INDEX OF ANTIBIOTICS FROM ACTINOMYCETES

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PREFACE

Of the numerous antibiotics that have been isolated from actinomycetes, some have found clinical use, such as in the chemotherapy of microbial diseases or malignant tumors. Others are used for the prevention of plant diseases, the preservation of organic materials, including foods, or the promotion of animal growth. These practical considerations aside, attention has recently been called to the modes of action and biogenesis of the antibiotics. Studies on modes of action have contributed greatly to both advanced biology and biochemistry. The knowledge accumulated will eventually, it is hoped, enable scientists to discover the exact relation between the chemical structure and activity of antibiotics, and provide a focal point for further development of practical applications. Structural information is essential to the progress of fundamental biology, to elucidate the biogenetic routes of antibiotic substances in living organisms, and to clarify the limits of structural variety possible in substances produced by these organisms.

When antibiotics were first studied, scientists were interested primarily in their usefulness. Now, however, no antibiotic can be ignored, whether it has a practical application or not, because of the interest in structure, mode of action, biogenesis, etc. Many antibiotics are structurally related, and the study of one may provide information of a generalized nature, while specific differences among related groups may lead to important new findings and conclusions. However, the number of antibiotics known today, and the variety of their properties, are so great that an index has become imperative.

This book attempts to list all the antibiotics isolated from actinomycetes up to 1966. It provides such generalized data as charts of infrared spectra, and also specific data such as melting points, solubilities, analytical data, optical rotations, ultraviolet spectra and toxicities and producing organisms. Much of this information has been tabulated for easy reference, and would be particularly suited for use in conjunction with computers. It is hoped that the tables, and the Index in general, will prove a convenient and helpful tool in the identification of newly-isolated antibiotics as well as in the day-to-day work of biologists, chemists, biochemists or anyone with any interest in antibiotics.

July, 1967

HAMAO UMEZAWA

Notes on the Use of This Index

CHAPTER I

The "Names" column lists antibiotics produced by actinomycetes, first those designated specifically and then those designated by a letter or a numeral. Asterisked antibiotics (*) are listed in Chapter II and those double-asterisked (**) are listed in Chapter III.

The synonyms cited in the "Synonym" column are useful in reference to the antibiotics listed in Chapters II and III. In those cases where it was hard to choose the most appropriate synonym, more than one synonym is cited.

The group-names of antibiotics related in structure and characteristics are cited in the "Group" column; the citation includes the generic name, common name, and trivial name of a family of antibiotics. This grouping is based on the editors' judgment. "Indicator" is an antibiotic showing a pH color change.

CHAPTER II

Each antibiotic described in detail is listed on a separate page; the pages are alphabetically arranged. The antibiotic is considered under the following categories: group, identical with, similar to, produced by, isolation, nature, M.P., $[\alpha]_D$, analysis (%), mol. wt., formula, UV max., active against, LD, IR. In some cases, the antibiotic's identification and synonyms have been decided by the editors. "Group" is the same as described for Chapter I. "Isolation" describes the first steps of the procedure. "Nature" describes the antibiotic's acid, base, appearance, and solubility in water. "Analysis" is based on the reporter's found values and is occasionally described by calculated values when an empirical formula has been proposed. "Active against" describes microorganisms inhibited at less than 100 mcg/ml and other biological activities. Data for each category are cited from relevant reports. Selected references are included for each antibiotic.

CHAPTER III

Briefly described antibiotics are listed successively, in alphabetical arrangement.

CHAPTER IV

This chapter consists of five tables which may help researchers identify isolated antibiotics. They are as follows:

1. Melting Point and Decomposition Point

The decomposition point is indicated by a dagger (†). The first column is

arranged according to increasing temperature. In the second column, antibiotics whose range of melting or decomposing point is less than 4°C are listed by temperature or mean value. Antibiotics whose range is more than 4°C are listed by mean value in the last column. Antibiotics whose melting or decomposing point has not been experimentally determined are listed at the end of the table.

2. Ultraviolet Absorption

The table is divided into categories a) antibiotics without characteristic absorption, b) antibiotics with one maximum, c) antibiotics with two maxima, and d) antibiotics with more than two maxima. In category a), the antibiotics are listed alphabetically. In categories b), c), and d), the first column lists antibiotics in alphabetical order. The second column indicates the solvents in which the absorption spectrum was measured. In the third column, the ultraviolet absorption maximum of each antibiotic within a range of 200 to 500 mμ is indicated by a short line; a shoulder or inflexion in the absorption spectrum is indicated by a short line in parentheses. An antibiotic with shoulder(s) is indicated in two categories, according to the number of maxima and to the total number of maxima and shoulder(s).

