

Class

Actinobacteria

Subclass

Actinobacteridae

Order

Actinomycetales

Suborder

Streptosporangineae

Family

Thermomonosporaceae

Genus

Actinomadura

The Genus Actinomadura

To the genus *Actinomadura* belong 34 species *Actinomadura atramentaria*, *catellatispora*, *citrea*, *coerulea*, *cremea*, *echinospora*, *fibrosa*, *formosensis*, *fulvescens*, *glauciflava*, *hallensis*, *hibisca*, *kijaniata*, *latina*, *livida*, *luteofluorescens*, *macra*, *madurae*, *mexicana*, *meyerae*, *namibiensis*, *napirensis*, *nitritigenes*, *oligospora*, *pelletieri* *rubrobrunnea*, *rugatobispora*, *spadix*, *umbrina*, *verrucosospora*, *vinacea*, *viridilutea*, *viridis* and *yumaensis*. In 2001 the species *aurantiaca*, *glomerata*, *libanotica*, *longicatena* and *viridilutea* were transferred to the genus *Actinocorallia* *Actinomadura carminata* is reclassified to *Nonomuraea roseoviolacea* subsp. *carminata* by Gyobu and Miyadoh (2001). *Excellospora viridilutea* is transferred to *Actinomadura* as *A. viridilutea* by Zhang et al. 2001.

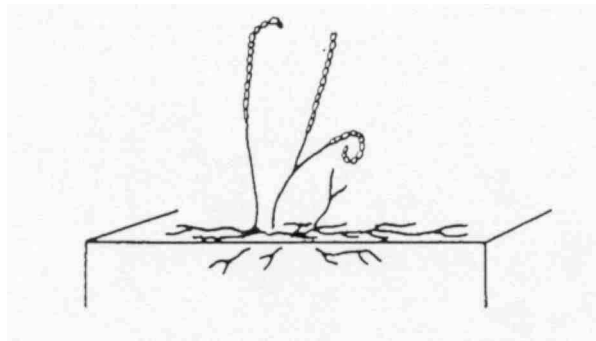
Extensively branching vegetative hyphae form a dense non fragmenting substrate mycelium; aerial mycelium is moderately developed or absent. At maturity, the aerial mycelium forms short or occasionally long chains of arthrospores. Spore chains are straight, hooked (open loops), or irregular spirals (1-4 turns). Spore surface is folded, irregular, rugose, smooth, spiny or warty. Aerial mycelium may be blue, brown, cream, grey, green, pink, red, white or yellow. Colonies have a leathery or cartilaginous appearance when aerial mycelium is absent. Aerobic, chemoorganotrophic, temperature range 10-60°C.

The peptidoglycan contains meso-diaminopimelic acid and N-acetylated muramic acid and is of the A1 γ type. Whole-organism hydrolysates contain galactose, glucose, mannose, ribose, and madurose, the latter sometimes in trace amounts. *Actinomadura* species have a complex mixture of fatty acids with hexadecanoic, 14-methylpentadecanoic, and 10-methyloctadecanoic acids predominating. Mycolic acids are not produced. Cells contain diphosphatidylglycerol and phosphatidylinositol as major phospholipids. Hexahydrogenated menaquinone with nine isoprene units saturated at sites II, III and VIII (MK-9(H₆, II, III, VIII)) are the major isoprenolog.

Widely distributed in soil. Some strains are pathogenic for animals, including human beings. The species epithet of the type species of this genus *A. madura* was given to a causative organism of „Madura foot“ (foot mycetoma) which occurs in tropical and subtropical areas

(originally named „Streptothrix madurae“). *A. pelletieri* strains are also isolated from mycetomas.

Secondary metabolites which are produced by *Actinomadura* strains are described together with the species.



Type species is *Actinomadura madurae*.

Lit.: Lechevalier, H.A., and M. P. Lechevalier. 1970
A critical evaluation of the genera of aerobic actinomycetes,
p. 393-405
In H. Prauser (ed.). The Actinomycetes.
VEB Gustav Fischer Verlag, Jena. German Democratic Republic.

