Perkin 1 Abstracts: Natural Product Synthesis

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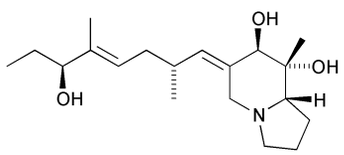
Perkin 1 Abstracts: Natural Product Synthesis aims to highlight syntheses that have been recently published. It includes brief descriptions of *biological activity* and *key steps*. A more comprehensive list of Natural Product syntheses and isolations can be found in *Natural Product Updates*.

(+)-Allopumiliotoxin 323B

Biological activity: mild toxin that exhibits cardiotonic and myotonic properties.

Key steps: intramolecular [3+2] cycloaddition of a (*Z*)-*N*-alkenylnitrone.

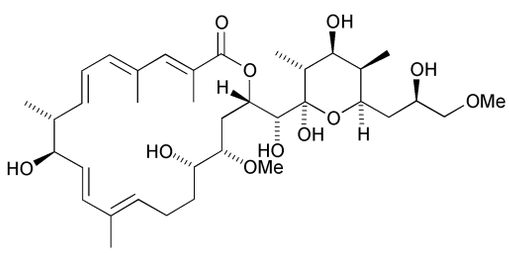


C.-H. Tan and A. B. Holmes, *Chem. Eur. J.*, 2001, **7**, 1845.

Apoptolidinone

Biological activity: apoptolidine is a natural product isolated from *Nocardiopsis* sp. that induces apoptosis in rat glia cells transformed with the E1A oncogene (IC_{50} = 11 ng ml^{-1} but not in untransformed cell lines.

Key steps: the aglycone was synthesised from (*R*)-glycidol and (3*S*,4*S*)-4-hydroxy-3-methyltetrahydrofuran-2-one using Wittig and Cu(I) thiophenecarboxylate-mediated coupling chemistry.

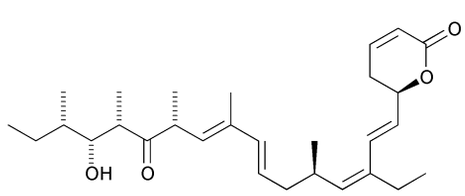


J. Schuppen, H. Wehlan, S. Keiper and U. Koert, *Angew. Chem., Int. Ed.*, 2001, **40**, 2063.

(–)-Callystatin A

Biological activity: (a) a member of the leptomycin family of antibiotics; (b) exhibits potent cytotoxic activity *in vitro* against the KB cancer cell line (IC_{50} = 0.01 ng mL^{-1}).

Key steps: (a) Evans aldol reaction; (b) Julia olefination.

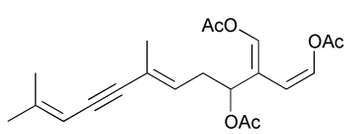


A. B. Smith III, and B. M. Brandt, *Org. Lett.*, 2001, **3**, 1685.

(±)-*iso*-Caulerpenyne

Biological activity: (a) isolated from *Caulerpa taxifolia* and *Caulerpa prolifera*; (b) inhibits the proliferation of the fibroblastic cell line BHK 21/C13 from baby hamster kidney; (c) inhibits the division of sea urchin eggs; (d) a toxicological risk to humans.

Key steps: (a) stereo- and regio-selective stannylcupration reaction; (b) Stille cross-coupling reaction.

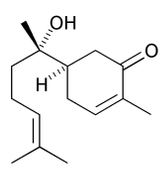


L. Commeiras, M. Santelli and J.-L. Parrain, *Org. Lett.*, 2001, **3**, 1713.

(–)-Delobanone

Biological activity: not reported.

Key steps: Fe-mediated cyclocarbonylation of an alkenyl cyclopropane.



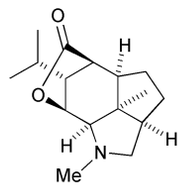
D. F. Taber, G. Bui and B. Chen, *J. Org. Chem.*, 2001, **66**, 3423.

(±)-Dendrobine

Biological activity: (a) isolated from the Chinese ornamental orchid *Dendrobium nobile*; (b) antipyretic; (c) hypotensive; (d) convulsant.

Key steps: intramolecular Diels–Alder cycloaddition/rearrangement sequence of a furanyl carbamate.

A. Padwa, M. A. Brodney, M. Dimitroff, B. Liu and T. Wu, *J. Org. Chem.*, 2001, **66**, 3119.

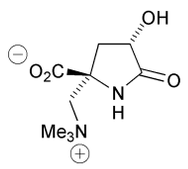


(–)-Dysibetaine

Biological activity: (a) isolated from an aqueous extract of the marine sponge *Dysidea herbacea*; (b) intracerebral injection in mice (20 μg/mouse) induced scratching.

Key steps: intramolecular alkylation of a glycidamide.

