CZECHOSLOVAK ACADEMY OF SCIENCES
SLOVAK CHEMICAL SOCIETY

7th CONFERENCE ON ISOPRENOIDS

MAY, 1977
TATRANSKÁ LOMNICA
CZECHOSLOVAKIA

The Conference is jointly organized
by the Institute of Organic Chemistry and Biochemistry,
Czechoslovak Academy of Sciences, Prague,
and by the Slovak Chemical Society, Bratislava.

Czechoslovak Academy of Sciences
Slovak Chemical Society

7th CONFERENCE ON ISOPRENOIDS

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Content

List of plenary lecturers

J. APSIMON	Carleton University, Department of Chemistry, Ottawa 1, Canada
A.J. BIRCH ✓	Research School of Chemistry, The Australian National University, Canberra, Australia
E. CASPI	The Worcester Foundation for Experimental Biology, Shrewsbury, Mass. 01545 USA
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G. LUKACS	Centre National de la Recherche Scientifique, Institut de Chimie des Substances Naturelles, 9190 Gif-Sur-Ivette, France
G. OURISSON	Université L. Pasteur de Strasbourg, 67008 Strasbourg-Cedex, France
SUKH DEV ✓	Malti-Chem. Research Centre, Nandesari, Baroda, India
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ASPECTS OF THE BIOSYNTHESIS OF POLYPRENOIDS

Eliahu Caspi[+]

[+] Worcester Foundation for Experimental Biology
Shrewsbury, Massachusetts, U. S. A.

Results of our recent studies on the biosynthesis of polyprenoids in different biological systems will be presented.

APPLICATION OF ^{13}C NMR SPECTROSCOPY

G. Lukacs[+]

[+]Institut de Chimie des Substances Naturelles,
Centre National de la Recherche Scientifique,
91190 Gif-sur-Yvette, France

^{13}C NMR spectroscopy has been extensively used in the field of isoprenoids during the recent years. This technique is particularly suitable for the structure elucidation of naturally occurring isoprenoid substances.

The analysis of the carbon shifts of selected examples of structurally complex terpenic and steroidic compounds is to be discussed. The relationship of the chemical shifts to the structure and conformation of the natural products in solution will be portrayed. Some biosynthetic applications will be shown using ^{13}C labeled precursors. The advantages of the double labeling technique will be demonstrated.

For technical reasons the organizing committee had to reduce the number of communications and therefore papers closely related have been put together for a Review lecture.

The Review lecture on isolation and structure elucidation of terpenoids is based on the following 11 contributions (for abstracts see pages 5 - 15).

A GROSHEIMIN EPIMER FROM CREPIS VIRENS

C.G.Casinovi[+], P.Barbetti[+], B.Santurbano[++], R.Longo[+++]

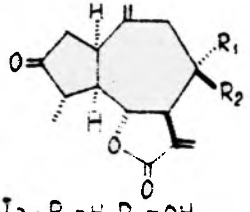
[+]Istituto di Chimica delle Sostanze Naturali, Facoltà di Farmacia, Università degli Studi, Perugia, Italy

[++]Istituto Superiore di Sanità, Viale Regina Elena, 299, Rome, Italy

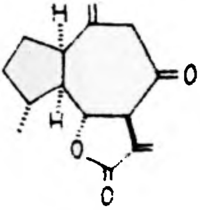
[+++]La Farmochimica Italiana, Via N.D'Apulia 8, Milano, Italy

Aqueous extracts of dried flowers of Crepis Virens, after extraction with chloroform and silica gel chromatography gave as relatively polar components two alcohols, A($C_{15}H_{16}O_4$, m.p. 167-170°C) and B($C_{15}H_{18}O_4$, m.p. 147-9°C); both showed interesting antibacterial and amoebicidal properties.

Investigations on the more stable compound B, chiefly by means of proton NMR spectroscopy of the free alcohol and of its acetate in different solvents, led us to adopt stereoformula Ia as a working hypothesis; a demonstration of the correctness of this proposal was achieved by transforming both Ia and its naturally occurring 8-epimer Grosheimin (Ib), through the rather unstable ketone II, into the same diketone III.



Ia R1 = H, R2 = OH
Ib R1 = OH, R2 = H



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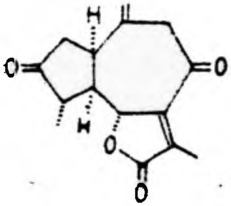


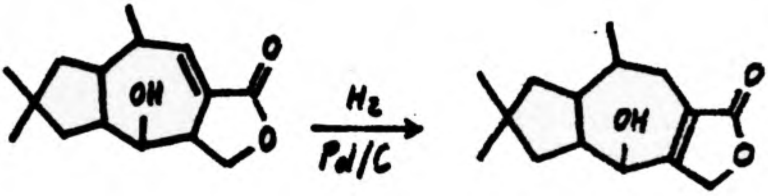
III

STRUCTURE OF DEOXYLACTARORUFIN A, A NEW SESQUITERPENE FROM LACTARIUS NECATOR

W.M.Daniewski, M.Kocór, J.Król

Institute of Organic Chemistry,Polish Academy of Sciences,
Warszawa,Poland

Deoxylactarorufin A / m.p.116-122°, $[\alpha]^{20}_{578} = +70.3°$, m/e 250, $C_{15}H_{22}O_3$ / was isolated from ethanolic extract of Lactarius necator. Its structure was established on the basis of full spectral and chemical analysis. It was also synthesised by the rearrangement of the known compound lactarorufin N as it is shown below:



Lactarorufin N   Deoxylactarorufin A

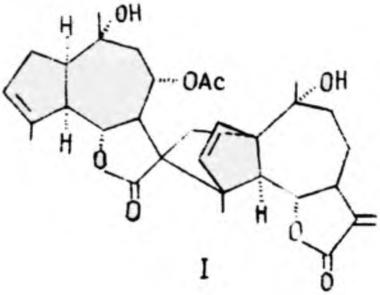
NEW SESQUITERPENE LACTONES HANDELIN, TANACIN AND TANAPSIN

Sh.Z.Kasimov, V.A.Tarasov, A.I.Yunusov, G.P.Sidyakin.
Institute of the Chemistry of Plant Substances Academy of Sciences UzSSR, Tashkent, USSR

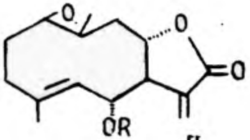
Handelin is a diguaianolide, $C_{32}H_{40}O_8$, m.p. 212° (decomp.) $[\alpha]^{20}_{D}$ +47,8° (c 1,3; pyridine) has been isolated alongside with other sesquiterpene lactones from Handelia trichophylla Heimerl. (Compositae).

The structure of lactone was determined on the basis of chemical transformations and spectral data. Molecule of handelin (I) consists of two guaianolides, what is confirmed by the production of cumambrin A, while cleavaging.

Germacranolide tanacin (II), $C_{20}H_{26}O_5$, m.p. 128-129°, $[\alpha]^{21}_{D}$ -74° (c 1,0; methanol) and eudesmanolide tanapsin (III), $C_{20}H_{28}O_6$, m.p. 191-192°, $[\alpha]^{24}_{D}$ -139° (c 1,38; methanol) have been isolated from Tanacetum pseudoachillea C.Winkl. The transformation of these lactones to chrysanin was performed.



I



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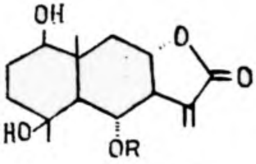
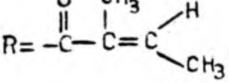


III



$$R=-\overset{\overset{\large O}{\|}}{C}-\overset{\overset{\large CH_3}{|}}{C}=C\genfrac{}{}{0pt}{}{\diagup H}{\diagdown CH_3}$$

A NEW SESQUITERPENE FROM SIUM LATIFOLIUM

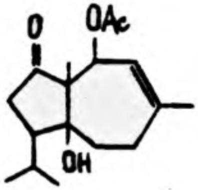
O.Motl[+], C.G.Casinovi[++] and G.Fardella[++]

[+] Institute of Organic Chemistry and Biochemistry,
Czechoslovak Academy of Sciences, Prague, Czechoslovakia

[++] Istituto di Chimica delle Sostanze Naturali, Facoltà di Farmacia, Università degli Studi, Perugia, Italy

From the light petroleum extract of the fruits of *Sium latifolium* (Umbelliferae) a new sesquiterpenic substance of the composition $C_{17}H_{26}O_4$ (MS) m.p. 129-130° and $[\alpha]_D^{20}$ - 23,6° was isolated by silica gel chromatography. Careful analysis of its proton nmr spectra in $CDCl_3$ and C_6D_6 and its ^{13}C nmr spectrum in $CDCl_3$ clearly showed the presence of an *i*-propyl, a quaternary and an allylic methyls, an allylic secondary acetoxyl, a tertiary hydroxyl, a trisubstituted double bond and a keto group in a five membered ring.

The formula reported below is proposed for the new compound:



Chemical transformations are in progress in the aim to demonstrate such a structure firmly.

NEW RESULTS IN THE CHEMISTRY OF EREMOPHILANE SESQUITERPENOIDES

L. Novotný, Z. Samek, J. Jizba

Institute of Organic Chemistry and Biochemistry,
Czechoslovak Academy of Sciences, Prague, Czechoslovakia

Chiroptical properties of some substances isolated from Petasites hybridus were investigated. Simultaneously the isolation and the structure determination of the first nitrogen-containing eremophilane derivative, eremophilenelactam, was also performed successfully.

Among the plant species of the Senecioneae tribe the species Senecio nemorensis var. bulgaricus was also analysed. In addition to some minor components the following components were isolated from it so far: Furanoligularenone and the as yet undescribed lactones 8-hydroxyeremophilenolid-1-en-3-one and its 8-ethoxy derivative.

CLERODANIC DITERPENES FROM TEUCRIUM FRUTICANS

S.Passannanti[*], M.P.Paternostro[*], F.Piozzi[*]
G.Savona[*], J.R.Hanson[**] and M.Siverns[**]

[*] Institute of Organic Chemistry, University of Palermo,
Palermo (Italy)

[**] School of Molecular Sciences, University of Sussex,
Brighton (United Kingdom)

From Teucrium fruticans (family Labiatae) collected in Sicily three new diterpenes were extracted, namely fruticone, isofruticone and 8β-hydroxy-fruticone. Their structures were determined by conventional methods and by ^{13}C-NMR spectroscopy. The products have a clerodane skeleton and a furane ring, and they are rather different from diterpenes occurring in other Teucrium species, like pykropolin, teucvin and the teucrines.

DITERPENES FROM MEDITERRANEAN LABIATAE

S.Passannanti*, M.P.Paternostro*, F.Piozzi*,
G.Savona*, J.R.Hanson** and M.Siverns**

* Institute of Organic Chemistry, University of Palermo, Palermo (Italy)

** School of Molecular Sciences, University of Sussex, Brighton (United Kingdom)

Salvia splendens collected in Sicily contains some new diterpenes with clerodane skeleton. Structural work is discussed and tentative formulae are suggested, in connection with the presence of several oxygenated functions; typical features are the occurrence of γ-lactone and furan rings. Preliminary reports are given also on work in progress on other genera and species.

