4-Thio Derivatives of Dibenzosuberone: Potential Antidepressant Compounds

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Received June 25, 2009: Revised December 07, 2009: Accepted March 30, 2010

Abstract: This work describes the synthesis of a series of nine 4-thio dibenzosuberone derivatives (10,11-dihydro-5H-dibenzo[*a*,*d*]cycloheptane-5-one derivatives). Ullmann´s reaction was used to synthesize six 4-thio dibenzosuberone derivatives **10**-**15** from 4-iodo dibenzosuberone **9**. Compound **9** was synthesized from dibenzosuberone **7** through the use of TTFA [thallium (III) trifluoroacetate] and KI. Hydrolysis of **10** yielded derivative **14**. Compound **17**, which was prepared through the chlorination of **14**, was aminated to furnish 4-thio derivative **18**.

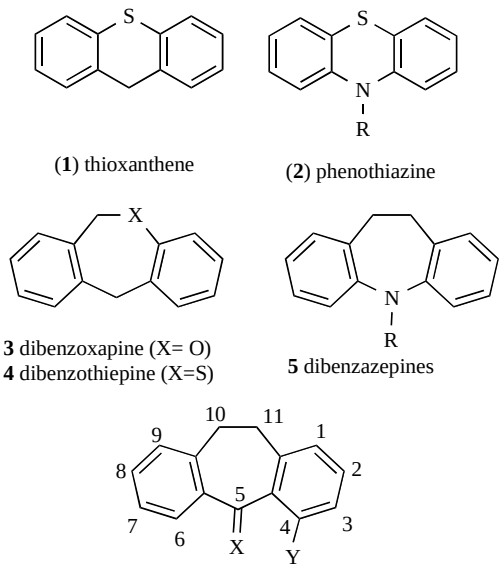
Keywords: Dibenzocycloheptane, dibenzosuberone, thio compounds, Ullmann reaction, thallium (III) salts, tricyclic antidepressants.

INTRODUCTION

Molecules bearing a tricyclic core have been synthesized by many research groups due to their various effects on the central nervous system (CNS) [1]. Thioxanthenes **1** [2], phenothiazines **2** [3], dibenzoxapines **3** [4], dibenzothiepines **4** [5], dibenzazepines **5** [6] and the dibenzocycloheptanes **6** [7] are some examples of this class of molecules with activity on the CNS. Dibenzosuberone **7**, which shares the basic structure of **6**, has been used to produce derivatives containing halide, amino, oxa, thio and other groups as substituents at aromatic carbons 1-3 and 6-9 as well as at saturated carbons 10 and 11 [8]. In contrast, not many examples have been described in the literature of analogs of **8** with substituents at carbon-4 (Fig. (**1**) [9, 10].

Due to our interest in this class of compounds we have previously described the synthesis of some 4-amino derivatives of dibenzosuberone **7** (10,11-dihydro-5-H-dibenzo[*a*,*d*]cycloheptane-5-one) [10] as well as some benzocycloheptanequinoline derivatives [6a]. Preliminary evaluations have shown antidepressant-like effects for some of these 4-amino derivatives [11]. These results prompted us to develop a synthetic sequence to prepare derivatives **8** with thio group bonded to C-4 of dibenzosuberone **7**.

The Ullmann reaction involves a copper promoted coupling between alkyl halides and amines [12]. More recently, many research groups have modified this reaction to N-, O- and S-arylation by aryl halides [13]. We decided to employ these modified Ullmann reactions to thiolate iodo-dibenzocycloheptane **6**. To install the iodine at carbon-4 of **6**, a thallium III reagent [TTFA (thallium (III) trifluoro-acetate] was used despite the lower reactivity for that carbon [14].



(**1**) thioxanthene

(**2**) phenothiazine

3 dibenzoxapine (X= O)
4 dibenzothiepine (X=S)

5 dibenzazepines

6 dibenzocycloheptane (X= H,H; Y=H)
7 dibenzosuberone (X=O; Y=H)
8 4-thiodibenzosuberone derivatives (X=O; Y= -SR)

R= alkyl group

Fig. (1). Tricyclics systems with CNS activities.

