Asymmetric Synthesis of 2*H*-Azirine 2-Carboxylate Esters

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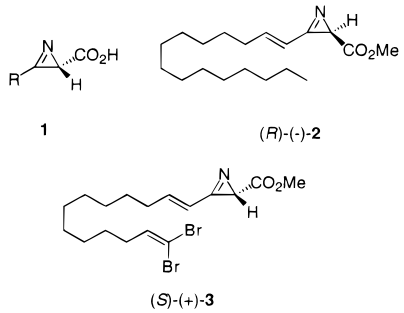
2*H*-Azirine 2-carboxylate esters (**5**), the smallest unsaturated nitrogen heterocycle, are readily prepared in enantiomerically pure form via the base-induced elimination of sulfenic acid (RSOH) from nonracemic *N*-sulfinylaziridine 2-carboxylate esters (**4**). Optimum yields were obtained when the aziridine was treated with TMSCl at −95 °C followed by LDA, which was attributed to the improved leaving group ability of an silicon−oxonium species. By using this new methodology the first asymmetric syntheses of the marine cytotoxic antibiotics (*R*)-(−)- and (*S*)-(+)-dysidazirine (**2**) were accomplished.

The theoretical, mechanistic and synthetic chemistry of 2*H*-azirines, the smallest unsaturated nitrogen heterocycle, has been extensively explored.[1] Activated by the high ring strain, the C−N π-bond and nitrogen lone pair participate in a wide variety of reactions with electrophiles and nucleophiles, as well as cycloadditions with dienes. Thermal and photochemical transformations include rearrangement to vinyl nitrenes and nitrile ylides. The ability of azirines to serve as precursors of more complex heterocyclic systems is impressive.[1] The reactivity of 2*H*-azirines is dictated by the ring substituents, and in this regard 2*H*-azirine 2-carboxylate acids (**1**) are of particular significance because they are found as naturally occurring antibiotics. For example azirinomycin (**1**, R = Me)[2] was isolated from *Streptomyces aureus*, and (*R*)-(−)-dysidazirine (**2**) was obtained from *Dysidea fragilis*, a marine sponge.[3] Dysidazirine (**2**) is cytotoxic to L1210 cells and inhibits the growth of Gram negative bacteria and yeast. Several related azacyclopropene analogues, including antazirine (**3**), a bromine-containing azirine, have recently been isolated.[4] Enantiomerically enriched 2*H*-azirine carboxylate esters have been employed in the synthesis of α,α-disubstituted α-amino acids,[5a] in cycloaddition reactions,[5b] and in the preparation of fully substituted aziridine 2-carboxylate acids, which on ring-opening lead to β-substituted α-amino acids.[6]

Methods for the synthesis of 2*H*-azirines include the modified Neber reaction,[7] thermolysis and photolysis of vinyl azides[8] and isoxazoles,[9] and thermolysis of oxazaphospholines.[10] Because these procedures are not readily adaptable, until recently there existed only a single report of an asymmetric synthesis wherein a diastereoselective Neber rearrangement was used to prepare a 3-amino-2*H*-azirine.[11] In 1995 we described the first asymmetric synthesis of (*R*)-(−)-dysidazirine (**2**) and a general method for the enantioselective synthesis of 2*H*-azirine 2-carboxylate esters involving the base-induced elimination of sulfenic acid from *N*-sulfinylaziridine 2-carboxylate esters.[12] After our report, a complementary method was described by Zwanenburg and co-workers involving the Swern oxidation of 1*H*-aziridine 2-carboxylate esters.[13] More recently this group reported an alkaloid-mediated Neber reaction for their synthesis, but the ee's were modest (57−82%).[14] Other recent methods include a lipase-catalyzed kinetic resolution of 3-phenyl-2*H*-azirine[15] and the diastereomeric synthesis of 3-amino-2*H*-azirines from α-azidoenamies.[5a,16] We report here full



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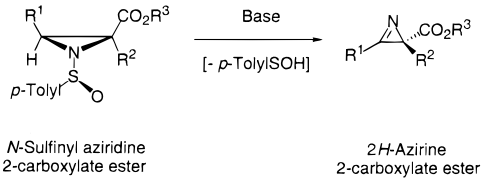
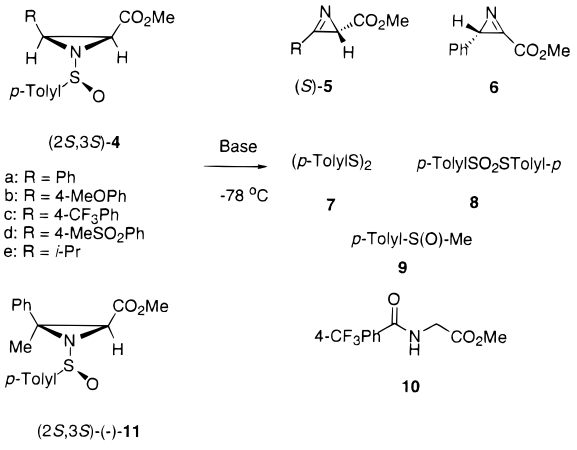
details of the asymmetric synthesis of 2*H*-azirine 2-carboxylate esters from *N*-sulfinylaziridine 2-carboxylate esters.[17]



Results and Discussion

Synthesis of 2*H*-Azirines. Treatment of (2*S*,3*S*)-(+)-*N*-(*p*-toluenesulfinyl)-2-carbomethoxy 3-phenylaziridine (**4a**) with 1.3−1.5 equiv of lithium diisopropylamide (LDA) at −78 °C in THF for 20 min and quenching with H_2O afforded a 47% yield of (*S*)-(+)-2-carbomethoxy-3-phenyl-2*H*-azirine (**5a**) (Scheme 1). In addition to the azirine, polar residues were isolated along with a 55% yield of *p*-tolyl disulfide (**7**) and a 26% yield of *p*-toluene-*p*-tolylthiosulfonate (**8**) (Table 1, entry 1). The latter products result from disproportionation of the *p*-toluenesulfenic acid (*p*-TolylSOH)[18] generated in formation of the 2*H*-azirine. When iodomethane was added to trap the sulfenic acid, methyl *p*-tolylsulfoxide (**9**) was isolated in 83% yield (Table 1, entry 2). The yield of azirine **5a** improved to 52%, likely a consequence of easier isolation. 1,2-Elimination of sulfenic acid to produce the known isomeric 3-carbomethoxy-2-phenyl-*2H*-azirine (**6**) was not detected in the ^{1}H NMR spectrum of the crude reaction material.[19] Attempts to improve the yield by varying the solvent, temperature, and base were unsuccessful, resulting in either no reaction or decomposition, i.e., the formation of polar oligomeric materials (Table 1, entries 3−7). Indeed only LDA afforded the azirine, and bases such as NaHMDS, LiHMDS and *n*-BuLi resulted in complex mixtures.