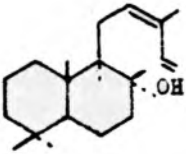
DITERPENOIDS OF THE OLEORESINS OF THE GENUS PICEA

E.N.Shmidt,V.A.Pentegova

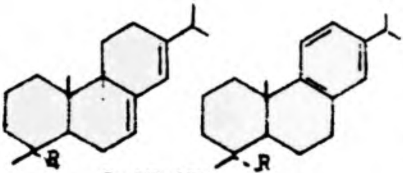
Institute of Organic Chemistry of the Siberian Division of the Academy of Sciences of the USSR,Novosibirsk,USSR.

Diterpenoids of the Oleoresins of different species of the Picea(fam.Pinaceae) have been investigated.The high contents of the bicyclic compounds of the labdane type (1) and tricyclic compounds of the abietane type (11) were found in the oleoresins of the genus Picea(species Picea sibirica,P.koraiensis,P.excelsa,P.glehni-section Morinda).Some transformations of diterpenic alcohols were investigeted.

Tetracyclic compounds of the phyllocladane type(111) were isolated from the oleoresin of Picea ajanensis(section Casicta). The structures were elucidated by IR-,UV-spectroscopy and nuclear manetic resonance.

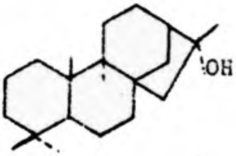


1



$R=CH_2OH$

11



111

NOVEL DITERPENES FROM THE GENUS BALLOTA

G.Savona*, F.Piozzi*, J.R.Hanson** and M.Siverns**

* Institute of Organic Chemistry, University of Palermo, Palermo (Italy)

**School of Molecular Sciences, University of Sussex, Brighton (United Kingdom)

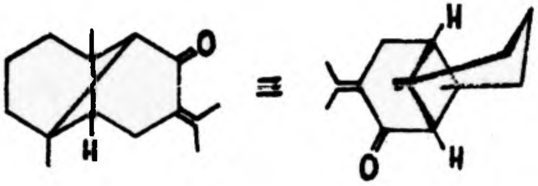
Although many genera of the family Labiatae have been investigated, the genus *Ballota*, rather similar to the genus *Marrubium*, was practically unexplored. Examination of *B.nigra* subsp. *foetida* and *B.rupestris*, both growing in Sicily, led to the isolation of several new furanoid diterpenes similar to marrubiin and related products. The structures of many of these substances (ballotinone, ballonigrin, ballonigrinone, ballotenol, rupestralic acid, etc.) were elucidated by conventional methods and by a wide use of ^{13}C-NMR spectroscopy; comparison of the spectra with those of known products (marrubiin, peregrinone, leonotin) is discussed.

GERMAZONE - A TRICYCLIC SESQUITERPENE KETONE WITH A NOVEL SKELETON

E. Tsankova, I. Ognyanov

Institute of Organic Chemistry, Bulgarian
Academy of Sciences, 1113 Sofia, Bulgaria

Germazone (1) was isolated as a minor component in the liquid part of Bulgarian essential oil of Geranium macrorrhisum L. Its structure was elucidated by means of spectral and chemical methods.



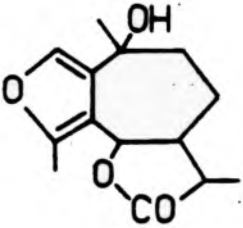
1

3-OXA-ARTABSINE, A NEW FURANO-LACTONE FROM Artemisia absinthium L.

K. Vokáč and Z. Samek

Institute of Organic Chemistry and Biochemistry,
Czechoslovak Academy of Sciences, Prague, Czechoslovakia

From ethanolic extract of Artemisia absinthium L., crystalline lactone (I) of the composition $C_{14}H_{18}O_4$ has been isolated. The structure of this compound was deduced from physico-chemical measurements, mainly from detailed analysis of ^{1}H-NMR and ^{13}C-NMR spectra.

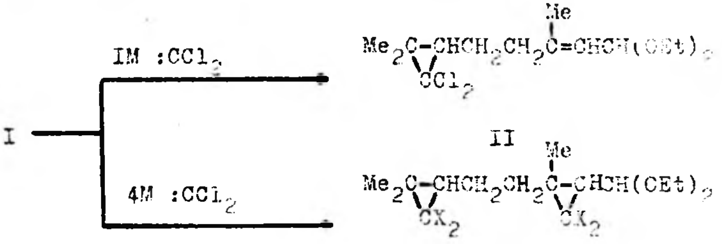


I

AN ADDITION ORDER OF SOME ELECTROPHYLIC REAGENTS TO CITRAL DIETHYLACETAL AND SOME ISOPRENOID ESTERS

L.A. Yanovskaya, G.V. Kryshtal, A.Kh. Khusid
N.D.Zelinsky Institute of Organic Chemistry of
Academy of Sciences of USSR, Moscow, USSR

An addition order of $:CCl_2$ to citral diethyl acetal I and an order of epoxidation of some isoprenoid esters by monoperphtalic acid are investigated. $:CCl_2$ is added at the end double bond of I when the reagent ratio is equimolar and with an excess of $:CCl_2$ a product of the addition at both double bonds of I is formed:

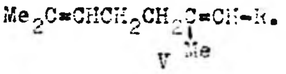


II

III, X=Cl; IV, X=H

Acetals II and III are easily hydrolyzed by dilute mineral acids to corresponding aldehydes. Acetal III is reduced by sodium in liquid ammonia to dicyclopropancarboxaldehyde acetal IV.

Epoxidation of esters of formula V proceeds differently depending on structure and reagent ratio to give mono- or dioxiranes



$Me_2C{=}CHCH_2CH_2\underset{Me}{C}{=}CH{-}R.$

V

PHEROMONE CONSTITUENTS OF THE PINE SAWFLY, *Neodiprion sertifer*, Geoffr. (Hymenoptera: Diprionidae)

Gunnar Bergström,[+] Jan Löfqvist,[++] and Torbjörn Norin[+++]

[+]Department of Ecological Chemistry, Göteborg University, S-400 33 Göteborg
Sweden

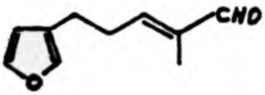
[++]Department of Animal Ecology, University of Lund, Ecology Building,
S-223 62 Lund, Sweden

[+++]Department of Organic Chemistry, Royal Institute of Technology,
S-100 44 Stockholm 70, Sweden

There is a remarkable antennal dimorphism between the sexes of pine sawflies of the genera *Diprion* and *Neodiprion*. The males have extremely enlarged, bushy antennae which indicates that sex attractants are released by the females. The presence of potent pheromones has also been demonstrat by Coppel *et al.*[1] Recently 3,7-dimethylpentadecan-2-acetate was shown to a sex attractant of *Neodiprion lecontei* and *N. sertifer*, whereas the corresponding propionate was isolated from *Diprion similis*.[2]

By GC-MS we have investigated the volatile constituents from various body-parts and glands of females of *N. sertifer* in order to obtain informati about sex attractants and other possible pheromones present in nanogram quantities. A very significant constituent was detected in the lateral parts of the integument of the abdominal segments II and III. This constituent has been identified as *trans*-perillenal, previously not known to occur in Nature, although described as an intermediate in a synthesis of some related furanoterpenes. The identification and synthesis of *trans*-perillenal will be described.

1. J.E. Casida, H.C. Coppel and T. Watanabe, *J. Econ. Entomol.* **56**, 18 (196
2. D.M. Jewell, F. Matsumura, H.C. Coppel, *Science* **192**, 51 (1976).



trans-Perillenal

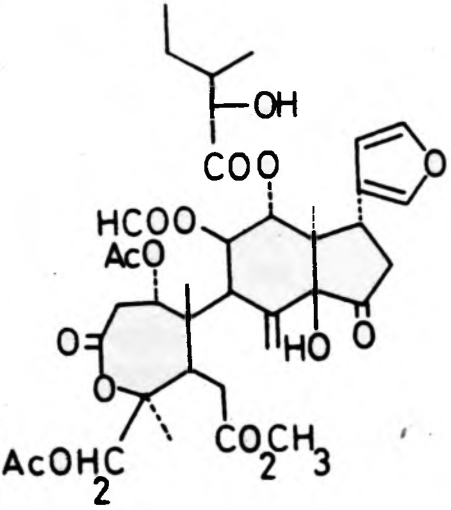
DREGEANIN AND RELATED TETRANORTRITERPENOIDS: FURTHER EXAMPLES OF CONFORMATIONAL COMPLEXITY.

J.D. Connolly,
Department of Chemistry, University of Glasgow,
Glasgow, G12 8QQ, Scotland.

The structural elucidation[1] of prieurianin 1 was complicated by the fact that it exists at room temperature as a mixture of conformational isomers. Analogous conformational problems arise with the related dregeanin $C_{37}H_{46}O_{14}$ from *Trichilia dregeana* (Meliaceae). The structure and the products of alkaline hydrolysis of dregeanin and several related compounds will be discussed.

Reference

1. Connolly et al, J.C.S. Chem. Comm., 1975, 345.



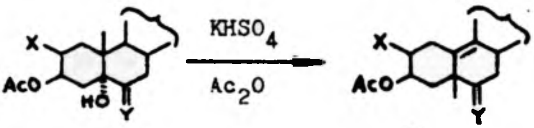
1

STRUCTURAL REQUIREMENTS IN WESTPHALEN REARRANGEMENT

P. Kočovský and V. Černý

Institute of Organic Chemistry and Biochemistry
Czechoslovak Academy of Sciences, Prague, Czechoslovakia

The relative importance of steric and electronic influence in Westphalen rearrangement was investigated on compounds 1) with or without an electron-withdrawing substituent at $C_{(6)}$ incapable of steric interaction with 10β-methyl group (keto group or α-benzoyloxy group), 2) with or without an axial 2β-substituent (steric compression by 1,3-diaxial interaction with 10β-methyl). The presence of an electron-withdrawing group at $C_{(4)}$ or $C_{(6)}$ is essential but its configuration is not important provided the 10β-methyl is in steric compression with a 2β-substituent. Some other aspects of the reaction will be discussed.



and/or other products

X = AcO, Y = $<^{H}_{OBz}$

X = H, Y = $<^{H}_{OBz}$

X = AcO, Y = O
X = H, Y = O
X = AcO, Y = H_2

MICHAEL REACTION WITH STEROIDAL 3-KETO-1-ENES

M. Kocór and W. Kroszczyński

Institute of Organic Chemistry,
Polish Academy of Sciences, Warsaw, Poland

The reactivity of steroidal 3-keto-1-enes, 3-keto-1,4-dienes and 3-keto-1,4,6-trienes as acceptors in Michael reaction is presented. Correlation between the electrophilicity of the above systems and their NMR spectra is discussed.

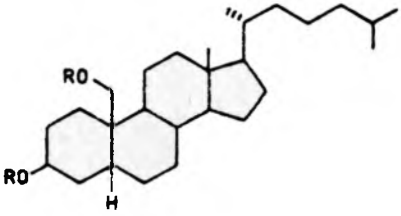
Examples of preparation of 1-substituted steroids are given.