Genus Identity Card

Genus	<i>Actinomadura</i>
Wall chemotype	meso-DAP (type III)
Whole cell sugar pattern mannose,	galactose, glucose, ribose, madurose
Fatty acid pattern	hexadecanoic, 14- methylpentadecanoic, 10 methyl octadecanoic acids
Major menaquinone (MK)	-9(H ₆)
Phospholipidtype	diphosphatidylglycerol, phosphatidylinositol
Mol% G+C of DNA	66-69
Morphology	extensive branching vegetative hyphae, aerial mycelium moderately developed or absent, forming short or occasionally long chains of arthrospores, spore chains are straight, hooked or irregular spirals
Type species	<i>Actinomadura madurae</i>

Name: ACTINOMADURA
Authors: Lechevalier and Lechevalier 1970
Status: Approved Lists
Type species: *A. madurae*
Literature: Int. J. Syst. Bacteriol. 30:241 (AL)

Name: *Actinomadura africana*
Authors: Preobrazhenskaya and Sveshnikova 1974
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:241 (AL)
Type strain: INA 1839
Synonym: *Nonomuraea africana*

Name: *Actinomadura atramentaria*
Authors: Miyadoh et al. 1987
Status: New Species
Literature: Int. J. Syst. Bacteriol. 37:342
Risk group: 1 (German classification)
Type strain: DSM 43919, IFO 14695, JCM 6250, SF 2197

Name: *Actinomadura aurantiaca*
Authors: Lavrova and Preobrazhenskaya 1975
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:241 (AL)
Risk group: 1 (German classification)
Type strain: DSM 43924, IMET 9577, INA 1933
Synonym: *Actinocorallia aurantiaca*

Name: *Actinomadura carminata*
Authors: Gauze et al. 1973
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Risk group: 1 (German classification)
Type strain: DSM 44170, INA 4281
Synonym: *Nonomuraea roseoviolacea* subsp. *carminata*

- Name: *Actinomadura catellatispora*
Authors: Lu et al. 2003
Status: New Species
Literature: Int. J. Syst. Bacteriol. 53:140
Risk group: 1 (German classification)
Type strain: 3.24, AS 4.1522, IFO 16341, DSM 44772
- Name: *Actinomadura citrea*
Authors: Lavrova et al. 1972
Status: Approved Lists
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Risk group: 1 (German classification)
Type strain: ATCC 27887, DSM 43461, IMET 9573, INA 1849
- Name: *Actinomadura coerulea*
Authors: Preobrazhenskaya et al. 1975
Status: Approved Lists
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Risk group: 1 (German classification)
Type strain: ATCC 33576, DSM 43675, IMET 9580, INA 765
- Name: *Actinomadura coeruleofusca*
Authors: Preobrazhenskaya and Sveshnikova 1974
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Type strain: IMET 9602, INA 1335
Synonym: *Saccharothrix coeruleofusca*
- Name: *Actinomadura coeruleoviolacea*
Authors: Preobrazhenskaya and Terekhova 1987
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 37:179 (validation list)
Type strain: DSM 43935, INA 3564, VKM Ac 1083
Synonym: *Saccharothrix coeruleoviolacea*
- Name: *Actinomadura cremea* subsp. *cremea*
Authors: Preobrazhenskaya et al. 1975
Status: Approved Lists
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Risk group: 1 (German classification)
Type strain: DSM 43676, IMET 9578, INA 292

Name: *Actinomadura cremea* subsp. *rifamycini*
Authors: Gauze et al. 1987
Status: New Subspecies
Literature: Int. J. Syst. Bacteriol. 37:179 (validation list)
Risk group: 1 (German classification)
Type strain: ATCC 33264, DSM 43936, IFO 14183, INA 1349, VKM Ac 1085

Name: *Actinomadura echinospora*
Authors: (Nonomura and Ohara 1971)
Kroppenstedt et al. 1991
Status: New Combination
Literature: Int. J. Syst. Bacteriol. 41:178 (validation list)
Risk group: 1 (German classification)
Type strain: ATCC 27300, DSM 43163
Synonyms: *Microbispora echinospora* (basonym)

Name: *Actinomadura fastidiosa*
Authors: Soina et al. 1975
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Type strain: ATCC 33516, DSM 43674, INMI 104
Synonym: *Nonomuraea fastidiosa*

Name: *Actinomadura ferruginea*
Authors: Meyer 1981
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 31:215 (validation list)
Type strain: ATCC 35575, DSM 43553, IMET 9567
Synonym: *Nonomuraea ferruginea*