Scheme 1



In a similar way, treatment of the 4-methoxyphenyl and 4-trifluoromethylphenyl aziridines **4b** and **4c** with LDA afforded 2*H*-azirines **5b** and **5c** in 55% and 33% yield, respectively (Table 1, entries 8 and 9). However, in the latter example methyl *N*-(4-trifluoromethylbenzoyl)glycine (**10**) was also obtained in 30% yield. This compound was prepared independently from 4-trifluoromethylbenzoyl chloride and methyl glycine hydrochloride salt in 85% yield and likely resulted from hydrolysis of **5c** on workup.[20] No characterizable products were identified when aziridines **4d** (R = 4-MeSO$_2$Ph), **4e** (R = *i*-Pr), and **11** were treated with LDA (Table 1, entries 10, 11 and 12). In the case of **4d** it is likely that methylsulfonyl protons are removed in preference to the aziridine C(3) proton, and in **4e** the C(3) proton is considerably less acidic than in the other compounds.

To examine the scope of our 2*H*-azirine synthesis we next turned to evaluating the effect of varying the aziridine ring substituents. *trans*-(2*S*,3*R*)-(+)-*N*-(*p*-Toluenesulfinyl)-2-carbomethoxy-3-phenylaziridine (**12**) gave only a 9% yield of (*S*)-**5a** versus *cis*-**4a**, which gave a 47% yield of the azirine (Scheme 2). The major product was sulfinamide **13**, isolated in 46% yield, resulting from attack of LDA at the sulfinyl group. Interestingly the NH aziridine corresponding to **12** was not detected. However, 2-methyl aziridine (2*R*,3*S*)-**14** gave sulfinamide **13**, but with this example the corresponding aziridine **15** and the 2*H*-azirine **16** were obtained in 57% and 41% yield, respectively (Scheme 2).

The new 2*H*-azirines 2-carboxylate esters (*S*)-(+)-**5a**−**c** and (*R*)-(−)-**16** gave satisfactory elemental analysis and had spectral properties consistent with their structures. The enantiomeric purity was determined to be >95% ee using the chiral shift reagent Eu(hfc)$_3$. Because it is reasonable to assume that the C(2) stereocenter in aziridines **4** and **14** are unaffected by deprotonation at C(3), the corresponding azirines have the *S*- and *R*-configurations, respectively.

A better nitrogen leaving group was expected to improve the modest yields of azirines produced in the base-promoted elimination of sulfenic acid from *N*-sulfinylaziridines **4** and **14** (Schemes 1 and 2). However, when *N*-tosylaziridines **17**, prepared in >95% yield by *m*-CPBA oxidation of **4a** and **11**, were treated at −78 °C with LDA, amino cinnamates **18a** and **18b** were obtained in 61% and 79% yield, respectively (Scheme 3). Hydrogenation (H_2/Pd) of **18a** produced a quantitative yield of the known *N*-tosyl phenylalanine.[21] These results are consistent with C(2) deprotonation followed by stereospecific ring opening and are similar to the results reported by Padwa et al. for 1,2-dibenzoyl-3-phenylaziridine (Scheme 3).[22] On the basis of these considerations the *trans* structure was assigned to **18** and was confirmed for **18b** by X-ray crystallography.[23]

Significantly, if the C(2) proton is absent, as in aziridine **19a**, the yield of (*R*)-(−)-**16** improves from 41% to 87% for elimination of tosic acid. Similar high yields were observed for the 2-ethyl and 2-phenyl 2*H*-azirines (*R*)-(−)-**20** and (*R*)-(+)-**21** prepared from **19b** and **19c**, respectively (Scheme 3).

We next turned our attention to increasing the leaving group ability of the sulfinyl functionality by complexing it with Lewis acids. These results are summarized in

(16) The in situ generation of optically active azirines from 2-silylaziridines, which were not isolated, has been reported. Atkinson, R. S.; Coogan, M. P.; Lochrie, I. S. T. *J. Chem. Soc., Perkin Trans. 1* **1997**, 897.

(17) Portions of this work have been reported elsewhere. See references 6 and 12.

(18) For leading references to the chemistry of sulfenic acids see: Davis, F. A.; Jenkins, L. A.; Billmers, R. L. *J. Org. Chem.* **1986**, *51*, 1033.

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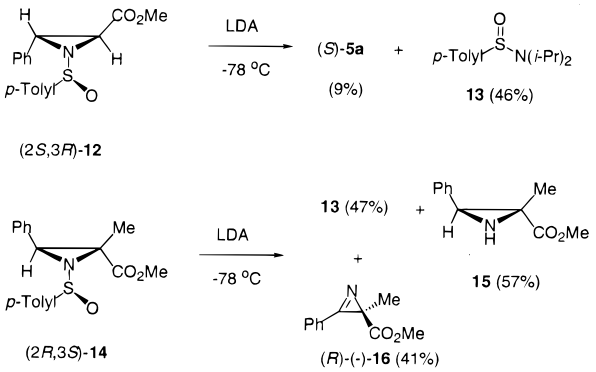
Table 1. Synthesis of 2*H*-Azirines 2-Carboxylate Esters 5 from Aziridines (2*S*,3*S*)-4/(2*S*,3*S*)-11 and (2*S*,3*S*)-11

entry	aziridine	conditions	products (% yield)[a]
1	(2*S*,3*S*)-**4a** (R = Ph)	LDA/−78 °C/THF/0.2 h	(*S*)-**5a** (47), **7** (55), **8** (26)
2		LDA/−78 °C/THF/0.2 h/MeI	(*S*)-**5a** (52), **9** (83)
3		LDA/−78 °C/Et_2O/0.5 h	decomposition[b]
4		LDA/rt/THF/0.5 h	decomposition
5		LiHMDS/−78 °C/THF/1 h	(2*S*,3*S*)-**4a** (56)
6		NaHMDS/−78 °C/THF/1 h	decomposition
7		*n*-BuLi/−78 °C/THF/1 h	decomposition
8	(2*S*,3*S*)-**4b** (R = 4-MeOPh)	LDA/−78 °C/THF/0.5 h	(*S*)-**5b** (54),
9	(2*S*,3*S*)-**4c** (R = 4-CF_3Ph)	LDA/−78 °C/THF/0.5 h	(*S*)-**5c** (33), **10** (30)
10	(2*S*,3*S*)-**4d** (R = 4-$MeSO_2$Ph)	LDA/−78 °C/THF/0.5 h	decomposition
11	(2*S*,3*S*)-**4e** (R = *i*-Pr)	LDA/−78 °C/THF/0.5 h	decomposition
12	(2*S*,3*S*)-**11**	LDA/−78 °C/THF/0.5 h	decomposition

[a] Isolated yields. [b] Complex mixtures.

