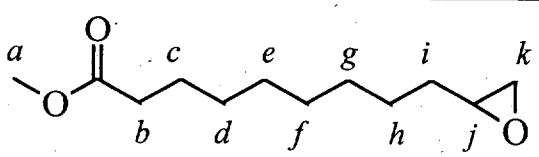
Supporting Information

During the course of this study, a subset of synthesized epoxide and dihydroxy containing fatty acid esters and analogs were submitted to rigorous structural validation. These data were acquired to ensure that the standard chemical synthesis procedures being used had been properly implemented. The supporting information contained in this document consist of 300MHz 1H-NMR spectra, electron impact mass spectra (EI-MS) from gas chromatographic analyses and supporting electrospray ionization mass spectra (ESI-MS).



a	*b*	*c*	*d - h*	*i*	*j*	*k*
3.66 (3H, s)	2.30 (2H, t)	1.61 (2H,m)	1.30 (10H,m)	1.55 (2H,m)	2.91 (1H, m)	2.46 (1H, dd), 2.74 (1 H, dd)

Figure S1: ^{1}H-NMR spectral results (300MHz; $CDCl_3$) of 10,11-epoxy undecanoic acid methyl ester (Compound **1**). ^{1}H-NMR chemical shifts are presented as ppm (proton number, peak multiplicity).

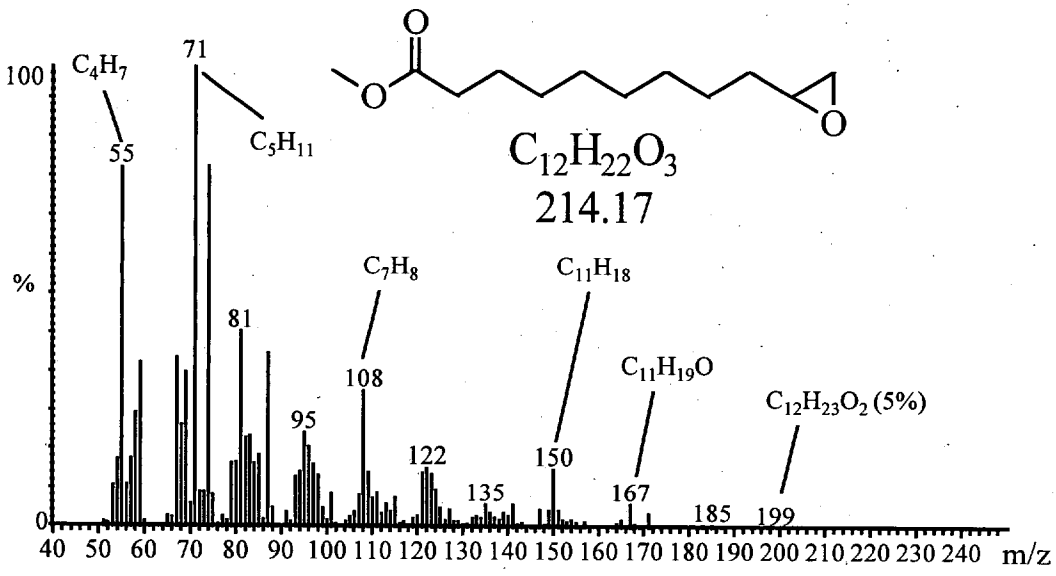
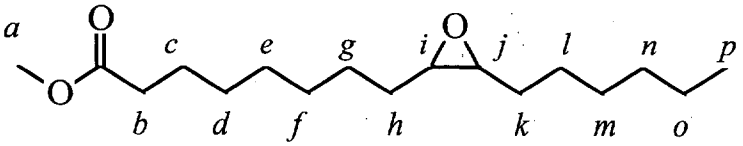


Figure S2: EI-MS spectra of 10,11-epoxyundecanoic acid methyl ester (Compound **1**).



a	*b*	*c*	*d - g, l - o*	*h, k*	*i, j*	*p*
3.66 (3H, s)	2.29 (2H, t)	1.61 (2H,m)	1.2 – 1.4 (16H,m)	1.48 (4H,m)	2.89 (2H, m)	0.88 (3H,t)

Figure S3: 1H-NMR spectral results (300MHz; $CDCl_3$) of (*Z*)-9,10-epoxyhexadecanoic acid methyl ester (Compound **5**). 1H-NMR chemical shifts are presented as ppm (proton number, peak multiplicity).

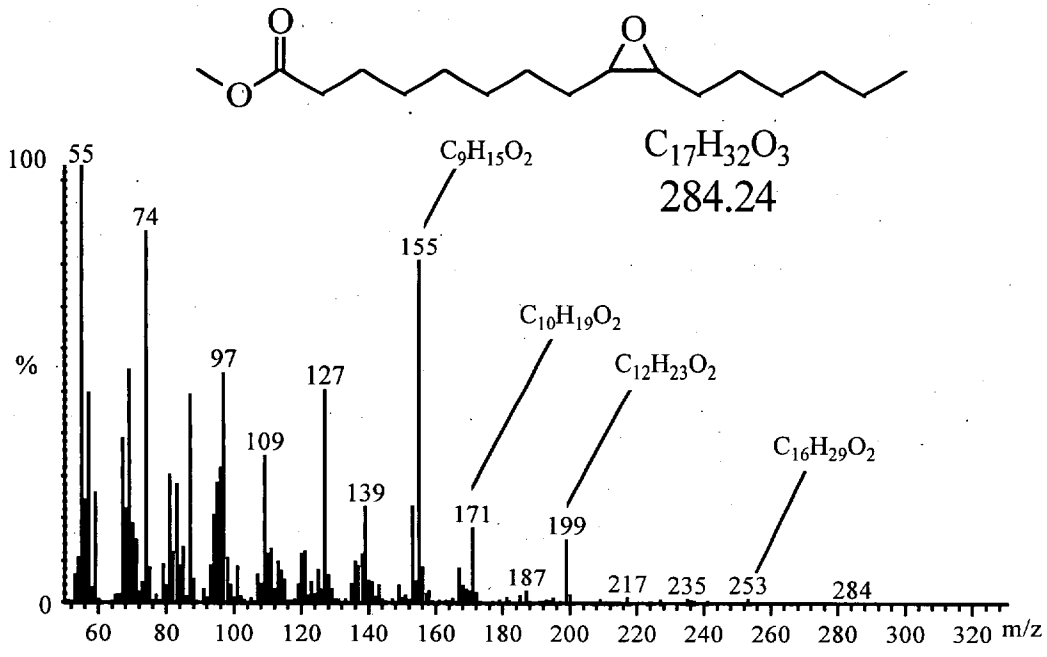
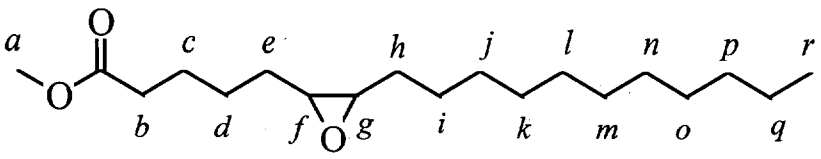


Figure S4: EI-MS spectra of (*Z*)-9,10-epoxyhexadecanoic acid methyl ester (Compound **5**).



a	*b*	*c*	*d, i - q*	*e, h*	*f, g*	*r*
3.66 (3H, s)	2.29 (2H, t)	1.61 (2H,m)	1.2 – 1.4 (20H,m)	1.49 (4H,m)	2.89 (2H, m)	0.87 (3H,t)

Figure S5: ^{1}H-NMR spectral results (300MHz; $CDCl_3$) for (*Z*)-6,7-epoxyoctdecanoic acid methyl ester (Compound **7**). ^{1}H-NMR chemical shifts are presented as ppm (proton number, peak multiplicity).

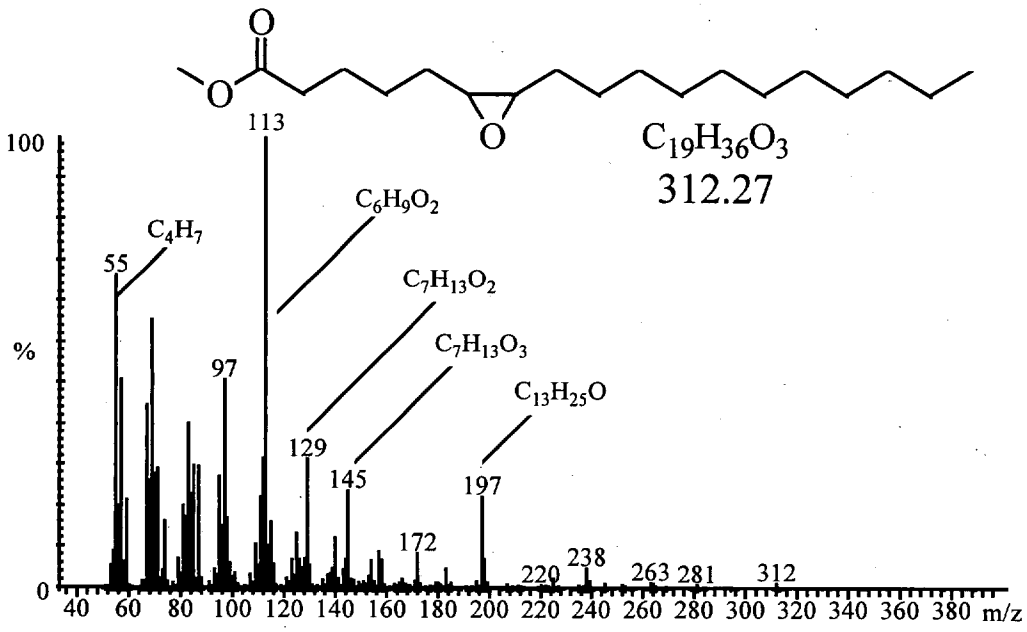
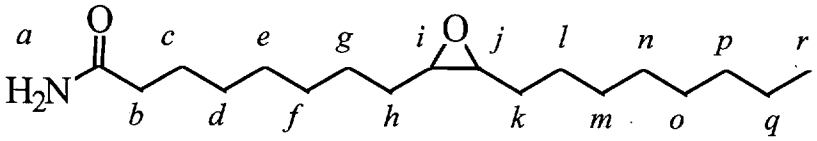