SYNTHESIS OF 19-HYDROXY-5α- AND 19-HYDROXY-5β-CHOLESTANE

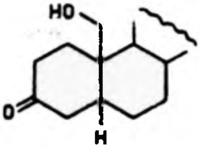
J. Wicha and A. Zarecki

Institute of Organic Chemistry of the Polish Academy
of Sciences, Warszawa, Poland

Reductive removal of 3-oxygen function in esters of diols 1 and hydroxyketones 2 was investigated. Participation of 19-hydroxyl group in 5α and 5β series was observed, leading to cyclic ethers 3. Mechanism and stereochemistry of reaction are discussed.



1



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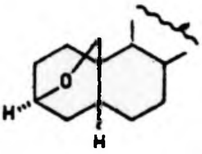


3

5αH and 5βH

ON THE REACTIVITY OF THE 8(14)-DOUBLE BOND OF STEROIDS

G. Langbein, H. J. Siemann, E. Menzer, I. Gruner und
H. S. Seeger

VEB Jenapharm, Bereich Forschung und Entwicklung

Starting with compounds of the type 3-methoxy-estra-1,3,5(10)-8,14-pentaene-17β-ol, which are convenient available by total synthesis, it is easy to prepare compounds with an isolated 8(14)-double bond. Thus, we have studied their reactivity to get an impression how to introduce the 14-hydroxy function.

Firstly, we tried the sequence epoxidation followed by reduction and were able to prepare 14α-hydroxy derivatives in satisfying yields. This was surprising because A. Lardon and T. Reichstein (Helv. 1963 392) had treated methyl 3β-acetoxy-8α,14α-epoxy-5β-etianate with $LiAlH_4$ and they have not found the corresponding 14α-hydroxy derivative they had expected.

Secondly, we studied the sequence hydroboration followed by oxidation. In 1964 M. Nussim, Y. Mazur and F. Sondheimer reported that Cholest-8(14)-ene-3β-ol (I) is inert in this sequence. In 1973 this was confirmed by E. Mincione and F. Feliziani. But after having enhanced the reaction temperature to 40 - 60 ° they were able to hydroborate (I), however, they obtained after H_2O_2-oxidation the corresponding 15α- and 15β-hydroxy derivatives.

Unexpectedly we have found that it is possible to get the original 8,14-addition products also at room temperature when we started with our 8(14)-olefinic steroids.

The results will be discussed in detail.

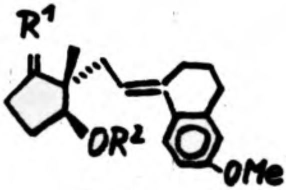
OXIDATIVE CLEAVAGE OF 8,14-SECO-STEROIDS

S. Schwarz[+], H. Schick[++], C. Carl[+] and U. Eberhardt[+]

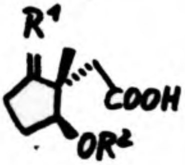
[+]VEB Jenapharm, Bereich Forschung und Entwicklung,
DDR-6900 Jena, Otto-Schott-Str. 13

[++]Akademie der Wissenschaften der DDR, Zentralinstitut
für Organische Chemie, DDR-1199 Berlin-Adlershof,
Rudower Chaussee 5

Studying a novel approach to the synthesis of modified prostaglandins, the oxidative cleavage of seco-steroids 1 and 2 has been investigated, in order to obtain the corresponding acids 3 and 4 respectively. Compound 4 subsequently can be converted into Keto lactone 5, which proved to be an appropriate synthone for preparing 8-methyl-prostanoids in a few steps.



1, 2



3, 4

5

1, 3: $R^1 = O$; $R^2 = Ac$

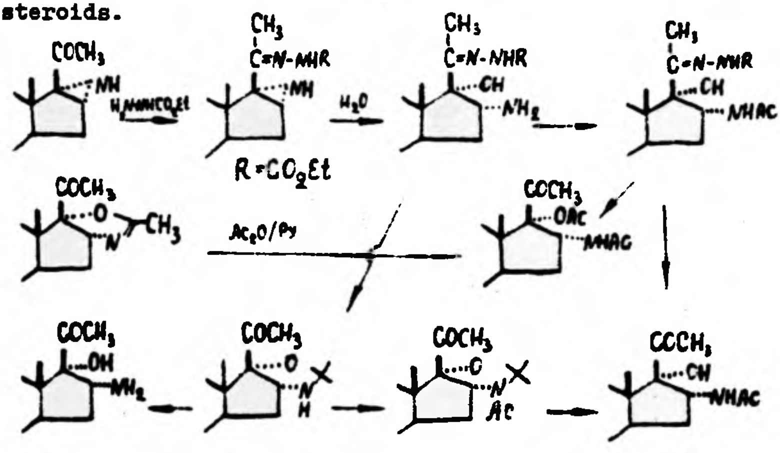
2, 4: $R^1 = \alpha$-OAc, β-H; $R^2 = Ac$

STEREOSPECIFIC CIS-OPENING OF 16,17α-EPIMINOPREGNENOLONES AND SYNTHESIS OF 16α,17α-DISUBSTITUTED 20-KETOPREGNENES WITH NITROGEN FUNCTION AT C-16

A.V.Kamernitzky, A.M.Turuta, D.Calcines

N.D.Zelinsky Institute of Organic Chemistry, Moscow, USSR

Two new methods are proposed for preparation of 16α,17α-disubstituted 20-ketopregnenes with nitrogen function at C-16. One of them includes hydrolysis of 16,17α-epimino-20-ketosteroids in the presence of carbethoxyhydrazine followed by elimination of hydrazone group. The substitution at C-20 directs the stereochemistry of aziridine ring opening. Another one involves the acid cleavage of the oxazoline cycle of 2'-methyl [16,17α-d]-oxazolines 20-ketosteroids.



SPECIFIC MONOFLUORATION OF STEROIDS

A. AMBLES AND R. JACQUESY

Laboratoire de Chimie XII-Faculté des Sciences
86022 POITIERS - FRANCE.

Regio and stereospecific monofluorination of steroids can be achieved through nucleophilic substitution of tertiary hydroxyl groups by the mean of anhydrous HF or HF-Pyridine complex. The main features of this reaction are discussed on model compounds, namely cholestanediols.

The reaction involves an intimate ion-pair leading, in the usual case, to highly specific retention of configuration. In anhydrous HF, specific solvatation of a secondary hydroxyl group in the vicinity of the tertiary center involved in the reaction induces "syn-orientation" which may lead to specific inversion of configuration.

14-hydroxylated steroids show a more complex behaviour : olefins formation can occur, depending on the reagent and the substitution at the 17 position.

Examples on biologically active steroids, i.e androstane derivatives, cortexolone, cardenolides, vitamin D3, are given.

A NOVEL METHOD OF THE ADDITION OF BROMINE-FLUORINE ON DOUBLE BONDS OF STEROIDS

R.Míčková, J.Moural and V.Schwarz

Research Institute for Pharmacy and Biochemistry
Prague, Czechoslovakia

This novel method consists of the reaction of diethyl-(2-chloro-1,1,2-trifluoroethyl)-amine and N-bromoacetamide with unsaturated steroid compounds. The reaction products are described and the probable reaction mechanism is discussed.

CATALYTIC HYDROGENATION OF Δ^5-7-KETOSTEROIDS

T.Kołek, I.Małunowicz, A.Mironowicz

Institute of Fundamental Chemistry
Academy of Agriculture, Wrocław, Poland

Taking into account existing interpretation of catalytic reduction of steroid Δ^4-3-ketones in different conditions, we have carried out analogous reactions of catalytic reduction of Δ^5-7-ketones with various substituents at C-3 and C-17.

In contrast to Δ^4-3-ketones Δ^5-7-ketones give stereospecifically A/B-trans isomers in all investigated cases.

CATALYTIC HYDROGENATION OF UNSATURATED STEROIDS IN STRONG ACID MEDIA

G.G.Vasiyarov, S.N.Ananchenko
Shemyakin Institute of Bioorganic Chemistry,
USSR Academy of Sciences, Moscow, USSR

Hydrogenation of unsaturated steroids in trifluoracetic acid in the presence of transition metal complexes has been studied. Hydrogenation of $\Delta^{8(9),14(15)}$-estrapentaenic system proceeds under these conditions to form estratrienic derivatives, the yield and character of the formed products being depended on the nature of the catalyst, dimension of D-ring and type of functional groups at C_3 (CH_3O-,HO-) and C_{17} (=O,-OH).

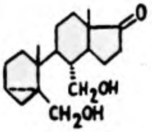
Hydrogenation of Δ^4-3-ketosystem in testosterone, 19-nortestosterone, 19-nor-D-homotestosterone, Δ^4-androstenedione-3,17, progesterone under the same conditions results mainly in products of 5β-series.

CYCLIZATION OF 6,7-SECO-3α,5-CYCLO-5α-ANDROSTANE-6,7-DIOL

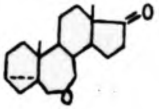
H. Velgová and V. Černý

Institute of Organic Chemistry and Biochemistry,
Czechoslovak Academy of Sciences, Prague, Czechoslovakia

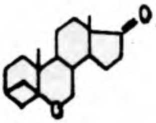
Intramolecular cyclization of 6,7-seco-3α,5-cyclo-5α-androstane-6,7-diol I with tosyl chloride in pyridine yielded two cyclic ethers II and III. Their structure has been established by means of physical methods (mass spectrometry, infrared spectroscopy, ^{1}H-NMR and ^{13}C-NMR spectroscopies). The reaction of the ethers II and III with boron trifluoride etherate in acetic anhydride yielded another cyclic ether IV as a by-product, partial structure of which has been established by physical methods. The possible mechanism of these rearrangements is discussed.



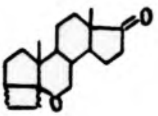
I



II



III



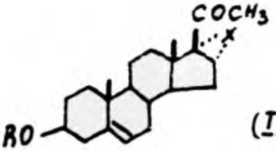
IV

CONFORMATIONAL ANALYSIS OF STEROIDS WITH A THREE-MEMBERED HETEROCYCLE (O, S, N) ADJACENT TO CARBONYL GROUP

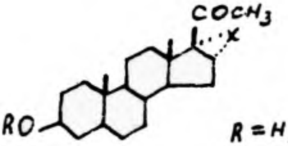
A.V.Kamernitzky, A.M.Turuta, T.K.Ustynyuk, T.M.Fadeeva

N.D.Zelinsky Institute of Organic Chemistry, Moscow, USSR

A comparative conformational study of optically active 20-ketosteroids of type I with a three-membered heterocycle (X=O, S or N) adjacent to the carbonyl group is carried out on the basis of their CD-spectra.



(I)



$R = H, Ac$

$X = O, N, S, CH_2$

The results of the study are analysed in terms of the "ordinary" and "reversed" octant rules. The correlations thus established between the nature of the hetero atom and the sign of the Cotton effect for n,π^* and π,π^* - transitions of the C(20)-carbonyl can be used in each particular case to predict both the conformation of the molecule and the extent of conjugation between the heterocycle and the keto-group. These correlations should find application in conformational and stereochemical studies.

