Supplementary Material

Muscarine-like compounds derived from a pyrolysis product of cellulose

Andrea Defant, Ines Mancini,* Rosanna Matucci, Cristina Bellucci, Federico Dosi,

Danilo Malferrari and Daniele Fabbri

Figure S1. Overlapped energy-minimized structures of (+)-muscarine (light gray) and of compound **4** (gray). Hydrogen atoms are omitted to simplify the view.

Figure S2. ^{1}H-NMR spectrum (CD_3OD, 400 MHz) of 1-((2*S*,4*R*)-4-hydroxy-4-(methoxycarbonyl)tetrahydrofuran-2-yl)-*N*,*N*,N-trimethylmethan- aminium iodide (**4**).

Figure S3. ^{13}C-NMR spectrum (CD_3OD, 100 MHz) of compound **4**.

Figure S4. ^{1}H-NMR spectrum ($CDCl_3$, 400 MHz) of N-(((2S,4R)-4-hydroxy-4-(methoxycarbonyl)tetrahydrofuran-2-yl)methyl)-N-methyl cyclohexanaminium 4-methylbenzenesulfonate (**5**).

Figure S5. ^{13}C-NMR spectrum ($CDCl_3$, 100 MHz) of compound **5.**

Figure S6. ^{1}H-NMR spectrum ($CDCl_3$, 400 MHz) of pure 1-(((2S,4R)-4-Hydroxy-4-(methoxycarbonyl)tetrahydrofuran-2-yl)methyl)pyrrolidin-1-ium 4-methylbenzenesulfonate (**6**).

Figure S7. ^{13}C-NMR spectrum ($CDCl_3$, 100 MHz) of pure compound **6**.

Figure S8. ^{1}H-NMR spectrum ($CDCl_3$, 400 MHz) of 1-(((2S,4R)-4-Hydroxy-4-(methoxycarbonyl)tetrahydrofuran-2-yl)methyl)piperidin-1-ium 4-methylbenzenesulfonate (**7**).

Figure S9. ^{13}C-NMR spectrum ($CDCl_3$, 100 MHz) of compound **7.**

Figure S10. ^{1}H-NMR spectrum ($CDCl_3$, 400 MHz) of 1-(((2S,4R)-4-hydroxy-4-(piperidine-1-carbonyl)tetrahydrofuran-2-yl)methyl)piperidin-1-ium (**8**).

Figure S11. ^{13}C-NMR spectrum ($CDCl_3$, 100 MHz) of compound **8.**

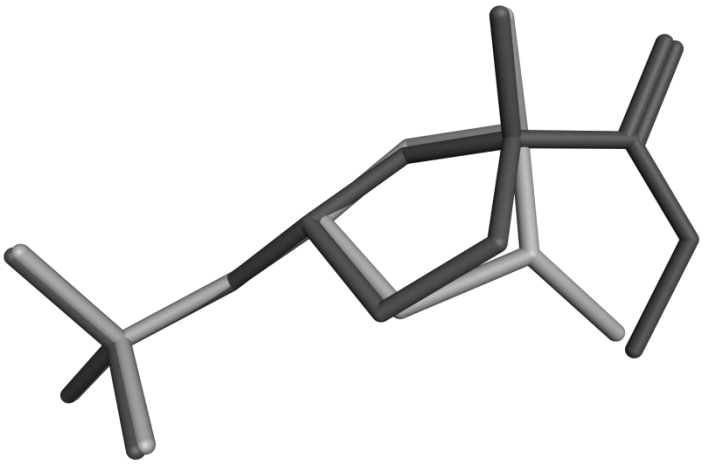

Figure S1. Overlapped energy-minimized structures of muscarine (light gray) and of compound **4** (gray). Hydrogen atoms are omitted to simplify the view.