B. B. Snider and Y. Gu, *Org. Lett.*, 2001, **3**, 1761.

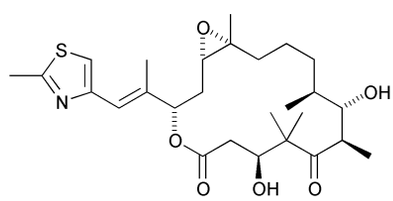


Epothilone B

Biological activity: (a) exhibits microtubule binding affinities; (b) cytotoxic against tumour cells and multiple drug resistant tumour cell lines.

Key steps: (a) Yamaguchi macrolactonisation; (b) Hafner–Duthaler allylation.

H. J. Martin, P. Pojarliev, H. Kählig and J. Mulzer, *Chem. Eur. J.*, 2001, **7**, 2261.

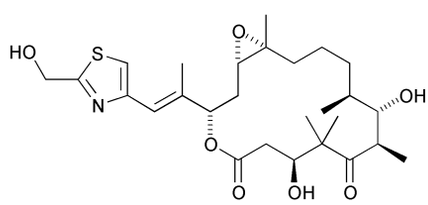


Epothilone F

Biological activity: (a) isolated from myxobacteria (*Sorangium cellulosum* strain 90); (b) cytotoxic against taxol-resistant cell lines; (c) inhibits growth of KB-31 epidermoid carcinoma cells (IC_{50} = 0.4 nM).

Key steps: (a) antibody-catalysed aldol and retro-aldol reactions; (b) ring-closing metathesis using Grubbs' catalysts.

S. C. Sinha, J. Sun, G. P. Miller, M. Wartmann and R. A. Lerner, *Chem. Eur. J.*, 2001, **7**, 1691.

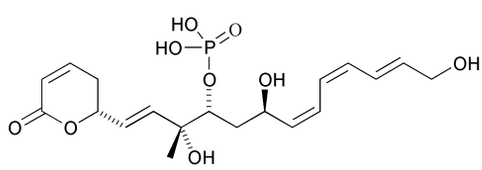


Fostriecin

Biological activity: antitumour agent that inhibits protein phosphatases 1, 2A and 4.

Key steps: (a) Sharpless AD reaction (twice); (b) Stille coupling; (c) Still–Gennari *cis*-olefination; (d) Wittig *cis*-olefination.

D. L. Boger, S. Ichikawa and W. Zhong, *J. Am. Chem. Soc.*, 2001, **123**, 4161.

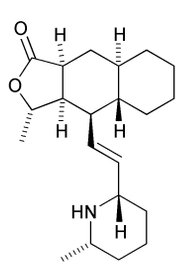


Himandravine

Biological activity: (a) isolated from the bark of *Galbulimima baccata*; (b) potent antimuscarinic activity.

Key steps: diastereoselective intramolecular Diels–Alder reaction.

S. Chackalamannil, R. Davies and A. T. McPhail, *Org. Lett.*, 2001, **3**, 1427.

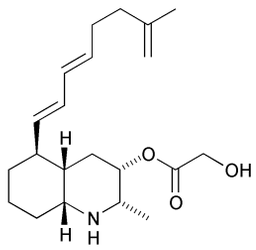


(–)-Lepadin A

Biological activity: (a) isolated from the tunicate *Clavelina lepadiformis*; (b) exhibits *in vitro* cytotoxicity against human cancer cell lines.

Key steps: intramolecular hetero-Diels–Alder reaction of an acylnitroso compound.

T. Ozawa, S. Aoyagi and C. Kibayashi, *J. Org. Chem.*, 2001, **66**, 3338.

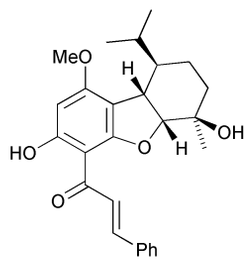


(±)-Linderol A

Biological activity: (a) isolated from the fresh bark of *Lindera umbellata* (Lauraceae); (b) potent inhibitory activity towards melanin biosynthesis of cultured B-16 melanoma cells without causing cytotoxicity.

Key steps: rearrangement of a coumarin derivative by treatment with dimethylsulfoxonium methylide.

M. Yamashita, N. Ohta, I. Kawasaki and S. Ohta, *Org. Lett.*, 2001, **3**, 1359.

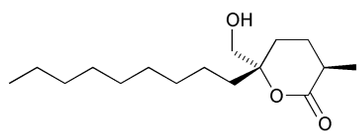


(–)-Malyngolide

Biological activity: not reported.

Key steps: (a) group-selective hydroalumination of a bis-alkynyl alcohol armed with an adjacent chiral centre; (b) Julia olefination.

T. Suzuki, K. Ohmori and K. Suzuki, *Org. Lett.*, 2001, **3**, 1741.

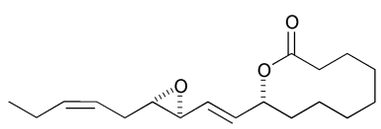


Mueggelone

Biological activity: isolated from the bloom-forming strain of *Aphanizomenon flos-aquae*.

Key steps: Yamaguchi lactonisation.