Scheme 2



Scheme 3

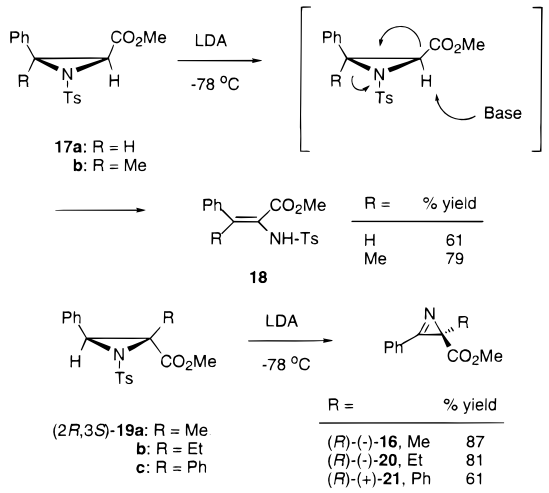
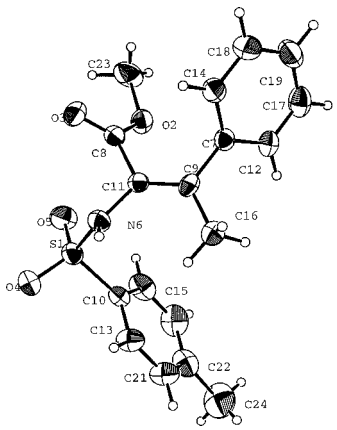


Table 2. Addition of aziridine **4a** (R = Ph) to a trimethylsilyl chloride (TMSCl)/LDA[24] solution at −78 °C produced no reaction, and the aziridine was recovered, albeit in 60% yield (Method A) (Table 2, entry 1). Cooling the reaction mixture to −95 °C gave a 17% yield of azirine **5a**, compared to the 33% yield of **5a** when the reaction was carried out at −95 °C without TMSCl (Table 2, entry 2). When **4a** was first treated with TMSCl followed by addition of LDA at −78 °C a 43% yield of **5a** was obtained (Method B) (Table 2, entry 3). However, this yield was not an improvement over that observed in the absence of TMSCl. Remarkably, when the reaction temperature was lowered to −95 °C, the yield of **5a** nearly doubled to 77% (Table 2, entry 4). Reducing the number of equivalents of TMSCl, use of trimethylsilyl triflate, phenyldimethylsilyl chloride, or boron trifluoride etherate all resulted in poorer yields of the azirine (Table 2, entries 5−12). Improved yields of azirines **5b** (4-MeOPh) and **5c** (4-CF_3Ph) were also observed using this new protocol (Table 2, entries 13 and 14). No azirine was detected using this method with aziridine **4e**, in which R = *i*-Pr.

Mechanistic Considerations. Generation of sulfenic acid by removal of the seemingly less acidic C(3) proton in aziridines **4** was not anticipated because α-deprotonation of aziridyl ketones[25] and (*S*)-phenylaziridinecarbothiolates[26] with C-alkylation has been described. The available evidence suggests, however, that deprotonation at the C(2) and C(3) positions in **4** is competitive, i.e., generation of aziridine enolates may be hampered by ring strain (I-strain) and stereoelectronic effects (Scheme 4).[27] That both of these protons can be lost in the deprotonation step is supported by the >80% yield of methyl *p*-toluene sulfoxide (**9**) isolated in the presence of MeI (Table 1, entry 2). Furthermore, this hypothesis is consistent with the fact that **4e** (R = *i*-Pr) gives no azirine because the C(3) proton is not sufficiently acidic to compete with C(2) proton removal and that **4c** (R = 4-CF_3Ph) gives higher azirine yields than **4a** (R = Ph), 63% vs 47% (Table 1). Although removal of the C(3) proton gives the 2*H*-azirine **5**, we speculate that C(2) deprotonation results in an unstable lithio species **22** that undergoes stereospecific ring opening to give the amino cinnamate **23** (Scheme 4). Recall that when an *N*-tosyl

(23) X-ray of methyl *trans*-2-(*p*-toluenesulfonyl) amino cinnamate (**18b**).



(24) For a discussion of TMSCl as a Lewis acid see: Fleming, I.; Barbero, A.; Walter, D. *Chem. Rev.* **1997**, *97*, 2063.

(25) Lutz, R. E.; Turner, A. B. *J. Org. Chem.* **1968**, *33*, 516. Tarburton, P.; Chung, A.; Badger, R. C.; Cromwell, N. H. *J. Heterocycl. Chem.* **1976**, *13*, 295. Tarburton, P.; Wall, D. K.; Cromwell, N. H. *J. Heterocycl. Chem.* **1978**, *15*, 1281.

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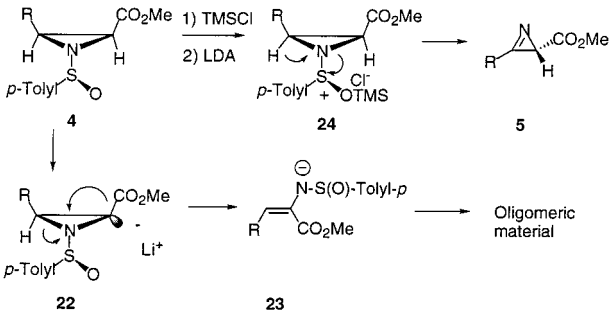
(27) For a discussion of the factors affecting the stability and structure of aziridine enolates see reference 25.

Table 2. Synthesis of 2*H*-Azirine 2-Carboxylate Esters 5 from Aziridine (2*S*,3*S*)-4 Using Lewis Acids in THF

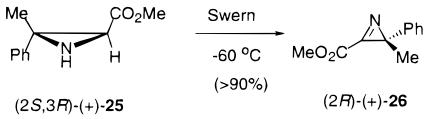
entry	(2*S*,3*S*)-aziridine	conditions additive/temp/method[c]	products (% yield)[a]
1	**4a** (R = Ph)	6.0 equiv. TMSCl/−78 °C/A	**5a** (0) [47],[b] **4a** (60) [0]
2		6.0 equiv. TMSCl/−95 °C/A	**5a** (17) [33], **4a** (65) [0]
3		6.0 equiv. TMSCl/−78 °C/B	**5a** (43) [47], **4a** (6) [0]
4		6.0 equiv. TMSCl/−95 °C/B	**5a** (77) [33], **4a** (0) [0]
5		1.5 equiv. TMSCl/−95 °C/B	**5a** (67), **4a** (0)
6		2.0 equiv. TMSCl/−95 °C/B	**5a** (71), **4a** (0)
7		2.5 equiv. TMSOTf/−95 °C/B	**5a** (9), **4a** (43)
8		6.0 equiv. $PhSi(Me)_2Cl$/−95 °C/B	**5a** (56), **4a** (0)
9		5.0 equiv. $BF_3{\cdot}OEt_2$/−78 °C/B	**5a** (38), **4a** (0)
10		5.0 equiv. $BF_3{\cdot}OEt_2$/−95 °C/B	**5a** (38), **4a** (0)
11		5.0 equiv. $BF_3{\cdot}OEt_2$/−78 °C/B[d]	no reaction
12		5.0 equiv. $BF_3{\cdot}OEt_2$/−95 °C/B[d]	no reaction
13	**4b** (R = 4-MeOPh)	6.0 equiv. TMSCl/−95 °C/B	**5b** (78) [53][e]
14	**4c** (R = 4-CF_3Ph)	6.0 equiv. TMSCl/−95 °C/B	**5c** (68) [30][e]
15	**4e** (R = *i*-Pr)	6.0 equiv. TMSCl/−95 °C/B	**5d** (0) [0]

[a] Isolated yields. [b] Yield of azirine in the absence of Lewis acid activation at the same temperature, cf. Table 1. [c] Method A: TMSCl or $BF_3{\cdot}OEt_2$, LDA followed by addition of the aziridine **4**. Method B: (i) aziridine **4**, TMSCl or $BF_3{\cdot}OEt_2$, 15 min. (ii) LDA. [d] Toluene solvent. [e] Yield of azirine at −78 °C, cf. Table 1.