CD AND UV OF SUBSTITUTED STEROID DIENES

Michał Kiełczewski and Andrzej Gałat

Institute of Chemistry, University of Poznań, Poland

Some novel $\Delta^{1,3}$ and $\Delta^{2,4}$ steroid dienes of normal and 19-nor series were obtained from the tosylhydrazone - methyllithium reaction sequence. Introduction of methyl groups in different positions of the diene chromophore was possible in this reaction and thus compounds of different methyl substitution pattern were obtained and characterized spectrally. The methyl groups are located at sp^2 carbons. Their effect upon UV and CD spectra is discussed in detail.
All spectra were computer fitted to the sum of gaussian components. Specific methyl substitution patterns are responsible for gaining or loosing the vibronic structure of spectral bands. Spectral parameters were calculated for all dienes.

For technical reasons the organizing committee had to reduce the number of communications and therefore papers closely related have been put together for a Review lecture.

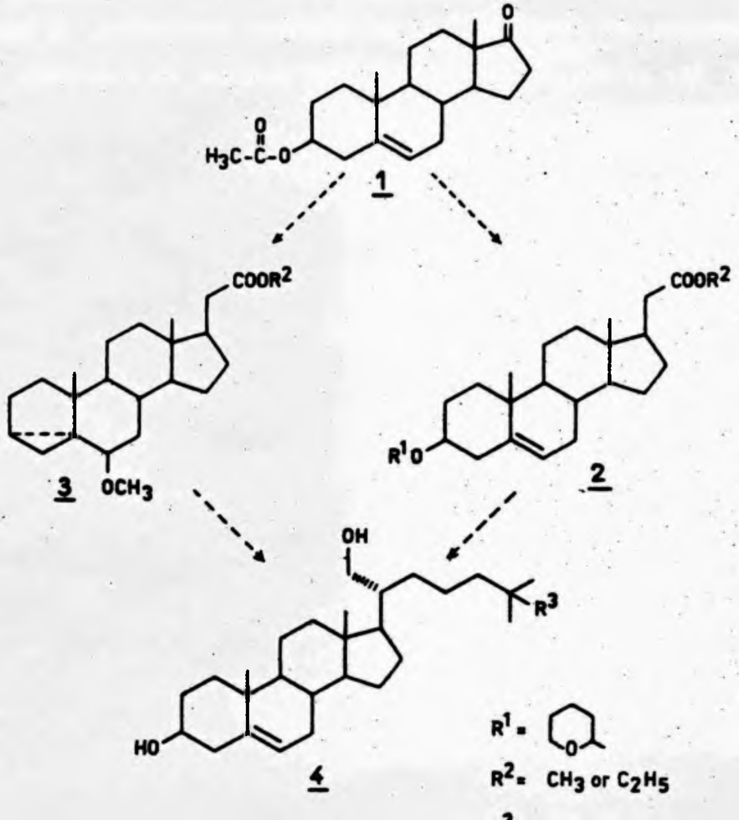
The Review lecture on partial syntheses of steroids is based on the following 11 contributions.
(for abstracts see pages 33 - 43).

SYNTHESIS OF 21-HYDROXYCHOLESTEROL DERIVATIVES

K. Bal, J. Wicha

Institute of Organic Chemistry, Polish Academy of Sciences,
Warszawa, Poland

21-Hydroxycholesterol 4 /R^3=H/ and 21,25-dihydroxycholesterol 4 /R^3=OH/ were synthetised from 3β-acetoxyandrost-5-en-17-one 1 using pregnane-21-oic acid derivatives 2 and 3 as key intermediates. Methods of efficient synthesis of 2 and 3 from 1 and the stereochemistry of the alkylation at C-20 were investigated.



A CONTRIBUTION TO THE SYNTHESIS OF CHENODEOXYCHOLIC ACID

J.Halásková and V.Schwarz

Research Institute for Pharmacy and Biochemistry
Prague, Czechoslovakia

A six step modified synthesis of chenodeoxycholic acid from cholic acid, based on the preparation of 12-toluene-p-sulphonylhydrazone and its reduction to 12-deoxo derivative, is presented. The yield of sufficiently pure product is over 10%.

PREPARATION AND STEREOCHEMISTRY OF 2-METHYL TRITERPENOIDS

J. Klinot, J. Světlý and A. Vystrčil

Department of Organic Chemistry,
Charles University, Prague, Czechoslovakia

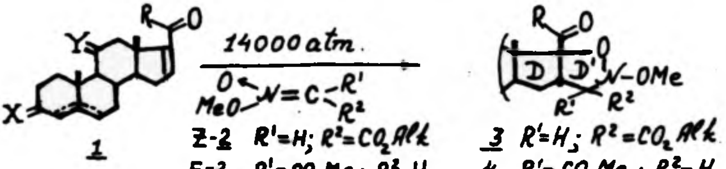
The series of 2-methyl derivatives of 19β,28-epoxy-18α-oleanane and lupane-28-nitrile containing hydroxyl or carbonyl group in position 3 or 1 was prepared as the model compounds for the study of the conformation of ring A in triterpenoids. The synthesis of 2-methyl-3-oxo and 2-methyl-3-hydroxy derivatives is based on Claisen or Mannich condensation of 3-oxo derivatives followed by hydride reduction and catalytic hydrogenation. Three isomeric 2-methyl-3-hydroxy derivatives were prepared in this way; 2β-methyl-3α-ol was obtained by hydroboration of 2-methyl-2-ene. Oxidation of hydroxyderivatives gave both isomeric 2-methyl-3-oxo derivatives.

The key step in the synthesis of 2-methyl-1-oxo derivatives was the allylic substitution of 3β-chloro-2-methyl-1-ene which led to 1α-hydroxy-2-methyl-2-ene. Hydrogenation of this derivative followed by oxidation and isomerisation gave both isomeric 2-methyl-1-oxo derivatives. Allylic oxidation of 2-methyl-2-ene was also studied. The stability of isomeric 2-methylketones and the stereochemistry of ring A is discussed.

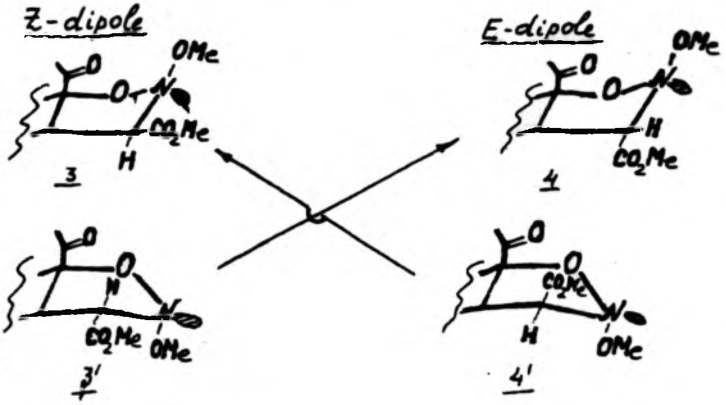
STEREOCHEMISTRY OF 1,3-DIPOLAR CYCLOADDITION OF Z- AND E-NITRONIC ESTERS TO Δ^{16}-20-OXOSTEROIDS

I.S.Levina, A.V.Kamernitzky, E.I.Mortikova, V.M.Shitkin
and B.S.Elyanov
N.D.Zelinsky Institute of Organic Chemistry,
Academy of Sciences, Moscow, USSR

New type of steroido/16α,17α-d/tetrahydro-1',2'-oxazoles 3,4 is prepared by regiospecific 1,3-dipolar cycloaddition of Z- and E-nitronic esters 2 to steroids 1 at high pressure. Both modes ("exo-endo") of dipolarophile approach to dipole is realized for the most of steroids examined. All four possible stereoisomers of N-methoxyisoxazolidines are isolated and their preferred conformations are established. Conversion of unstable stereomers to stable ones (3' → 3 ; 4' → 4) is nitrogen inversion and isoxazolidine cycle conformational change (${}_{N}E \rightarrow E^{N}$) process.



Z-2 $R'=H$; $R^2=CO_2Alk$ 3 $R'=H$; $R^2=CO_2Alk$
E-2 $R'=CO_2Me$; $R^2=H$ 4 $R'=CO_2Me$; $R^2=H$

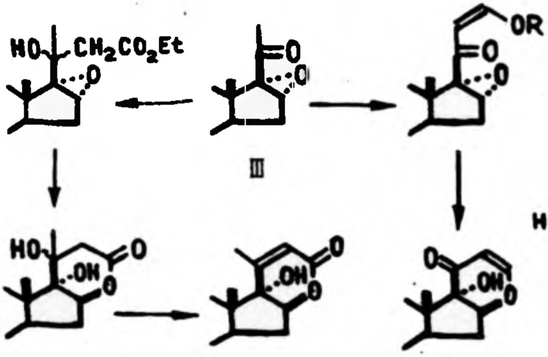


SYNTHESIS OF TRANSFORMED STEROIDS STRUCTURALLY RELATED TO NATURAL SHIOGRALACTONE

I.G.Reshetova, A.V.Kamernitzky, V.A.Krivoruchko,
K.J.Chernjuk

N.D.Zelinsky Institute of Organic Chemistry, Moscow, USSR

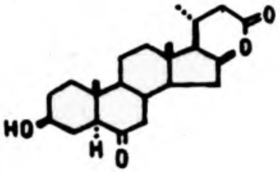
Steroid 23 → 16-lactones (I) and their 21-norvinilogs (II) were obtained from 16α,17α-epoxypregnenolone (III) according to the scheme:



III

I

II



IY

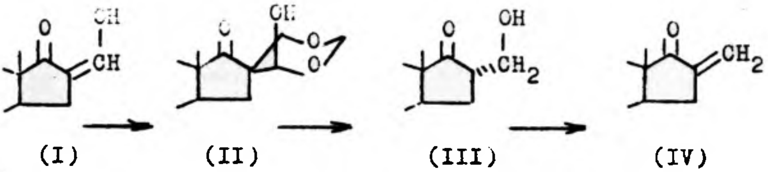
These compounds are structurally related to the shiogralactone (IV) from natural sources. The structures of these compounds were proved and some of their reactions were studied.

A NEW PREPARATION OF 16-METHYLENE-17-KETO STEROIDS.

Gy. Schneider, I.Weisz-Vincze and A.Polák

Institute of Organic Chemistry, József Attila University,
Szeged, Hungary.

The 16-hydroxymethylene-17-keto steroids (I) give 16-spirodioxane (II) at room temperature with excess of formaldehyde. These spirodioxanes (II) are relatively unstable compounds. Potassium carbonate in acetone or in pyridine readily converts them to 16-hydroxymethyl-17-keto steroids (III). After a few hours they decompose to the 16-methylene-17-keto steroids (IV):



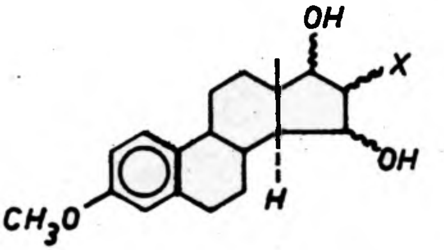
The mechanism of the reaction will be discussed.