RESULTS AND DISCUSSION

To synthesize the derivatives of **4**, dibenzosuberone **7** was treated with TTFA (tallium (III) trifluoroacetate) in TFA (trifluoroacetic acid) for 48 h at 25°C. This was followed by a reaction with KI leading to 4-iodo-dibenzosuberone **9** in 83% yield[15]. An Ullmman type reaction was employed to prepare 4-thio dibenzosuberone derivatives **10**-**15** from 4-iodo-dibenzosuberone **9** in moderate yields (Scheme **1**). In

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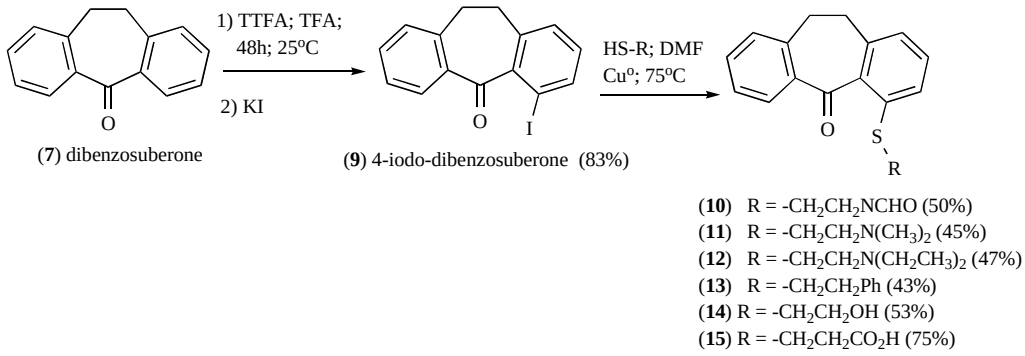


Scheme 1. 4-thio derivatives (**10-15**) from dibenzosuberone (**7**).

these reactions, 4-iodo derivative **9** was treated with Cu^o and the corresponding thiol reagent in DMF at 75°C.

Derivative **10** was used as starting material to prepare **16**. For this purpose, **16** was obtained *via* hydrolysis of **10** in 62% yield in refluxing sulfuric acid. Derivative **17** was prepared from **14** in 74% yield *via* a substitution reaction in refluxing $SOCl_2$. Halide **17** was treated with a piperazine derivative to yield 4-thio dibenzosuberone **18** in 61% yield (Scheme **2**).

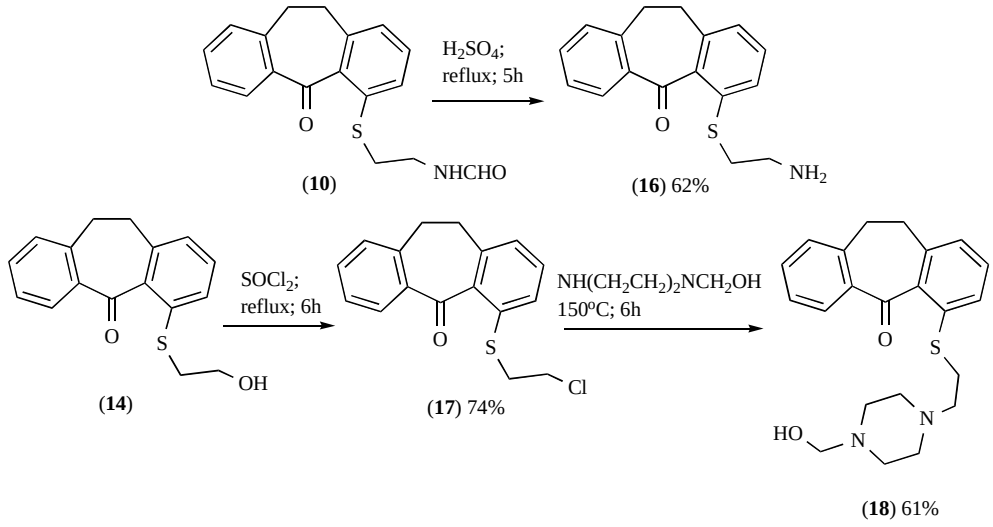
EXPERIMENTAL

General

All solvents and reagents used were supplied by E. Merck or Aldrich Co. TLC: silica gel 60 F254 plates (0.25 mm; Merck). Column chromatography (CC): silica gel 60 (0.040-0.063 mm; Merck). Melting points were determined on a Fischer-Johns apparatus: uncorrected. ^{1}H-NMR (300 MHz) and ^{13}C-NMR (75.5 MHz) spectra: Varian 7T instrument in $CDCl_3$ (Me_4Si as internal standard); chemical shifts are in ppm and coupling constants are given in Hz. IR spectra were recorded on films or KBr pellets with a Perkin Elmer 1420 spectrometer. Low-resolution EI mass spectra were recorded on a Finnigan MAT-711 instrument, at 70 eV with the source at 200°C and with an accelerating voltage of 8KV.