Name: *Actinomadura fibrosa*
Authors: Mertz and Yao 1990
Status: New Species
Literature: Int. J. Syst. Bacteriol. 40:31
Risk group: 1 (German classification)
Type strain: A82810.1, DSM 44224, NRRL 18348

- Name: *Actinomadura flava*
Authors: Gauze et al. 1974
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Type strain: ATCC 29533, DSM 43885, IMET 9748
Synonym: *Lechevalieria flava*
- Name: *Actinomadura flexuosa*
Authors: (ex Cross and Goodfellow 1973) Meyer 1989
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 39:495 (validation list)
Type strain: IMET 9552, K1132, DSM 44514
Synonym: *Nonomuraea flexuosa*
- Name: *Actinomadura formosensis*
Authors: (Hasegawa et al. 1986) Zhang et al. 1998
Status: New Combination
Literature: Int. J. Syst. Bacteriol. 48:418
Risk group: 1 (German classification)
Type strain: C-36820, DSM 43997, IFO 14204
Synonyms: *Thermomonospora formosensis* (basonym)
- Name: *Actinomadura fulvescens*
Authors: Terekhova et al. 1987
Status: New Species
Literature: Int. J. Syst. Bacteriol. 37:179 (validation list)
Risk group: 1 (German classification)
Type strain: DSM 43923, IFO 14347, IMET 9745, INA 3321, VKM Ac 938
- Name: *Actinomadura glauciflava*
Authors: Lu et al. 2003
Status: New Species
Literature: Int. J. Syst. Bacteriol. 53:141
Risk group: 1 (German classification)
Type strain: 80-60, AS 4.1202, IFO 14668, JCM 16161, DSM 44770

Name: *Actinomadura glomerata*
Authors: Itoh et al. 1996
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 46:625 (validation list)
Risk group: 1 (German classification)
Type strain: DSM 44360, I-226, JCM 9376
Synonym: *Actinocorallia glomerata*

Name: *Actinomadura hallensis*
Authors: Lee and Jeong 2006
Status: New species
Literature: Int. J. Syst. Evol. Microbiol. 56:263
Risk group: 1 (German classification)
Type strain:

Name: *Actinomadura helvata*
Authors: Nonomura and Ohara 1971
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Type strain: ATCC 27295, DSM 43142, IMET 9584, KCC A-0143
Synonym: *Nonomuraea helvata*

Name: *Actinomadura hibisca*
Authors: Tomita et al. 1991
Status: New Species
Literature: Int. J. Syst. Bacteriol. 41:178 (validation list)
Risk group: 1 (German classification)
Type strain: ATCC 53557, DSM 44148, P157-2

Name: *Actinomadura kijaniata*
Authors: Horan and Brodsky 1982
Status: New Species
Literature: Int. J. Syst. Bacteriol. 32:198
Risk group: 1 (German classification)
Type strain: ATCC 31588, DSM 43764, IMET 9741, SCC 1256

Name: *Actinomadura latina*
Authors: Trujillo and Goodfellow 1997
Status: New Species
Literature: Int. J. Syst. Bacteriol. 47:915 (validation list)
Risk group: 2 (German classification)

- Type strain: A10, DSM 43382
- Name: *Actinomadura libanotica*
Authors: Meyer 1981
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 31:215 (validation list)
Risk group: 1 (German classification)
Type strain: DSM 43554, IMET 9616
Synonym: *Actinocorallia libanotica*
- Name: *Actinomadura livida*
Authors: Lavrova and Preobrazhenskaya 1975
Status: Approved Lists
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Risk group: 1 (German classification)
Type strain: ATCC 33578, DSM 43677, IMET 9575, INA 1678
- Name: *Actinomadura longicatena*
Authors: Itoh et al. 1996
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 46:625 (validation list)
Risk group: 1 (German classification)
Type strain: DSM 44361, I-497, JCM 9377
Synonym: *Actinocorallia longicatena*
- Name: *Actinomadura longispora*
Authors: Preobrazhenskaya and Sveshnikova 1974
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Type strain: IMET 9603, INA 10222
Synonym: *Saccharothrix longispora*
- Name: *Actinomadura luteofluorescens*
Authors: (Shinobu 1962) Preobrazhenskaya et al. 1975
Status: Approved Lists
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Risk group: 1 (German classification)
Type strain: ATCC 25469, CBS 702.69, DSM 40398, IFO 13057, IMET 9672, ISP 5398, RIA 1249

