Supporting Information

Chlorotrimethylsilane: a suitable reagent for the synthesis of chlorohydrin esters

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Characterization data of 3-chloro-2-butyl palmitate (10a-d).

Diastereomeric ratio of the mixture of chlorohydrin esters has been evaluated by GC analysis of the crude product. NMR data of both diastereomers are described. DEPT and two-dimensional NMR experiments as well as data comparison with similar compounds described in this manuscript have been used for peak assignment.

^1H NMR (500 MHz, CDCl_3) δ

	(2 <i>S</i> ,3 <i>R</i>)-3-chloro-2-butyl palmitate (2 <i>R</i> ,3 <i>S</i>)-3-chloro-2-butyl palmitate (10a-b)	(2 <i>R</i> ,3 <i>R</i>)-3-chloro-2-butyl palmitate (2 <i>S</i> ,3 <i>S</i>)-3-chloro-2-butyl palmitate (10c-d)
^1H
4	4.97 (qd, $J=6.3, 4.3$ Hz, 1 H)	5.02 (qd, $J=6.5, 4.6$ Hz, 1 H)
5	4.08 (qd, $J=6.8, 4.3$ Hz, 1 H)	4.02 (qd, $J=6.8, 4.6$ Hz, 1 H)
7	2.30 (t, $J=7.3$ Hz, 2 H)	
8	1.58-1.64 (m, 2 H)	
9-20	1.18-1.34 (m, 24 H)	
21	0.86 (t, $J=6.8$ Hz, 3 H)	
22	1.26 (d, $J=6.3$ Hz, 3 H)	1.27 (d, $J=6.5$ Hz, 3 H)
23	1.45 (d, $J=6.8$ Hz, 3 H) 1.45 (d, $J=6.8$ Hz, 3 H)	

^{13}C NMR (75 MHz) δ

	(2 <i>S</i> ,3 <i>R</i>)-3-chloro-2-butyl palmitate (2 <i>R</i> ,3 <i>S</i>)-3-chloro-2-butyl palmitate (10a-b)	(2 <i>R</i> ,3 <i>R</i>)-3-chloro-2-butyl palmitate (2 <i>S</i> ,3 <i>S</i>)-3-chloro-2-butyl palmitate (10c-d)
^{13}C
2	173.1	
4	72.8	59.2
5	72.4	58.8
7	34.5	34.4
8	24.9	
9-18	29.1, 29.2, 29.3, 29.4, 29.6, 29.7	
19	31.9	
20	22.7	
21	14.1	
22	15.5	16.4
23	20.7	20.5

MS m/z 348 ($M+1$)⁺, 346 ($M-1$)⁺, 256, 239, 92, 90, 55.

Characterization data of (2R, 3S)-3-chloro-2-butyl palmitate (10b).

Diastereomeric purity has been evaluated by GC and NMR analysis of the crude product. A Jasco OR-1590 HPLC detector was used to determine the optical rotation sign of this enantiomer. Absolute configuration was assigned considering the experimental results and accepting a S_N2 mechanism.

¹H NMR (300 MHz, CDCl₃) δ 0.88 (t, *J*=7.0 Hz, 3 H) 1.20-1.35 (m, 24 H) 1.30 (d, *J*=6.4 Hz, 3 H) 1.48 (d, *J*=6.6 Hz, 3 H) 1.58-1.69 (m, 2 H) 2.32 (t, *J*=7.4 Hz, 2 H) 4.11 (qd, *J*=6.6, 4.6 Hz, 1 H) 4.99 (qd, *J*=6.4, 4.6 Hz, 1 H). ¹³C NMR (75 MHz) δ 14.1, 15.5, 20.7, 22.7, 25.0, 29.1, 29.2, 29.3, 29.4, 29.6, 29.7, 31.9, 34.5, 59.2, 72.8, 173.0. MS *m/z* 348 (M+1)⁺, 346 (M-1)⁺, 256, 239, 92, 90, 55. Calcd. for C₂₀ H₃₉ Cl O₂: C, 69.23%; H, 11.33% Found: C, 69.26%; H, 11.37%.