4-iodo-10,11-dihydro-5H-dibenzo[a,d]cycloheptane-5-one (9) (4-iodo-dibenzosuberone)

TTFA (thallium (III) trifluoroacetate, 25g, 65.5 mmol) was added to a solution of dibenzosuberone **7** (10 g, 51.5 mmol) in 25 mL of trifluoroacetic acid. The reaction was stirred in the dark at room temperature for 48 hours. A solution of KI (28g, 168.7 mmol) in 20 mL of water was then added slowly to the reaction. The reaction was stirred at room temperature for 30 minutes during which time, a precipitate formed. While stirring, sodium metabisulfide was slowly added until the reaction color changed. The reaction was then treated with a 4N KOH solution. The reaction was subsequently filtered and the solid was washed with a hot $CHCl_3$. The aqueous solution was extracted with $CHCl_3$. The combined organic layers were washed with brine, dried over anhydrous Na_2SO_4 and evaporated under reduced pressure. The resulting residue was recrystallized from ethanol. Yield: 83%. Oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ (ppm) [15]: 3.08-3.13 (2H, m), 3.22-3.25 (2H, m), 7.02 (1H, t, 7.8 Hz), 7.18 (1H, d, 7.5Hz), 7.19 (1H, d, 8.4 Hz), 7.33 (1H, t, 7.5 Hz), 7.44 (1H, t, 7.8 Hz), 7.45 (1H, d, 7.8 Hz), 7.86 (1H, d, 7.8 Hz). ^{13}C NMR (75 MHz, $CDCl_3$) δ (ppm): 32.8; 34.5; 91.9; 126.4; 127.3; 129,7; 130.2; 131.3; 132.2; 137.8; 138.2; 139.1; 140.3; 141.8; 199.9.



Scheme 2. derivatives (**16**), (**17**) and (**18**) synthesis.

General Procedure for the Preparation of 4-thio Dibenzosuberone Derivatives 10-15

A round-bottom flask equipped with a magnetic stirrer and condenser was charged with 4-iodo-dibenzosuberone **9** (0.3 g, 0.89 mmol), the appropriate thiol (1 eq.), Cu^0 (0.04g, 1.37 mmol) and 3 mL of DMF. The reaction was stirred at 75 °C for 5-24 hours, depending on the thiol used. The solution was then filtered and the solid was washed with 50 mL of $CHCl_3$. The aqueous solution was extracted with $CHCl_3$. The combined organic layers were washed with brine, dried over anhydrous $MgSO_4$ and the solvent was evaporated under reduced pressure. The residue was then purified by silica gel column chromatography.

2-[(5-oxo-10,11-dihydro-5H-dibenzo[a,d]cyclohepten-4-yl)sulfanyl]ethylformamide (10)

Yield: 50%. oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ (ppm): 3.04-3.10 (2H, m), 3.04-3.11 (2H, m), 3.22-3.26 (2H; m); 3.42-3.48 (2H; m); 6.73 (1H, sl); 7.12 (1H, dd, 7.5 and 1.2 Hz), 7.19 (1H, dd, 7.8 and 0.9 Hz), 7.29 (1H, d, 7.8 Hz), 7.34 (1H, d, 1.2 Hz), 7.38 (1H, dt, 7.8 and 1.5 Hz), 7.44 (1H, dt, 7.5 and 1.5 Hz), 7.90 (1H, dd, 7.8 and 1.5 Hz), 8.10 (1H, s). ^{13}C NMR (75 MHz, $CDCl_3$) δ (ppm): 32.6; 34.6; 34.9; 36.3; 125.9; 126.3; 129.2; 129.4; 130.3; 130.5; 132.2; 132.4; 138.1; 139.5; 140.8; 161.1; 199.9. EI-MS [*m/z* (%)]: 311 (5, $[M]^{+\cdot}$), 293 (10), 266(30), 239 (100), 178 (15), 83 (25). IR (film) (λ cm^{-1}): 3308*s*, 3055*s*, 2922*s*, 2859*s*, 2753*w*, 1947*w*, 1663*s*, 1596*s*, 1580*s*, 1520*m*, 1449*m*, 1424*m*, 1385*m*, 1357*m*, 1296*s*, 1257*s*, 1191*w*, 1157*w*, 1157*w*, 1137*w*, 1101*w*, 1077*w*, 1053*w*, 1033*w*, 955*w*, 924*s*, 873*w*, 832*m*, 783*s*, 754*m*, 724*s*, 697*w*, 646*w*, 665*w*, 611*w*.