3. Elementary Analysis

The table's three categories consist of a) antibiotics in order of carbon content, b) antibiotics in order of nitrogen content, and c) formula and calculated per cent. In the first column of category a), the instance of carbon content is indicated at intervals of 1 per cent, except $<$39.9 and $>$73 per cent. The second column indicates nitrogen content in intervals of 0, 0.1–10.9, 11.0–15.9, 16.0–20.9, 21.0–25.9, and $>$26 per cent. In category b), the percentage of nitrogen content is listed in the first column and is divided at intervals of 1 per cent except $<$1.9 and $>$25 per cent. The second column indicates carbon content in intervals of $<$39.9, 40.0–49.9, 50.0–55.9, 56.0–58.9, 59.0–60.9, 61.0–63.9, 64.0–69.9, and $>$70 per cent. The first column of category c) lists chemical formulae in order of increasing number of C, H, O, and N. The calculated percentage of each element and the molecular weight are cited in the following column. The names of corresponding antibiotics are given in the last column.

4. Toxicity

In the first column, the antibiotics are arranged alphabetically. Unless otherwise noted, toxicity is shown by a short line on a logarithmic scale according to the LD_{50} in mice into which the antibiotic was intravenously injected.

5. Producing Organisms

The producing organisms are listed alphabetically, and the names of correspond ing antibiotics are given.

ABBREVIATIONS

Most of the abbreviations follow those cited in "Chemical Abstracts."

A.	*Actinomyces*
abs.	absolute
Ac	acetyl CH_3CO-; ethyl acetate AcOEt; acetic acid AcOH; acetic anhydride Ac_2O
add.	adding
addn.	addition
alc.	alcohol(ic); ethanol; ethyl alcohol
alk.	alkali(ne)
$[\alpha]_D^{25}$	specific optical rotation at 25°C for D (sodium) line
Am	amyl
amorph.	amorphous
amt.	amount
anhydr.	anhydrous
approx.	approximate(ly)
aq.	aqueous
Ar	aryl
As	ascaris
B	bacteria
B.	*Bacillus*, used only in genus and species names
biol.	biological
boil.	boiling
b.p.	boiling point
Bu	butyl (*normal* butyl)
Bz	benzoyl $C_6H_5 \cdot CO$-; BzH, benzaldehyde; BzOH, benzoic acid
c	concentration by volume (after optical rotations only). Example: $[\alpha]_D^{25}$ +14° (*c* 2.5, abs. alcohol) means 2.5 g. of the substance dissolved in 100 ml abs. alcohol.
C	centigrade degrees, also carbon
C.	*Candida*
ca.	(*circa*), about
C.A.	Chemical Abstracts
calc.	calculate
calcd.	calculated
cf.	(*confer*) compare
chem.	chemical
cm	centimeter(s)
compd.	compound
compn.	composition
concd.	concentrated
concn.	concentration
constit.	constituent
contg.	containing
cor(r).	corrected
cryst.	crystalline
crystn.	crystallization
d.	density; specific gravity (d_4^{19} specific gravity at 19° referred to water at 4°)
dec. / decomp.	decompose(s)
deriv.	derivative
determn.	determination
diff.	difference
dil.	dilute
dild.	diluted
diln.	dilution
d.p.	decomposition point
$E_{1cm}^{1\%}$	the absorbancy of a solution containing one gram per 100 ml contained in a cell having an absorption path of one centimeter.
equiv.	equivalent
esp.	especially
Et	ethyl
et al.	(*et alii*) and others
etc.	*et cetera*
Et_2O	ether
EtOH	ethyl alcohol
evapn.	evaporation
ext.	extract
extd.	extracted
F	fungi
F.D.A.	Food and Drug Administration (U.S.A.)
g	gram(s)
γ	(gamma) microgram(s)
Gn	Gram negative bacteria
Gp	Gram positive bacteria
-HCl	hydrochloride
$-HNO_3$	nitrate
$-H_2O$	hydrate
hr.	hour