Scheme 4



Scheme 5



group is present the amino cinnamate, i.e., **18**, was isolated, but an *N*-sulfinyl group apparently results in elimination of sulfenate ion, resulting in the formation of oligomeric materials. Consistent with this hypothesis is the observation that when the C(2) proton is absent, as in **14** and **19**, the yields of 2*H*-azirines are much higher (Scheme 3).

For steric reasons the *N*-sulfinyl aziridine invertomers likely adopt structure **4** in which the bulky *p*-toluenesulfinyl group is *anti* to the aziridine ring substituents.[28] This syn-periplanar arrangement of leaving groups results in a syn elimination of sulfenic acid to afford 2*H*-azirine **5** (Scheme 4). Furthermore, it is nearly impossible in the aziridine for the leaving groups to obtain the dihedral angle of 180° necessary for anti-elimination. It is probably for this reason that aziridine **12** reacts with LDA, primarily at the sulfinyl sulfur, to give sulfinamide **13** (Scheme 2).

Treatment of *N*-sulfinyl aziridine **4** with TMSCl results in formation of the silicon−oxonium species **24**, which is well precedented in the silicon-induced Pummerer-type rearrangements[29] and in the conversion of alcohols to chlorides by TMSCl and DMSO.[30] Indeed, if the aziridine-TMSCl mixture is quenched prior to addition of LDA, an 85:15 epimeric mixture at sulfur of (S_S)-**4a** and (R_S)-**4a** is formed. Although the silicon−oxonium species **24** is undoubtedly a better leaving group than the *p*-toluenesulfinyl group, the reason for the impressive improvement in yields at −95 °C (77%) vs −78 °C (43%) is not readily apparent (Table 2, entries 3 and 4). Perhaps the seemingly enhanced kinetic acidity of the C(3) proton in **4** is due to a more favorable arrangement of leaving groups or to the fact that **24** is more stable at the lower temperature.

Synthesis of 3-Carbomethoxy-2-methyl-2-phenyl-2*H*-azirine. As mentioned earlier the isomeric azirine **6** was not detected in the LDA-induced elimination of sulfenic acid from aziridine **4a** (Scheme 1). However, Swern oxidation of (2*S*,3*R*)-(+)-**25**,[6] which lacks a C(3) proton, at −60 °C afforded a >90% yield of (*R*)-(+)-3-carbomethoxy-2-methyl-2-phenyl-2*H*-azirine (**26**) (Scheme 5) and is the first enantiomerically enriched example of an azirine in which the carboxyl group is conjugated with the C=N bond. Unfortunately all attempts to purify **26** chromatographically resulted in intractable mixtures. In **26** the C(2) methyl and carbomethoxy protons appear at δ 1.83 and 4.0 ppm, and the imine carbon is observed at δ 159.4 ppm in the ^{13}C NMR. This absorption is upfield from the imine carbon 2*H*-azirine (*R*)-(−)-**16** (δ 163.5 ppm) and is consistent with its conjugated nature. Furthermore, the imine and carbonyl infrared absorption frequencies at 1715 and 1750 cm^{-1}, respectively, are nearly identical to those reported for the related 3-carboethoxy-2-(2,6-dichlorophenyl)-2*H*-azirine.[31] The difficulty in purifying this azirine may be as result of the enhanced electrophilicity of the C=N bond, due to its conjugation with the carbomethoxy group, making it more susceptible to hydrolysis.

Synthesis of (*R*)-(−) and (*S*)-(+)-Dysidarizine. Employing our 2*H*-azirine synthesis, the marine cytoxic antibiotic (*R*)-(−)-dysidazirine (**2**) was prepared as outlined in Scheme 6. Aziridine (2*R*,3*R*)-(−)-**28** was synthesized in 86% yield via the in situ one-pot aza-Darzens reaction of the lithium enolate of methyl bromoacetate with (*R*)-(−)-**27**.[28] With LDA/MeI/−78 °C a 42% yield of

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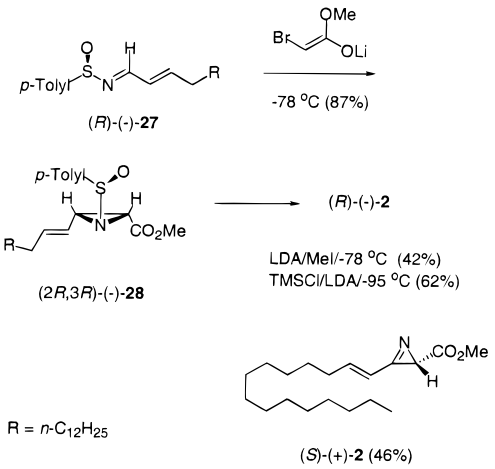
Scheme 6



(*R*)-(−)-**2** was obtained following flash chromatography and was improved to 62% using the LDA/TMSCl/−95 °C protocol. (*R*)-(−)-Dysidazirine (**2**) had spectral properties identical with literature values, confirming the structure and absolute configuration of (*R*)-(−)-**2** established by Molinski and Ireland on the basis of chemical correlation and circular dichroism studies.[3] However, our synthetic sample, determined to be >95% ee by chiral shift reagent studies with Eu(hfc)$_3$, had a specific rotation of $[\alpha]^{20}_D$ −186.4, whereas the naturally occurring material had a rotation of $[\alpha]^{20}_D$ −165, suggesting that the latter is less than 89% optically pure. In a similar manner the epimeric dysidazirine, (*S*)-(+)-**2**, was prepared in 46% yield using the LDA method.

In summary, the base-induced elimination of *p*-toluenesulfenic acid from readily available N-sulfinylaziridine 2-carboxylate esters affords stereodefined enantiopure 2*H*-azirine 2-carboxylate esters in good yield. The optimum conditions for the elimination were at −95 °C in the presence of TMSCl.

Experimental Section

General Procedures. Column chromatography was performed on silica gel, Merck grade 60 (230−400 mesh). Analytical and preparative thin-layer chromatography was performed on precoated silica gel plates (250 and 1000 microns) purchased from Analtech Inc. TLC plates were visualized with UV, in an iodine chamber or with phosphomolybdic acid unless noted otherwise. THF was freshly distilled under nitrogen from a purple solution of sodium and benzophenone.