OR signal: The blue plot corresponds to a 6 mg/ml solution of **10b** in hexane. The black plot corresponds to a pure hexane sample.

Characterization data of (2R, 3R)-3-chloro-2-butyl palmitate and (2S, 3S)-3-chloro-2-butyl palmitate (10c-d). Diastereomeric purity has been evaluated by GC and NMR analysis of the crude product. Absolute configuration was assigned considering the experimental results and accepting a S_N2 mechanism.

^1H NMR (300 MHz, CDCl_3) δ 0.88 (t, $J=6.6$ Hz, 3 H) 1.20-1.40 (m, 24 H) 1.29 (d, $J=6.4$ Hz, 3 H) 1.48 (d, $J=6.8$ Hz, 3 H) 1.57-1.64 (m, 2 H) 2.33 (t, $J=7.2$ Hz, 2 H) 4.04 (qd, $J=6.8, 4.6$ Hz, 1 H) 5.05 (qd, $J=6.4, 4.6$ Hz, 1 H). ^{13}C NMR (75 MHz) δ 14.1, 16.4, 20.5,

22.7, 25.0, 29.1, 29.2, 29.3, 29.4, 29.6, 29.7, 31.9, 34.4, 58.8, 72.4, 173.0. MS m/z 348 (M+1)⁺, 346 (M-1)⁺, 256, 239, 92, 90, 55. Calcd for C₂₀ H₃₉ Cl O₂: C, 69.23%; H, 11.33% Found: C, 68.92 %; H, 11.34%.

Characterization data of 2,3-dipalmitoyloxybutane (11). ¹H NMR (300 MHz, CDCl₃) δ 0.86 (t, J =7.0 Hz, 6 H) 1.18 (d, J =6.7 Hz, 6 H) 1.14-1.44 (m, 48 H) 1.54-1.70 (m, 4 H) 2.22-2.31 (m, 4 H) 4.90-5.03 (m, 2 H).

Characterization data of chlorohydrin esters 12a to 12 c.

2-Chloro-1-ethyl palmitate (12a)¹. ¹H NMR (300 MHz, CDCl₃) δ 0.88 (t, J =6.6 Hz, 3 H) 1.20-1.40 (m, 24 H) 1.55-1.60 (m, 2 H) 2.35 (t, J =7.4 Hz, 2 H) 3.68 (t, J =5.8 Hz, 2 H) 4.33 (t, J =5.8 Hz, 2 H). ¹³C NMR (75 MHz) δ 14.1, 22.7, 24.9, 29.0, 29.1, 29.2, 29.4, 29.5, 29.6, 29.7, 31.9, 34.1, 41.6, 63.8, 173.5. MS m/z : 320 (M+1)⁺, 318 (M-1)⁺, 239, 43.

4-Chloro-1-butyl palmitate (12b). ¹H NMR (300 MHz, CDCl₃) δ 0.88 (t, J =6.56 Hz, 3 H) 1.20-1.37 (m, 24 H) 1.57-1.67 (m, 2 H) 1.74-1.91 (m, 4 H) 2.30 (t, J =7.5 Hz, 2 H) 3.57 (t, J =6.3 Hz, 2 H) 4.11 (t, J =6.1 Hz, 2 H). ¹³C NMR (75 MHz) δ 14.0, 22.6, 24.9, 26.0, 29.0, 29.1, 29.2, 29.3, 29.4, 29.5, 29.6, 31.8, 34.2, 44.4, 63.2, 173.8. MS m/z : 348 (M+1)⁺,

¹ Beger, J.; Jacobi, R.; Rehbeil, U.; Knoll, E. *Tenside, Surfactants, Deterg.* 1992, 29, 328-332.

346 (M-1)⁺, 256, 239, 93, 91, 55. Calcd for C₂₀H₃₉ClO₂: C, 69.23%; H, 11.33% Found: C, 68.92%; H, 11.34%.