Figure S6: EI-MS spectra of (*Z*)-6,7-epoxyoctdecanoic acid methyl ester (Compound **7**).



a	*b*	*c*	*d - g, l - q*	*h, k*	*i, j*	*r*
-	2.11 (2H, t)	1.70 (2H,m)	1.2 – 1.4 (20H,m)	1.49 (4H,m)	2.85 (2H, m)	0.88 (3H,t)

Figure S7: 1H-NMR spectral results (300MHz; $CDCl_3$) for (*Z*)-9,10-epoxyoctadecanamide (Compound **20**). Amide protons were not observed. 1H-NMR chemical shifts are presented as ppm (proton number, peak multiplicity).

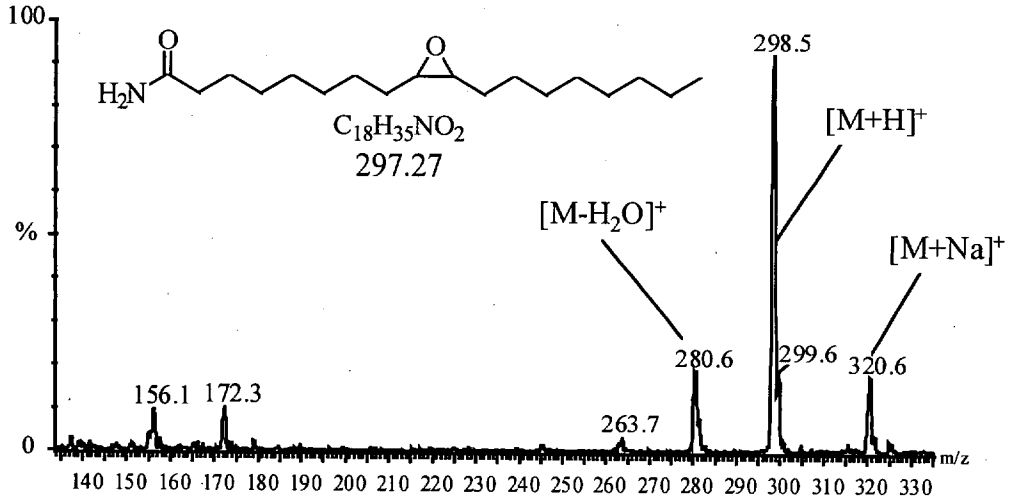


Figure S8: Positive mode ESI-MS spectra of (*Z*)-9,10-epoxyoctadecanamide (Compound **20**) clearly demonstrating the presence of the molecular ion, a molecular sodium adduct and the expected dehydration product.

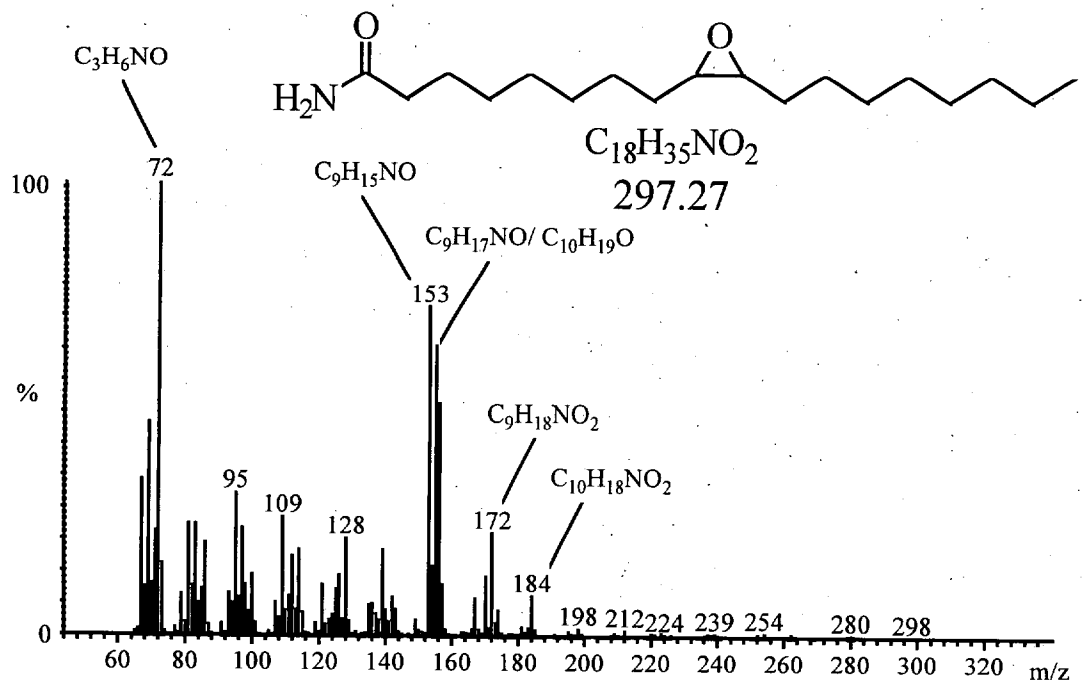
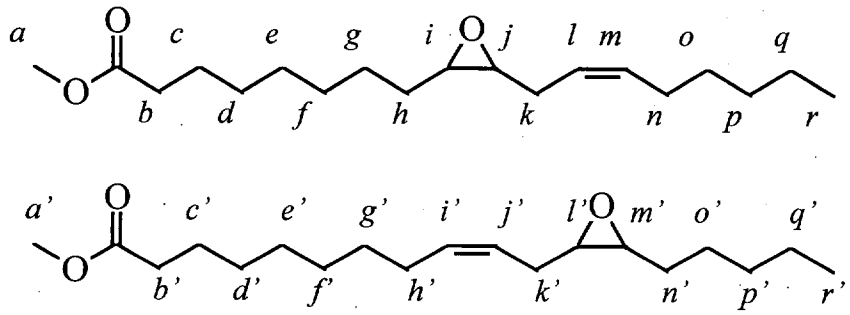


Figure S9: EI-MS spectra of (*Z*)-9,10-epoxyoctadecanamide (Compound **20**).



a, a'	*b, b'*	*c, c'*	*d - g, k, n – q, d'– h', k', o'- q'*	*h, n'*	*i, j, l', m'*	*l, m, i', j'*	*r, r'*
3.66 (3H, s)	2.29 (2H, t)	1.68 (2H,m)	1.2 – 1.4 (20H,m)	2.02 (2H,dd)	2.89 (2H,m)	5.41 (1H m) 5.50 (1H, m)	0.88 (3H,t)

Figure S10: 1H-NMR spectral results (300MHz; $CDCl_3$) for a 1:1 regioisomeric mixture of (9,10*Z*)-epoxyoctadeca-(12*Z*)enoic acid methyl ester and (12,13*Z*)-epoxyoctadeca-(9*Z*)enoic acid methyl ester (Compounds **23** and **24**). Assignment of proton *h and n'* are tentative. 1H-NMR chemical shifts are presented as ppm (proton number, peak multiplicity).