$-H_2SO_4$	sulfate
ibid.	(*ibidem*) at the same place
i.m.	intramuscular
inorg.	inorganic
Ins	insect
i.p.	intraperitoneal
IR	infrared spectrum
isoln.	isolation
i.v.	intravenous
K	ionization constant
kg	kilogram(s)
l	liter
(l)	limited strain of
LD	lethal dose; LD_{50}, a dose which is lethal to 50% of the animals tested.
m.	melts, melting at, when followed by a figure denoting temperature.
M	mole, also mycobacteria
max.	maximum, maxima
mcg	microgram
MIBK	methylisobutylketone
Me	methyl, CH_3-
MeOH	methyl alcohol, CH_3OH
Me_2CO	acetone
mg	milligram
microcryst.	microcrystalline or microcrystal
min.	minimum, also minute(s)
ml	milliliter (cubic centimeter)
MLD	minimum lethal dose
mm	millimeter(s)
mμ	millimicron(s)
mol. wt.	molecular weight
m.p.	melting point
M. tub.	*Mycobacterium tuberculosis*
n	normal, as *n*-propyl
N	normal (equivalents per liter, as applied to concentration); nitrogen (as in N-methylpyridine)
N.	*Nocardia*
-Na	sodium salt
neg.	negative
no.	number
ORD	optical rotatory dispersion
org.	organic
p., pp.	page(s)
pat.	patent
Pd	plant disease
per os	oral administration
petr.	petroleum
pH	acid-base scale; log of reciprocal of hydrogen ion concentration
Ph	bacteriophage
pK	log $(1/K)$
pos.	positive
PPLO	pleuropneumonia like organism
p.p.m.	parts per million
ppt.	precipitate
pptd.	precipitated
pptg.	precipitating
Pr	propyl (normal), also protozoa
prepn.	preparation
press.	pressure
prob.	probably
R	rickettsiae
recryst.	recrystallize
res.	resembling
R_f, R_F	(in paper chromatography) ratio of movement of the band to the front of the solvent
S.	*Streptomyces*
satd.	saturated
s.c.	subcutaneous
sec-	secondary
sh.	shoulder
soln.	solution
sp.	species; specific
sp. gr.	specific gravity
S. sp.	*Streptomyces* species unidentified
subl.	sublime(s)
®	trade name
temp.	temperature
tert-	tertiary
UV	ultraviolet spectrum
V	virus
var.	variant
vol.	volume
v/v	per cent "volume in volume"
(w)	weakly
wt.	weight
Y	yeast including *Candida* sp.
>	greater than
<	less than

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CHAPTER I

LIST OF ANTIBIOTICS WITH THEIR SOURCES AND ACTIVITIES

Names	Synonym	Group
*Abikoviromycin	*Latumcidin	
Abramycin®	Tetracycline	
*Aburamycin		Aureolic acid
Aburamycin isomer	*M5-18903	Aureolic acid
Acetopyrrothin	*Thiolutin	
*Acetomycin		
*2-Acetyl-2-decarboxamido-oxytetracycline	Terramycin X	Tetracycline
4-Acetoxy-cycloheximide	*E-73	Glutarimide
**Achromoviromycin		
Achromycin®	*Tetracycline	
Achromycin	*Puromycin	
Acidomycin	*Actithiazic acid	
Acronize®	Chlortetracycline	
Actidione®	*Cycloheximide	
**Actiduins		
**Actinin		Peptide
*Actinobolin	Actinovorin	
Actinochrysin	*Actinomycin C	Actinomycin
Actinoflavin	*Actinomycin J	Actinomycin
**Actinoflocin		Actinomycin
*Actinogan		Peptide
**Actinoidin		Peptide
*Actinoleukin		Quinoxaline
**Actinolysin		
**Actinomycelin		
**Actinomycetin		Peptide prob.
*Actinomycin group		
**Actinomycin A		Actinomycin
*Actinomycin B	X-45	Actinomycin
*Actinomycin C	Actinochrysin, **Actinomycin S-67, HBF-386	Actinomycin
*Actinomycin D (or D_{IV})		Actinomycin
**Actinomycin E		Actinomycin
**Actinomycin F		Actinomycin
**Actinomycin FS		Actinomycin