Name: *Actinomadura macra*
Authors: Huang 1980
Status: New Species
Literature: Int. J. Syst. Bacteriol. 30:567
Risk group: 1 (German classification)
Type strain: ATCC 31286, DSM 43862, FD 25934,
IFO 14102, IMET 9754, JCM 3287, KCC A-0287

Name: *Actinomadura madurae* (**Type species**)
Authors: (Vincent 1894) Lechevalier and Lechevalier 1970
Status: Approved Lists
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Risk group: 2 (German classification)
Type strain: CCM 136, DSM 43067, IMET 9585, NCTC 5654

Name: *Actinomadura malachitica*
Authors: Lavrova et al. 1972
Status: Heterotypic Synonym
Literature: Int. J. Syst. Bacteriol. 30:242 (AL)
Comment: synonymy: IJSB 39:156*
Type strain: ATCC 27888, DSM 43462, IMET 9581, INA 1920
Synonym: *Actinomadura viridis*

Name: *Actinomadura mexicana*
Authors: Quintara et al. 2004
Status: New species
Literature: Int. J. Syst. Evol. Microbiol. 54:307
Risk group: 1 (German classification)
Type strain: DSM 44485, NRRL B-24203

Name: *Actinomadura meyeræ*
Authors: Quintara et al. 2004
Status: New species
Literature: Int. J. Syst. Evol. Microbiol. 54:307
Risk group: 1 (German classification)
Comment: nomen corrig. : *Actinomadura meyerii* (sic)
Type strain: DSM 44715, NRRL B-24247

Name: *Actinomadura namibiensis*
Authors: Wink et al. 2003
Status: New Species
Literature: Int. J. Syst. Bacteriol. 53:724
Risk group: 1 (German classification)

Type strain: DSM 44197, HAG 010767, NRRL B-24153
Name: *Actinomadura napiriensis*
Authors: Cook et al. 2005
Status: New species
Literature: Int. J. Syst. Evol. Microbiol. 55:706
Risk group: 1 (German classification)
Type strain: DSM 44846, NRRL B-24319

Name: *Actinomadura nitritigenes*
Authors: Lipski and Altendorf 1995
Status: New Species
Literature: Int. J. Syst. Bacteriol. 45:722
Risk group: 1 (German classification)
Type strain: DSM 44137, L46

Name: *Actinomadura oligospora*
Authors: Mertz and Yao 1986
Status: New Species
Literature: Int. J. Syst. Bacteriol. 36:179
Risk group: 1 (German classification)
Type strain: A 80190.1, NRRL 15878

Name: *Actinomadura pelletieri*
Authors: (Laveran 1906) Lechevalier and Lechevalier 1970
Status: Approved Lists
Literature: Int. J. Syst. Bacteriol. 30:243 (AL)
Risk group: 2 (German classification)
Type strain: DSM 43383, IMET 9693, NCTC 4162

Name: *Actinomadura polychroma*
Authors: Galatenko et al. 1987
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 37:179 (validation list)
Type strain: ATCC 49500, DSM 43925, IFO 14345,
IMET 9743, INA 2755, VKM Ac 1084
Synonym: *Nonomuraea polychroma*

Name: *Actinomadura pusilla*
Authors: Nonomura and Ohara 1971
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:243 (AL)
Type strain: ATCC 27296, DSM 43357, IMET 9586
Synonym: *Nonomuraea pusilla*

- Name: *Actinomadura recticatena*
Authors: Terekhova et al. 1987
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 37:179 (validation list)
Type strain: DSM 43937, INA 308, VKM Ac 940
Synonym: *Nonomuraea recticatena*
- Name: *Actinomadura roseola*
Authors: Lavrova and Preobrazhenskaya 1975
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:243 (AL)
Type strain: ATCC 33579, DSM 43767, IMET 9576, INA 1671
Synonym: *Nonomuraea roseola*
- Name: *Actinomadura roseoviolacea*
Authors: Nonomura and Ohara 1971
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:243 (AL)
Type strain: ATCC 27297, DSM 43144, IMET 9751, KCC A-0145
Synonym: *Nonomuraea roseoviolacea* subsp. *roseoviolacea*
- Name: *Actinomadura rubra*
Authors: (Sveshnikova et al. 1969)
Meyer and Sveshnikova 1974
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:243 (AL)
Type strain: ATCC 27031, DSM 43768, IMET 8181
Synonym: *Nonomuraea rubra*
- Name: *Actinomadura rubrobrunea*
Authors: Kroppenstedt et al. 1991
Status: New Combination
Literature: Int. J. Syst. Bacteriol. 41:178 (validation list)
Risk group: 1 (German classification)
Comment: basonym "*Excellospora rubrobrunea*"; "*Excellospora viridinigra*" is a synonym, Syst. Appl. Microbiol. 13:157 (1990)
Type strain: ATCC 49883, DSM 43750