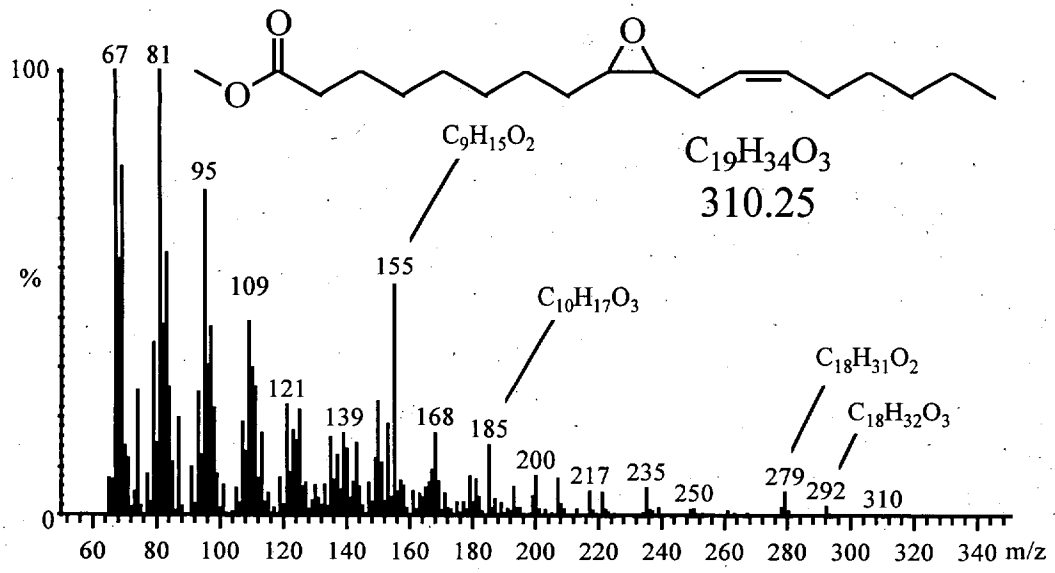


Figure S11: EI-MS spectra of (9,10*Z*)-epoxyoctadeca-(12*Z*)enoic acid methyl ester (Compound **23**), from a 1:1 mixture with Compound **24**. Compound **23** elutes prior to Compound **24**.

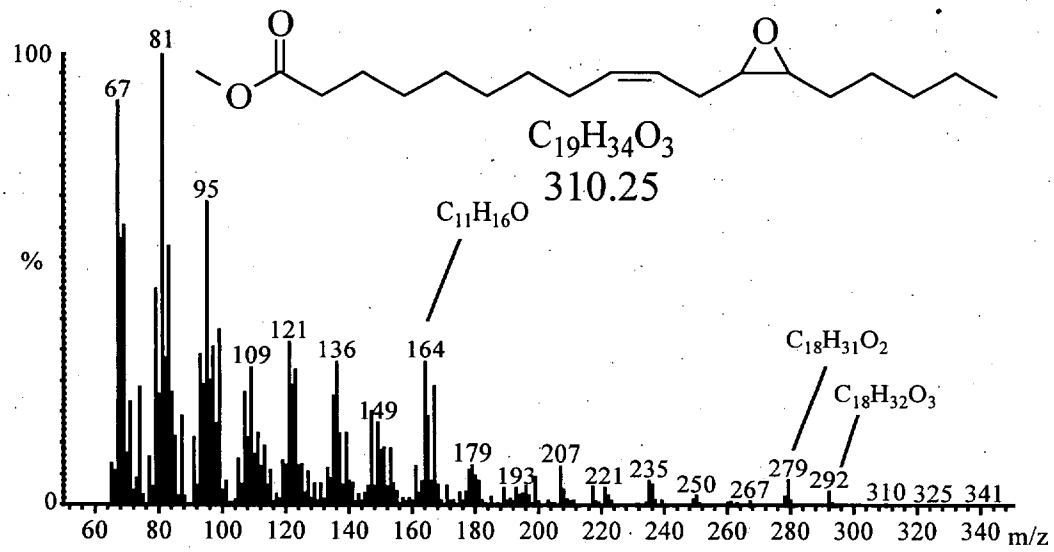
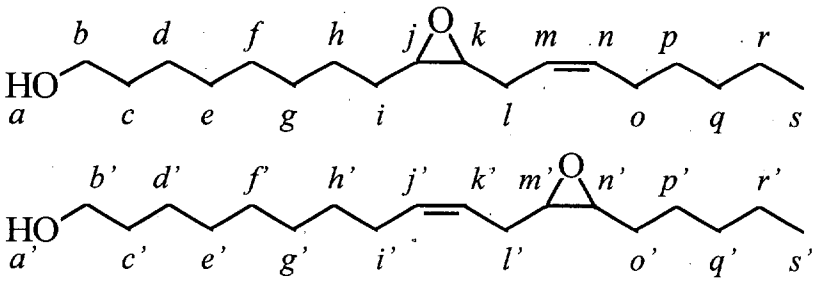


Figure S12: EI-MS spectra of (12,13*Z*)-epoxyoctadeca-(9*Z*)enoic acid methyl ester (Compound **24**) from a 1:1 mixture with Compound **23**. Compound **24** elutes after Compound **23**.



a, a'	*b, b'*	*c, c'*	*d - h, l, o – r, d'– i', l', p'- r'*	*i, o'*	*j, k, m', n'*	*m, n, j', k'*	*s, s'*
-	3.63 (2H, t)	1.53 (2H,m)	1.2 – 1.4 (20H,m)	2.02 (2H,dd)	2.89 (2H,m)	5.42 (1H m) 5.50 (1H, m)	0.88 (3H,t)

Figure S13: 1H-NMR spectral results (300MHz; $CDCl_3$) for the 1:1 regioisomeric mixture of (9,10Z)-epoxyoctadeca-(12Z)enol and (12,13Z)-epoxyoctadeca-(9Z)enol screened as Compound **25**. Assignment of proton *i and o'* are tentative. The free hydroxyl proton (*a, a'*) was not observed.

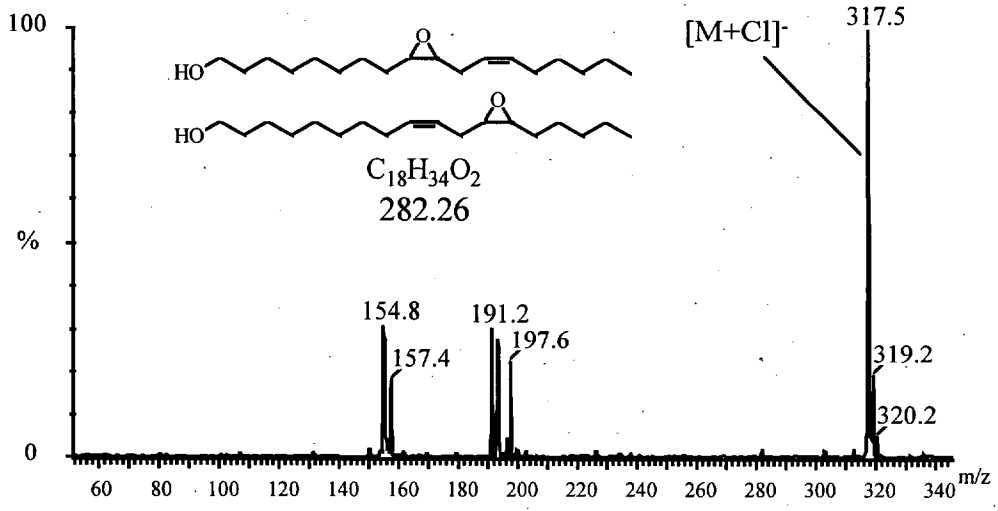


Figure S14: Negative mode ESI-MS spectra of the 1:1 regioisomeric (*Z*)-epoxyoctadeca-(*Z*)enol mixture screened as Compound **25**. The presence of a chlorine adduct of the molecular ion supported the 1H-NMR results.

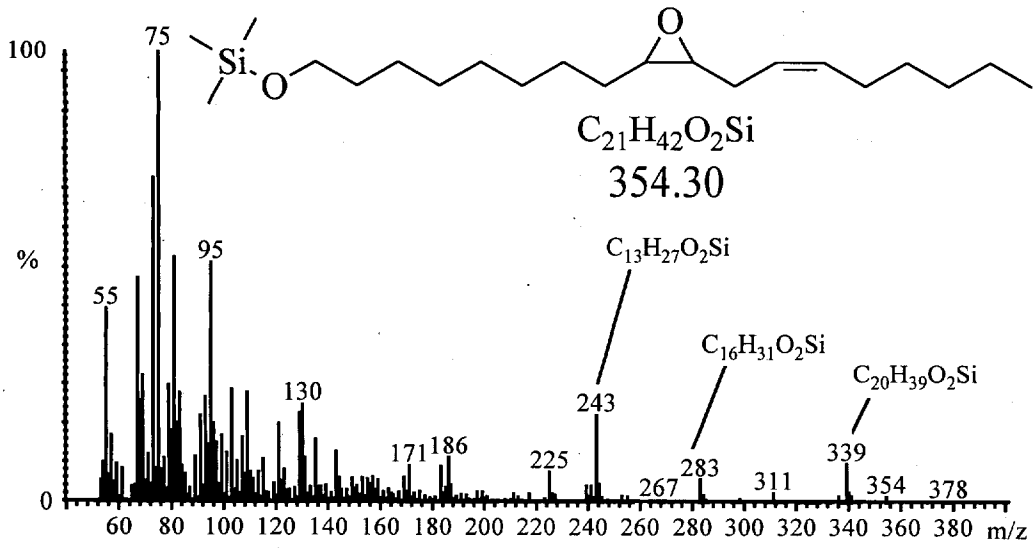


Figure S15: EI-MS spectra of (9,10*Z*)-epoxyoctadeca-(12*Z*)enol as its trimethyl silyl ether. This is the early eluting isomer detected in the 1:1 regioisomeric mixture screened as Compound **25**.