Unless stated otherwise, all reagents were purchased from commercial sources and used without additional purification. Enantiomerically pure *N*-sulfinylaziridines 2-carboxylates (2*S*,3*S*)-**4**,[21] (2*S*,3*S*)-**11**,[28] (2*S*,3*R*)-**12**,[21] and (2*R*,3*S*)-**14**[21] were prepared using the aza-Darzens reaction of α-bromoenolates with sulfinimines (*N*-sulfinyl imines) as previously described.[28] Sulfinimines were prepared by the one-step[32] or two-step[33] procedures as previously reported.[34] *N*-Tosyl aziridines **17a**,[6] **17b**,[27] **19a**,[6,35] and **19b,c**[28] were prepared by oxidation of the corresponding *N*-sulfinylaziridines with *m*-CPBA.[28]

Synthesis of (*S*)-(+)-2-Carbomethoxy-3-phenyl-2*H*-azirine (5a). Typical Procedure. In a 25 mL oven-dried two-necked round-bottomed flask fitted with a magnetic stirring bar, a rubber septum, and an argon-filled balloon was placed 0.14 g (0.45 mmol) of (2*S*,3*S*)-(+)-*N*-(*p*-toluenesulfinyl)-2-carbomethoxy-3-phenylaziridine (**4a**)[21,28] in THF (10 mL). The solution was cooled to −78 °C, and 0.56 mL (0.56 mmol, 1.0 M in THF) of LDA was added slowly. The reaction was stirred at −78 °C for 15 min, quenched with H_2O (2 mL), and diluted with EtOAc (10 mL). The organic phase was separated, and the aqueous layer was washed with EtOAc (2 × 20 mL). The combined organic extracts were washed with brine (10 mL), dried ($MgSO_4$), and concentrated. Purification by flash chromatography (EtOAc/hexane, 10:90) gave 0.04 g (47%) of (*S*)-(+)-**5a**, 0.02 g (26%) of *p*-TolylSO$_2$STolyl-*p* (**8**), 0.03 g (55%) of *p*-TolylSSTolyl-*p* (**7**), and 0.04 g of polar material from the baseline as a yellow oil. When 0.14 g (1.0 mmol) of iodomethane was added after the addition of LDA, **5a** was isolated in 52% yield and methyl *p*-toluenesulfoxide (**9**) was obtained in 83% yield following chromatography. **(*S*)-(+)-2-Carbomethoxy-3-phenyl-2*H*-azirine (5a):** yellow wax; $[\alpha]^{20}_D$ 289.3 (*c* 1.8, $CHCl_3$); ^{1}H NMR ($CDCl_3$) δ 7.89 (m, 2H), 7.69−7.54 (m, 3H), 3.75 (s, 3H), 2.87 (s, 1H); ^{13}C NMR ($CDCl_3$) δ 172.1, 158.5, 133.9, 130.5, 129.3, 122.1, 52.3, 29.4; (*S*)-(+)-**5a** has other physical and spectroscopic properties identical to literature values.[19,36] The optical purity of (+)-**5a** was determined using the chiral shift reagent Eu(hfc)$_3$ and monitoring the C-2 proton. In the racemic material this proton was split by >25 Hz using Eu(hfc)$_3$.

(*S*)-(+)-2-Carbomethoxy-3-(4-methoxyphenyl)-2*H*-azirine (5b). Purification by flash chromatography (EtOAc/hexanes, 1:4) gave 0.03 g (54%) of (*S*)-(+)-**5b** as an oil: $[\alpha]^{20}_D$ 295.2 (*c* 0.90, $CHCl_3$); IR (neat) cm^{-1} 2954, 1772, 1734, 1507, 1260; ^{1}H NMR ($CDCl_3$) δ 7.84 (d, 2H, J = 8.7 Hz), 7.08 (d, 2H, J = 8.7 Hz), 3.91 (s, 3H), 3.75 (s, 3H), 2.81 (s, 1H); ^{13}C NMR ($CDCl_3$) δ 172.4, 164.1, 157.1, 132.5, 114.9, 114.5, 55.6, 52.2, 29.2; HRMS calcd for $C_{11}H_{12}NO_3$ (m + H) 206.0817, found 206.0813. Anal. Calcd for $C_{11}H_{11}NO_3$: C, 64.39; H, 5.37; N, 6.83. Found: C, 64.80; H, 5.32; N, 7.01.

Preparation of (*S*)-(+)-2-Carbomethoxy-3-(4-trifluoromethylphenyl)-2*H*-azirine (5c) and Methyl *N*-(4-trifluoromethylbenzoyl)glycine (10). Purification by flash chromatography (EtOAc/hexanes, 15:85) gave 0.015 g (33%) of (*S*)-(+)-**5c** as an oil and 0.015 g (30%) of **10** as a yellow solid. **(*S*)-(+)-2-Carbomethoxy-3-(4-trifluoromethylphenyl)-2*H*-azirine (5c):** oil; $[\alpha]^{20}_D$ 70.3 (*c* 0.40, $CHCl_3$); IR (neat) cm^{-1} 2958, 1775, 1737, 1325, 1132; ^{1}H NMR ($CDCl_3$) δ 8.04 (d, 2H, J = 7.9 Hz), 7.86 (d, 2H, J = 8.6 Hz), 3.76 (s, 3H), 2.94 (s, 1H); ^{13}C NMR ($CDCl_3$) δ 171.5, 158.5, 135.2 (q, J = 129.5 Hz, CF_3), 130.7, 126.4, 126.4, 125.6, 52.5, 29.9; HRMS calcd for $C_{11}H_9F_3NO_2$ (m + H) 244.0585, found 244.0589. Anal. Calcd for $C_{11}H_8F_3NO_2$: C, 54.32; H, 3.29. Found: C, 54.00; H, 3.44. **Methyl *N*-(4-trifluoromethylbenzoyl)glycine (10):** mp 60−61 °C; IR (KBr) cm^{-1} 3273, 1747, 1648, 1573, 1337; ^{1}H NMR ($CDCl_3$) δ 7.94 (d, 2H, J = 8.1 Hz), 7.73 (d, 2H, J = 8.1 Hz), 6.80 (bs, 1H), 4.28 (d, 2H, J = 5.1 Hz), 3.84 (s, 3H); ^{13}C NMR ($CDCl_3$) δ 170.3, 166.1, 136.9, 133.5 (q, J = 129.5 Hz, CF_3), 127.6, 125.7, 124.7, 122.5, 52.6, 41.8; HRMS calcd for $C_{11}H_{11}F_3NO_3$ (m + H) 262.0691, found 262.0695. Anal. Calcd for $C_{11}H_{10}F_3NO_3$: C, 50.58; H, 3.83; N 5.36. Found: C, 50.25; H, 3.80; N 5.11.

Synthesis of Methyl *N*-(4-trifluoromethylbenzoyl)glycine (10) from the Hydrochloride Salt of Methyl Glycine. In a 15 mL oven-dried two-necked round-bottomed flask fitted with a magnetic stirring bar, a rubber septum, and an argon-filled balloon was placed 0.06 g (0.47 mmol) of the hydrochloride salt of methyl glycine (Aldrich**)** in THF (5 mL). The solution was cooled to 0 °C, and 0.20 mL (1.41 mmol) of Et_3N was slowly added. The reaction mixture was stirred at 0 °C for 10 min, and 0.14 mL (0.94 mmol) of 4-trifluoromethylbenzoyl chloride (Aldrich) was added. The reaction mixture was stirred at 0 °C for 1 h, warmed to room temperature for 1 h,

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and quenched with saturated aqueous NH_4Cl (2 mL). The reaction mixture was diluted with EtOAc (10 mL), the organic phase was separated, and the aqueous layer was washed with EtOAc. The combined organic phases were washed with brine, dried (Na_2SO_4), and concentrated to give 0.11 g (90%) of **10** as a yellow solid, mp 60−61 °C.