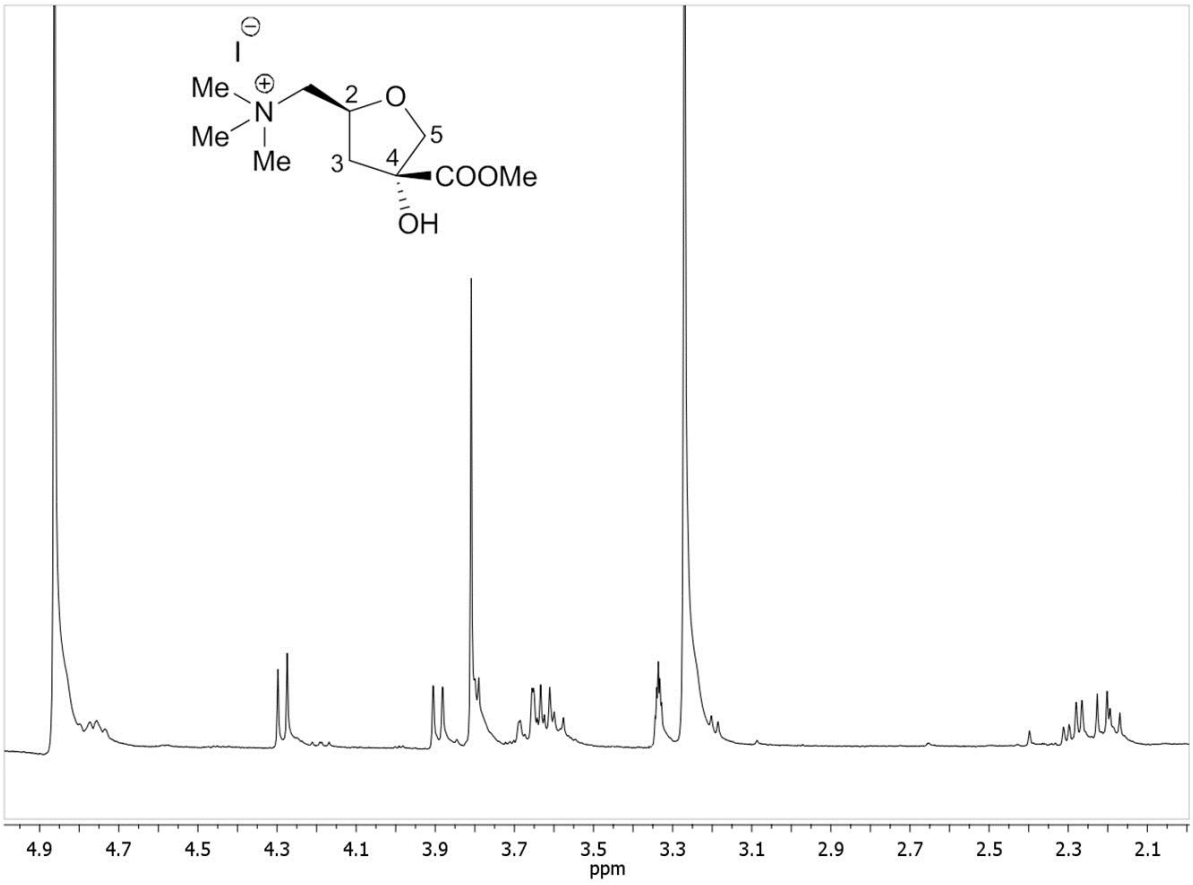

Figure S2. ^{1}H-NMR spectrum (CD_3OD, 400 MHz) of 1-((2*S*,4*R*)-4-hydroxy-4-(methoxycarbonyl)tetrahydrofuran-2-yl)-*N*,*N*,N-trimethylmethan- aminium iodide (**4**).