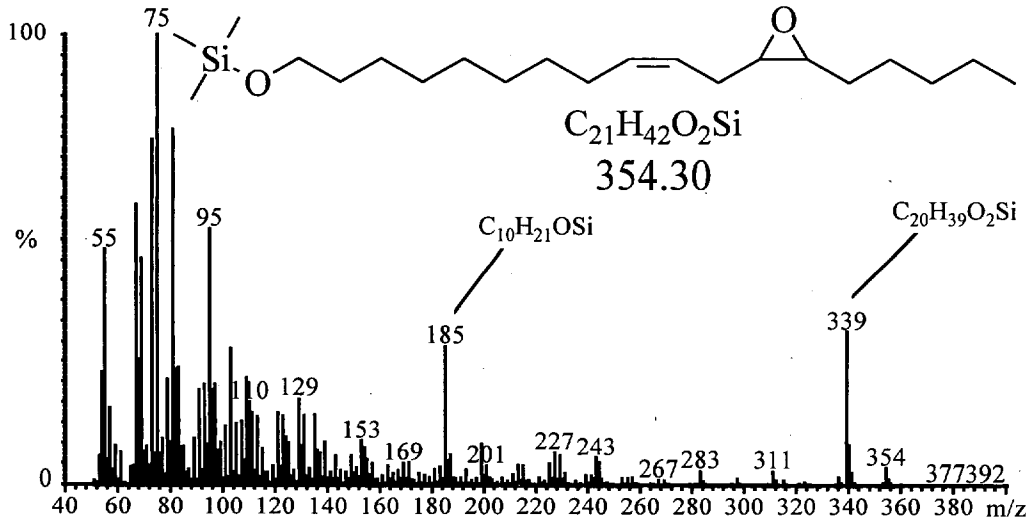
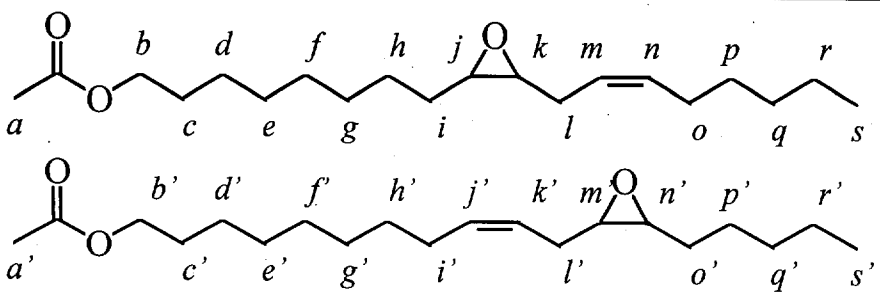


Figure S16: EI-MS spectra of (12,13*Z*)-epoxyoctadeca-(9*Z*)enol as its trimethyl silyl ether. This is the late eluting isomer detected in the 1:1 regioisomeric mixture screened as Compound **25**.



a, a'	*b, b'*	*c, c'*	*d, d'*	*e - h, l, o – r, e'– i', l', p'- r'*	*i, o'*	*j, k, m', n'*	*m, n, j', k'*	*s, s'*
2.04 (3H, s)	4.02 (2H, t)	1.61 (2H,m)	1.51 (2H, m)	1.2 – 1.4 (18H,m)	2.02 (2H,dd)	2.92 (2H,m)	5.39 (1H m) 5.52 (1H, m)	0.88 (3H,t)

Figure S17: 1H-NMR spectral results (300MHz; $CDCl_3$) for a 1:1 regioisomeric mixture of 1-acetyl-(9,10*Z*)-epoxyoctadeca-(12*Z*)ene and 1-acetyl-(12,13*Z*)-epoxyoctadeca-(9*Z*)ene screened as Compound **26**. Assignment of proton *i and o'* are tentative. 1H-NMR chemical shifts are presented as ppm (proton number, peak multiplicity).

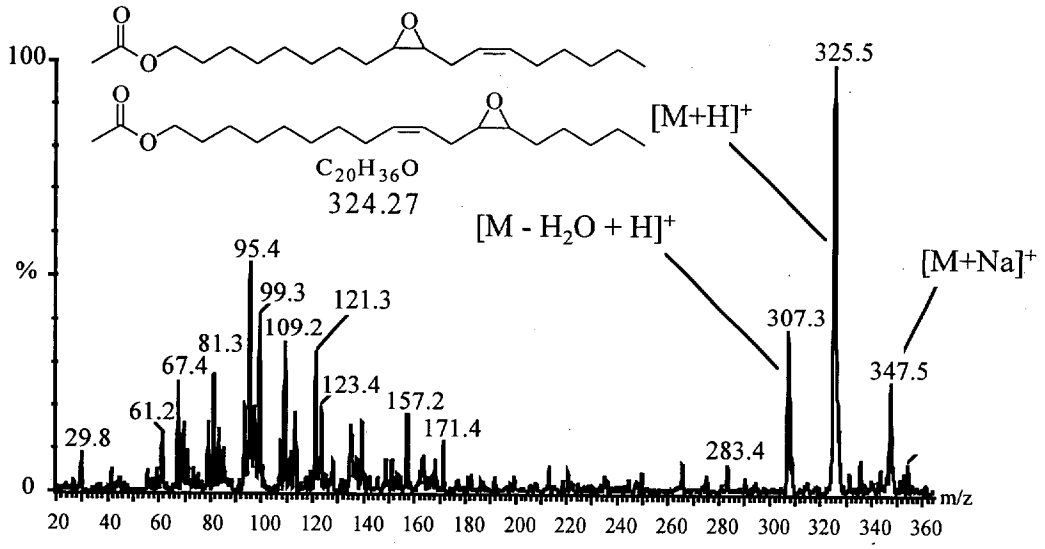


Figure S18: Positive mode ESI-MS spectra of a 1:1 regioisomeric mixture of 1-acetyl-(*Z*)-epoxyoctadeca-(*Z*)ene screened as Compound **26**. The presence of the molecular ion, the sodium adduct and the expected dehydration product in this secondary analysis support the 1H-NMR results.

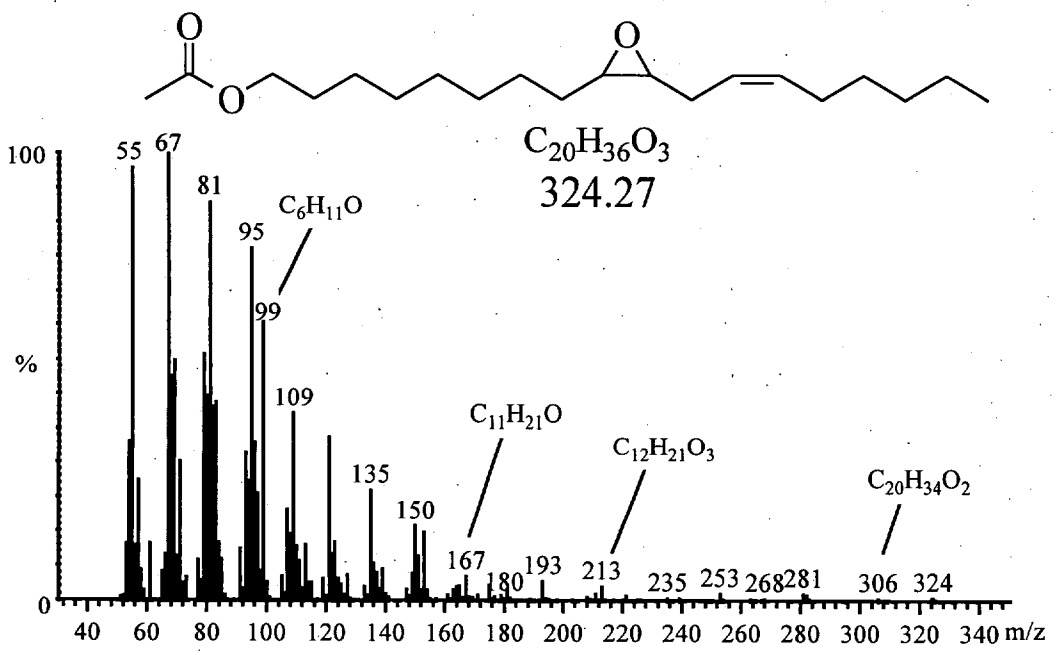


Figure S19: EI-MS spectra of 1-acetyl-(9,10*Z*)-epoxyoctadeca-(12*Z*)ene, the early eluting isomer in the 1:1 regioisomeric mixture screened as Compound **26**.