4-{[2-(dimethylamino)ethyl]sulfanyl}-10,11-dihydro-5H-dibenzo[a,d]cyclohepten-5-one (11)

Yield: 45%. m.p.: 103-104°C; ^{1}H NMR (300 MHz, $CDCl_3$) δ (ppm): 2.97-3.02 (2H, m), 3.05-3.09 (2H, m), 3.15-3.21 (2H; m); 2.24 (3H; s); 2.49-2.54 (2H, m); 7.03 (1H, dd, 5.7 and 2.7 Hz); 7.17 (1H, dd, 7.8 and 0.9 Hz), 7.29 (1H, d, 5.7 Hz), 7.30 (1H, d, 2.4 Hz), 7.33 (1H, dd, 7.5 and 1.5 Hz), 7.42 (1H, dt, 7.5 and 1.5 Hz), 7.95 (1H, dd, 7.8 and 1.5 Hz). ^{13}C NMR (75 MHz, $CDCl_3$) δ (ppm): 31.3; 32.7; 34.7; 45.0; 58.0; 124.7; 126.2; 126.5; 130.0; 130.1; 130.3 (2C); 135.5; 138.1; 139.4; 140.8; 198.3. EI-MS [*m/z* (%)]: 312 (10, $[M+1]^{+\cdot}$), 239 (60), 208 (20), 191 (10), 178 (30), 71 (50), 58 (100). IR (KBr) (λ cm^{-1}): 3059*s*, 2940*m*, 2856*m*, 2818*m*, 2778*m*, 1657*s*, 1596*m*, 1578*m*, 1450*m*, 1424*m*, 1357*s*, 1296*s*, 1256*s*, 1156*w*, 1136*w*, 1098*w*, 1041*w*, 1007*w*, 957*w*, 924*s*, 832*w*, 783*m*, 757*w*, 724*m*, 696*w*, 647*w*, 665*w*, 610*w*.

4-{[2-(diethylamino)ethyl]sulfanyl}-10,11-dihydro-5H-dibenzo[a,d]cyclohepten-5-one (12)

Yield: 47%. m.p.: 65°C; ^{1}H NMR (300 MHz, $CDCl_3$) δ (ppm): 0.98 (3H, t, 7.2 Hz); 2.95-3.02 (2H, m), 3.06-3.09 (2H, m), 3.22-3.25 (2H; m); 2.65-2.66 (2H; m); 2.52 (2H, q, 7.2Hz); 7.02 (1H, dd, 6.9 and 1.5 Hz); 7.18 (1H, d, 7.5 Hz), 7.29 (1H, d, 6.9 Hz), 7.30 (1H, d, 1.5 Hz), 7.33 (1H, dd, 7.8 and 1.5 Hz), 7.42 (1H, dt, 7.5 and 1.5 Hz), 7.96 (1H, dd, 7.8 and 1.5 Hz). ^{13}C NMR (75 MHz, $CDCl_3$) δ (ppm): 11.1; 30.5; 32.7; 34.8; 46.8; 51.4; 124.9; 126.3; 126.8; 130.0; 130.2; 130.4; 132.1; 135.1; 138.1; 139.5; 140.9; 141.5; 198.4. EI-MS [*m/z* (%)]: 339 (1, $[M]^{+\cdot}$), 239 (17), 208 (10), 178 (10), 86(100), 71 (18), 57(65), 44(18). IR (KBr) (λ cm^{-1}): 3401*m*, 3056*m*, 2968*s*, 2810*m*, 2429*w*, 1943*w*, 1788*w*, 1659*s*, 1596*s*, 1580*s*, 1449*s*, 1357*s*, 1296*s*, 1256*s*, 1198*w*, 1156*w*, 1102*w*, 1068*w*, 991*w*, 854*w*, 924*s*, 833*m*, 782*m*, 754*m*, 724*m*, 696*w*, 646*w*, 665*w*, 611w.