Treatment of (2*R*,3*S*)-*N*-(*p*-Toluenesulfinyl)-2-carbomethoxy-2-methyl-3-phenylaziridine (14) with LDA. Treatment of aziridine (2*R*,3*S*)-**14** under the standard conditions followed by flash chromatography (EtOAc/*n*-pentane, 30:70) gave 0.12 g of an inseparable mixture of (*R*)-(−)-**16**, (2*R*,3*S*)-2-carbomethoxy-2-methyl-3-phenylaziridine (**15**),[28] and 0.07 g (46%) of *N*,*N*-bis(isopropyl)-*p*-toluenesulfinamide (**13**).[37] The yields of **16** and 1*H*-aziridine **15** were estimated by ^{1}H NMR integration (1:1.39) to be 41% and 57%, respectively.

Preparation of Methyl *trans*-2-(*p*-Toluenesulfonyl)-amino Cinnamate (18a). In a 25 mL oven-dried two-necked round-bottomed flask fitted with an argon-filled balloon, a rubber septum and a magnetic stirring bar was placed 0.19 g (0.58 mmol) of (2*S*,3*S*)-(+)-**17a** in THF (10 mL). The reaction flask was cooled to −78 °C, and 0.62 mL of LDA (0.62 mmol, 1.0 M in THF) was slowly added. The reaction mixture was stirred at −78 °C for 10 min, quenched by the addition of H_2O (2 mL), and diluted with CH_2Cl_2. The organic phase was separated, washed with brine, dried ($MgSO_4$), and concentrated. Purification by flash chromatography (EtOAc/*n*-pentane, 20:80) afforded 0.12 g (61%) of **18a** as a yellow solid: mp 138−142 °C; IR (KBr) cm^{-1} 3246, 3070, 2952, 2851, 1716, 1439, 1338, 1252, 1165, 1091; ^{1}H NMR ($CDCl_3$) δ 7.87−7.84 (m, 2H), 7.66 (d, 2H, J = 8.3 Hz), 7.53 (s, 1H), 7.38−7.33 (m, 3H), 7.23 (d, 2H, J = 8.3 Hz), 6.25 (bs, 1H), 3.52 (s, 3H), 2.39 (s, 3H); ^{13}C NMR ($CDCl_3$) δ 165.4, 143.9, 137.7, 136.3, 132.7, 131.0, 130.3, 129.3, 128.4, 127.8, 122.7, 52.5, 21.5; HRMS calcd for $C_{17}H_{18}NSO_4$ (m + H) 332.0957, found 332.0954. Anal. Calcd for $C_{17}H_{17}NSO_4$: C, 61.63; H, 5.14. Found: C, 61.53; H, 5.35.

Hydrogenation of 18a to *N*-Tosyl Phenylalanine. In a 25 mL two-necked round-bottomed flask equipped with a hydrogen filled balloon, a glass stopper, and a magnetic stirring bar was placed 0.10 g (0.30 mmol) of **18a** in methanol (10 mL). Palladium (0.03 g, 10% on activated carbon) was added, and the reaction mixture was stirred at room temperature for 1.5 h, diluted with CH_2Cl_2 (10 mL), and filtered through a short silica gel column. Concentration of the filtrate afforded 0.10 g (99%) of *N*-tosyl phenylalanine as a white solid, mp 93 °C [lit.[21] mp 92−93 °C], which had spectrometric properties identical with an authentic sample.[21]

Methyl *trans*-2-(*p*-Toluenesulfonyl)amino-3-methyl Cinnamate (18b). Purification by flash chromatography (EtOAc/hexanes, 50:50) gave 0.05 g (79%) of **18b**: mp 159−160 °C; IR (KBr) cm^{-1} 3261, 3051, 1721, 1405, 1172; ^{1}H NMR ($CDCl_3$) δ 7.76 (d, 2H, J = 8.1 Hz), 7.42−7.22 (m, 5H), 7.12−7.04 (m, 2H), 6.20 (bs, 1H), 3.10 (s, 3H), 2.41 (s, 3H), 2.29 (s, 3H); ^{13}C NMR ($CDCl_3$) δ 164.6, 153.5, 143.9, 141.1, 136.2, 129.5, 128.1, 127.8, 127.6, 126.4, 121.4, 104.3, 51.5, 24.1, 21.5; HRMS calcd for $C_{18}H_{19}NSO_4$ (m) 345.1035, found 345.1033. Anal. Calcd for $C_{18}H_{19}NSO_4$: C, 62.61; H, 5.51; N, 4.06. Found: C, 62.63; H, 5.55; N, 3.83.

Preparation of (*R*)-(−)-2-Carbomethoxy-2-methyl-3-phenyl-2*H*-azirine (16) from (2*R*,3*S*)-*N*-(*p*-Toluenesulfonyl)-2-carbomethoxy-2-methyl-3-phenylaziridine (19a). Typical Procedure. In a 25 mL oven-dried two-necked round-bottomed flask fitted with a magnetic stirring bar, rubber septum, and an argon-filled balloon was placed 0.09 g (0.27 mmol) of (2*R*,3*S*)-(+)-**19a** in THF (9 mL). The solution was cooled to −78 °C, and 0.37 mL (0.37 mmol, 1.0 M in THF) of LDA was added slowly. The reaction was stirred at −78 °C for 20 min, quenched with H_2O (3 mL), and diluted with EtOAc (10 mL). The organic phase was separated, and the aqueous phase was washed with EtOAc. The combined organic phases were washed with brine, dried ($MgSO_4$), and concentrated. Purification by flash chromatography (EtOAc/hexanes, 30:70) gave 0.04 g (87%) of (*R*)-(−)-**16** as an oily solid: $[\alpha]^{20}_D$ −163.2 (*c* 0.43, $CHCl_3$); IR (neat) cm^{-1} 2930, 1760, 1726, 1273, 1128; ^{1}H NMR ($CDCl_3$) δ 7.85 (d, 2H, J = 7.8), 7.68−7.51 (m, 3H), 3.68 (s, 3H), 1.64 (s, 3H); ^{13}C NMR ($CDCl_3$) δ 173.5, 163.5, 133.6, 130.1, 129.6, 129.3, 122.4, 52.4, 35.4, 17.7; HRMS calcd for $C_{11}H_{12}NO_2$ (m + H) 190.0868, found 190.0869. Anal. Calcd for $C_{11}H_{11}NO_2$: C, 69.83; H, 5.86; N, 7.40. Found: C, 69.71; H, 5.65; N, 7.54.