SYNTHESIS AND STEREOCHEMISTRY OF 16-MONO-, 16,17-DI- AND 15,16,17-TRISUBSTITUTED ESTRA-1,3,5(10)-TRIENES

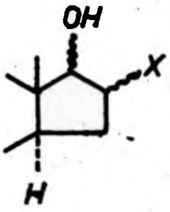
B. Schönecker, G. Schubert and K. Ponsold

Academy of Sciences of the GDR, Research Centre of Molecularbiology and Medicine, Central Institute of Microbiology and Experimental Therapy, Jena, GDR

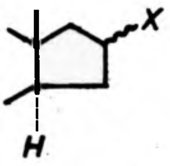
A suitable starting material for the synthesis of 16-substituted 15,17-diols (1) is the 15β,16β-epoxide of 3-methoxy-estra-1,3,5(10)-trien-17β-ol. Analogous compounds without the 15-hydroxyl group (2) can be obtained by cleavage of 16,17-epoxides or by nucleophilic substitution. For chemical, stereochemical and spectroscopical comparisons the synthesis of 16-monosubstituted compounds (3) was undertaken starting from the 16,17-olefin. The key step is the regio- and stereospecific introduction of a 16β-hydroxyl group. Transformations of this hydroxyl group gave the desired 16α- and 16β-substituted compounds. The NMR spectroscopy is a useful method for configurational assignment.



1



2



3

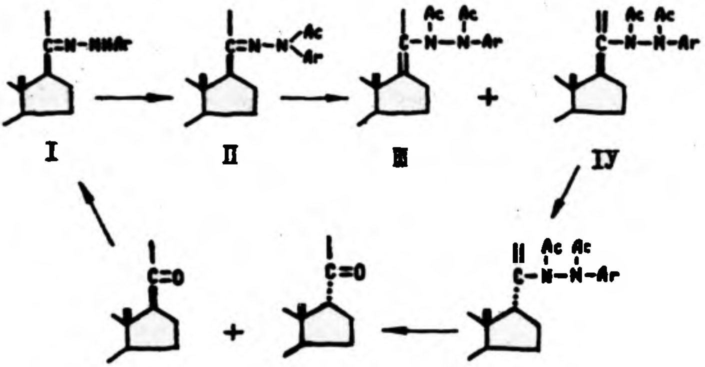
X = OR, halogen, N_3, NHR, NCS, SR, SeCN

SYNTHESIS OF N,N'-DIACETYL-20-ARYLHYDRAZINO-PREGNADIENOLS AND THEIR TRANSFORMATIONS

A.V.Skorova, A.V.Kamernitzky, N.S.Pavlova-Grishina

N.D.Zelinsky Institute of Organic Chemistry, Moscow, USSR

Acetylation of pregnane 20-arylhydrazones (I) in the presence of strong acid proceeds via mono-N-acetylhydrazones (II) and results in both $\Delta^{17(20)}$- and $\Delta^{22(21)}$-N,N'-diacetylarylhydrazines (III) and (IV). Compounds (IV) predominate in the mixture. Under basic conditions these isomerize easily to 17α-derivatives.



Reactivity of $\Delta^{20(21)}$-bond in the compounds was investigated.

NEW SYNTHESIS OF B-NORCORTISOL

V.Šanda,J.Fajkoš and J.Protiva

Institute of Organic Chemistry and Biochemistry,
Czechoslovak Academy of Sciences,16610 Prague 6
Research Institute for Pharmacy and Biochemistry
Prague 9

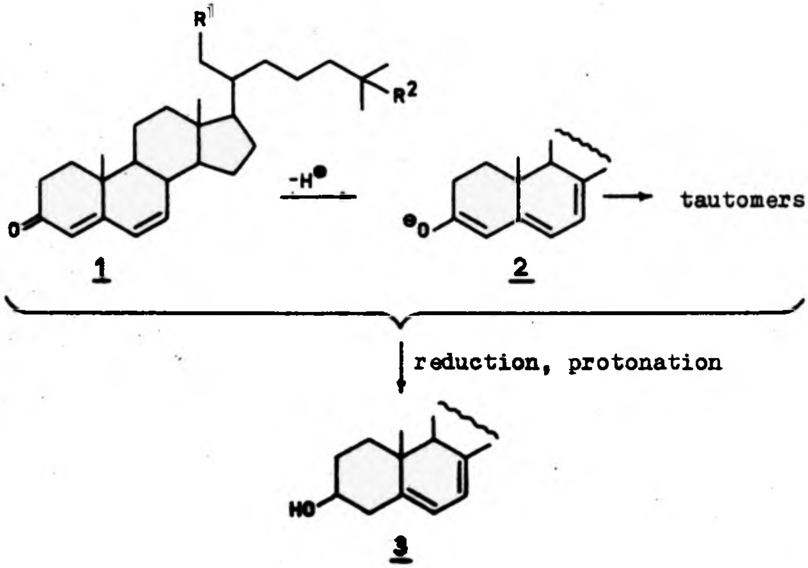
Microbial hydroxylation of 17α,21-dihydroxy-B-norpregn-4-en,20-dione and 3β,17α,21-trihydroxy-B-norpregn-5-en,20-one with the fungus Beauveria bassiana was investigated.A series of products of this biotransformation was isolated and their structure determined.

On the basis of this studies a new synthesis of B-norcortisol was elaborated.

PREPARATION OF 3-β-HYDROXY-CHOLESTA-5,7-DIENE DERIVATIVES FROM CHOLESTA-4,6-DIENE-3-ONE

J. Wicha, S. Piekut
Institute of Organic Chemistry of the
Polish Academy of Sciences, Warszawa, Poland

Reduction of equilibrium mixture of 4,6-diene-3-one 1 enolates 2 was investigated. The method of synthesis of 3 in cca 40% yield will be presented and details of reaction discussed.



R^1 and R^2 = H and OH

CLEAVAGE OF ISOMERIC 5,6-EPOXYCHOLESTAN-3β,4β-DIOLS WITH PROTONIC ACIDS

K.Jaworski, I.Małunowicz

Institute of Fundamental Chemistry
Academy of Agriculture, Wrocław, Poland

For investigating the influence of vicinal diols on the cleavage of 5,6-epoxycholestan-3β,4β-diols the reaction was carried out by means of hydrobromic acid and perchloric acid in acetone.

In the case of hydrobromic acid mainly bromohydrins resulted while by means of perchloric acid the reaction followed different pathways to a few products.

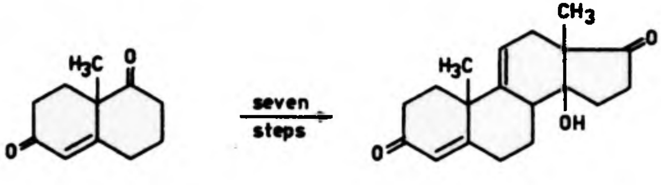
The structure of the reaction products has been resolved.

TOTAL SYNTHESIS OF STEROIDS

Andrzej Robert Daniewski[+] and Zdenek Valenta[++]

[+] Institute of Organic Chemistry, Polish Academy of Sciences
Warsaw, Poland
[++] University of New Brunswick, Fredericton, Canada

A new total synthesis of an androstane derivatives is described. The starting diketone I in the racemic form as well as opticaly active one was transformed into compound II in seven steps. The transformation of II to useful steroids is discussed.



I

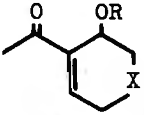
II

TOTAL SYNTHESIS OF STEROIDS BASED ON 2-ACETYLCYCLOALKENE-2-OLS-1

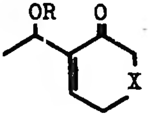
A. A. Akhrem, F. A. Lakhvich, V. A. Khripach, I. B. Klebanovich
and A. N. Pyrko

Institute of Bioorganic Chemistry, Byelorussian SSR
Academy of Sciences, Minsk, USSR

Methods for preparation of hitherto unknown acetylcycloalkene derivatives 1 and 2 have been developed and their properties have been studied. 1 and 2 are proposed as perspective synthons for the total synthesis of steroids and other polycyclic systems.

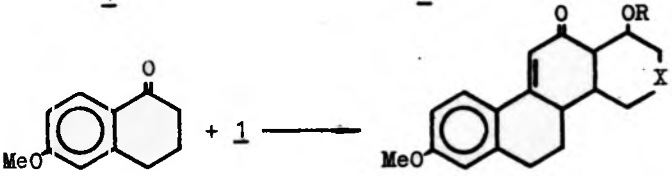


1



2

R = H, Ac, THP
X = -, CH_2, CMe_2



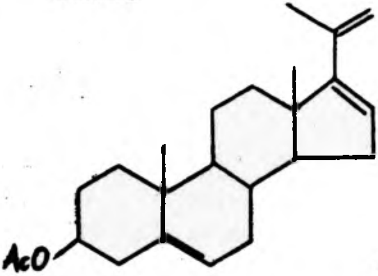
3 4

Application of these compounds to steroid total synthesis following AB→D→C scheme is illustrated by the construction of the tetracyclic intermediates 4 resulting from Michael reaction of the acetylcyclenes 1 with the methoxytetralone 3 followed by intramolecular crotonic condensation of ABD-fragments.

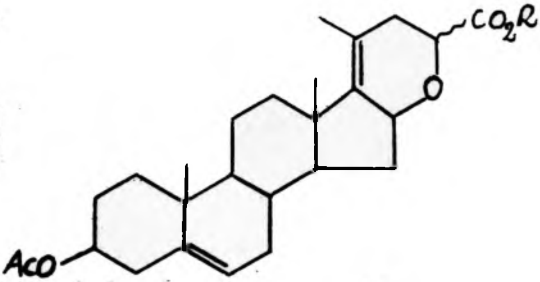
EXTENSION OF THE STEROIDAL SIDE CHAIN

M. Kocór and W.Wojciechowska
Institute of Organic Chemistry,Pol. Acad. Sci.
Warsaw,Poland

Diels-Alder condensation of 1 with ethyl and butyl glyoxalates gave adducts of type 2.The adducts and their derivatives were used for the transformations of the steroidal side chain. The new formed pyrane ring was cleaved and the corresponding triacetate was thus obtained.Further transformations of the carboxyl group led to new modifications of the steroidal side chain.



1.



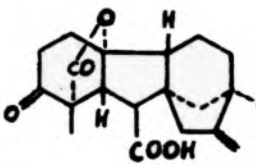
2.