Name: *Actinomadura rugatobispora*
Authors: Miyadoh et al. 1991
Status: New Combination, New name
Literature: Int. J. Syst. Bacteriol. 41:178 (validation list)
Risk group: 1 (German classification)
Comment: new name according to Rule 41a
Type strain: DSM 44130, IFO 14382, JCM 3366, SF-2240
Synonyms: *Microbispora viridis* (basonym)

Name: *Actinomadura salmonea*
Authors: Preobrazhenskaya et al. 1975
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:243 (AL)
Type strain: TCC 33580, DSM 43678, IMET 9582, INA 2488
Synonym: *Nonomuraea salmonea*

Name: *Actinomadura spadix*
Authors: Nonomura and Ohara 1971
Status: Approved Lists
Literature: Int. J. Syst. Bacteriol. 30:243 (AL)
Risk group: 1 (German classification)
Type strain: ATCC 27298, DSM 43459, IMET 9752, KCC A-0146

Name: *Actinomadura spiralis*
Authors: Meyer 1981
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 31:215 (validation list)
Type strain: ATCC 35114, DSM 43555, IMET 9621
Synonym: *Nonomuraea spiralis*

Name: *Actinomadura turkmeniaca*
Authors: Terekhova et al. 1982
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 37:179 (validation list)
Type strain: ATCC 49501, DSM 43926, IFO 14348, IMET 9747, INA 3344, VKM Ac 852
Synonym: *Nonomuraea turkmeniaca*

Name: *Actinomadura umbrina*
Authors: Galatenko et al. 1987
Status: New Species
Literature: Int. J. Syst. Bacteriol. 37:179 (validation list)
Risk group: 1 (German classification)
Type strain: DSM 43927, IFO 14346, IMET 9746, INA 2309, VKM Ac 1086

Name: *Actinomadura verrucosospora*
Authors: Nonomura and Ohara 1971
Status: Approved Lists
Literature: Int. J. Syst. Bacteriol. 30:243 (AL)
Risk group: 1 (German classification)
Type strain: ATCC 27299, DSM 43358, DSM 43550, IMET 9588

Name: *Actinomadura vinacea*
Authors: Lavrova and Preobrazhenskaya 1975
Status: Approved Lists
Literature: Int. J. Syst. Bacteriol. 30:243 (AL)
Risk group: 1 (German classification)
Type strain: DSM 43765, IMET 9574, INA 1682

Name: *Actinomadura viridilutea*
Authors: (Agre and Guzeva 1975) Zhang et al. 2001
Status: New Combination
Literature: Int. J. Syst. Bacteriol. 51:381
Risk group: 1 (German classification)
Type strain: DSM 44433, IMET 9742, INMI 187, JCM 3398
Synonyms: *Excellospora viridilutea* (basonym)

Name: *Actinomadura viridis*
Authors: (Nonomura and Ohara 1971) Miyadoh et al. 1989
Status: New Combination
Literature: Int. J. Syst. Bacteriol. 39:156
Risk group: 1 (German classification)
Type strain: ATCC 27103, DSM 43175, JCM 3112
Synonyms: *Actinomadura malachitica* (heterotypic synonym), *Microtetraspora viridis* (basonym)

Name: *Actinomadura yumaensis*
Authors: Labeda et al. 1985
Status: New Species
Literature: Int. J. Syst. Bacteriol. 35:335
Risk group: 1 (German classification)
Type strain: L-C23024, NRRL 12515

Name: EXCELLOSPORA
Authors: Agre and Guzeva 1975
Status: Approved Lists, Heterotypic Synonym
Type species: *E. viridilutea*
Literature: Int. J. Syst. Bacteriol. 30:299 (AL)
Comment: type species transferred to the genus
Actinomadura; IJSEM 51:381*
Synonym: *ACTINOMADURA*