4-[(2-phenylethyl)sulfanyl]-10,11-dihydro-5H-dibenzo[a,d]cyclohepten-5-one (13)

Yield: 43%. m.p.: 82-83°C; ^{1}H NMR (300 MHz, $CDCl_3$) δ (ppm): 2.81-2.87 (2H, m); 3.07-3.14 (4H, m), 3.23-3.27 (2H, m); 7.02 (1H, dd, 5.4 and 3.0 Hz); 7.08-7.24 (5H, m); 7.10 (1H, dd, 8.1 and 1.8 Hz), 7.27 (1H, d, 5.4 Hz), 7.28 (1H, d, 3.0 Hz), 7.32 (1H, dt, 7.5 and 1.2 Hz), 7.42 (1H, dt, 7.5 and 1.5 Hz), 7.95 (1H, dd, 7.8 and 1.5 Hz). ^{13}C NMR (75 MHz, $CDCl_3$) δ (ppm): 32.7; 34.8; 34.9; 35.8; 124.6; 126.2; 126.3 (2C); 128.3 (3C); 130.1; 130.3; 132.1; 135.7; 138.1; 139.5; 140.0; 141.2; 198.3. EI-MS [*m/z* (%)]: 344 (10, $[M]^{+\cdot}$), 239 (100), 178 (17), 152(5), 77(5). IR (KBr) (λ cm^{-1}): 3059*m*, 3026*m*, 2920*s*, 2855*m*, 1944*w*, 1660*s*, 1597*s*, 1589*s*, 1495*m*, 1451*s*, 1423*s*, 1357*m*, 1296*s*, 1253*s*, 1179*w*, 1156*w*, 1137*w*, 1100*w*, 1073*w*, 1053*w*, 1029*w*, 954*w*, 924*s*, 833*m*, 805*w*, 781*m*, 723*m*, 697*m*, 665*w*, 646*m*, 611*m*.

4-[(2-hydroxyethyl)sulfanyl]-10,11-dihydro-5H-dibenzo[a,d]cyclohepten-5-one (14)

Yield: 53%. oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ (ppm): 3.07-3.11 (2H, m); 3.19-3.25 (2H, m); 3.69 (2H, t, 5.7 Hz), 7.11 (1H, dd, 7.5 and 1.2 Hz); 7.18 (1H, dd, 7.8 and 1.2 Hz), 7.28 (1H, d, 7.8 Hz), 7.34 (1H, dd, 7.8 and 1.2 Hz), 7.40 (1H, dd, 7.8 and 1.5 Hz), 7.44 (1H, dt, 7.2 and 1.5 Hz), 7.92 (1H, dd, 7.5 and 1.5 Hz). ^{13}C NMR (75 MHz, $CDCl_3$) δ (ppm): 32.3; 34.4; 37.6; 59.8; 125.5; 126.1; 129.4; 128.9; 130.0; 130.2; 132.00; 132.9; 137.9; 139.1; 140.6; 142.6; 199.5. EI-MS [*m/z* (%)]: 284 (8, $[M]^{+\cdot}$), 266(10), 239 (100), 178 (15), 83(17). IR (film) (λ cm^{-1}): 3428*s*, 2924*s*, 1651*s*, 1449*m*, 1257*m*, 665*s*.

3-[(5-oxo-10,11-dihydro-5H-dibenzo[a,d]cyclohepten-4-yl) sulfanyl]propanoic acid (15)