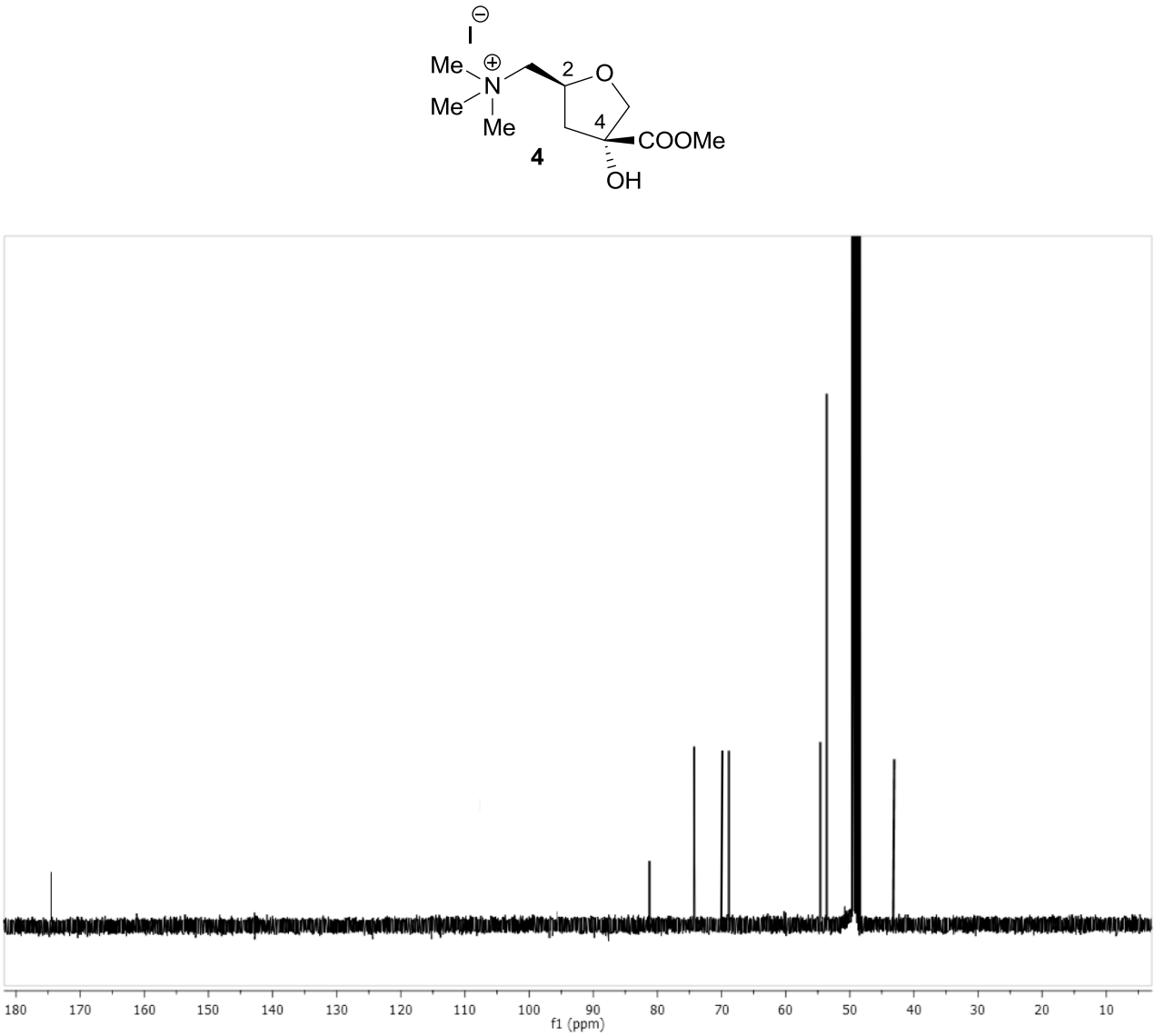

Figure S3. ^{13}C-NMR spectrum (CD_3OD, 100 MHz) of compound **4.**

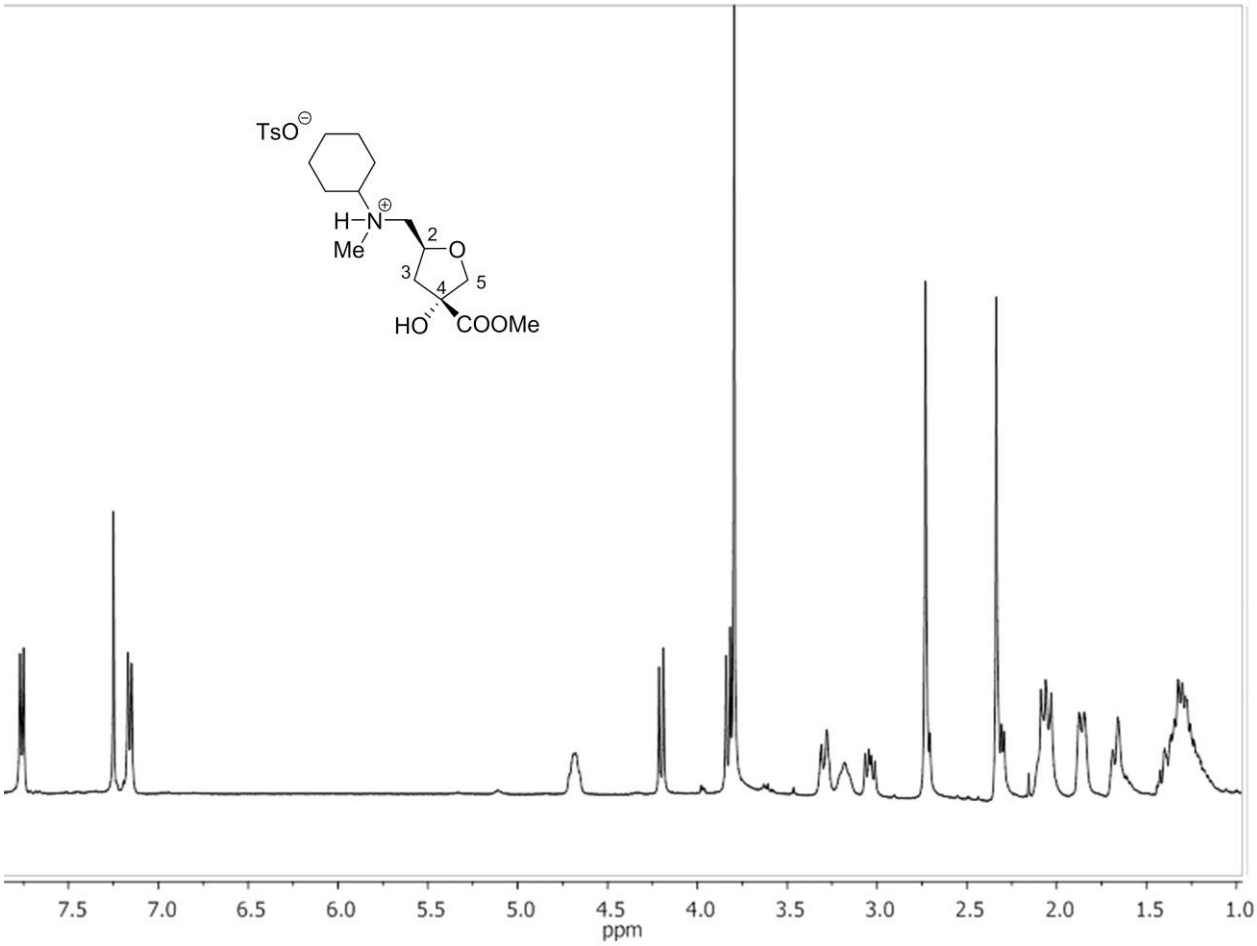

Figure S4. ^{1}H-NMR spectrum ($CDCl_3$, 400 MHz) of N-(((2S,4R)-4-hydroxy-4-(methoxycarbonyl)tetrahydrofuran-2-yl)methyl)-N-methyl cyclohexanaminium 4-methyl benzene sulfonate (**5**).