(*R*)-(−)-2-Carbomethoxy-2-ethyl-3-phenyl-2*H*-azirine (20). The compound was prepared from (2*R*,3*S*)-**19b**; purification by flash chromatography (EtOAc/hexanes, 10:90) gave 0.04 g (81%) of (*R*)-(−)-**20**: oil; $[\alpha]^{20}_D$ −87.6 (*c* 0.8, $CHCl_3$); IR (neat) cm^{-1} 2930, 1760, 1726, 1273, 1128; ^{1}H NMR ($CDCl_3$) δ 7.91−7.84 (m, 2H), 7.67−7.54 (m, 3H), 3.68 (s, 3H), 2.23−2.05 (m, 2H), 0.87 (t, 3H, J = 7.5 Hz); ^{13}C NMR ($CDCl_3$) δ 173.2, 163.2, 133.6, 130.1, 129.6, 129.3, 123.1, 52.4, 40.6, 23.6, 10.5; HRMS calcd for $C_{12}H_{14}NO_2$ (m + H) 204.1025, found 204.1025. Anal. Calcd for $C_{12}H_{13}NO_2$: C, 70.94; H, 6.40; N, 6.90. Found: C, 71.22; H, 6.75; N, 6.52.

(*R*)-(+)-2-Carbomethoxy-2-phenyl-3-phenyl-2*H*-azirine (21). The compound was prepared from (2*R*,3*S*)-(+)-**19c**;[28] purification by flash chromatography (EtOAc/hexanes, 10:90) gave 0.05 g (61%) of (*R*)-(+)-**21**; mp 70−71 °C; $[\alpha]^{20}_D$ 83.5 (*c* 0.64, $CHCl_3$); IR (KBr) cm^{-1} 2945, 1759, 1725, 1450; ^{1}H NMR ($CDCl_3$) δ 7.93 (d, 2H, J = 8.2 Hz), 7.63−7.48 (m, 5H), 7.35−7.27 (m, 3H), 3.74 (s, 3H); ^{13}C NMR ($CDCl_3$) δ 171.6, 160.7, 136.2, 133.9, 130.4, 129.4, 128.2, 128.1, 127.7, 121.9, 52.7, 41.0; HRMS calcd for $C_{16}H_{14}NO_2$ (m + H) 252.1025, found 252.1026. Anal. Calcd for $C_{16}H_{13}NO_2$: C, 76.19; H, 5.18; N, 5.56. Found: C, 75.67; H, 5.37; N, 5.27.

Preparation of (*S*)-(+)-2-Carbomethoxy-3-phenyl-2*H*-azirine (5a) in the Presence of TMSCl. Typical Procedure (Method A). In a 25 mL oven-dried two-necked round-bottomed flask fitted with a magnetic stirring bar, a rubber septum, and an argon-filled balloon was placed 0.12 mL (0.94 mmol) of TMSCl in THF (6 mL). The solution was cooled to −95 °C (MeOH/liquid N_2), and 0.35 mL (0.53 mmol, 1.5 M in cyclohexane) of LDA was added slowly. The reaction was stirred at −95 °C for 10 min, and a solution of 0.09 g (0.28 mmol) of (2*S*,3*S*)-(+)-**4a** in THF (8 mL) was added via cannula. The reaction was stirred at −95 °C for another 20 min, quenched with saturated aqueous NH_4Cl (5 mL), and diluted with EtOAc (10 mL). The organic phase was separated, and the aqueous phase was washed with EtOAc (2 × 10 mL). The combined organic phases were washed with brine (10 mL), dried (Na_2SO_4), and concentrated. The crude reaction mixture was purified by flash chromatography (EtOAc/hexanes, 10: 90) to give 0.01 g (17%) of (*S*)-(+)-**5a** and 0.06 g (65%) of aziridine **4a**.

Improved Preparation of (*S*)-(+)-2-Carbomethoxy-3-phenyl-2*H*-azirine (5a) in the Presence of TMSCl. Typical Procedure (Method B). In a 25 mL oven-dried two-necked round-bottomed flask fitted with a magnetic stirring bar, a rubber septum, and an argon-filled balloon was placed 0.15 g (0.46 mmol) of aziridine (2*S*,3*S*)-**4a** in THF (12 mL). The solution was cooled to −95 °C, and 0.35 mL (2.76 mmol) of TMSCl was added. The reaction mixture was stirred at −95 °C for 15 min, and 0.60 mL (0.90 mmol, 1.5 M in cyclohexane) of LDA was slowly added. The solution was stirred at −95 °C for 15 min, quenched with saturated aqueous NH_4Cl (5 mL), and diluted with EtOAc (10 mL). The organic phase was separated, and the aqueous phase was washed with EtOAc. The combined organic phases were washed with brine, dried ($MgSO_4$), and concentrated. Purification by flash chromatography (EtOAc/hexanes, 1: 9) gave 0.06 g (76%) of (*S*)-(+)-**5a** as a yellow wax identical to that prepared above.

(*R*)-(+)-3-Carbomethoxy-2-methyl-2-phenyl-2*H*-azirine (26). In a 25 mL oven-dried two-necked round-bottomed flask fitted with a magnetic stirring bar, a rubber septum, and an argon-filled balloon was placed 0.05 mL (0.56 mmol) of oxalyl chloride in CH_2Cl_2 (2 mL). The solution was cooled to −60 °C, and 0.1 mL (1.4 mmol) of DMSO was added. After 10 min, 0.04 g (0.21 mmol) of aziridine (2*S*,3*R*)-(+)-**25**[6] in CH_2Cl_2 (1.0 mL) was added dropwise at −60 °C followed by 0.3 mL (2.15 mmol) of triethylamine. The reaction mixture was warmed to room temperature. After 3 h the solution was

(37) Solladie, G.; Zimmermann, R. *J. Org. Chem.* **1985**, *50*, 4062.

concentrated to give a residue to which diethyl ether (25 mL) was added. The precipitated salts were filtered, and the filtrate was washed with brine (2 × 10 mL), dried ($MgSO_4$), and concentrated to give 0.036 g (90%) of crude (*R*)-(+)-**26** in 95% purity as indicated by ^{1}H NMR. Attempts to purify **26** by flash chromatography (silica gel, neutral and basic alumna oxide) resulted in decomposition. Compound (*R*)-(+)-**26**: $[\alpha]^{20}_D$ 303 (*c* 0.66, $CHCl_3$); IR (neat) cm^{-1} 2960, 2925, 1750, 1715, 1260, 1027; ^{1}H NMR ($CDCl_3$) δ 7.36−7.17 (m, 5H), 4.00 (s, 3H), 1.83 (s, 3H); ^{13}C NMR ($CDCl_3$) δ 169.1, 159.4, 141.6, 128.3, 127.4, 126.2, 53.5, 43.1, 21.4.

