), 3.79 (2H, d, J = 3.9 Hz), 3.73 (3H, s); ^{13}C NMR (75 MHz, CD_3OD) δ 172.2, 168.3, 161.6, 140.1, 139.3, 130.9, 127.0, 124.9, 123.8, 120.5, 115.8, 113.9, 112.9, 66.0, 62.7, 55.6, 53.6; mass spectrum (ESI) m/z 4342 (M + H$^+$).

3-(Hydroxymethyl)-4-(2-naphthylmethyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8s). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 4:1) to obtain 19 mg (66% yield) of a white solid: mp 149−150 °C; $[\alpha]^{22.5}_D = -193.5$ ($c = 1.00$; MeOH); HPLC t_R 5.1 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.89−7.76 (4H, m), 7.46−7.33 (5H, m), 6.74 (1H, d, J = 8.4 Hz), 4.98 (1H, d, J = 16 Hz), 4.69 (1H, d, J = 16 Hz), 4.11 (1H, t, J = 3.9 Hz), 3.82 (2H, d, J = 3.9 Hz); ^{13}C NMR (75 MHz, CD_3OD) δ 172.2, 168.3, 139.3, 135.9, 134.9, 134.4, 129.7, 128.8, 128.7, 127.3, 127.2, 127.1, 126.9, 126.3, 124.9, 123.9, 115.9, 112.9, 66.0, 62.7, 53.9; mass spectrum (ESI) m/z 362 (M + H$^+$).

3-(Hydroxymethyl)-4-(4-nitrobenzyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8t). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 4:1) to obtain 16 mg (56% yield) of a white solid: mp 184−186 °C; $[\alpha]^{22.5}_D = -240.9$ ($c = 1.00$; MeOH); HPLC t_R 4.6 min; ^{1}H NMR (300 MHz, CD_3OD) δ 8.18 (2H, d, J = 8.6 Hz), 7.57 (2H, d, J = 8.6 Hz), 7.35 (2H, m), 6.56 (1H, d, J = 8.5 Hz), 4.96 (1H, d, J = 17 Hz), 4.73 (1H, d, J = 17 Hz), 4.17 (1H, t, J = 3.9 Hz), 3.83 (2H, m); ^{13}C NMR (75 MHz, CD_3OD) δ 172.0, 168.2, 148.7,

146.8, 138.5, 129.1, 127.2, 124.8, 124.3, 116.0, 112.9, 66.9, 62.9, 53.4; mass spectrum (ESI) m/z 357 ($M + H^+$).

3-Phenyl-4-benzyl-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8u). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 11 mg (39% yield) of a light yellow solid: mp 135−136 °C; $[\alpha]^{22.5}_D = -0.6$ ($c = 1.00$; MeOH); HPLC t_R 5.8 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.53−7.11 (12H, m), 6.79 (1H, d, $J = 8.6$ Hz), 5.00 (1H, s), 4.74 (1H, d, $J = 15.5$ Hz), 3.74 (1H, d, $J = 15.5$ Hz); ^{13}C NMR (75 MHz, CD_3OD) δ 172.0, 167.9, 138.8, 138.7, 137.7, 129.9, 129.9, 129.8, 129.5, 129.3, 128.7, 128.2, 127.8, 127.5, 127.4, 126.9, 125.2, 124.7, 116.2, 112.7, 66.6, 52.9; mass spectrum (ESI) m/z 358 ($M + H^+$).

3-Phenyl-4-[4-(carboxymethyl)benzyl]-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8v). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 13 mg (39% yield) of a light yellow solid: mp 145−146 °C; $[\alpha]^{22.5}_D = +0.6$ ($c = 1.00$; MeOH); HPLC t_R 5.7 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.95 (2H, d, $J = 8.3$ Hz), 7.50−7.19 (9H, m), 6.69 (1H, d, $J = 9.2$ Hz), 5.08 (1H, s), 4.76 (1H, d, $J = 16.4$ Hz), 4.37 (1H, d, $J = 16.4$ Hz), 3.87 (3H, s); ^{13}C NMR (75 MHz, CD_3OD) δ 171.9, 168.3, 167.8, 143.8, 138.7, 138.3, 131.0, 130.6, 130.0, 129.8, 128.5, 128.2, 127.0, 125.1, 125.0, 116.3, 112.8, 67.4, 52.9, 52.6; mass spectrum (ESI) m/z 416 ($M + H^+$).