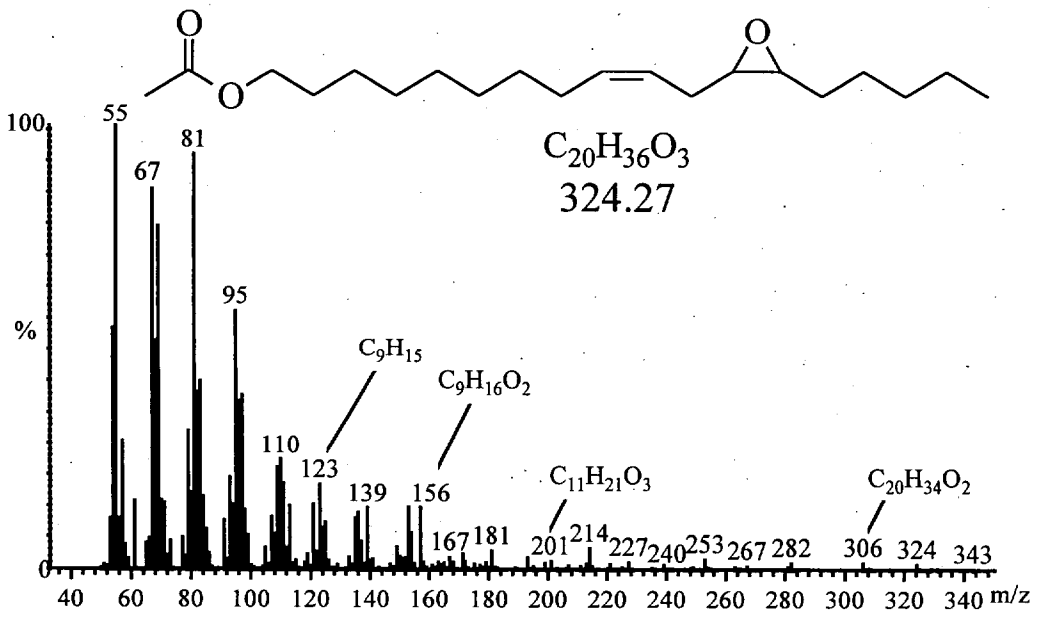
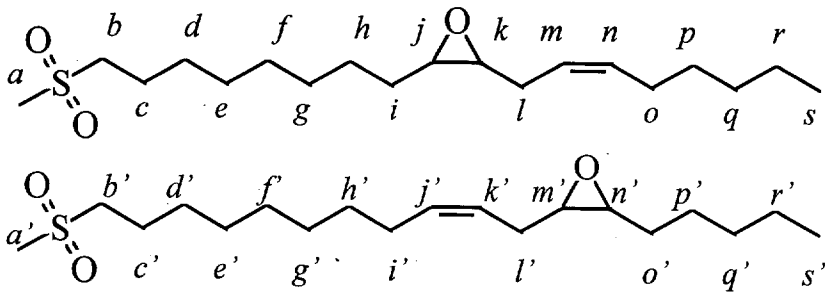


Figure S20: EI-MS spectra of 1-acetyl-(12,13*Z*)-epoxyoctadeca-(9*Z*), the late eluting isomer detected in the 1:1 regioisomeric mixture screened as Compound **26**.



a, a'	*b, b'*	*c, c'*	*d, d'*	*e, e'*	*f - h, l, o – r, f'– i', l', p'- r'*	*i, o'*	*j, k, m', n'*	*m, n, j', k'*	*s, s'*
3.00 (3H, s)	4.22 (2H, t)	2.35 (2H,p)	2.17 (2H, p)	1.75 (2H, p)	1.2 – 1.4 (16H,m)	2.02 (2H,dd)	2.94 (2H,m)	5.39 (1H m) 5.52 (1H, m)	0.88 (3H,t)

Figure S21: 1H-NMR spectral results (300MHz; $CDCl_3$) for a 1:1 regioisomeric mixture of 1-methylsulfonyl-(9,10*Z*)-epoxyoctadeca-(12*Z*)ene and 1-methylsulfonyl-(12,13*Z*)-epoxyoctadeca-(9*Z*)ene screened as Compound **27**. Assignment of proton *i and o'* are tentative. 1H-NMR chemical shifts are presented as ppm (proton number, peak multiplicity).

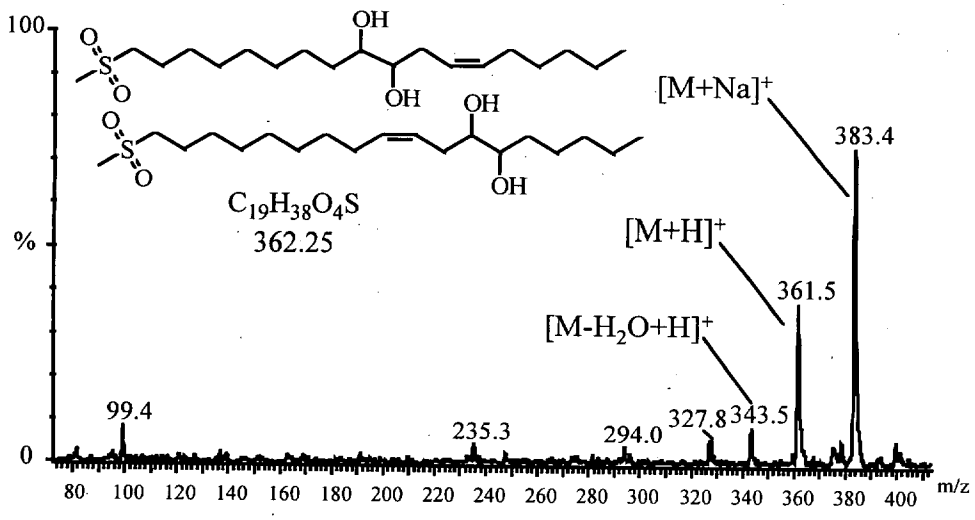


Figure S22: Positive mode ESI-MS analysis of 1-methylsulfonyl-(*Z*)-epoxyoctadeca-(*Z*)ene mixture (*i.e.* Compound **27**) suggested epoxide hydrolysis occurred prior to or during this analysis which was performed immediately after NMR data acquisition.

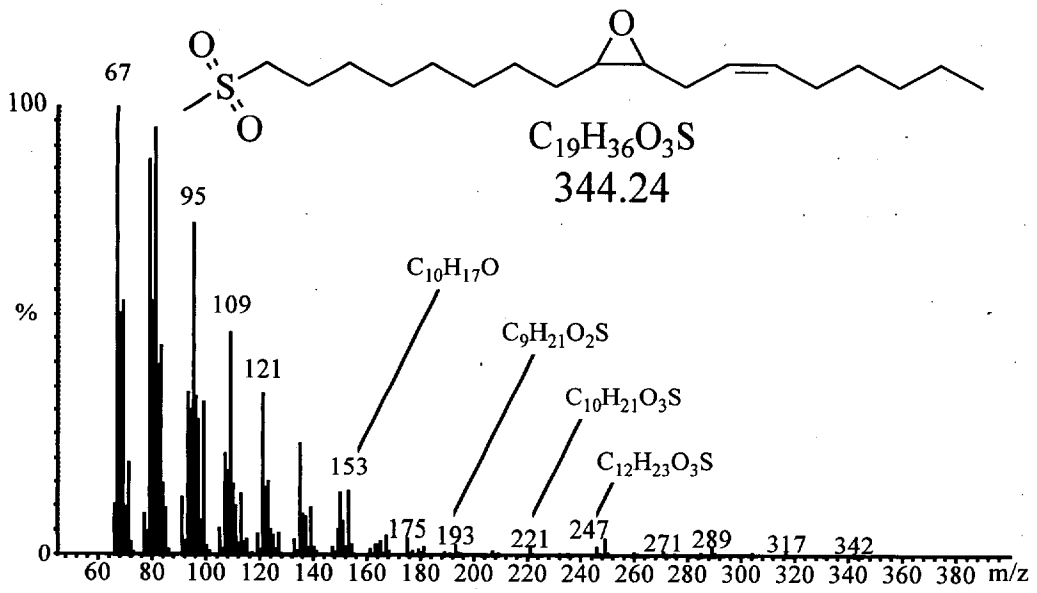


Figure S23: EI-MS spectra of 1-methylsulfonyl-(9,10*Z*)-epoxyoctadeca-(12*Z*)ene, the early eluting isomer in the 1:1 regioisomeric mixture screened as Compound **27**. These results support the ^{1}H-NMR results.