PHOTOCHEMICAL REACTIONS OF SATURATED GIBBERELLIN KETONES

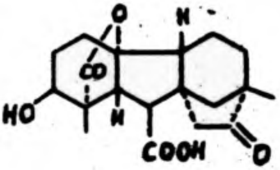
G. Adam and T. v. Sung

Institute for Plant Biochemistry Halle (Saale)
of the Academy of Sciences of GDR

The solution $n \rightarrow \pi^*$ photochemistry of diterpenoid saturated gibberellin ketones of the 2-dehydro gibberellin A_1 (I) as well as that of the gibberellin C series (II) has been investigated. In the GA_1-2-ketone series NORRISH I cleavage has been found to be the main process leading to $\Delta^{1(10a)}$-unsaturated 1.2-seco gibbane-2-aldehydes in high preparative yields. Such compounds are useful starting materials for recyclization reaction sequences yielding gibberellin A_1 and its 2-epimers affording a proof for the retroaldol mechanism of the alkalicatalyzed GA_1-epimerization postulated by CORNFORTH. In the gibberellin C series also a NORRISH type I process to the corresponding ring D opened seco aldehyde takes place followed by an intramolecular PATERNO-BÜCHI reaction giving highly strained 8(7 → 11)-abeo-7.8-epoxy-gibbanes. Structural and mechanistic aspects of these reactions as well as further acid catalyzed rearrangements of the last mentioned abeo-gibberellins are discussed.



I



II

SYNTHESIS OF ABSCISIC ACID ANALOGUES

N.S. Wulfson, V.B. Berzin, L.G. Isaeva
Shemyakin Institute of Bioorganic Chemistry, USSR
Academy of Sciences, Moscow, USSR

Some tert.-butylsubstituted analogues of abscisic acid with the saturated cyclohexane ring, fixed orientation and geometrical isomerism of the side chain (1-10) were synthesized:

1 R = cis-C=C-C(Me)=CH-COOH (e)
2 R = trans-C=C-C(Me)=CH-COOH (e)
3 R = cis-C=C-C(Me)=CH-COOH (a)
4 R = trans-C=C-C(Me)=CH-COOH (a)
5 R = cis-trans-CH=CH-C(Me)=CH-COOH (e)
6 R = cis-cis-CH=CH-C(me)=CH-COOH (a)
7 R = trans-cis-CH=CH-C(me)=CH-COOH (a)
8 R = trans-CH_2-CH_2-C(Me)=CH-COOH (a)
9 R = trans-CH_2-CH=C(Me)-CH_2-COOH (a)
10 R = cis-CO-CH_2-C(Me)=CH-COOH (e)
11 R = cis-cis-CH=CH-C(Me)=CH-COOH (e)

It was found that the hydrolysis of methyl esters of unsaturated acids with equatorial side chain (ME 1,11) proceeds abnormally. In order to elucidate the effects of unsaturation and of the presence of tert.butyl group, some analogues were synthesized.

PREPARATION OF SOME MODEL LACTONES FOR STEREOCHEMICAL STUDY OF LACTONE RING BY MEANS OF ^{1}H-NMR SPECTROSCOPY

J. Harmatha and Z. Samek

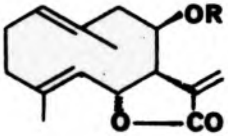
Institute of Organic Chemistry and Biochemistry,
Czechoslovak Academy of Sciences, Prague, Czechoslovakia

In connection with the checking of the validity of the rule $|J_{BD}|$, $|J_{BD'}|$ (trans-lactone) $\geqslant 3 \geqslant$ $|J_{BD}|$, $|J_{BD'}|$ (cis-lactone), used for the determination of the relative configuration of the lactone ring (type A) in sesquiterpenic lactones, some model compounds have been prepared.

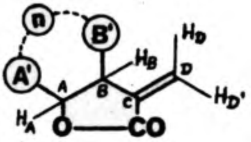
It was found that the validity of this rule depends on a number of conformational factors limiting the range of dihedral angles on the fragment C_A-C_B (determining the relative configuration) and of the "allylic" angle $\Phi \equiv H_B - C_B - C_C - C_D$ (determining the value of the allylic long-range coupling constants J_{BD} and $J_{BD'}$). Good conditions for the validity of this rule exist for small annelated cycles (n=5,6,7) for which the range of the dihedral angle $\vartheta \equiv C_{A'} - C_A - C_B - C_{B'}$ is limited à priori to $0^\circ \leqslant \vartheta \leqslant 120^\circ$, for optimum conformations of the annelated cycle, both for the trans and cis lactones. In the case of larger cycles (for example n = 10), trans lactones may have optimum conformations both in the $0^\circ \leqslant \vartheta \leqslant 120^\circ$ and the $120^\circ \leqslant \vartheta \leqslant 180^\circ$ ranges. In the extreme case of an open chain lactone ($n = \infty$) the trans lactones should prefer, à priori, the conformation in the $120^\circ \leqslant \vartheta \leqslant 180^\circ$ range. Within this interval the relation $|J_{BD}|$, $|J_{BD'}| \leqslant 3$ should dominate and the rule becomes invalid.

Our initial interest was focussed on the preparation of lactones with a saturated annelated ring (n = 10) and with an open ring ($n = \infty$) related to eupatoriopicrin (I).

I:



Type A:



SYNTHESIS OF SOME SESQUITERPENE LACTONES OF THE EUDESMANO TYPE

A González González, J Bermejo Barrera, J L Bretón Funes,
G Martínez Massanet and A Galindo Brito

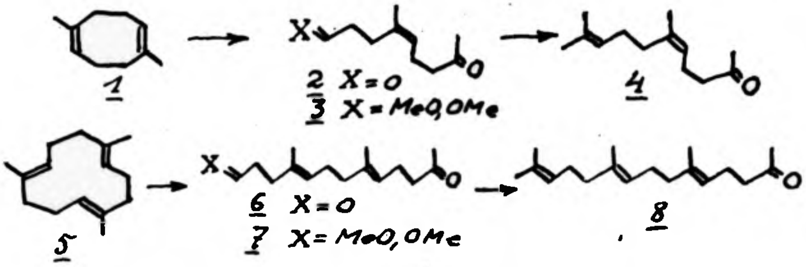
Instituto de Productos Naturales Orgánicos del CSIC
La Laguna Tenerife Spain

As part of a synthetic study of chemical transformations in eudesmanolides, a hydroxyl group was introduced into the α-methyl-γ-butyrolactone ring. The synthetic route will be described together with a series of related reactions.

A NEW ROUTE TO STEREOSPECIFIC SYNTHESIS OF TERPENOID 1,5-POLYENES via ISOPRENE CYCLOOLIGOMERS

A.M.Moiseenkov and A.V.Semenovsky,
N.D.Zelinsky Institute of Organic Chemistry,
Academy of Sciences, Moscow, USSR,
H.A.Tolstikov, U.M.Djemilev and V.N.Odinokov,
Institute of Chemistry, Academy of Sciences, Ufa, USSR

The use of isoprene for designing of terpenoids is one of the most challenging problems of synthetic chemistry. We have developed a new approach in utilization of isoprene for stereospecific synthesis of terpenoid 1,5-polyenes by means of the selective transformation of isoprene cyclooligomers with regular structure. The approach is exemplified by conversion of dimer 1 and trimer 5 into the corresponding keto aldehydes 2,6 and their acetals 3,7 , the former can be smoothly prepared by partial ozonolysis of cyclooligomers. The selective olefination of aldehydes 2 and 6 gives Z-geranyl- (4) and E,E-farnesylacetone (8) with a satisfactory yield. Thus, the transformations under consideration represent the simple and stereospecific way to useful synthons starting from isoprene.



SOME NEW TRANSFORMATIONS IN THE SERIES OF GIBBERELLIN A_3

E.P.Serebryakov, L.M.Suslova, V.F.Kucherov
Zelinsky Institute of Organic Chemistry,
the USSR Academy of Sciences, Moscow.

Three groups of UV-induced transformations in the series of gibberellin A_3 are considered:

(a)The cycloaddition of acetylene to 3-dehydrogibberellin A_3 and its methyl ester ;

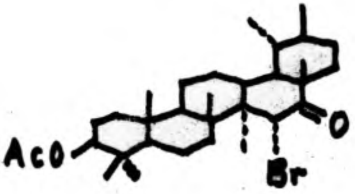
(b)The synthesis of 7-homo-gibberellin A_3 by means of Wolf rearrangement;

(c)The obtention of GA_3 derivatives modified in the ring A and/or at C-I3 by use of photosensitive carboxyl-protecting groups(such as p-methoxyphenacyl or 9-anthrylmethyl esters).

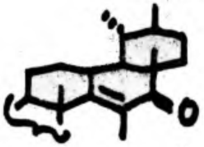
MECHANISMS OF THE DEHYDROBROMINATION OF 16-OXO-15α-BROMO-TARAXANE

Jan St. Pyrek and Ewa Czyżewska
Institute of Organic Chemistry, Polish Academy of Sciences,
Warszawa, Polska.

Our previous studies have shown, that the title compound 1 undergoes the dehydrobromination reactions with the rearrangement of the methyl group 27, or 13-14 bond migration, to give αβ-unsturated ketones 2 and 3 resp., or with the formation of α-cyclopropyl ketone 4 and stable ketene 5, depending on the reaction conditions:



1



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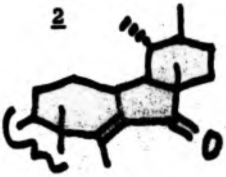

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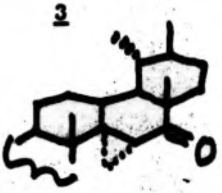
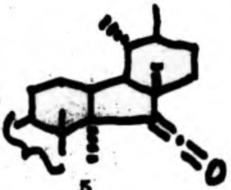


4

+



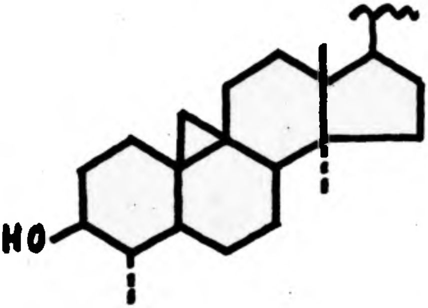
5

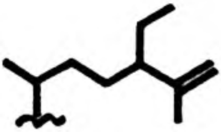
The mechanistic explanation of the different reaction course, studied by the specific deuteration and kinetic measurements, including isotope effects, will be presented.

THE SYNTHESIS OF CYCLOTRICHOSANTOL FROM CYCLOEUCALENOL

Jan St.Pyrek, Anna Schmidt-Szałowska
Institute of Organic Chemistry,Polish Academy of Sciences,
Warszawa,Poland

The synthesis of the side chain of cyclotrichosantol 1 based on the cycloeucalenol 2 degradation product 3 is presented.



1


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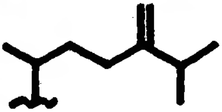

3


A NEW ROUTE TO POLYCYCLIC KETONES

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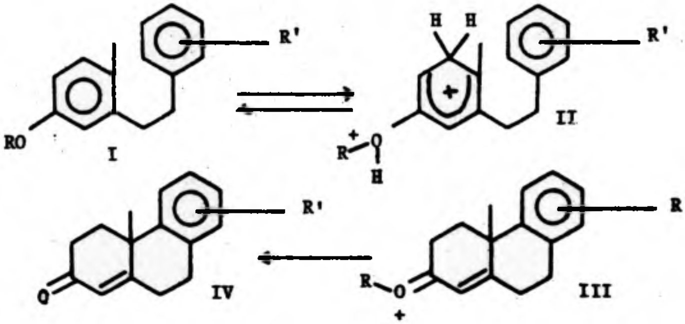
Laboratoire de Chimie XII, E.R.A. N° 556
40, Avenue du Recteur PINEAU
86022 POITIERS (FRANCE).