6-Chloro-1-hexyl palmitate (12c). ¹H NMR (300 MHz, CDCl₃) δ 0.88 (t, *J*=6.6 Hz, 3 H) 1.20-1.52 (m, 28 H) 1.57-1.70 (m, 4 H) 1.77-1.83 (m, 2 H) 2.29 (t, *J*=7.3 Hz, 2 H) 3.54 (t, *J*=6.7 Hz, 2 H) 4.07 (t, *J*=6.6 Hz, 2 H). ¹³C NMR (75 MHz) δ 14.0, 22.6, 24.9, 25.2, 26.4, 28.4, 29.1, 29.2, 29.3, 29.4, 29.6, 31.9, 32.4, 34.3, 44.8, 64.0, 173.8. MS *m/z*: 376 (M+1)⁺, 374 (M-1)⁺, 257, 239, 118, 83. Calcd for C₂₂H₄₃ClO₂: C, 70.46%; H, 11.56%. Found C, 70.24%; H, 11.60%.

Characterization data of chlorohydrin esters 12d-13d to 12f-13f.

Regioisomeric ratio of the mixture of chlorohydrin esters has been evaluated by GC analysis of the crude product. NMR data of the prevailing regioisomers are described. NMR data used to identify minor regioisomers are presented. Integration values are consistent with the regioisomeric ratio found by GC.

2-Chloro-1-propyl palmitate (12d) and 1-chloro-2-propyl palmitate (13d)².

13d: ¹H NMR (300 MHz, CDCl₃) δ 0.88 (t, $J=6.56$ Hz, 3 H) 1.20-1.35 (m, 24 H) 1.32 (d, $J=6.4$ Hz, 3 H) 1.60-1.75 (m, 2 H) 2.31 (t, $J=7.2$ Hz, 2 H) 3.55 (dd, $J=11.4, 5.5$ Hz, 1 H) 3.59 (dd, $J=11.4, 5.1$ Hz, 1 H) 5.05-5.16 (m, 1 H). ¹³C NMR (75 MHz) δ 14.0, 17.5, 22.6, 24.9, 29.0, 29.1, 29.2, 29.3, 29.4, 29.5, 29.6, 29.7, 31.8, 34.4, 46.8, 69.3, 173.0. MS m/z : 334 (M+1)⁺, 332 (M-1)⁺, 256, 239, 43.

12d: ¹H NMR (300 MHz, CDCl₃) δ 1.52 (d, $J=6.7$ Hz, 3 H) 3.80-3.83 (m, 1 H) 4.15-4.21 (m, 2 H). MS m/z : 334 (M+1)⁺, 332 (M-1)⁺, 256, 239, 43.

2-Chloro-1-butyl palmitate (12e) and 1-chloro-2-butyl palmitate (13e).

13e: ¹H NMR (300 MHz, CDCl₃) δ 0.88 (t, $J=7.0$ Hz, 3 H) 0.93 (t, $J=7.5$ Hz, 3 H) 1.22-1.35 (m, 24 H) 1.60-1.80 (m, 4 H) 2.34 (t, $J=7.3$ Hz, 2 H) 3.57 (dd, $J=11.6, 6.3$ Hz, 1 H) 3.63 (dd, $J=11.6, 7.2$ Hz, 1 H) 4.94-5.03 (m, 1 H). ¹³C NMR (75 MHz) δ 9.4, 14.1, 22.7, 24.6, 25.0, 29.1, 29.2, 29.3, 29.4, 29.6, 29.7, 31.9, 34.4, 45.3, 73.7, 173.4. MS m/z : 348 (M+1)⁺, 346 (M-1)⁺, 256, 239, 55.

² (2) Derbesy, M.; Naudet, M. *Bull.Soc.Chim.France* 1968, 4531-4539.

12e: ^1H NMR (300 MHz, CDCl_3) δ 4.24 (d, $J=5.9$ Hz, 1 H) 4.23 (d, $J=6.3$ Hz, 1 H). MS m/z : 348 ($\text{M}+1$) $^+$, 346 ($\text{M}-1$) $^+$, 256, 239, 55.

3-Chloro-1-butyl palmitate (12f) and 4-chloro-2-butyl palmitate (13f)².