Yield: 75%. m.p.: 191-192 °C; ^{1}H NMR (300 MHz, DMSO) δ (ppm): 2.56 (2H, t, 7.5 Hz); 3.11-3.15 (2H, m), 3.18 (2H, t, 7.5 Hz); 3.28-3.32 (2H; m); 7.28 (1H, dd, 6.9 and 0.9 Hz); 7.40 (1H, d, 7.5 Hz), 7.45-7.54 (3H, m), 7.63 (1H, dt, 7.8 and 1.5 Hz), 7.85 (1H, dd, 7.8 and 1.2 Hz), 12.45 (1H, sl). ^{13}C NMR (75 MHz, DMSO) δ (ppm): 27.8; 32.0; 33.4; 34.4; 125.0; 125.8; 126.4; 129.4; 130.0; 131.0; 132.8; 135.0; 137.7; 139.6; 140.5; 141.2; 172.7; 197.7. EI-MS [*m/z* (%)]: 312 (10, $[M]^{+\cdot}$), 239 (100), 208 (75), 180(47), 165 (27), 149(20), 105(19), 89(25), 73(20). IR (KBr) (λ cm^{-1}): 2953*w*, 1718*s*, 1648*s*, 1597*m*, 1578*m*, 1427*m*, 1405*m*, 1301*m*, 1261*m*, 1240*m*, 1213*w*, 955*w*, 924*w*, 833*w*, 791*m*, 755*m*, 723*m*, 696*w*, 647*w*, 608*w*.

4-[(2-aminoethyl)sulfanyl]-10,11-dihydro-5H-dibenzo[a,d]cyclohepten-5-one (16)

A round-bottom flask equipped with a magnetic stirrer and condenser was charged with 4-thio dibenzosuberone **10** (0.5 g, 1.7 mmol) and 10 mL of H_2SO_4. The reaction was stirred at reflux for 5 hours. After this time, the reaction solution was neutralized with a solution of 10% NaOH. The

aqueous solution was extracted with $CHCl_3$. The combined organic layers were washed with brine, dried over anhydrous $MgSO_4$ and the solvent was evaporated under reduced pressure. After that, the residue was purified by silica gel column chromatography eluting first with $CHCl_3$, followed by AcOEt and MeOH. Yield: 62%. Oil; ^{1}H NMR (300 MHz, $CHCl_3$) δ (ppm): 2.84 (2H, t, 6.0 Hz); 2.98 (2H, t, 6.0 Hz); 3.04-3.08 (2H, m), 3.20-3.24 (2H, m); 7.03 (1H, dd, 6.3 and 2.1 Hz); 7.17 (1H, dd, 7.8 and 0.9 Hz), 7.26 (1H, d, 6.6 Hz), 7.28 (1H, d, 2.1 Hz), 7.32 (1H, dd, 7.8 and 1.2 Hz), 7.41 (1H, dt, 7.5 and 1.5 Hz), 7.93 (1H, dd, 7.8 and 1.5 Hz). ^{13}C NMR (75 MHz, $CHCl_3$) δ (ppm): 32.6; 34.6; 37.6; 40.2; 125.0; 126.4; 127.3; 129.7; 130.1; 130.3; 132.0; 134.3; 138.0; 139.9; 140.7; 141.9; 198.7. EI-MS [*m/z* (%)]: 283(6, $[M]^{+\cdot}$), 264(100), 239 (80), 222(23), 208(57), 178 (40), 165(25), 152(13), 89(21), 77 (18), 57(16). IR (film) (λ cm^{-1}): 3053*m*, 2922*m*, 2859*m*, 1659*s*, 1616*w*, 1596*m*, 1581*w*, 1484*w*, 1450*m*, 1424*m*, 1357*w*, 1297*w*, 1257*w*, 1191*w*, 1157*w*, 1137*w*, 1102*w*, 1025*w*, 954*w*, 924*m*, 832*w*, 781*m*, 735*s*, 707*m*, 646*m*, 611*w*.

4-[(2-chloroethyl)sulfanyl]-10,11-dihydro-5H-dibenzo[a,d] cyclohepten-5-one (17):