H. Motoyoshi, K. Ishigami and T. Kitahara, *Tetrahedron*, 2001, **57**, 3899.

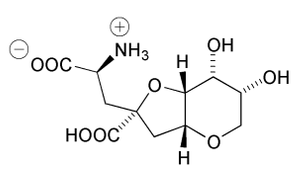


Neodysiherbaine A

Biological activity: (a) isolated from the aqueous extract of the marine sponge *Dysidea herbacea*; (b) neuroactive.

Key steps: Pd(0)-catalysed cross-coupling of an organozinc compound and a vinyl triflate.

R. Sakai, T. Koike, M. Sasaki, K. Shimamoto, C. Oiwa, A. Yano, K. Suzuki, K. Tachibana and H. Kamiya, *Org. Lett.*, 2001, **3**, 1479.

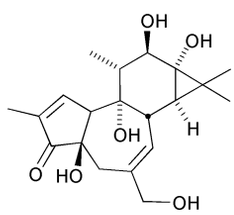


(+)-Phorbol

Biological activity: tumour promotion activity owing to activation of protein kinase C.

Key steps: (a) [4+3] oxyallyl cation cycloaddition to a furan; (b) intramolecular Heck reaction

K. Lee and J. K. Cha, *J. Am. Chem. Soc.*, 2001, **123**, 5590.

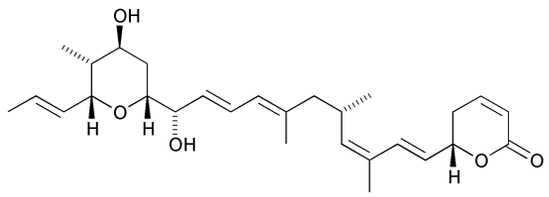


(–)-Ratjadone

Biological activity: (a) isolated from cultures of *Sorangium cellulosum* strain So ce360; (b) potent *in vitro* antifungal activity against *Mucor hiemalis*, *Phythophthora drechsleri*, *Ceratocystis ulmi* and *Monilia brunnea* (MIC = 0.04-0.6 μg mL^{-1}); (c) cytotoxic in mammalian L929 cell lines (IC_{50} = 0.05 ng mL^{-1}) and HeLa cell line KB3.1 (IC_{50} = 0.04 ng mL^{-1}).

Key steps: (a) Brown asymmetric allylation; (b) Sharpless asymmetric epoxidation; (c) 6-*exo*-*tet* acid-catalysed oxirane opening; (d) Terashima asymmetric reduction.

D. R. Williams, D. C. Ihle and S. V. Plummer, *Org. Lett.*, 2001, **3**, 1383.

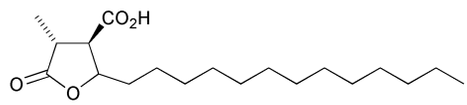


(–)-Roccellaric acid

Biological activity: (a) antibiotic; (b) antitumour.

Key steps: (a) copper(I)-catalysed asymmetric cyclopropanation; (b) tin(IV)-catalysed retroaldol/lactonisation sequence; (c) ruthenium-catalysed intermolecular metathesis reaction.

C. Böhm and O. Reiser, *Org. Lett.*, 2001, **3**, 1315.

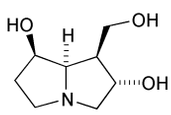


(–)-Rosmarinecine

Biological activity: not reported.

Key steps: Mitsunobu/intramolecular nitrone cycloaddition sequence.

A. Goti, M. Cacciarini, F. Cardona, F. M. Cordero and A. Brandi, *Org. Lett.*, 2001, **3**, 1367.

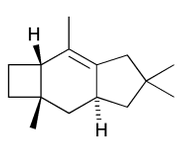


(±)-Sterpurene

Biological activity: (a) a metabolite of *Stereum purpureum*; (b) a fungus responsible for silver leaf disease.

Key steps: intramolecular C–H insertion reaction of a (η^5-cyclopentadienyl)dicarbonyliron carbene complex.

S. Ishii, S. Zhao, G. Mehta, C. J. Knors and P. Helquist, *J. Org. Chem.*, 2001, **66**, 3449.

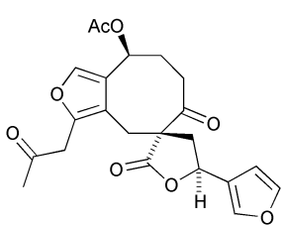


Teubrevin G

Biological activity: not reported

Key steps: (a) cycloaddition-fragmentation to generate the 2,3,4-trisubstituted furan ring; (b) ring-closing metathesis

L. A. Paquette and I. Efremov, *J. Am. Chem. Soc.*, 2001, **123**, 4492.



(+)-Trehazolin

Biological activity: (a) isolated from a culture broth of *Micromonospora strain* SANK 62390; (b) specific and potent inhibitor of trehalase which is the principal blood sugar found in insects.

Key steps: (a) ring-closing metathesis reaction; (b) asymmetric aldol addition reaction.

M. T. Crimmins and E. A. Tabet, *J. Org. Chem.*, 2001, **66**, 4012.