13f: ^1H NMR (300 MHz, CDCl_3) δ 0.88 (t, $J=6.4$ Hz, 3 H) 1.20-1.35 (m, 27 H) 1.1.58-1.66 (m, 2 H) 1.90-2.14 (m, 2 H) 2.29 (t, $J=7.3$ Hz, 2 H) 3.53 (dt, $J=6.6$, 1.1 Hz, 2 H) 5.05-5.58 (m, 1 H). ^{13}C NMR (75 MHz) δ 14.1, 19.9, 22.7, 25.0, 29.1, 29.2, 29.3, 29.4, 29.6, 29.7, 31.9, 34.5, 38.7, 40.7, 67.9, 173.3. MS m/z : 348 ($\text{M}+1$) $^+$, 346 ($\text{M}-1$) $^+$, 256, 239, 92, 90, 55.

12f: ^1H NMR (300 MHz, CDCl_3) δ 1.55 (d, $J=6.6$ Hz, 3H) 4.06-4.41 (m, 3 H). ^{13}C NMR (75 MHz) δ 54.2, 61.5. MS m/z : 348 ($\text{M}+1$) $^+$, 346 ($\text{M}-1$) $^+$, 256, 239, 55.

Characterization data of 4-chloro-1-pentyl palmitate (12g) and 5-chloro-2-pentyl palmitate (13g). Regioisomeric ratio of the mixture of chlorohydrin esters has been evaluated by GC analysis of the crude product. NMR data of both regioisomers are described. DEPT experiments, as well as data comparison with similar compounds described in this manuscript, have been used for peak assignment.

^1H NMR (400 MHz, CDCl_3) δ

	4-chloro-1-pentyl palmitate (12g)	5-chloro-2-pentyl palmitate (13g)
^1H	<p style="text-align: center;">12g</p>	<p style="text-align: center;">13g</p>
4		4.94 (tq, $J=6.3$, 6.3 Hz, 1 H)
5, 6, 10	1.57-1.88 (m, 6 H)	
4,7	4.00-4.15 (m, 3 H)	
7		3.54 (t, $J=6.7$ Hz, 2 H)
9	2.27 (t, $J=7.3$ Hz, 2 H)	2.30 (t, $J=7.6$ Hz, 2 H)
11-22	1.18-1.37 (m, 24 H)	
23	0.88 (t, $J=6.6$ Hz, 3 H)	
24	1.53 (d, $J=6.6$ Hz, 3 H)	1.23 (d, $J=6.3$ Hz, 3 H)

^{13}C NMR (100 MHz) δ

	4-chloro-1-pentyl palmitate (12g)	5-chloro-2-pentyl palmitate (13g)
^{13}C	<p style="text-align: center;">12g</p>	<p style="text-align: center;">13g</p>
2	174.1	173.7
4	63.8	69.9
5	25.2	33.5
6	36.9	28.8
7	58.3	44.9
9	34.6, 34.9	
10	25.6, 26.2	
11-20	29.3, 29.4, 29.5, 29.6, 29.7, 29.8, 29.9	
21	32.1	
22	22.9	
23	14.3	
24	25.3	20.3

12g MS m/z 360 ($\text{M}-1$)⁺, 256, 239, 105, 69. **13g** MS m/z 256, 239, 105, 69, 43.

Characterization data of 5-chloro-1-hexyl palmitate (12h) and 6-chloro-2-hexyl palmitate (13h). Regioisomeric ratio of the mixture of chlorohydrin esters has been evaluated by GC analysis of the crude product. NMR data of the prevailing regioisomer are described. NMR data used to identify the minor regioisomer are presented too. Other RMN data coincide with the ones from the prevailing isomer. Integration values are consistent with the regioisomeric ratio found. MS data from each regioisomer are presented.

