A New Player in Environmentally Induced Oxidative Stress: Polychlorinated Biphenyl Congener, 3,3' dichlorobiphenyl (PCB11)

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Supplemental Methods:

Synthesis and structural verification of methoxylated PCB 11 standards. Four methoxylated standards of PCB 11 were synthesized using the Suzuki coupling reaction of 3-chlorobenzene boronic acid with an appropriate methoxybenzene as described previously (Song *et al.,* 2008; Lehmler and Robinson 2001). 3,3'-Dichlorobiphenyl-4-ol was synthesized by demethylation of the corresponding 3,3'-dichloro-4-methoxybiphenyl with BBr_3 (Lehmler and Robinson 2001). Melting points were measured on a Mel-Temp melting point apparatus and are uncorrected. The NMR spectra were recorded in $CDCl_3$ on a Bruker Avance DRX-400 spectrometer in the University of Iowa Central NMR Research Facility (Iowa City, IA, USA). Gas chromatography-mass spectrometry (GC-MS) analyses were performed on an Agilent 6890N gas chromatograph coupled with an Agilent 5975 inert mass selective detector (Agilent Technologies, CA, USA) as reported earlier (Telu *et al.,* 2010). Only the isotopic ion with the lowest mass is reported for all fragments observed in the mass spectra. High resolution mass spectra were recorded by the High Resolution Mass Spectrometry Facility of the University of California Riverside (Riverside, CA, USA). Combustion analyses were performed by Atlantic Microlab Inc. (Atlanta, GA, USA).

3,3'-Dichloro-2-methoxybiphenyl. Prepared by coupling of 3-chlorobenzene boronic acid (0.58 g, 3.8 mmol) with 1-bromo-3-chloro-2-methoxybenzene (0.55 g, 2.5 mmol) (Lehmler and Robinson 2001) and purified by column chromatography over silica gel with n-hexanes/$CHCl_3$ (6:1, *v/v*) as eluent. Yield: 0.60 g (61%). Colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$): δ/ppm 7.54 (br s, 1H), 7.43-7.38 (m, 1H), 7.34-7.27 (m, 3H), 7.15 (dd, J = 8.0 Hz, J ~ 1.6 Hz, 1H), 7.07-7.02 (pseudo t, J ~ 7.8 Hz, 1H), 3.49 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ/ppm 153.5, 139.4, 135.5, 134.2, 130.1, 129.6, 129.3, 129.2, 128.8, 127.7, 127.3, 125.0, 60.6. Mass spectrum *m/z*

(relative intensity, %): 252 (70, M^+), 217 (24), 202 (100), 182 (20), 173 (14), 152 (16), 139 (23). HRMS: *m/z* $[M]^+$ calculated for $C_{13}H_{10}OCl_2$ 252.0103; found 252.0104. Anal. Calcd for $C_{13}H_{10}Cl_2O$: C, 61.68; H, 3.98. Found: C, 61.94; H, 3.97.

3,3'-Dichloro-4-methoxybiphenyl. Prepared by coupling of 3-chlorobenzene boronic acid (1.88 g, 12 mmol) with 4-bromo-2-chloro-1-methoxybenzene (2.21 g, 10 mmol) (Lehmler and Robinson 2001) and purified by column chromatography over silica gel with n-hexanes/$CHCl_3$ (9:1, *v/v*) as eluent. Yield: 1.13 g (45%); White solid. Mp = 44-45°C. ^{1}H NMR (400 MHz, $CDCl_3$): δ/ppm 7.56 (d, *J* = 2.2 Hz, 1H), 7.48 (br s, 1H), 7.42–7.23 (m, 4H), 6.96 (d, *J* = 8.5 Hz, 1H), 3.92 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ/ppm 155.0, 141.5, 134.9, 133.3, 130.2, 128.9, 127.3, 126.9, 126.4, 125.0, 123.0, 112.4, 56.4. Mass spectrum *m/z* (relative intensity, %): 252 (100, M^+), 237 (54), 209 (36), 173 (12), 139 (23). HRMS: *m/z* $[M]^+$ calculated for $C_{13}H_{10}OCl_2$ 252.0103; found 252.0101.