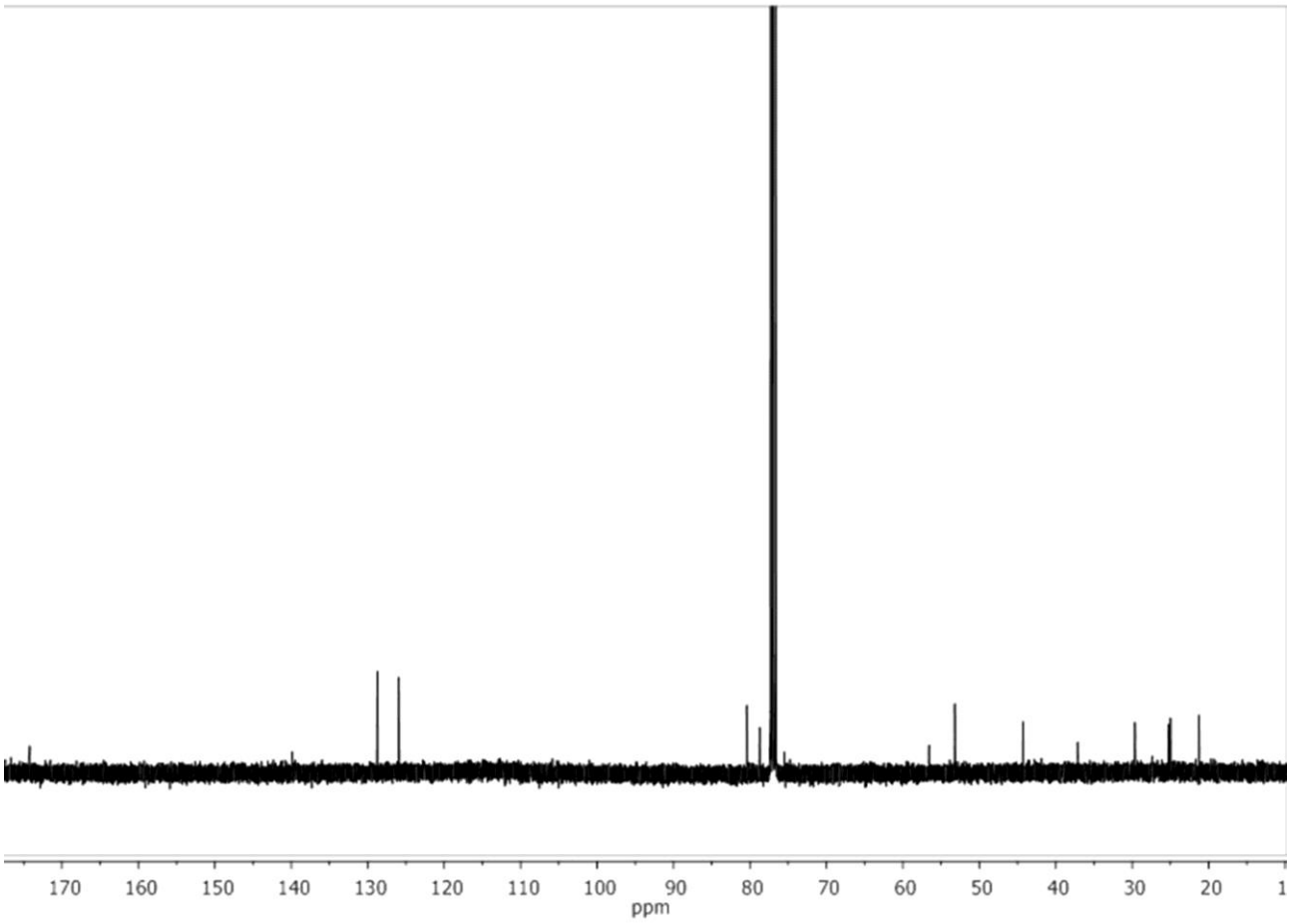

Figure S5. ^{13}C-NMR spectrum ($CDCl_3$, 100 MHz) of compound **5.**

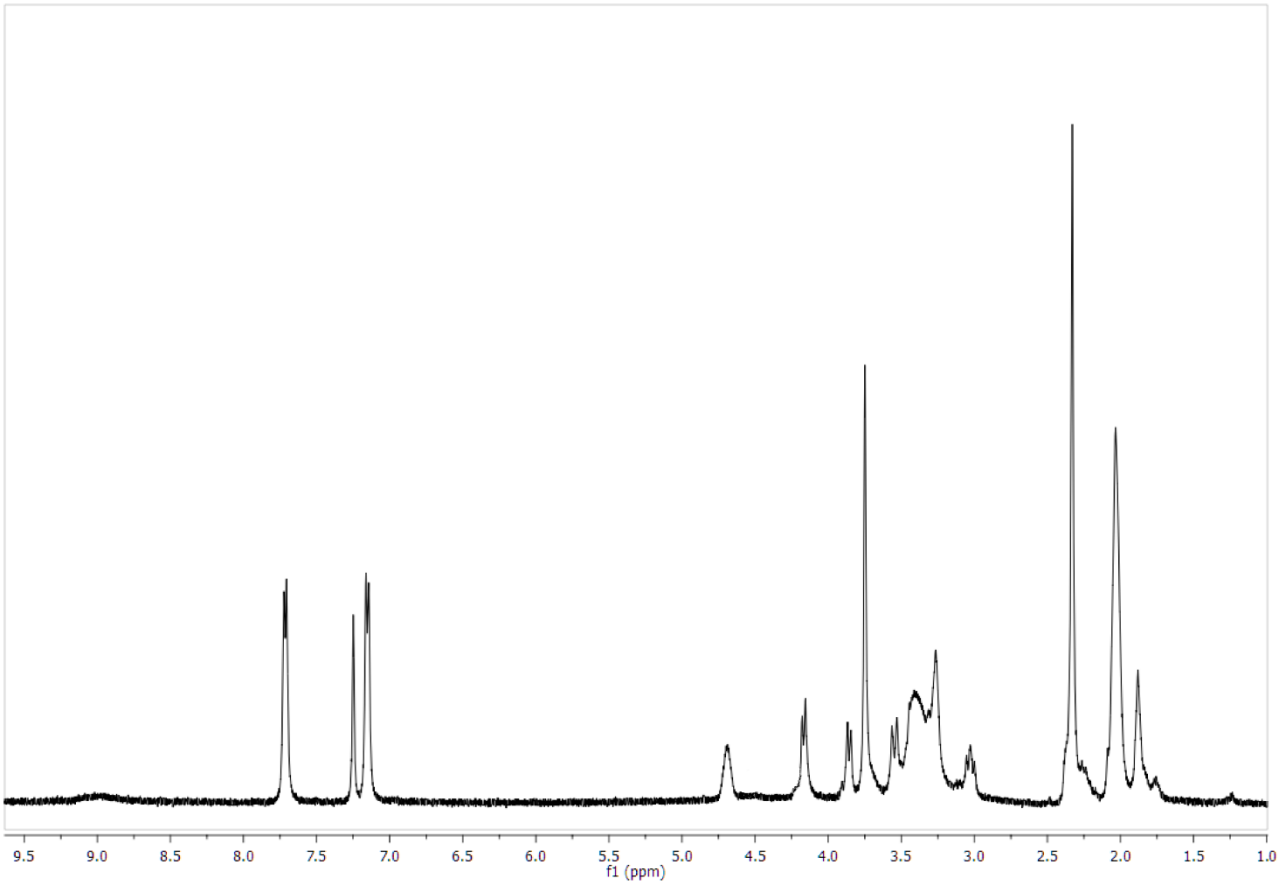

Figure S6. ^{1}H-NMR spectrum ($CDCl_3$, 400 MHz) of pure 1-(((2S,4R)-4-Hydroxy-4-(methoxycarbonyl)tetrahydrofuran-2-yl)methyl)pyrrolidin-1-ium 4-methylbenzenesulfonate (**6**).