Name: *Excellospora viridilutea* (**Type species**)
Authors: Agre and Guzeva 1975
Status: Basonym
Literature: Int. J. Syst. Bacteriol. 30:299 (AL)
Risk group: 1 (German classification)
Type strain: DSM 43934, DSM 44433, IMET 9742, INMI 187
Synonym: *Actinomadura viridilutea*

The genus *Excellospora* was composed of thermophilic species with optimum growth at about 50°C. Its members produce well-developed, branched substrate and aerial mycelia, and spores are born on both the aerial and substrate mycelia singly or in relatively short chains.

Chemotaxonomic properties of the genus are similar to those of the genus *Actinomadura* but are characterized by a higher amount of branched fatty acids particularly iso-C 17 : 0, and a lower amount of 10-methyl acids than this of the typical actinomadurae.

Although the genus *Excellospora* encompassed the type species *E. viridilutea* and two invalidly proposed species „*E. rubrobrunnea*“ and „*E. viridinigra*“, the latter two species have been transferred into the genus *Actinomadura* as *A. rubrobrunnea*. This was due to that the differences in the fatty acid compositions mentioned above are not substantial. No proposal to transfer the type species has been made so far, but the taxonomic position of the type species is questionable.

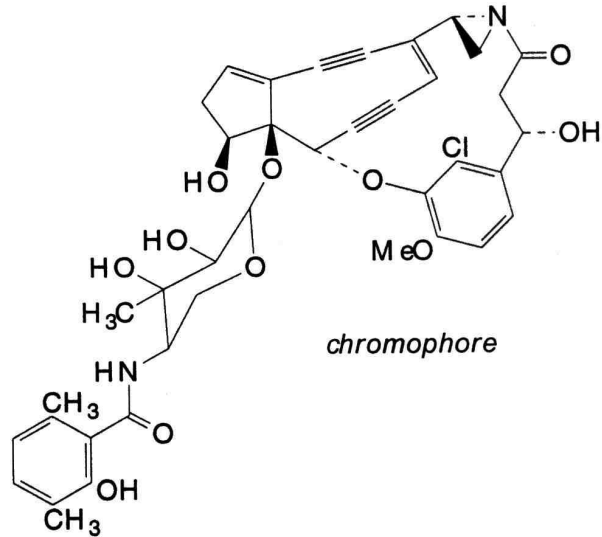
This species is now transferred to the genus *Actinomadura* by Zhang et al. 2001.

Type species is *Excellospora viridilutea*.

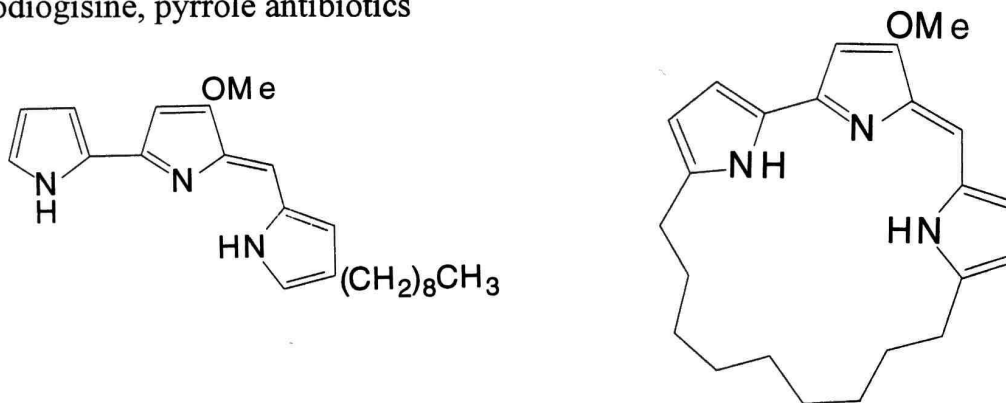
Lit.: Agre, N. S. and N. L. Guzeva. 1975.
New genus of the actinomycetes: *Excellospora*