3',5-Dichloro-3-methoxybiphenyl. Prepared by coupling of 3-chlorobenzene boronic acid (2.35 g, 15.0 mmol) with 1,3-dichloro-5-methoxybenzene (1.77 g, 10.0 mmol) (Song *et al.,* 2008) and purified by column chromatography over silica gel with n-hexanes/$CHCl_3$ (12:1, *v/v*) as eluent. Yield: 0.40 g (16%). Colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.51-7.50 (m, 1H), 7.36-7.31 (m, 3H), 7.11-7.10 (m, 1H), 6.93-6.92 (m, 1H), 6.90-6.89 (m, 1H), 3.80 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ/ppm 160.6, 142.2, 141.5, 135.3, 134.7, 130.1, 128.0, 127.2, 125.2, 119.6, 113.4, 111.5, 55.5. Mass spectrum *m/z* (relative intensity, %): 252 (100, M^+), 222 (19), 209 (10), 173 (11), 152 (23), 139 (28). HRMS: *m/z* $[M]^+$ calculated for $C_{13}H_{10}OCl_2$ 252.0103; found 252.0102. Anal. Calcd for C13H10Cl2O: C, 61.68; H, 3.98. Found: C, 61.76; H, 3.85.

3',5-Dichloro-2-methoxybiphenyl. Prepared by coupling of 3-chlorobenzene boronic acid

(1.72 g, 11.0 mmol) with 2-bromo-4-chloro-1-methoxybenzene (2.21 g, 10 mmol) (Lehmler and Robinson 2001) and purified by column chromatography over silica gel with n-hexanes/$CHCl_3$ (19:1, *v/v*) as eluent. Yield: 0.59 g (24%). Colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$): δ/ppm 7.50–7.47 (m, 1H), 7.40–7.25 (m, 5H), 6.91-6.88 (m, 1H), 3.78 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): δ/ppm 155.2, 139.1, 134.1, 130.8, 130.6, 129.7, 129.5, 128.8, 127.8, 127.7, 125.9, 112.6, 56.0. Mass spectrum *m/z* (relative intensity, %): 252 (81, M^+), 237 (5), 217 (9), 202 (100), 182 (13), 173 (12), 152 (8), 139 (23). HRMS: *m/z* $[M]^+$ calculated for $C_{13}H_{10}OCl_2$ 252.0103; found 252.0098. Anal. Calcd for $C_{13}H_{10}Cl_2O$: C, 61.68; H, 3.98. Found: C, 61.83; H, 3.98.

3,3'-Dichlorobiphenyl-4-ol. Synthesized from 3,3'-dichloro-4-methoxybiphenyl (0.30 g, 1.2 mmol) by demethylation with BBr_3 (Lehmler and Robinson 2001). Yield: 0.22 g (72 %). White solid. Mp = 50.5-52°C. ^{1}H NMR (400 MHz, $CDCl_3$): δ/ppm 7.54-7.47 (m, 2H), 7.40-7.26 (m, 4H), 7.07 (d, *J* = 8 Hz, 1H), 5.62 (br s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): δ/ppm 151.4, 141.5, 135.0, 133.7, 130.3, 127.706, 127.5, 127.3, 127.0, 125.0, 120.6, 116.8. Mass spectrum *m/z* (relative intensity, %): 238 (100, M^+), 168 (9), 139 (60). HRMS: *m/z* $[M]^+$ calculated for $C_{12}H_8OCl_2$ 237.9947; found 237.9953. Anal. Calcd for $C_{12}H_{18}Cl_2O$: C, 60.26; H, 3.37. Found: C, 60.47; H, 3.40.

References for Supplemental Methods:

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