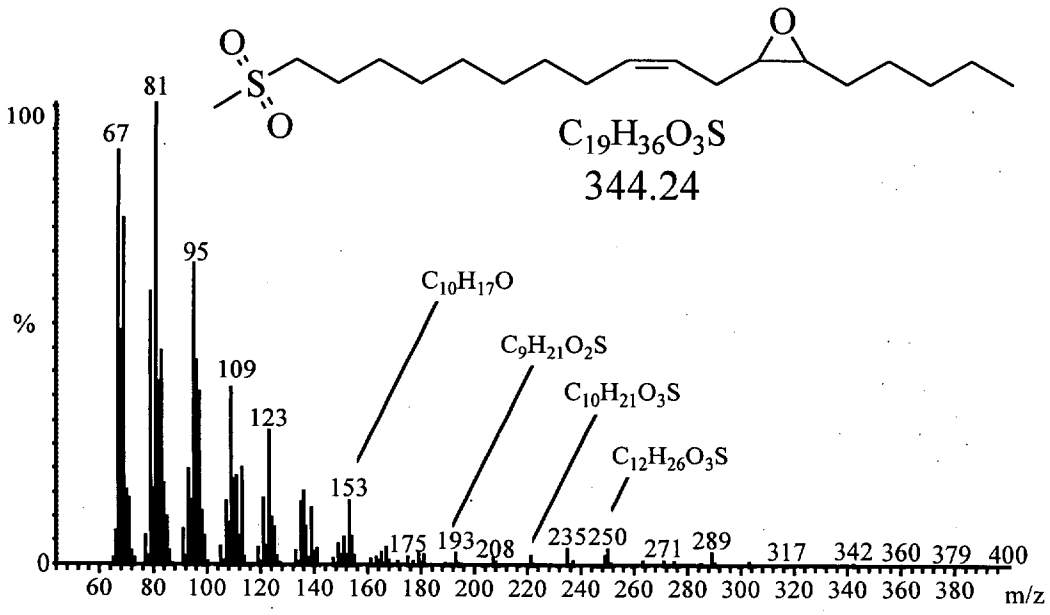
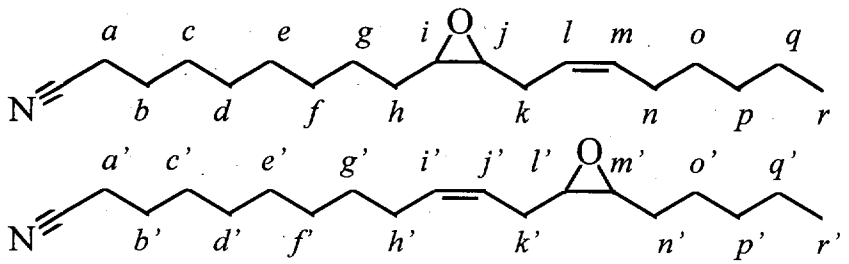


Figure S24: EI-MS spectra of 1-methylsulfonyl-(12,13*Z*)-epoxyoctadeca-(9*Z*)ene, the late eluting isomer in the 1:1 regioisomeric mixture screened as Compound **27**. These results support the ^{1}H-NMR results.



a, a'	*b, b'*	*c, c'*	*d - g, k, n – q, d'– h', k', o'- q'*	*h, n'*	*i, j, l', m'*	*l, m, i', j'*	*r, r'*
2.33 (2H, t)	1.65 (2H, p)	1.48 (2H,m)	1.2 – 1.4 (18H,m)	2.02 (2H,dd)	2.94 (2H,m)	5.39 (1H m) 5.52 (1H, m)	0.88 (3H,t)

Figure S25: 1H-NMR spectral results (300MHz; $CDCl_3$) for a 1:1 regioisomeric mixture of of (9,10*Z*)-epoxyoctadeca-(12*Z*)enitrile (12;13*Z*)-epoxyoctadeca-(9*Z*)enitrile screened as Compound **28**. Assignment of proton *h and n'* are tentative. 1H-NMR chemical shifts are presented as ppm (proton number, peak multiplicity).

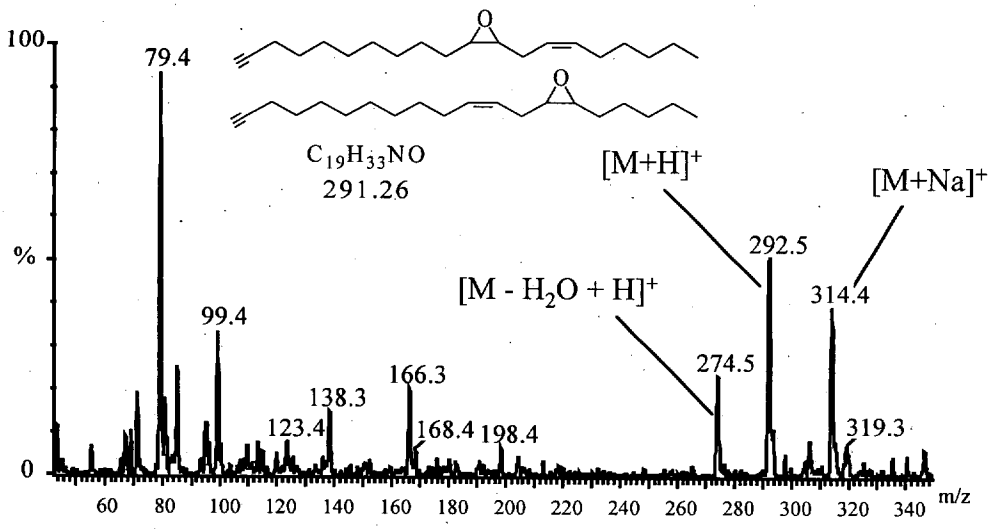


Figure S26: Positive mode ESI-MS spectra of the (*Z*)-epoxyoctadeca-(*Z*)enitrile mixture (*i.e.* Compound **28**) clearly showing the molecular ion, the sodium adduct of the molecular ion and the expected dehydration product. These results support the 1H-NMR data.

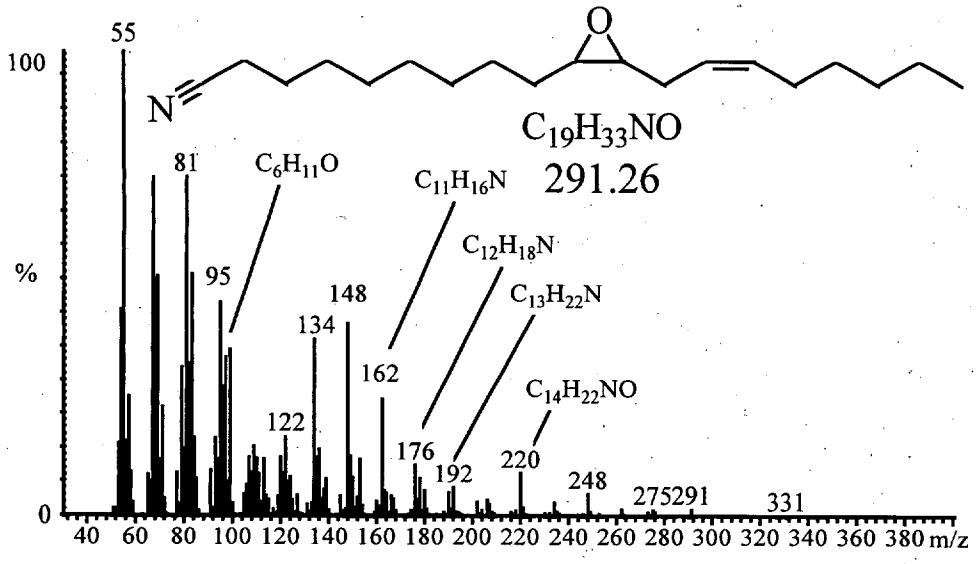


Figure S27: EI-MS spectra of (9,10*Z*)-epoxyoctadeca-(12*Z*), the early eluting isomer in the 1:1 regioisomeric mixture screened as Compound **28**.

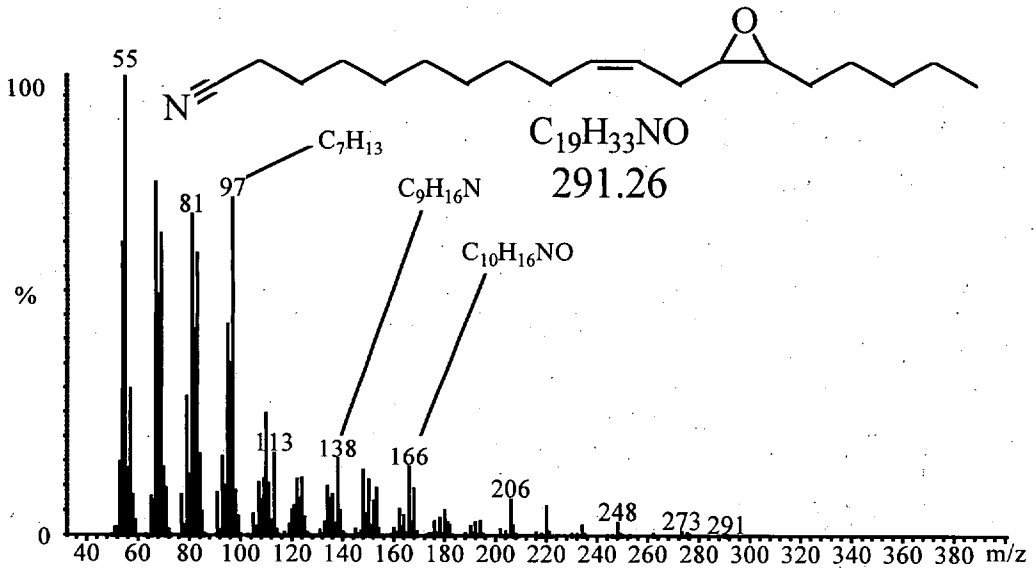
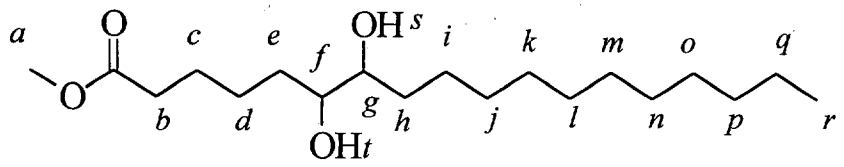


Figure S28: EI-MS spectra of (12,13*Z*)-epoxyoctadeca-(9*Z*)), the late eluting isomer in the 1:1 regioisomeric mixture screened as Compound **28**.



a	*b*	*c - e, h - q*	*f, g*	*r*	*s, t*
3.66 (3H, s)	2.33 (2H, t)	1.2 – 1.7 (26H,m)	3.39 (2H,m)	0.88 (3H,t)	2.14 (1H bs) 2.3 (1H,bs)

Figure S29: 1H-NMR spectral results (300MHz; $CDCl_3$) for (*threo*)-6,7-dihydroxyhexadecanoic acid methyl ester (Compound **34**). The hydroxyl protons (*s* and *t*) were not definitively assigned. One hydroxyl proton (2.3 ppm) was only partially resolved from the proton *b* triplet. The sum integration of the peaks equaled three protons and the hydroxyl apex was distinct. 1H-NMR chemical shifts are presented as ppm (proton number, peak multiplicity).