A round-bottom flask equipped with a magnetic stirrer and condenser was charged with 4-thio dibenzosuberone **14** (0.4 g, 1.4 mmol) and 5 mL of $SOCl_2$. The reaction was stirred at reflux for 6 hours. After this time, the reaction solution was concentrated under reduced pressure. The residue was purified by silica gel column chromatography eluting with $CHCl_3$. Yield: 74%. Oil; ^{1}H NMR (300 MHz, $CHCl_3$) δ (ppm): 3.07-3.11 (2H, m); 3.19-3.26 (4H, m), 3.50-3.58 (2H, m); 7.10 (1H, dd, 5.4 and 3.0 Hz); 7.18 (1H, dd, 7.5 and 0.6 Hz), 7.32 (1H, d, 5.4 Hz), 7.33 (1H, d, 3.0 Hz), 7.33 (1H, dd, 7.8 and 0.9 Hz), 7.43 (1H, dt, 7.5 and 1.5 Hz). ^{13}C NMR (75 MHz, $CHCl_3$) δ (ppm): 32.7; 34.7; 35.9; 41.9; 125.8; 126.4; 127.8; 129.9; 130.2; 130.5; 132.2; 133.2; 138.0; 139.7; 140.7; 142.6; 198.3. EI-MS [*m/z* (%)]: 304(4, $[M+2]^{+\cdot}$), 302(12, [M]+), 266(25), 239 (100), 208(20), 178(30), 165(12), 152(10), 63(10). IR (film) (λ cm^{-1}): 3056*m*, 2920*m*, 2857*m*, 1942*w*, 1856*w*, 1659*s*, 1596*s*, 1581*s*, 1484*m*, 1446*s*, 1423*s*, 1357*m*, 1296*s*, 1256*s*, 1214*m*, 1190*w*, 1156*m*, 1137*m*, 1101*w*, 1053*w*, 1036*w*, 955*w*, 924*s*, 871*w*, 832*m*, 805*w*, 782*s*, 754*m*, 722*m*, 697*m*, 665*w*, 610*m*.

4-({2-[4-(2-hydroxyethyl)-1-piperazinyl]ethyl}sulfanyl)-10,11-dihydro-5H-dibenzo[a,d]cyclohepten-5-one (18):

A round-bottom flask equipped with a magnetic stirrer and condenser was charged with 4-thio dibenzosuberone **17** (0.2 g, 0.66 mmol) and 1-(2-hydroxyethyl)piperazine (1 mL, 8 mmol). The reaction was stirred at 150°C for 6 hours. After this time, 50 mL of $CHCl_3$ was added and the organic layer was washed with water (4 x 30 mL). The solvent of organic layer was dried over anhydrous $MgSO_4$, and evaporated under reduced pressure after which the residue was purified by silica gel column chromatography using as eluent $CHCl_3$, followed by AcOEt and MeOH. Yield: 61%. Oil; ^{1}H NMR (300 MHz, $CHCl_3$) δ (ppm): 2.37-2.73 (10H, m); 2.98-3.03 (2H, m), 3.05-3.09 (2H, m); 3.22-3.25 (2H, m); 7.03 (1H, dd, 5.4 and 3.0 Hz); 7.18 (1H, d, 7.5 Hz), 7.27 (1H, d, 5.4 Hz), 7.28 (1H, d, 3.0 Hz), 7.33 (1H, dd, 7.8 and 0.9 Hz), 7.42 (1H, dt, 7.5 and 1.5 Hz), 7.93 (1H, dd, 7.8 and 1.5Hz). ^{13}C NMR (75 MHz, $CHCl_3$) δ (ppm): 30.7; 32.7; 34.7; 52.4 (2C); 52.5 (2C); 59.1; 124.7; 126.2; 126.5; 130.0; 130.2; 130.3; 132.1; 135.4; 138.0; 139.5; 140.8; 141.3. EI-MS [*m/z* (%)]: 396(1, $[M]^{+\cdot}$), 380(10), 239 (70), 178 (15), 157(65), 143(100), 100(25), 70(28), 56(17). IR (film) (λ cm^{-1}): 3375*s*, 3054*s*, 2941*s*, 2817*s*, 1658*s*, 1597*s*, 1580*m*, 1449*s*, 1357*m*, 1298*s*, 1257*s*, 1155*m*, 1055*w*, 1006*w*, 955*w*, 924*m*, 876*w*, 833*w*, 782*m*, 734*s*, 700*m*, 665*w*, 647*w*, 611*w*.

ACKNOWLEDGEMENTS

We gratefully acknowledge CAPES, CNPq and FAPERJ.

CONCLUSION

This work describes the synthesis of nine 4-thio dibenzosuberone derivatives **10**-**18** (4-thio-10,11-dihydro-5H-dibenzo [a,d] cycloheptane-5-one derivatives) which are potential antidepressant agents. To prepare intermediates **9**, thallium III reagents were employed to iodinate the appropriate position of the tricyclic system. A modified Ullmman reaction then furnished the 4-thio derivatives in good to moderate yields, representing an efficient methodology for the synthesis of this class of compounds.

REFERENCES AND NOTES

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