Active against	Produced by
(w)B, Pr, V	*S. abikoensis*, *S. rubescens*
Gp, (l)M, T	*S. aburaviensis*
(w)Gp, (w)Gn, M, Pr	*S. ramulosus*
Gp, Gn, R	*S. rimosus*
Y, T	*S.* sp.
V	*S. achromogenes*
Gp, Pr	*S. alboniger*
M	*S. acidomyceticus*
Gp	*S.* sp.
Gp, Gn, T	*S. felis*
Gp, Gn, T	*S. griseoviridis* var. *atrofaciens*
	S. flavus
Gp, T	*S.* sp. res. *S. albus*
T	*S.* sp.
Gp	*Proactinomyces actinoides*
Gp, (w)Gn, T	*S. abikoensis*, *S. aureus*, *S.* sp.
A.	*S. albicans*
Gp	*S.* sp. res. *S. antibioticus*
Gp, M	*S. albus*, *S.* sp.
Gp, T	*S. antibioticus*
Gp, T	*S. antibioticus*
Gp, T	*S. chrysomallus*
Gp, T	*S. antibioticus*, *S. chrysomallus*, *S. parvullus*
Gp, T	*S.* sp.
Gp, T	*S.* sp.
Gp, T	

Names	Synonym	Group
**Actinomycin H		Actinomycin
**Actinomycin I		Actinomycin
*Actinomycin J (or J_1)	Actinoflavin	Actinomycin
**Actinomycin K		Actinomycin
*Actinomycin L		Actinomycin
**Actinomycin M		Actinomycin
*Actinomycin P	P_2=PA-126 P_2	Actinomycin
**Actinomycin S		Actinomycin
**Actinomycin S-67	*Actinomycin C	Actinomycin
**Actinomycin U		Actinomycin
*Actinomycin X		Actinomycin
*Actinomycin Z		Actinomycin
**Actinomycin I	Actinomycin A_I, B_I, $X_{0\beta}$,	Actinomycin
*Actinomycin II	Actinomycin A_{II}, B_{II}	Actinomycin
*Actinomycin III	Actinomycin A_{III}, B_{III}, $X_{0\gamma}$	Actinomycin
**Actinomycin IV	Actinomycin A_{IV}, B_{IV}, C_1, I_1, X_1	Actinomycin
**Actinomycin V	Actinomycin A_V, B_V, X_2	Actinomycin
**Actinomycin VI	Actinomycin C_2	Actinomycin
**Actinomycin VII	Actinomycin C_3	Actinomycin
**Actinone		
**Actinone B		
*Actinonin		
*Actinorhodin	Coelicomycin	Indicator
*Actinorubin		Streptothricin
*Actinospectacin	M-141	
Actinovorin	*Actinobolin	
**Actinoxanthin(e)		Peptide
*Actiphenol	*C-73	Glutarimide
*Actithiazic acid	Acidomycin, Cinnamonin, *Mycobacidin, Thiazolidone antibiotic, PA-95	
*Acumycin		Macrolide
*Akimycin		Streptothricin
*Akitamycin	*Toyamycin	Tetraene
*Aklavin		Anthracycline

Active against	Produced by
Gp, T	*S.* sp.
Gp, T	*S. parvullus*, *S. antibioticus*, *S.* sp.
Gp, T	*S. flaveolus*, *S. flavus*, *S.* sp.
Gp, T	*S.* sp.
Gp, T	*S.* sp.
	S. antibioticus
Gp, T	*S. aureofaciens*
Gp, T	*S.* sp.
Gp, T	
Gp, T	
Gp, T	*S. chrysomallus*
Gp, T	*S. fradiae*
Gp, T	
Gp, T	*S. antibioticus*
Gp, T	*S. antibioticus*
Gp, T	
Gp, T	
Gp, T	
Gp, T	
F, Y	*S.* sp. res. *S. antibioticus*
	S. sp. res. *S. antibioticus*
Gp, M	*S.* sp.
(w)Gp	*S. coelicolor*
Gp, Gn, M, (l)F	*S.* sp. res. *S. erythreus*
Gp, Gn	*S. flavopersicus*, *S. spectabilis*
Gp, T	*A. globisporus*
F	*S. albus*, *S. noursei*, *S. pulveraceus*, *S.* sp.
M	*S. acidomyceticus*, *S. roseochromogenes*, *S. virginiae*
Gp	*S. griseoflavus*
Gp, Gn, M	*S. lavendulae*
F, Pr	*S. akitaensis*
Ph	*S.* sp.