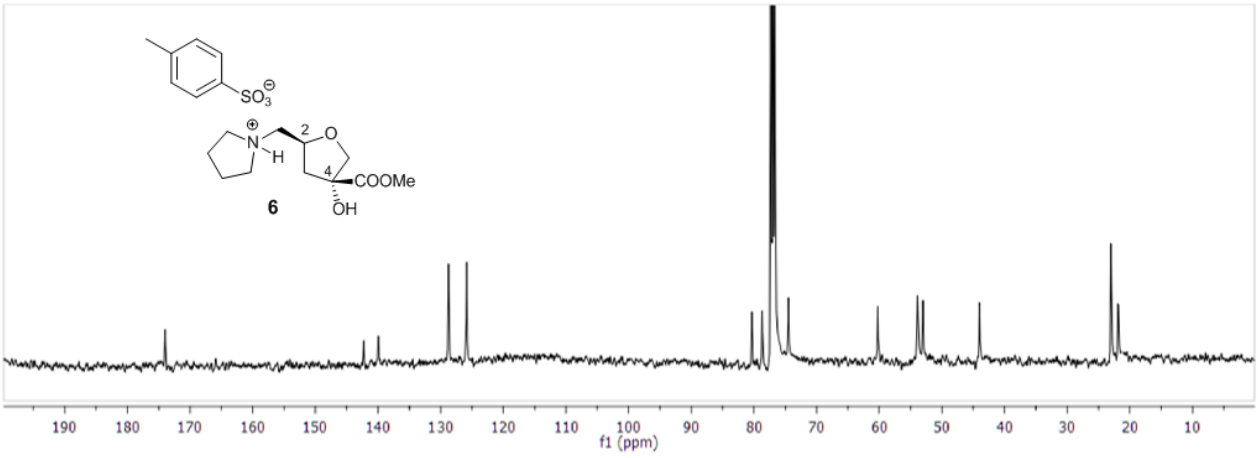

Figure S7. ^{13}C-NMR spectrum ($CDCl_3$, 100 MHz) of pure compound **6.**

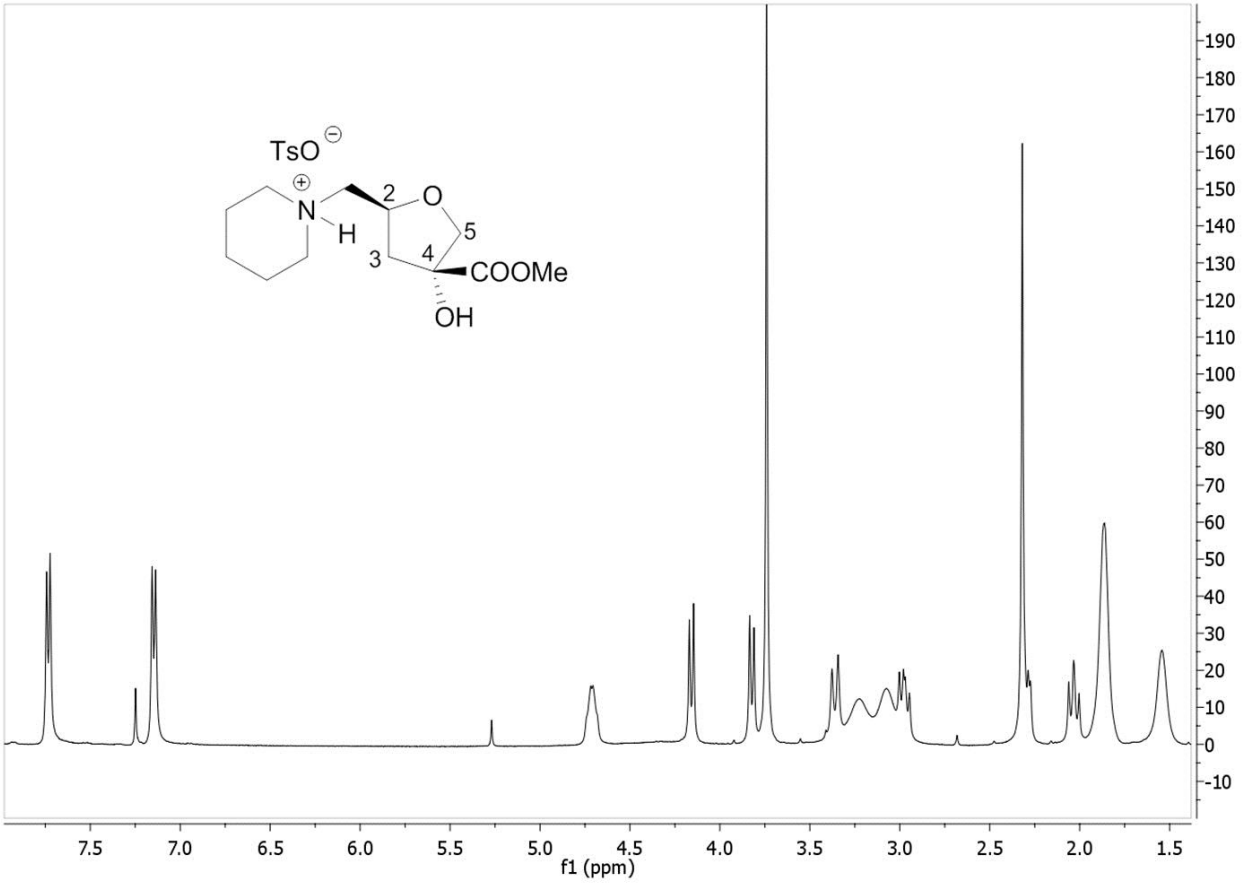

Figure S8. ^{1}H-NMR spectrum ($CDCl_3$, 400 MHz) of 1-(((2S,4R)-4-Hydroxy-4-(methoxycarbonyl)tetrahydrofuran-2-yl)methyl)piperidin-1-ium 4-methylbenzenesulfonate (**7**).