3-Phenyl-4-(3-methoxybenzyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8w). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 10 mg (32% yield) of a light yellow solid: mp 121−123 °C; $[\alpha]^{22.5}_D = +0.1$ ($c = 1.00$; MeOH); HPLC t_R 5.8 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.53−7.17 (8H, m), 6.85−6.77 (4H, m), 5.00 (1H, s), 4.71 (1H, d, $J = 15.5$ Hz), 4.20 (1H, d, $J = 15.5$ Hz), 3.72 (3H, s); ^{13}C NMR (75 MHz, CD_3OD) δ 172.0, 167.9, 161.6, 139.3, 138.8, 138.7, 130.9, 129.9, 129.7, 129.3, 128.2, 127.5, 126.9, 125.2, 124.7, 120.8, 116.2, 114.1, 112.7, 66.7, 55.6, 53.0; mass spectrum (ESI) m/z 388 ($M + H^+$).

3-Phenyl-4-(2-naphthylmethyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8x). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 14 mg (44% yield) of a light yellow solid: mp 148−149 °C; $[\alpha]^{22.5}_D = +1.0$ ($c = 1.00$; MeOH); HPLC t_R 6.4 min; ^{1}H NMR (300 MHz, CD_3OD) δ 7.83−7.73 (4H, m), 7.47−7.17 (10H, m), 6.83 (1H, d, $J = 8.5$ Hz), 5.05 (1H, s), 4.85 (1H, d, $J = 15.6$ Hz), 4.38 (1H, d, $J = 15.6$ Hz); ^{13}C NMR (75 MHz, CD_3OD) δ 172,0, 168.0, 138.7, 135.1, 134.9, 134.5, 130.0, 129.8, 129.3, 128.8, 128.7, 128.2, 127.6, 127.4, 127.1, 126.9, 126.4, 125.2, 124.8, 116.3, 112.8, 66.8, 53.2; mass spectrum (ESI) m/z 409 ($M + H^+$).

3-Phenyl-4-(4-nitrobenzyl)-7-carbamoyl-1,2,3,4-tetrahydroquinoxalin-2-one (8y). The crude product was purified by flash chromatography ($CHCl_3$:EtOH, 6:1) to obtain 14 mg (45% yield) of a light yellow solid: mp 146−147 °C; $[\alpha]^{21}_D = -0.1$ ($c = 0.80$; DMSO); HPLC t_R 5.8 min; ^{1}H NMR (300 MHz, DMSO) δ 8.18 (2H, d, $J = 8.6$ Hz), 7.58 (2H, d, $J = 8.6$ Hz), 7.40−7.19 (7H, m), 6.54 (1H, d, $J = 8.5$ Hz), 5.26 (1H, s), 4.78 (1H, d, $J = 17$ Hz), 4.52 (1H, d, $J = 17$ Hz); ^{13}C NMR (75 MHz, DMSO) δ 167.5, 165.1, 146.6, 145.8, 137.8, 135.3, 128.8, 128.3, 128.2, 126.7, 125.9, 124.5, 123.6, 122.7, 115.0, 111.1, 65.9, 51.0; mass spectrum (ESI) m/z 403 ($M + H^+$).

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Supporting Information Available: ^{1}H NMR spectra of the 25 quinoxalinones are available (25 pages). This material is contained in libraries on microfiche, immediately follows this article in the microfilm version of the journal, and can be ordered from the ACS; see any current masthead page for ordering information.

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