Microbiolgiya 44. 518-522

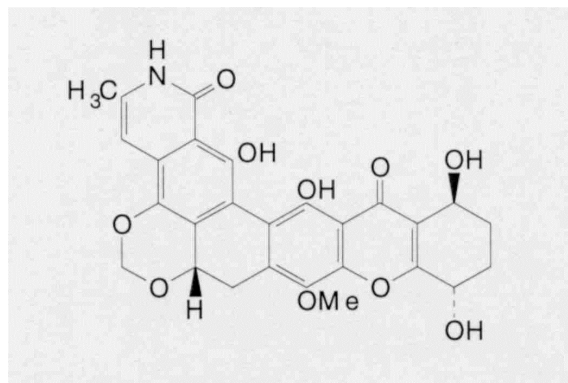
Secondary metabolites from *Actinomadura madurae*
Maduropeptin, enediyne antibiotic, selective protease activity and DNA
cleaving



Prodiogisine, pyrrole antibiotics



Simaomicin, anticoccidial agent



Genus: *Actinomadura*

FH 2142

Species: *madurae*

Numbers in other collections: CBS 331.54

Morphology:

	G	R
<u>ISP 2</u>	good	beige
	A	SP
	white	none
	G	R
<u>ISP 3</u>	good	beige
	A	SP
	none	none
	G	R
<u>ISP 4</u>	good	beige
	A	SP
	none	none
	G	R
<u>ISP 5</u>	good	beige
	A	SP
	none	none
	G	R
<u>ISP 6</u>	sparse	beige
	A	SP
	none	none
	G	R
<u>ISP 7</u>	good	beige
	A	SP
	none	none

Spore chains:

Spore surface:

Sporangia:

Fragmentation:

Melanoid pigment: - - - -

NaCl resistance: 2,5 %

Lysozyme resistance: -

pH: Value-

Optimum-

Temperature : Value-

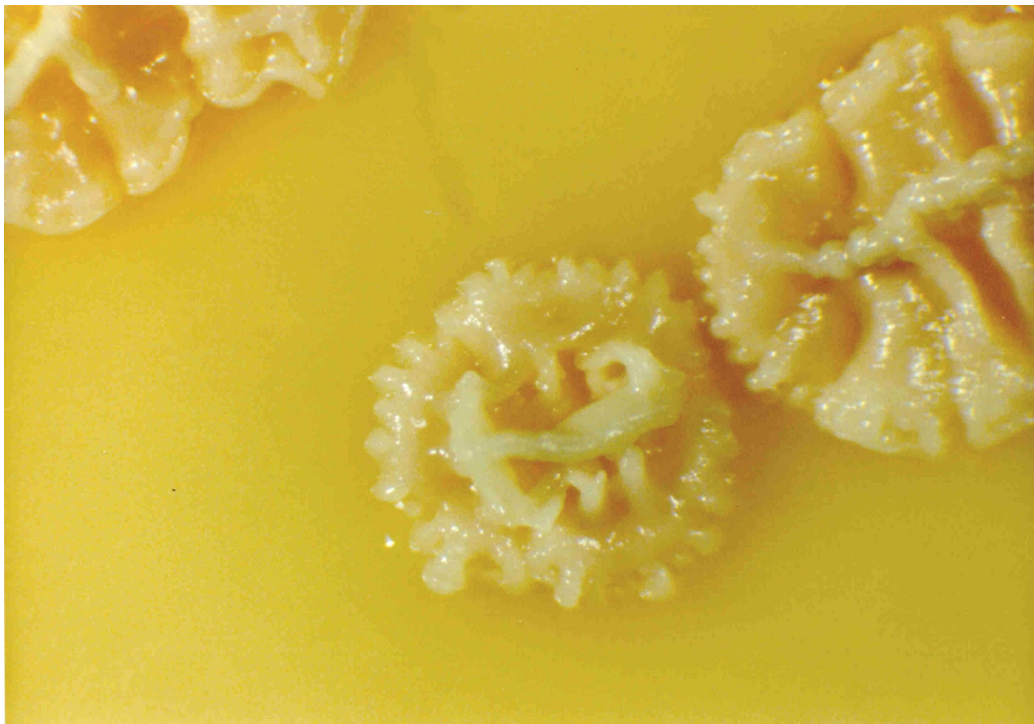
Optimum- 37 °C

Carbon utilization:

Glu	Ara	Suc	Xyl	Ino	Man	Fru	Rha	Raf	Cel
+	+	-	+	-	-	+	-	-	-

Enzymes:

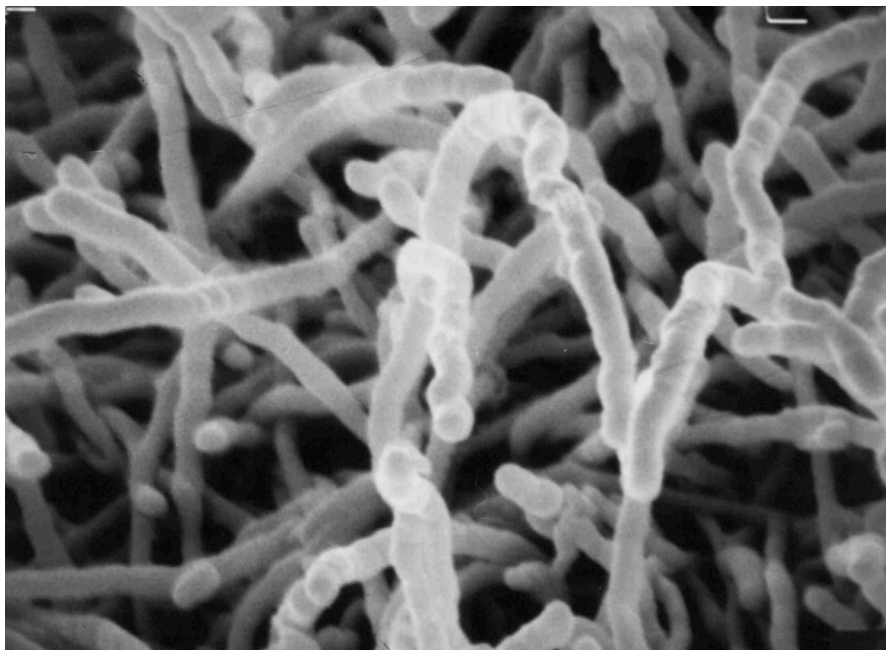
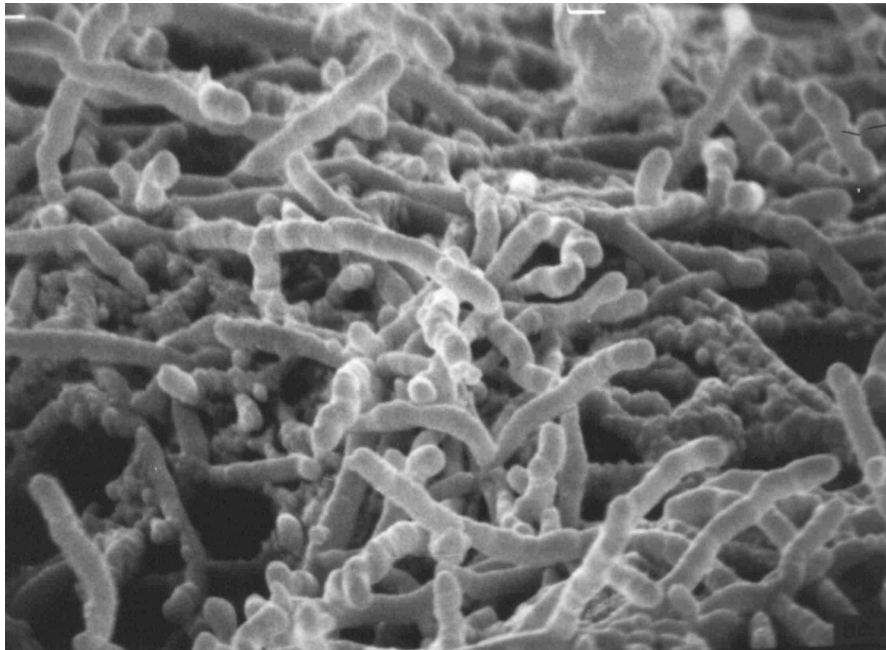
Gel	Cit	Ure	Arg	Onp	Trp	Lys	Odc	VP	Ind	H2S
+	-	-	-	-	-	-	-	-	-	-
2+	3-	4+	5-	6+	7-	8-	9-	10+	11+	12+
13-	14-	15-	16-	17+	18-	19-	20-			



Actinomadura madurae

A – Colony detail on medium 5265

B – Colony detail on medium 5294



Actinomadura madurae

Aerial mycelium in SEM

C x 7.500 D x 10.000