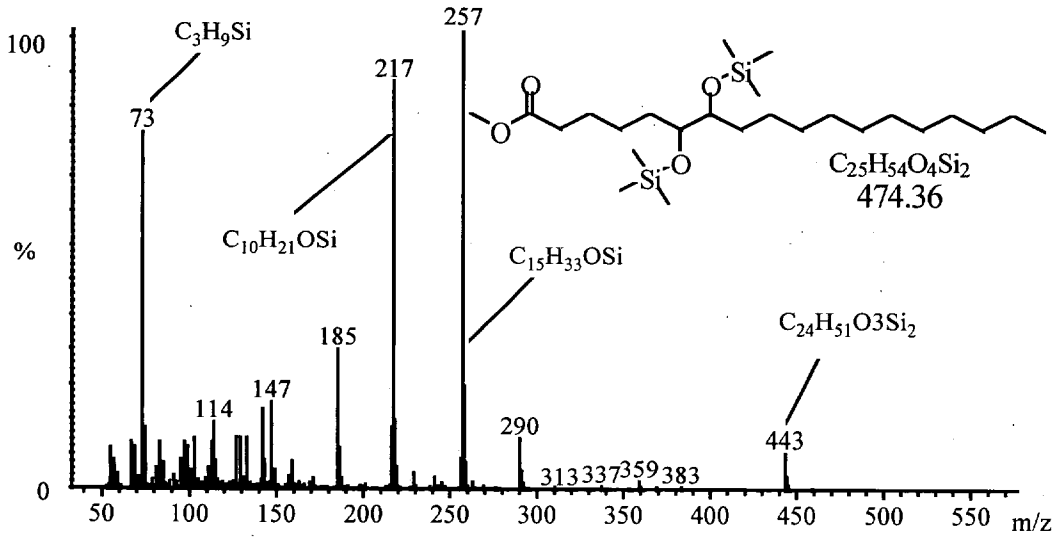
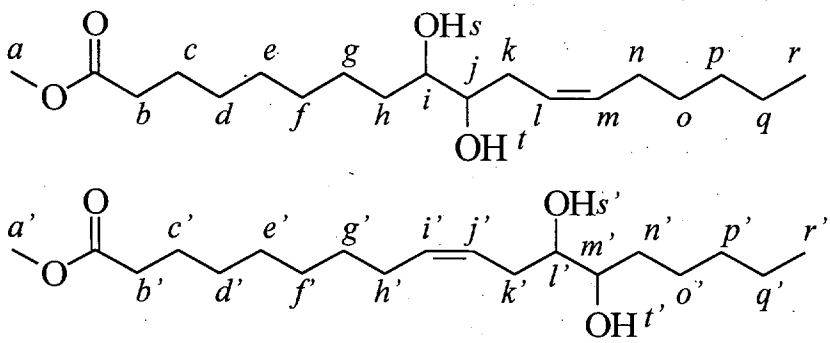


Figure S30: EI-MS spectra of (*threo*)-6,7-dihydroxyoctadecanoic acid methyl ester (Compound **34**) as its trimethyl silyl ether.



a, a'	*b, b'*	*c, c'*	*d, d'*	*e - g, k, n – q, e'–h', k', o'-q'*	*h, n'*	*i, j, l', m'*	*l, m, i', j'*	*r, r'*	*s, t, s', t'*
3.66 (3H, s)	2.29 (2H, t)	1.63 (2H,p)	1.48 (2H,m)	1.2 – 1.4 (16H,m)	2.02 (2H,dd)	3.45 (2H,m)	5.43 (1H m) 5.56 (1H, m)	0.88 (3H,t)	2.0 (1H bs) 2.3 (1H,bs)

Figure S31: 1H-NMR spectral results (300MHz; $CDCl_3$) for a 1:1 regioisomeric mixture of (*threo*)-9,10-dihydroxy octdec-(12*Z*)-enoic acid methyl ester (Compound **47**) and (*threo*)-12,13-dihydroxy octdec-(9Z)-enoic acid methyl ester (Compound **48**). Assignment of proton *h and n'* are tentative. The hydroxyl protons (*s, t, s'* and *t'*) were not definitively assigned. 1H-NMR chemical shifts are presented as ppm (proton number, peak multiplicity).

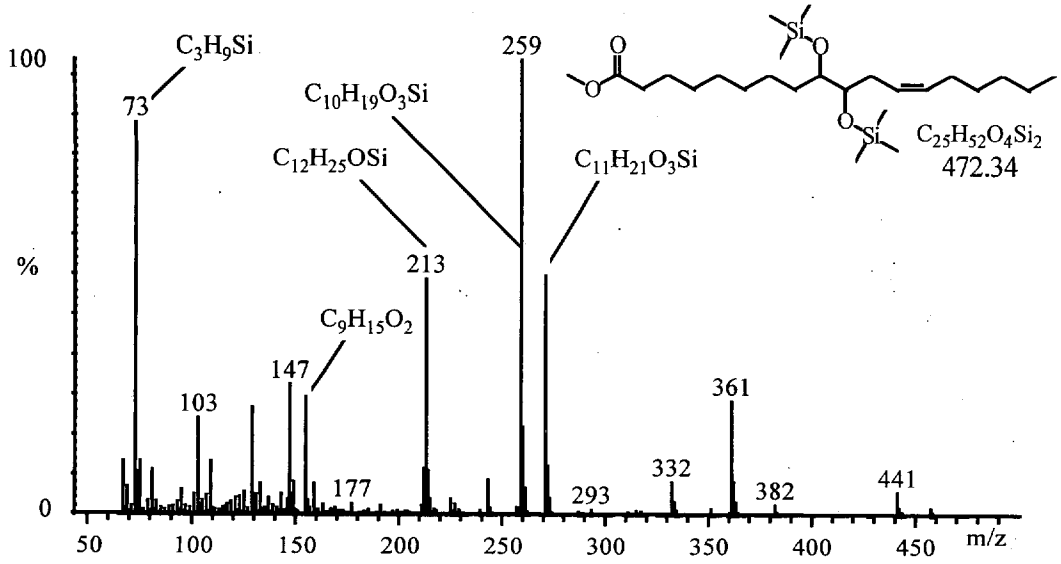


Figure S32: EI-MS spectra of (*threo*)-9,10-dihydroxy octdec-(12*Z*)-enoic acid methyl ester as its trimethyl silyl ether.. This is the early eluting isomer in the 1:1 regioisomeric mixture analyzed as Compound **47**.

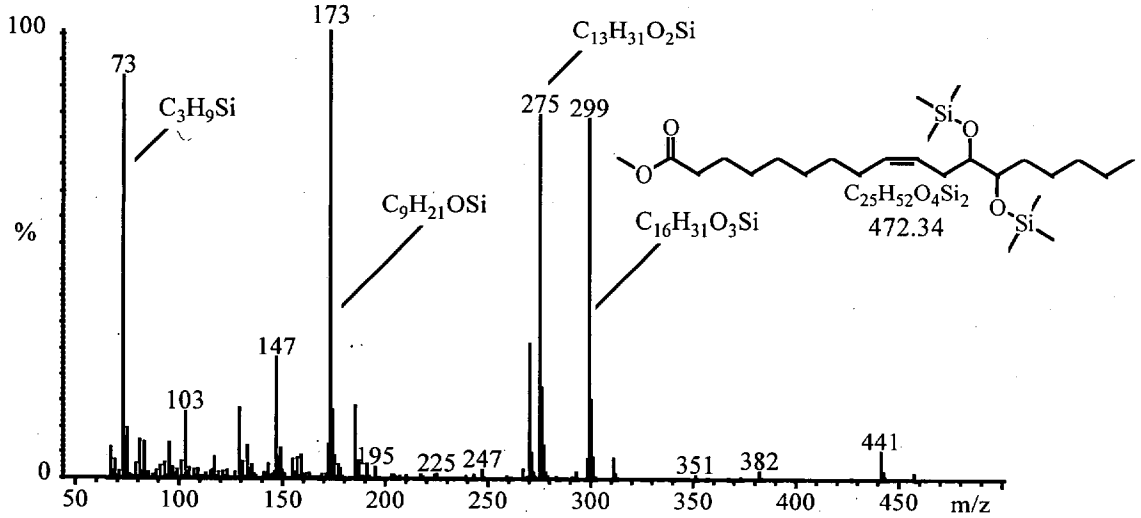
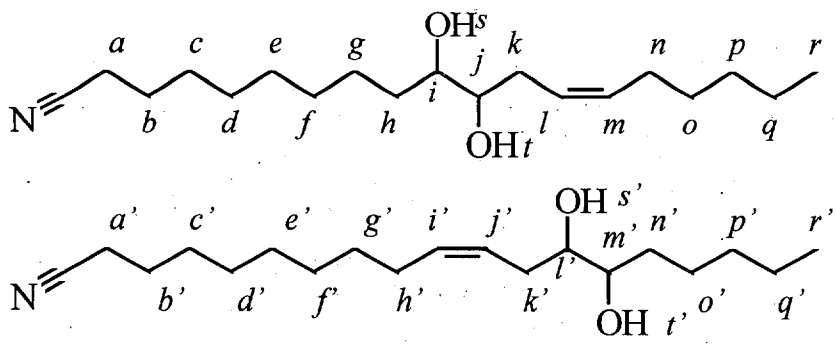