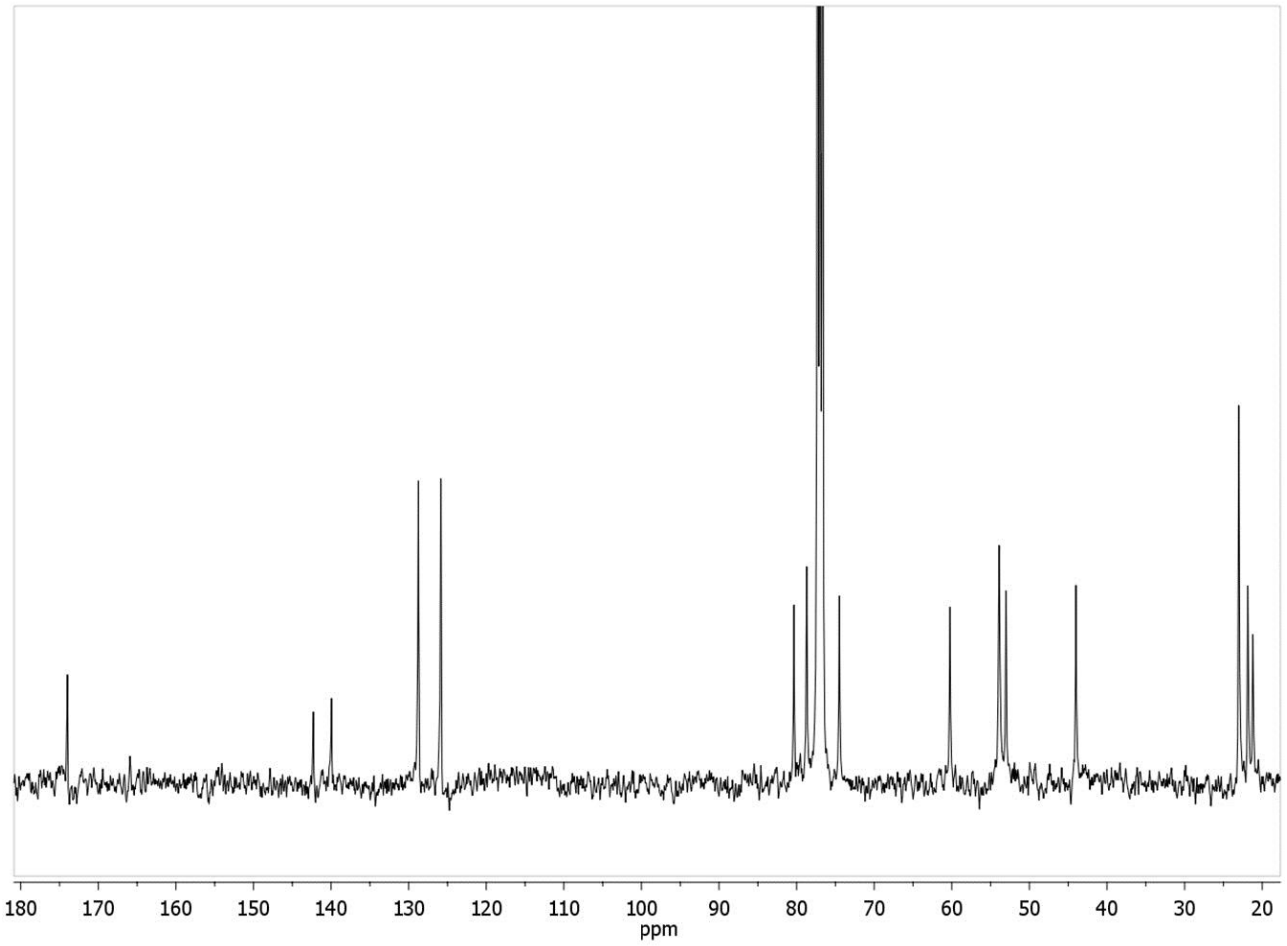

Figure S9. ^{13}C-NMR spectrum ($CDCl_3$, 100 MHz) of compound **7.**

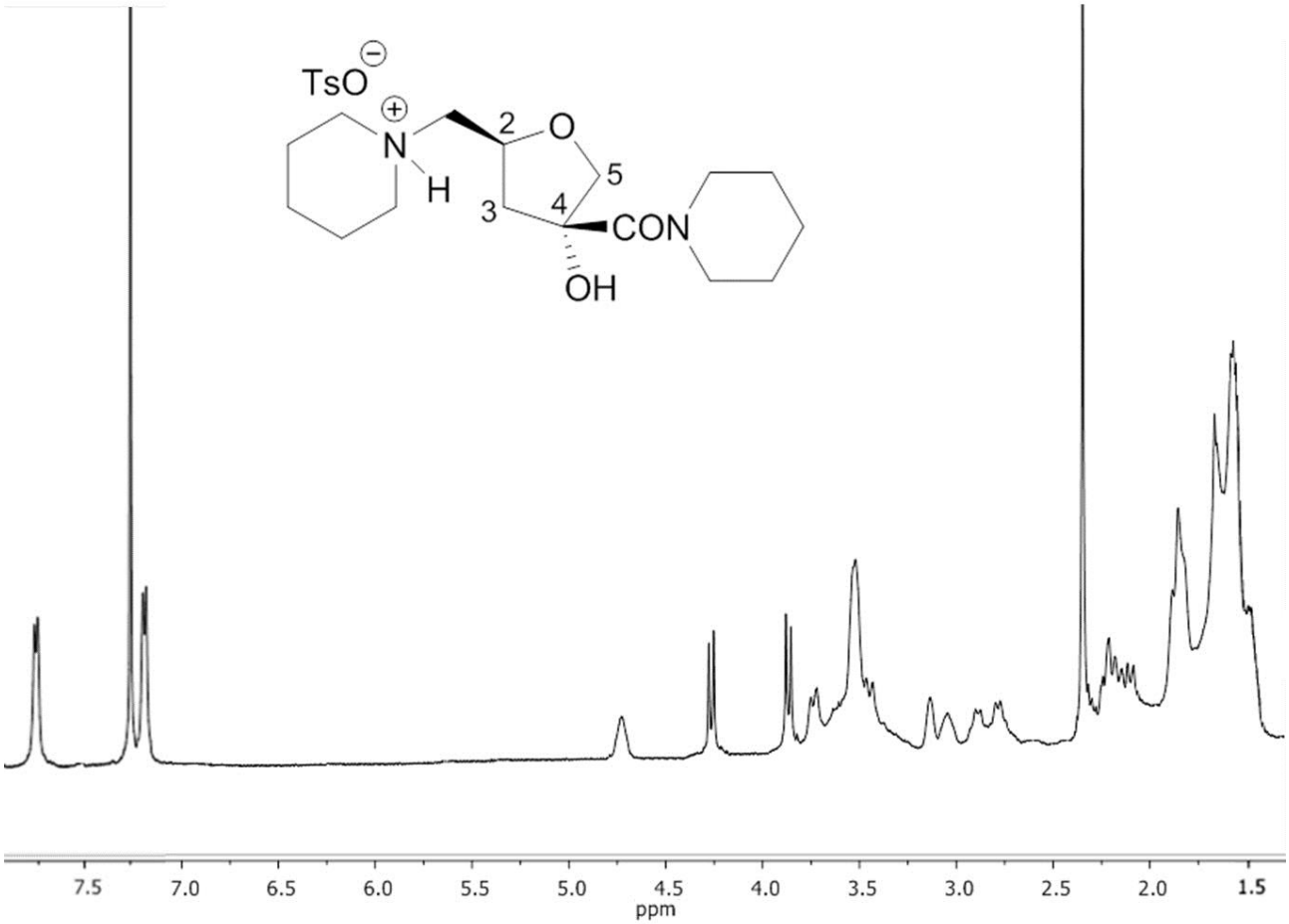

Figure S10. ^{1}H-NMR spectrum ($CDCl_3$, 400 MHz) of 