Phenols (or phenol ethers) in superacid systems ($HF-SbF_5$ or HSO_3F-SbF_5) can be diprotonated, first on oxygen, secondly on one of the meta carbon atoms.

The reactive resulting species II may be trapped intramolecularly by a phenyl group to afford a tricyclic ketone IV, according to the following scheme :



Yields of the ketones IV are good but with long reaction times, isomerisation and/or rearrangement of the primary products IV are observed.

This type of reaction can be obviously used to prepare complex polycyclic ketones.

COMPONENTS OF LIVERWORTS (Hepaticae)

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Institute of Organic Chemistry and Biochemistry,
Czechoslovak Academy of Sciences, Prague, Czechoslovakia

Liverworts (Hepaticae), which form an independant class of mosses (Bryophytae), differ from other green plants not only by their multiplication through spores and also vegetatively, but also by the fact that they contain the so-called "essential oil bodies" which are located in the cell. The essential oil bodies of the liverworts were investigated from various viewpoints. In view of our traditional orientation extractive substances from liverworts, mainly of terpenic origin, became the subject of our investigations. In our communication the isolation and the structure of these substances from fifteen plants are discussed.

SYNTHESIS OF LABELLED 3β-D-GLUCOSIDES OF VARIOUS STEROLS WITH USE OF PLANT ENZYMES

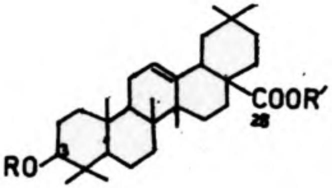
Z.A.Wojciechowski and J.Zimowski
Department of Biochemistry, Warsaw University,
02-089 Warsaw, Poland

Partially purified preparations of enzymes catalysing the synthesis of 3-monoglucosides of several natural sterols have been obtained from Calendula officinalis /a higher plant/ and Physarum polycephalum / a slime mold/. Both enzymes are specific for uridine diphosphoglucose as the sugar donor, show optimal activity at pH 7.2 and are activated by some sulphydryl reagents and phospholipids. Only glucosides with β configuration of glucoside bond are formed. Both preparations can be used for microscale synthesis of ^{14}C or ^{3}H labelled glucoside of cholesterol, /labelled both in glucose or sterol moiety/ with a good yield reaching 80 %. Labelled monoglucosides of several other C_{27} - C_{29} sterols can be prepared by the same method however the rate of glucosylation depends on the sterol structure. Sterols posessing an alkyl group at C-24 are glucosylated more rapidly than C_{27} sterols. The presence of Δ^{22} double bond decreases the rate of glucosylation by about 50%. Sterols with Δ^{5} double bond are glucosylated at much higher rate than Δ^{7} sterols. Fully saturated sterols /stanols/ and sterols with conjugated double bonds in the ring B are glucosylated very slow.

SYNTHESIS OF 3-GLUCOSIDE OF OLEANOLIC ACID

W. Janiszowska, B. Wiłkomirski and Z. Kasprzyk
Institute of Biochemistry, University, Warszawa, Poland

The purpose of our work was to prepare 3-glucoside of radioactive oleanolic acid for investigation on the biosynthesis of oleanolic acid glycosides in Calendula officinalis.A modified method of Meystre and Miescher / Helv. Chim. Acta 27, 231, 1944/ for synthesis of 3-glucoside of cholesterol yielded 4 products in reaction mixture : unreacted oleanolic acid I /37 %/ as well as acylated derivatives of 3-glucoside II / 18 %/, 28-glucoside III / 18 %/ and 3,28-di-glucoside IV /24 %/ The hydrolysis of the whole reaction mixture with 15 % NaOH yielded as the only products I /55 %/ and II / 42 %/ resulting from deacetylation of glucose moieties and splitting of the glycosidic bond in the position 28.

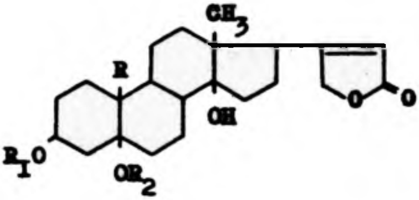


I - R = R' = H
II - R = Glc, R' = H
III - R = H, R' = Glc
IV - R = R' = Glc

CARDIAC 3,5-BISGLYCOSIDES.

M.Sh. Pal'yants. M.B. Gorovits, N.K. Abubakirov.
Institute of Chemistry of Plant Substances,
Academy of Sciences of the Uzbek SSR, Tashkent, USSR.

The Koenigs-Knorr condensation of strophanthidin (I), 3-acetoxy-strophanthidin (II), periplogenin (III) with corresponding acetobromo sugars along with acetates of usual 3-glycosides YI and YIII gave acetylated 5-rhamnoside IY and 3,5-bisglycosides Y, YII, IX. The structure of IY was established by the conversion into IYa, IYb, IYc. Saponification of Y, YI, YIII, IX gave Ya, YIa, YIIIa, IXa. The bisglycosides inhibit transport Na^+,K^+-ATPase.



	R	R_I	R_2
I	CHO	H	H
II	CHO	Ac	H
III	CH_3	H	H
IY	CHO	Ac	α-L-Rha(OAc)$_3$
IYa	CHO	Ac	α-L-Rha
IYb	CHO	Ac	α-L-Rha(OBz)$_3$
IYc	CHO	H	α-L-Rha
Y	CHO	$R_I=R_2$	α-L-Rha(OAc)$_3$
Ya	CHO	$R_I=R_2$	α-L-Rha
YI	CHO	Me-β-D-GalUA(OAc)$_3$	H
YIa	CHO	Me-β-D-GalUA	H
YII	CHO	$R_I=R_2$	Me-β-D-GalUA(OAc)$_3$
YIII	CH_3	Me-β-D-GlcUA(OAc)$_3$	H
YIIIA	CH_3	Me-β-D-GlcUA	H
IX	CH_3	$R_I=R_2$	Me-β-D-GlcUA(OAc)$_3$
IXa	CH_3	$R_I=R_2$	Me-β-D-GlcUA

MICROBIOLOGICAL HYDROXYLATION
OF 16,17-EPOXY-I-STEROIDS

N.E.Voishvillo, A.V.Kamernitzky, I.G.Leontiev

N.D.Zelinsky Institute of Organic Chemistry,
Moscow, USSR

The microbiological hydroxylation of 6β-hydroxy- and 6β-methoxy-16α,17α-epoxy-i-pregnane-20-ones by the fungi of classes Phycomyces and Fungi Imperfecti was studied.

The method of isomerization of i-steroids into 3-acetates of steroids with preserving the epoxide ring was elaborated. The structure of the formed products was established and some chemical transformations of the products were realized.

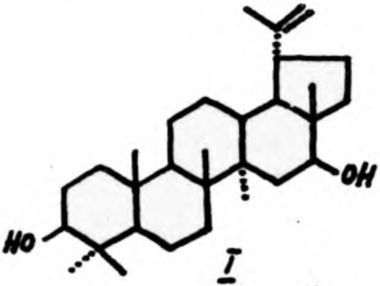
MASS SPECTRA OF 12-OXOLUPANE DERIVATIVES
THURBERINE - THE REVISION OF THE STRUCTURE

J.Protiva, V.Pouzar, A.Vystrčil

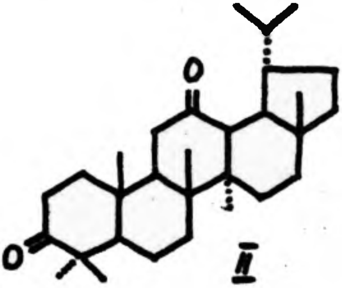
Department of Organic Chemistry, Charles University, Prague
Czechoslovakia

In the paper, an evidence is given that thurberine considered to be 20(29)-lupene-3β,12β-diol is in fact 20,(29)-lupene-3β,16β-diol (I).

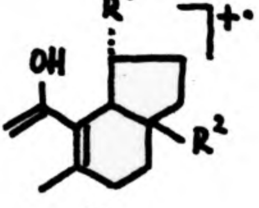
The mass spectra of a series of substituted 12-oxolupane derivatives were studied. The basic type of molecular ion fragmentation is a retro-Diels-Alder cleavage of the enol form occurring in ring C, under formation of fragments of type a. To a lesser extent ions of type b are also formed. 3,12-Lupanedione (II) was prepared by an unambiguous route and shown not to be identical with a derivative of naturally occuring thurberine. On the basis of a comparison of physical data of the 3,16 substituted lupane derivatives with those of analogous derivatives of thurberine and by means of mass spectra of II, 3,16-lupanedione and dihydrothurberodione , thurberine has been now proposed the corrected structure I.



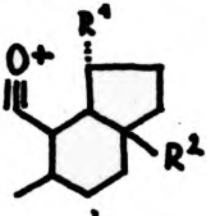
I



II



a



b

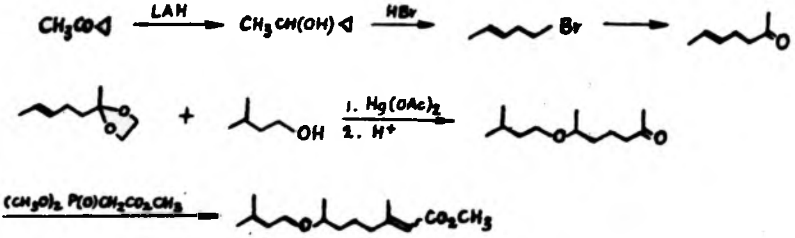
JUVENILE HORMONE ANALOGS. SYNTHESIS OF METHYL 3,7,11-TRIMETHYL-8-OXA-2-DODECENATE (A) AND ETHYL 3,7,11-TRIMETHYL-10-OXADECA-2,6-DIENOATE (B)

W. Biernacki and W. Sobótka

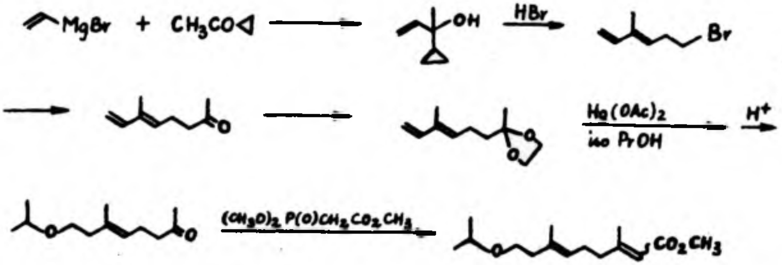
Institute of Organic Chemistry, Polish Academy of Sciences,
Warsaw, Poland

The synthesis of the title compounds, prepared for biological investigation of their activity as insect growth regulators, is described. The compounds A and B were obtained according to the following reaction schemes:

A)



B)



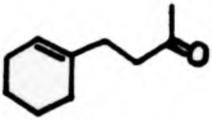
THE SYNTHESIS OF JH ANALOGUE WITH CYCLOHEXANE RING

L.Borowiecki and A.Kazubski

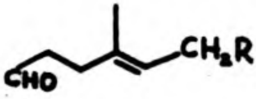
Institute of Chemistry , N.Copernicus University

87-100 TORUN - POLAND

An attempt of the total synthesis of the juvenile hormone analogue with the six-membered ring at the terminal position by combining synthons 1 and 2 will be reported. Compounds 1 and 2 were prepared in multistep transformations from cyclohexane carboxylic acid or benzyl chloride and geraniol respectively.