Figure S33: EI-MS spectra of (*threo*)-12,13-dihydroxy octdec-(9Z)-enoic acid methyl ester as its trimethylsilyl ether. This is the late eluting isomer isomer in the 1:1 regioisomeric mixture analyzed as Compound **48**.



a, a'	*b, b'*	*c, c'*	*d - g, k, n – q, d'–h', k', o'-q'*	*h, n'*	*i, j, l', m'*	*l, m, i', j'*	*r, r'*	*s, t, s', t'*
2.33 (2H, t)	1.65 (2H, p)	1.48 (2H,m)	1.2 – 1.4 (18H,m)	2.04 (2H,dd)	3.43 (2H,m)	5.42 (1H m) 5.53 (1H, m)	0.87 (3H,t)	-

Figure S34: 1H-NMR spectral results (300MHz; $CDCl_3$) for a 1:1 regioisomeric mixture of (*threo*)-9,10-dihydroxy octdec-(12Z)-enitrile and (*threo*)-12,13-dihydroxy octdec-(9Z)-enitrile screened as Compound **50**. Assignment of proton *h and n'* are tentative. The hydroxyl protons (*s, t, s'* and *t'*) were not observed. 1H-NMR chemical shifts are presented as ppm (proton number, peak multiplicity).

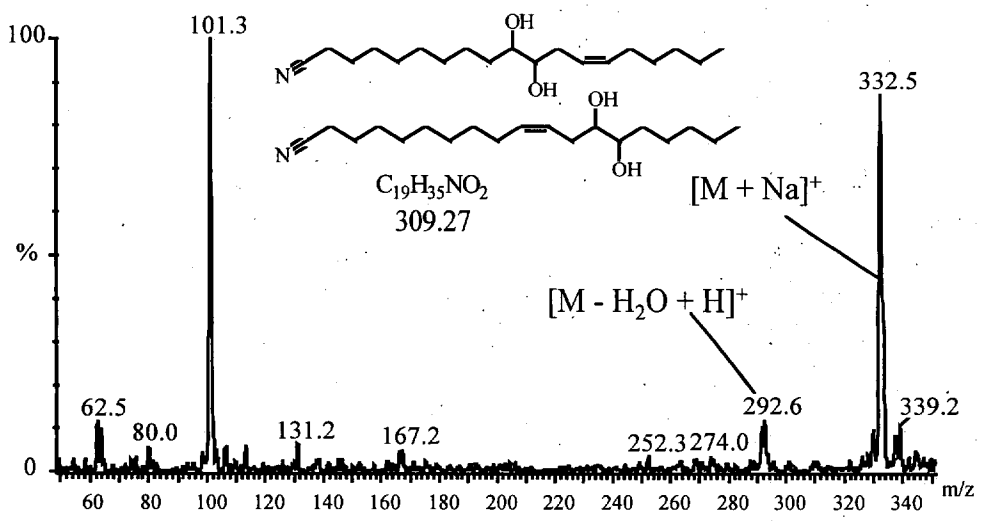


Figure S35: Positive mode ESI-MS spectra of a 1:1 regioisomeric mixture of (*threo*)-9,10-dihydroxy octdec-(12Z)-enitrile and (*threo*)-12,13-dihydroxy octdec-(9Z)-enitrile screened as Compound **50**. The presence of the sodiated and dehydrated molecular ion are clearly apparent. MS/MS experiments on the sodiated ion yielded molecular ion (data not shown).

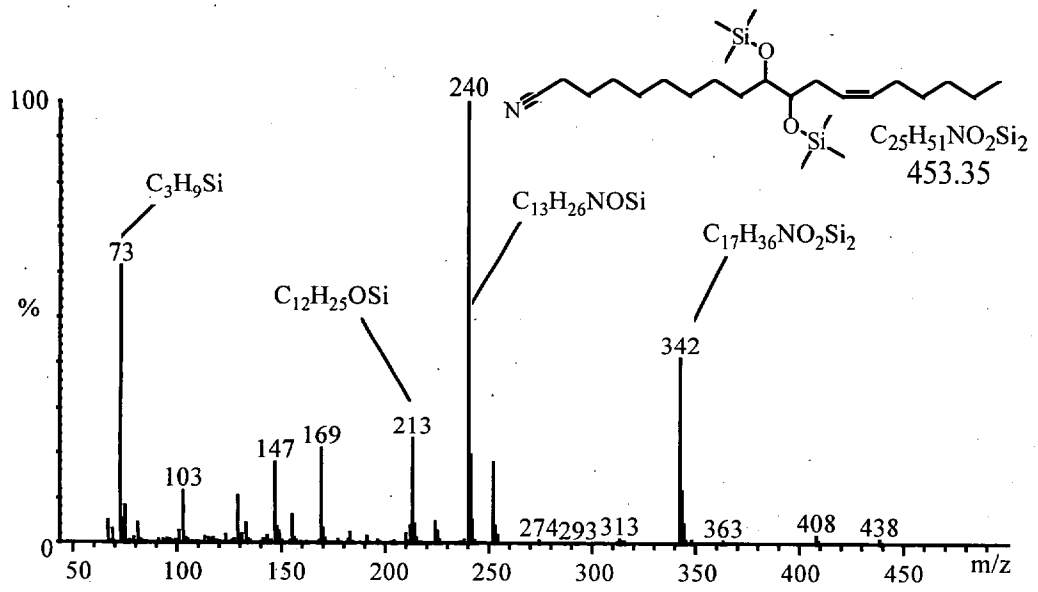


Figure S36: EI-MS spectra of (*threo*)-9,10-dihydroxy octdec-(12Z)-enitrile as its trimethyl silyl ether. This is the early eluting isomer in the 1:1 regioisomeric mixture analyzed as Compound **50**.

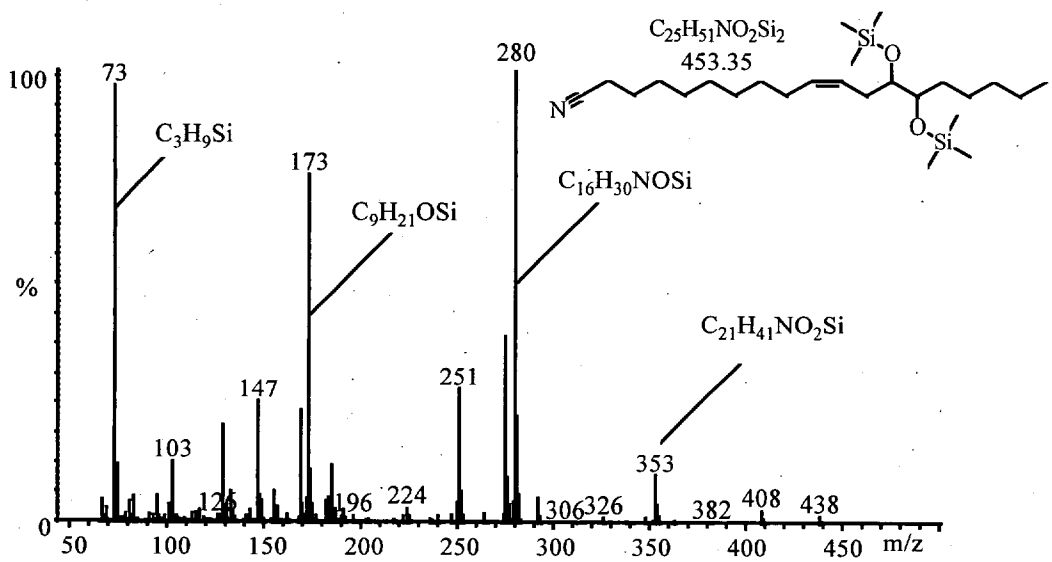


Figure S37: EI-MS spectra of a (*threo*)-12,13-dihydroxy octdec-(9Z)-enitrile trimethyl silyl ether. This is the early eluting isomer in the 1:1 regioisomeric mixture analyzed as Compound **50**.