12h: ^1H NMR (300 MHz, CDCl_3) δ 0.88 (t, $J=6.6$ Hz, 3 H) 1.20-1.35 (m, 24 H) 1.51 (d, $J=6.6$ Hz, 3 H) 1.44-1.69 (m, 6 H) 1.70-1.80 (m, 2 H) 2.29 (t, $J=7.3$ Hz, 2 H) 4.03 (tq, $J=6.6$, 6.4 Hz, 1 H) 4.08 (t, $J=6.4$ Hz, 2 H). ^{13}C NMR (75 MHz) δ 14.3, 22.6, 23.1, 25.0, 25.3, 28.1, 29.1, 29.2, 29.3, 29.4, 29.5, 29.6, 29.7, 31.9, 34.4, 34.7, 35.0, 39.8, 44.8, 58.4, 63.9, 70.2, 173.9. MS m/z : 256, 239, 55.

13h: ^1H NMR (300 MHz, CDCl_3) δ 1.21 (d, $J=6.3$ Hz, 3 H) 3.53 (t, $J=6.6$ Hz, 2 H) 4.70-4.95 (m, 1 H) ^{13}C NMR (75 MHz) δ 34.7, 35.0, 44.8, 70.2. MS m/z : 256, 239, 90, 92, 55.

Characterization data of 1,3-dichloro-2-propyl palmitate (13i)³³. ¹H

NMR (300 MHz, CDCl₃) δ 0.88 (t, J =6.4 Hz, 3 H) 1.20-1.40 (m, 24 H) 1.60-1.75 (m, 2 H) 2.37 (t, J =7.5 Hz, 2 H) 3.72 (dd, J =11.6, 5.1 Hz, 2 H) 3.77 (dd, J =11.6, 5.3 Hz, 2 H) 5.18 (tt, J =5.1, 5.3 Hz, 1 H). ¹³C NMR (75 MHz) δ 14.1, 22.7, 24.8, 29.0, 29.2, 29.3, 29.4, 29.6, 29.7, 31.9, 34.1, 42.4, 71.4, 172.7. MS m/z : 368 (M+1)⁺, 366 (M-1)⁺, 239, 43.

³ Davidek, J.; Velisek, J.; Kubelka, V.; Janicek, G.; Simicova, Z. *Z. Lebensm. -Unters. Forsch.* **1980**, *171*, 14-17.

Chromatographic analyses (GLC) conditions for 10a-d. Capillary column (30 m $\times$ 0.25 mm diameter, 0.25 μ m film thickness). Hydrogen (0.5 mL/min) as carrier gas. T_{injector} = 275 $^{\circ}$ C, T_{detector} = 300 $^{\circ}$ C, T_{column} = 50 $^{\circ}$ C (1 min), 50–250 $^{\circ}$ C (10 $^{\circ}$ C/min), and 250 $^{\circ}$ C (10 min); t_R values are given in min under these conditions.

10a-d (24.03 and 24.18)

10a-d (24.03 and 24.18) (enlargement)

10b (24.12 min) **10c-d (24.35 min)**

Detail of the GLC chromatogram of the mixture 10a (24.02 min)+ 10c-d (24.26 min)

Chromatographic analyses (GLC) conditions for 12d-h and 13a-i. Capillary column (30 m $\times$ 0.25 mm diameter, 0.25 μ m film thickness). Hydrogen (0.5 mL/min) as carrier gas. $T_{\text{injector}} = 275\text{ }^{\circ}\text{C}$, $T_{\text{detector}} = 300\text{ }^{\circ}\text{C}$, $T_{\text{column}} = 150\text{ }^{\circ}\text{C}$ (2 min), 150–250 $^{\circ}\text{C}$ (10 $^{\circ}\text{C}/\text{min}$), and 250 $^{\circ}\text{C}$ (20 min); t_r values are given in min under these conditions.

12a (13.77 min)

12b (16.81 min) **12c (21.75 min)**

13d (13.96 min) + 12d (14.06 min)

13d (13.96 min) + 12d (14.06 min) (enlargement)

13e (15.20 min) + 12e (15.41 min)

13e (15.20 min) + 12e (15.41 min) (enlargement)

13f (15.37 min) + 12f (15.67 min)

13g (17.04 min) + 12g (17.63 min)

13h (18.57 min) + 12h (19.39 min)

13i (16.69 min)