1.



R = -OAc , -OTHP

2.

ALKALOIDS FROM BUXUS HARLANDI HANCE

Z. Votický, A. Vassová and J. Černík[+]

Institute of Chemistry
Slovak Academy of Sciences, Bratislava, Czechoslovakia

[+]The County Institute of National Health,
Třebíč, Czechoslovakia

The leaves of Buxus Harlandi have been investigated for the content of steroid alkaloids. The structures of the separated alkaloids were determined by physical methods and verified by comparison with the authentic specimens.

UMBROSIN - A NEW ALKALOID FROM ACONITUM UMBROSUM

M.S.Yunusov, V.A.Telnov, N.M.Golubev, S.Yu.Yunusov.

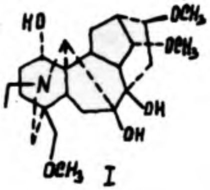
Institute of the Chemistry of Plant Substances,
Academy of Sciences of the Uzbek SSR, Taschkent,
USSR.

From the roots of noninvestigated before species Aconitum umbrosum the alkaloids lycaconitine, antranoil-lycoctonine, ajacin and a new alkaloid named umbrosin with the composition $C_{24}H_{39}NO_6$ and m.p. 150–151^0(hexane), M 437, 2738 have been isolated and the latter's structure was established(I).

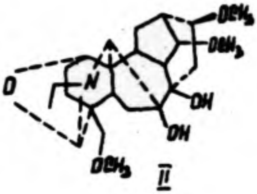
This alkaloid possesses C_2H_5, 3 OH, 3 OCH_3 groups. Its composition and spectral data allowed to regard it as a diterpene alkaloid of a lycoctonine skeleton. Further chemical transformations confirm this proposal. Mass- and - NMR - spectra of I and of its monoacetate are characteristic of the alkaloids of lycoctonine-type with the α-hydroxy group and α-acetoxygroup at C-I.

The presence of α-C_1-OH and methoxymethylene-group at C-4 is confirmed by the mass-spectrum of anhydroxyumbrosin(II). The information on the presence of $HO-\overset{|}{\underset{|}{C}}_7-\overset{|}{\underset{|}{C}}_8-OH$ system and methoxy-group at C-15 was taken from the results of oxidation of this alkaloid with the HJO_4 led to III.

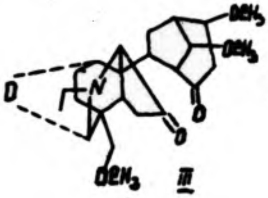
New methods of discovering of the substituents at C-1, C-4 and C-6 were considered.



I



II



III

ISOLATION OF SOME NOVEL ALKALOIDS FROM Fritillaria imperialis L.

I. Mašterová, V. Suchý, J. Tomko

Department of Pharmacognosy and Botany, Faculty of Pharmacy,
Comenius university, Bratislava, Czechoslovakia

Two novel alkaloids were isolated from the bulbs of Fritillaria imperialis L. var. rubra. Both belong to the C-nor D-homo steroid series.

The first alkaloid has the composition $C_{27}H_{45}NO_3$, identical with that of verticine, but it differs in stereochemistry at the position C-22.

The second compound ($C_{27}H_{41}NO_2$) contains a carbonyl group at the position C-6. The absence of Bohlmann bands in its IR spectrum suggests the presence of cis-chinolizidine moiety in the structure of the alkaloid.

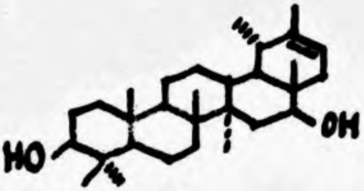
THE CHEMICAL AND SPECTRAL INTERCORRELATION OF PENTACYCLIC TRITERPENE DIOLS OF COMPOSITAE PLANT FLOWERS

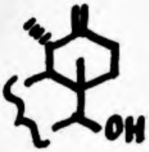
Jan St. Pyrek and Ewa Czyżewska
Institute of Organic Chemistry, Polish Academy of Sciences,
Warszawa, Polska.

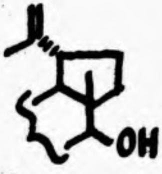
Our previous chemical studies indicated that the triterpene diols: faradiol, arnidiol, calenduladiol and coflodiol are hydroxylated at positions 3β,16β, as it was known for manilladiol and brein. All these compounds are widely distributed in Compositae plant flowers.

Despite of the abnormal back-bone rearrangement due to the influence of the 16-oxygen function it was possible to intercorrelate some of above compounds.

The Exciton Chirality Method used for 3β,16β and 3β,16α dibenzoates gave the alternative, unambigous proof of the same substitution pattern.


faradiol


arnidiol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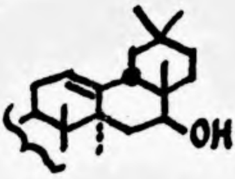
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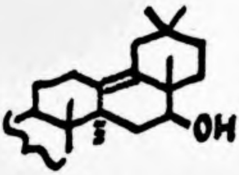
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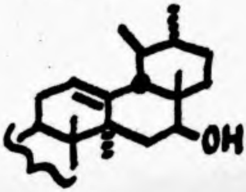
brein

CHEMOTAXONOMIC STUDIES OF LACTARIUS

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The mushrooms of Lactarius genus form a large group of species; about 70 of them are known in Poland. It was very interesting to us to estimate their sesquiterpene contents in regards to furans, mono- and di- hydroxylactones.

Especially purified and chromatographed ethanolic extracts of Lactarius necator, L.terminosus, L.helvus, L.quietus, L.thejogalus, L.subdulcis, L. rufus were subjected to HPLC analysis using Waters μ-Porasil column. The analytical results were confirmed by the subsequent isolation and full comparison of the sesquiterpenes with known standard compounds.

HPLC STUDIES OF THE DISTRIBUTION OF PENTACYCLIC TRITERPENE DIOLS IN COMPOSITAE FAMILY

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Using the efficient separation technique - HPLC on packed μ-Partisil and μ-Porasil - columns the detailed study of the distribution of pentacyclic triterpene diols: faradiol, arnidiol, calenduladiol, coflodiol, brein, manilladiol and tetracyclic triterpene, dammarendiol II was done for more then twenty species.
The chemotaxonomical implications will be discussed in view of the biogenetic sequence: triterpene monoalcohols ⟶ triterpene monoalcohols - 3β - fatty acid esters ⟶ / 16β - hydroxylation / ⟶ 3β - acylated triterpene diols.
The failure of "Zimmermann rule" will be also demonstrated.

THE ABSOLUTE STEREOCHEMISTRY OF LACTARORUFIN A

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Warszawa,Polska

The determination of the absolute stereochemistry of lactarorufin A was carried out with the use of the Exciton Chirality Method. The CD measurements were performed on lactarorufin A benzoate and p-chlorobenzoate. The results of the measurements are discussed on the basis of the well established relative stereochemistry and conformation of lactarorufin A.

THE STRUCTURE ELUCIDATION OF COMPOSITAE PLANT FLOWERS TRITERPENE TRIOLS: HELIANTRIOLS B, B', C, E, F, G and X.

Jan St. Pyrek

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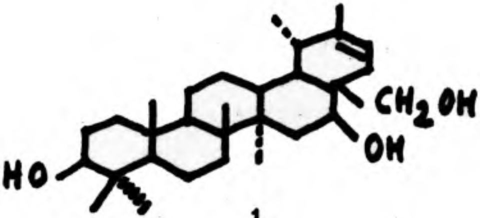
From the lingule flowers of Calendula off. L, and Helianthus annuus L. a series of pentacyclic triterpene triols was isolated.

The elucidation of their structures based on chemical and spectral data will be presented.

heliantriol B	1
heliantriol B'	2
heliantriol C	3
heliantriol E	4
heliantriol F	5
heliantriol G	6



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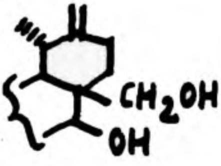

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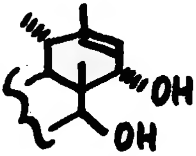

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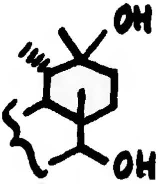

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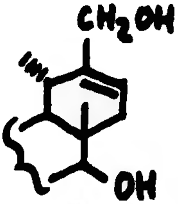

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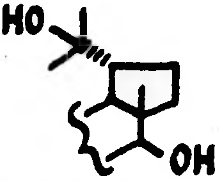

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TRANSFORMATION OF DEHYDROEPIANDROSTERONE WITH THE MUSHROOM Pleurotus ostreatus

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Among numerous Pleurotus species Pleurotus ostreatus was the best in hydroxylating dehydroepiandrosterone differently from other Pleurotus species, and some other Basidiomycetes and common moulds. The pattern of transformation products was dependent on the medium used and the temperature of the cultivation. Large scale transformation was carried out with fruit-body slices in tap water and under aeration. The main product of the transformation was isolated and its structure determined.

NEW DITERPENES FROM *Eupatorium jhanii*

B.M. Fraga, A.G. González, J.M. Artenaga,
J.L. Bretón, M.G. Hernándéz
Instituto de Productos Naturales del CSIC,
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RECENT ADVANCES IN SYNTHESIS OF VELLERAL AND RELATED COMPOUNDS FROM *Lactarius russulaceae*

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NEW 17- SUBSTITUTED DERIVATIVES OF 19-NORTESTOSTERONE

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MECHANISTIC AND PREPARATIVE ASPECTS OF THE REDOX REACTIONS BETWEEN TETRAZOLIUM SALTS AND CORTICOSTEROIDS

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STEREOSPECIFIC PHOTOCHEMICAL SYNTHESIS OF EXO-BREVICOMIN

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SYNTHESIS OF MONOTERPENIC HYDROCARBONS WITH ALLENE STRUCTURE

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CHOLESTEROL AS A STARTING MATERIAL TO THE SYNTHESIS OF LIQUID CRYSTALS

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NEW DERIVATIVES OF CARDIOACTIVE STEROID LACTONES

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SYNTHESIS OF GIBBERELLIN GLUCOSIDES

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OXIDATION OF SOME STEROIDAL EPOXIDES WITH DIMETHYLSULPHOXIDE IN THE PRESENCE OF AIR OXYGEN

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STEREOSELECTIVE SYNTHESES OF SIDE CHAIN HYDROXYLATED CHOLESTEROLS

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SYNTHESIS OF JUVENILE HORMONES ANALOGUES

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SYNTHESIS OF CORTICOSTEROIDAL ANALOGUE OF ECDYSONE

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