Names	Synonym	Group
*Alazopeptin		Azaamino acid
Albamycin®	*Novobiocin	
*Albimycin		
**Albofungin		
*Albomycetin		Macrolide prob.
*Albomycin complex		Sideromycin
*Albon(o)ursin	B-73	
*Alboverticillin		Peptide
*Aldgamycin E	LL-AL 471 E	Macrolide
Alficetyn®	*Chloramphenicol	
*Aliomycin		Pentaene
*Allomycin	*Amicetin	Pyrimidine
*Almarcetin		Peptide
**Alomycin		
*Althiomycin	116a, *Matamycin prob.	
**Alveomycin		Sideromycin
*Amaromycin	Amaromycin I	Macrolide
*Amicetin	*Allomycin, Sacromycin, *D-13	Pyrimidine
*Amicetin B	*Plicacetin, C, R-285	Pyrimidine
*Amicetin C		
*Amidinomycin	*Myxoviromycin	
*Amidomycin		Depsipeptide
Amimycin®	*Oleandomycin	
D-4-Amino-3-isoxazolidone	*Cycloserine	
*Aminomycin (Brockmann)	Valinomycin	Depsipeptide
Aminomycin	Fungimycin, *Perimycin, NC-1968	Heptaene
*Am(m)inosidin	*Catenulin, Crestomycin, Farmiglucin, *Hydroxymycin, *Paromomycin, FI-5853, FI-1600, *Zygomycin A	Aminocyclitol Neomycin
*Amphomycin		Peptide
*Amphotericin A		Tetraene
*Amphotericin B		Heptaene
*Amycin(e)		
**Amylocyanin		Pigment
*Angolamycin		Macrolide

Active against	Produced by
T	*S. griseoplanus*
F, Pd	*S.* sp. res. *S. albochromogenes* or *S. griseochromogenes*
Gp, F, Y	*S. albus*, *S. albus* var. *fungatus*
Gp	*S. albus*, *S.* sp. res. *S. albus*
Gp	*S. subtropicus*
T	*A. albus* var. *fungatus*, *S. noursei*
(w)Gp, M	*S. alboverticillatus*
Gp	*S. lavendulae*
F, Y, T	*S. acidomyceticus*
Gp, M	*S. sindenensis*
Gp, Gn, M, F, Y	*S. albus*
Y	*S.* sp.
Gp, Gn	*S. althioticus*
Gp, Gn	*S.* sp.
Gp, (l)Gn	*S. flavochromogenes*
Gp, M	*S. fasciculatus*, *S. plicatus*, *S. sacromyceticus*, *S. vinaceus-drappus*
Gp, M	*S. plicatus*, *S.* sp.
Gp, M	*S. vinaceus-drappus*
Gp, V	*S.* sp. res. *S. flavochromogenes*
F, Y, Pd	*S.* sp.
Gp, M	*S.* sp.
F, Y	*S.* sp.
Gp, Gn, M	*S. chrestomyceticus*
Gp, Pr	*S. canus*, *S. violaceus*, *S.* sp. res. *S. lavendulae*
F, Y	*S. nodosus*, *S.* sp.
F, Y	*S. nodosus*, *S.* sp.
Gp, Gn, (w)F	*S. lavendulae*
F	*S. coelicolor*
Gp	*S. eurythermus*

Names	Synonym	Group
*Angustmycin A	*Decoynin	Purine
*Angustmycin C	*Psicofuranine	Purine
*Anisomycin	Flagecidin, PA-106	
*Anthelmycin		
**Anthelvencin A, B		
*Anthracidin A		
*Anthracidin B		
*Anthramycin	Refusin	
*Antifongin 4915		Heptaene
*Antimycin A_1		
**Antimycin A_{2a}, A_{2b}		
*Antimycin A_3	*Blastmycin	
*Antimycin A_4		
**Antimycoins	C-381	Tetraene
*Antipiriculin	*Antimycins	
*Antiprotozoin		
**Antivirubin		Pigment
*Aquamycin	Acetylene dicarboxyamide, *Cellocidin, *Lenamycin	
Argomycin	*Pikromycin	
*Arsimycin		Peptide
*Arvomycin		
*Ascarinase		
**Ascaricidin		
**Ascomycin		
*Ascosin A, B		Heptaene
*Aspartocin		Peptide
Audricurin	*Curamycin	
*Aurant(h)ins		Actinomycin
**Aureofacin		Heptaene
*Aureofungin		Heptaene
*Aureolic acid		Aureolic acid
Aureomycin®	*Chlortetracycline	
Aureomykoin®	*Chlortetracycline	
*Aureothricin	Farcinicin	Pyrrothine