1-(((2S,4R)-4-hydroxy-4-(piperidine-1-carbonyl)tetrahydrofuran-2-yl)methyl)piperidin-1-ium (**8**).

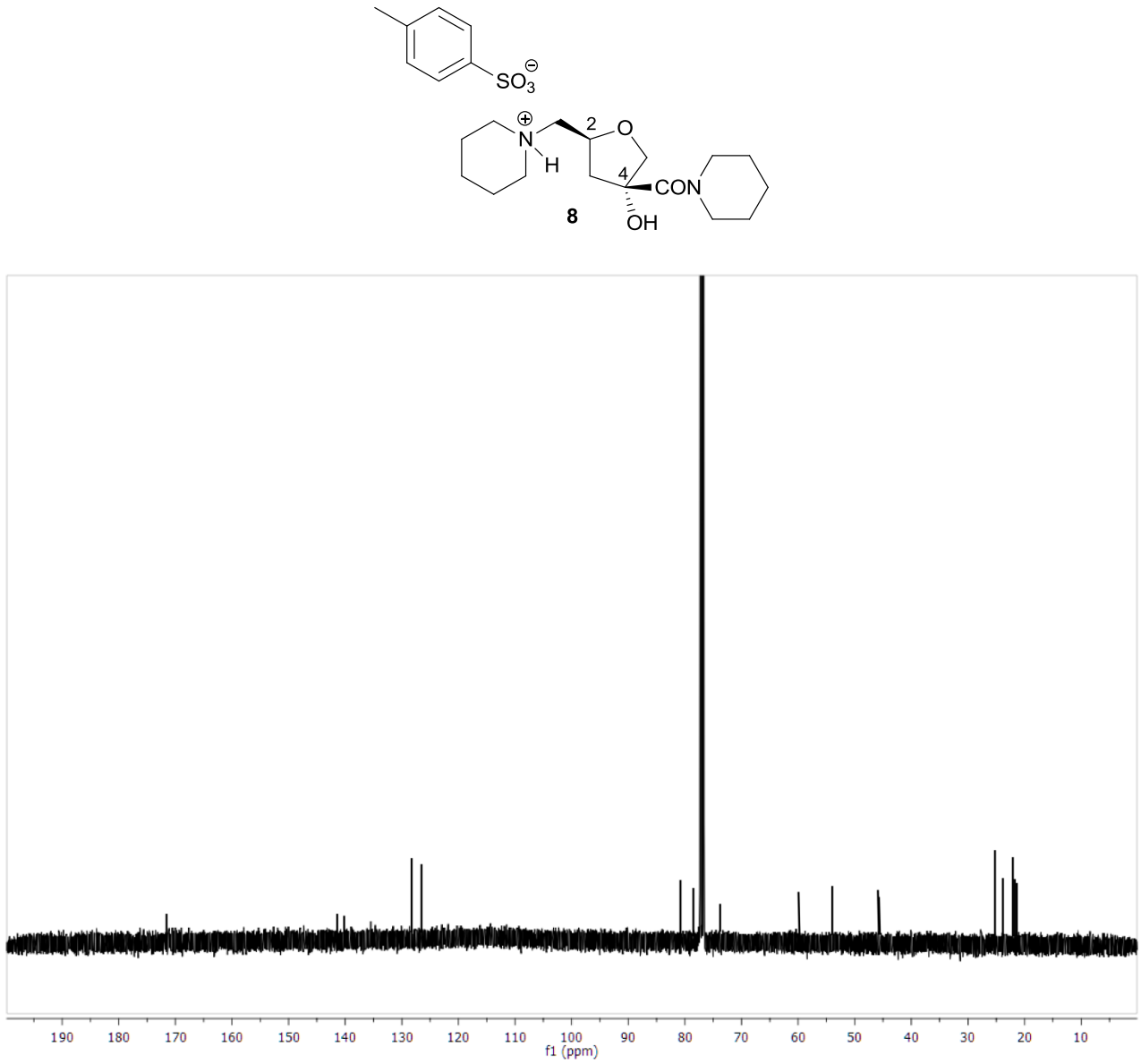

Figure S11. ^{13}C-NMR spectrum ($CDCl_3$, 100 MHz) of compound **8.**