(*R*)-(−)-*N*-(*E*-2-Hexadecenylidene)-*p*-toluenesulfinimide (27). In a 50 mL two-necked round-bottomed flask equipped with a magnetic stirring bar, a rubber septum, and an argon-filled balloon was placed 0.30 g (1.0 mmol) of (1*S*,2*R*,5*S*)-(+)-menthyl-(*R*)-*p*-toluenesulfinate in THF (10 mL). The solution was cooled to −78 °C, and 2.0 mL (2.0 mmol, 1.0 M in THF) of LiHMDS was added. The mixture was warmed to room temperature, stirred for 5 h, and cooled to 0 °C. Cesium fluoride (0.30 g, 2.0 mmol) was added, and the reaction was stirred for 30 min prior to addition of 0.19 g (0.80 mmol) of (2*E*)-hexadecenal.[38] After an additional 2 h, the reaction mixture was quenched with H_2O (3 mL). The organic phase was separated, and the aqueous phase was washed with EtOAc (2 × 40 mL). The combined organic phases were washed with brine, dried ($MgSO_4$), and concentrated to give the crude sulfinimine, which was purified by column chromatography (EtOAc/hexanes, 10:90) to afford 0.24 g (79%) of (*R*)-(−)-**27** as a low melting solid: mp 38−40 °C; $[\alpha]^{20}_D$ −393.3 (*c* 1.87, $CHCl_3$); IR (neat) cm^{-1} 2958, 2915, 2848, 1639, 1579, 1094, 809; ^{1}H NMR ($CDCl_3$) δ 8.33 (d, 1H, J = 9.1 Hz), 7.57 (d, 2H, J = 8.0 Hz), 7.30 (d, 2H, J = 8.1 Hz), 6.58 (dt, 1H, J = 15.5, 6.7 Hz), 6.40 (m, 1H), 2.40 (s, 3H), 2.25 (q, 2H, J = 6.8, 13.7 Hz), 1.46 (m, 2H), 1.25 (bs, 20 H), 0.88 (t, 3H, J = 6.3 Hz); ^{13}C NMR ($CDCl_3$) δ 162.0, 152.5, 142.0, 141.6, 129.8, 128.5, 124.6, 33.0, 31.9, 29.6, 29.5, 29.3, 29.1, 28.1, 22.6, 21.4, 14.1. Anal. Calcd for $C_{23}H_{37}NOS$: C, 73.55; H, 9.93. Found: C, 73.47; H, 10.02. **(*S*)-(+)-*N*-(*E*-2-Hexadecenylidene)-*p*-toluenesulfinimide (27):** low melting solid; mp 38−40 °C; $[\alpha]^{20}_D$ 394.1 (*c* 2.23, $CHCl_3$).

(2*R*,3*R*)-(−)-*N*-(*p*-Toluenesulfinyl)-2-carbomethoxy-3-(1-pentadecenyl)aziridine (28). In a 50 mL oven-dried two-necked round-bottomed flask equipped with a magnetic stirring bar, a rubber septum, and an argon-filled balloon was placed 0.10 g (0.27 mmol) of sulfinimine (*R*)-(−)-**27** in THF (18 mL). The solution was cooled to −78 °C, and 0.10 mL (1.1 mmol) of methyl bromoacetate was added. After 2 min, 0.49 mL (0.49 mmol, 1.0 M in THF) of LiHMDS was added, and the solution was stirred at −78 °C for 1 h, warmed to −45 °C for 1.5 h, and quenched with saturated aqueous NH_4Cl (5 mL). The organic phase was separated, and the aqueous phase was washed with EtOAc. The combined organic phases were washed with brine, dried ($NaSO_4$), and concentrated. Purification by flash chromatography (EtOAc/*n*-Pentane, 7: 93) gave 0.10 g (86%) of (2*R*,3*R*)-(−)-**28** as a low melting solid: mp 40−42 °C; $[\alpha]^{20}_D$ −86.9 (*c* 1.6, $CHCl_3$); IR ($CHCl_3$) cm^{-1} 2924, 2852, 1751, 1735, 1664, 1596, 1490, 1437, 1369, 1281, 1200, 1175 1098, 969, 809; ^{1}H NMR ($CDCl_3$) δ 7.61 (d, 2H, J = 8.3 Hz), 7.30 (d, 2H, J = 8.2 Hz), 6.02 (dt, 1H, J = 15.5, 6.6 Hz), 5.51−5.42 (m, 1H), 3.61 (s, 3H), 3.29 (m, 2H), 2.41 (s, 3H), 2.06 (m, 2H), 1.36 (m, 2H), 1.26 (bs, 20 H), 0.88 (t, 3H, J = 6.4 Hz); ^{13}C NMR ($CDCl_3$) δ 167.0, 142.1, 139.4, 129.6, 124,8, 121.8, 52.1, 42.3, 32.4, 31.8, 29.6, 29.5, 29.4, 29.3, 29.0, 28.7, 22.6, 21.4, 14.2. Anal. Calcd for $C_{26}H_{41}NO_3S$: C, 69.76; H, 9.23. Found: C, 69.63; H, 9.29. **(2*S*,3*S*)-(+)-*N*-(*p*-Toluenesulfinyl)-2-carbomethoxy-3-(1-pentadecenyl)aziridine (28)**: mp 40−42 °C; $[\alpha]^{20}_D$ 86.3 (*c* 1.8, $CHCl_3$).

(*R*)-(−)-2-Carbomethoxy-3-(1-pentadecenyl)-2*H*-azirine [Dysidazirine] (2). In a 50 mL two-necked round-bottomed flask equipped with a magnetic stirring bar, a rubber septum, and an argon-filled balloon was placed 0.45 g (1.0 mmol) of (2*R*,3*R*)-(−)-**28** in THF (7 mL), which was cooled to −78 °C. Freshly prepared lithium diisopropylamide[39] (1.3 mL, 1.3 mmol, 1.0 M in THF) was added via syringe to the reaction mixture, and stirring was continued for 15 min, at which time 0.28 g (2.0 mmol) of iodomethane was added. After stirring for 20 min the reaction mixture was quenched at −78 °C with H_2O (5 mL). The organic phase was separated, and the aqueous phase was washed with ether. The combined ether extracts were washed with brine, dried ($MgSO_4$), and concentrated to give an oil that was purified by column chromatography (EtOAc/hexanes, 7:93) to afford 0.13 g (85%) of methyl *p*-tolyl sulfoxide (**9**) and 0.13 g (42%) of azirine (*R*)-(−)-**2** as a low melting solid: $[\alpha]^{20}_D$ −186.3 (*c* 2.53, MeOH) [lit.[3] $[\alpha]^{20}_D$ −165 (*c* 0.5, MeOH)]; the IR and ^{1}H NMR data were identical with literature values;[3] ^{13}C NMR ($CDCl_3$) δ 172.2, 156.6, 155.8, 112.9, 52.2, 33.2, 31.9, 29.6, 29.5, 29.3, 29.1, 28.3, 27.8, 22.7, 14.1. Anal. Calcd for $C_{19}H_{33}NO_2$: C, 74.22; H, 10.82; Found: C, 73.92; H, 10.99. ***(S)*-(+)-2-Carbomethoxy-3-(1-pentadecenyl)-2*H*-azirine [Dysidazirine] (2):** Low melting solid; $[\alpha]^{20}_D$ 183.7 (*c* 2.23, MeOH), 191.5 (*c* 1.77, $CHCl_3$) [(lit.[4] $[\alpha]^{20}_D$ 47.2 (*c* 1.08, $CHCl_3$)].

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Supporting Information Available: X-ray data for **18b** and spectra for (2*R*)-(+)-**26**. This material is available free of charge via the Internet at http://pubs.acs.org.

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