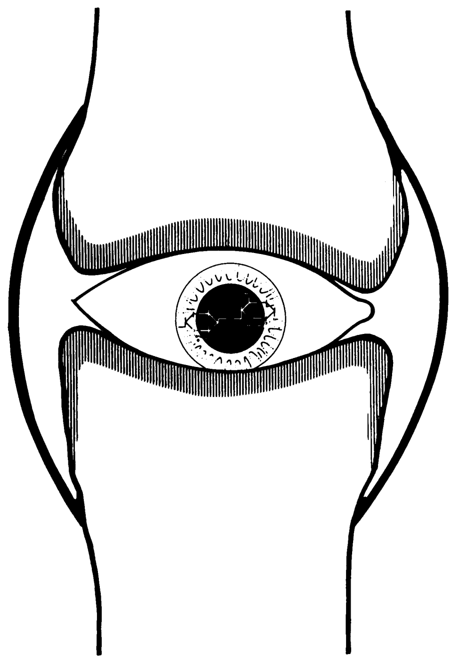
KERATAN SULPHATE

Chemistry, Biology, Chemical Pathology



Edited by

HELMUT GREILING
&
JOHN E. SCOTT

Keratan sulphate is unique, standing at a crossroads, sharing the potential of both typical glycoproteins and typical proteoglycans. In one direction lie immunology, cell development and oncogenesis; in the other, important roles in the ultrastructure and function of cornea, joints and intervertebral discs. This book, the first in the field, is the fruit of the first full international symposium on keratan sulphate. The challenge of new viewpoints produced controversy, but also much common ground; this is revealed by the edited discussions, grouped for continuity, which follow the main sections. The bibliography is collected into one section, providing much of the literature on keratan sulphate in one place.

Contents: **PART I - CHEMISTRY:** Structure of keratan sulphate proteoglycans: core proteins, linkage regions, carbohydrate chains *(Stuhlsatz, Keller, Becker, Oeben, Lennarts, Fisher & Greiling);* Structural and conformational analysis of keratan sulphate oligosaccharides and related carbohydrate structures *(Hounsell);* Discussion. **PART II - IMMUNOLOGY:** Keratan sulphate oligosaccharides, members of a family of antigens of the poly-N-acetyl-lactosamine series *(Feizi);* Studies of keratan sulphates of aorta and cartilage utilizing MAb 6D2 *(Baker);* Detection and purification of corneal keratan sulphate proteoglycan from non-corneal tissues *(Funderburgh & Conrad);* Discussion. **PART III - BIOSYNTHESIS:** Biosynthesis of skeletal and corneal keratan sulphate *(Balduini, De Luca & Castellani);* Keratan sulphate proteoglycans: chemistry and biosynthesis of the linkage regions *(Hascall & Kimura);* Discussion. **PART IV - REGULATION OF BIOSYNTHESIS:** Factors affecting the pathway for the biosynthesis of keratan sulphate *(Mason & Sweeney);* Sulphation, chain elongation and chain termination in keratan sulphate biosynthesis *(Keller, Stuhlsatz & Greiling);* Keratan sulphate: a functional substitute for chondroitin sulphate in O_2 -deficient tissues? *(Scott, Stockwell, Balduini & De Luca);* Discussion. **PART V - DEGRADATION:** Substrate specificity of keratan sulphate-degrading enzymes (endo-β-galactosidase, keratanase and keratanase II) from micro-organisms *(Nakazawa, Ito, Yamagata & Suzuki);* Degradation of keratan sulphate proteoglycans *(Kresse);* Discussion. **PART VI - KERATAN SULPHATE IN THE TISSUES:** The chemical morphology of keratan sulphate proteoglycans *(Scott);* Articular cartilage keratan sulphate: maturation, ageing, biomechanical and scale effects *(Stockwell);* Proteoglycans of mammalian corneal stroma *(Damle & Gregory);* Discussion; Developmental aspects of keratan sulphate *(Cintron, Covington, Kublin, Gregory & Damle);* Keratan sulphate proteoglycans in organ and cell culture *(Dahl);* Discussion. **PART VII -CHEMICAL PATHOLOGY:** Studies of the metabolism of keratan-sulphate-bearing proteoglycans of cartilage *(Thonar, Williams, Sweet, Maldonado, Lenz, Schnitzer & Kuettner);* Serum keratan sulphate in rheumatoid arthritis and different clinical subsets of osteoarthritis *(Seibel, Towbin, Braun, Kiefer, Müller & Paulsson);* Factors affecting the determination of keratan sulphate using monoclonal antibodies in immunoassay procedures *(Caterson, Brooks, Sattsangi, Ratcliffe, Hardingham & Muir);* Discussion; Alterations in the synthesis of keratan sulphate proteoglycan in corneal wound healing and in macular corneal dystrophy *(Hassell, SundarRaj, Cintron, Midura & Hascall);* Distribution of keratan sulphate-containing proteoglycans in human aorta and their possible role in the calcification of aorta *(Greiling, Loffler & Stuhlsatz);* Discussion. *Bibliography. Index.*

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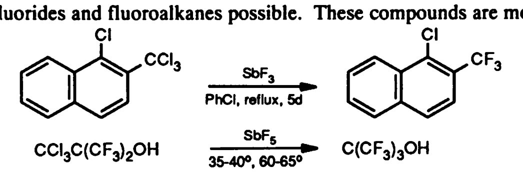
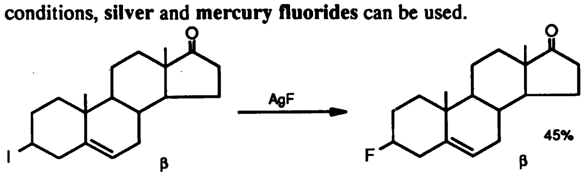
Reagents for Fluorination

Aldrich offers the world's largest range of fluorine-containing products. In addition, we offer many reagents for introducing fluorine into molecules, most of which can be handled safely and easily in standard laboratory glassware. There are four general classes of fluorination reactions, and Aldrich offers reagents suitable for use in each class.[1]

1. Halogen exchange is perhaps the best known method for introduction of fluorine into organic compounds. Pioneering work by Swarts using **antimony fluorides** made the early preparation of benzotrifluorides and fluoroalkanes possible. These compounds are more



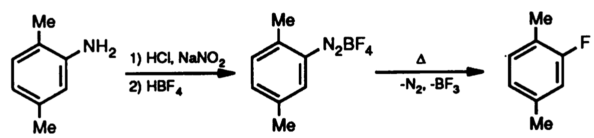
commonly prepared now using large-scale batch or continuous processes employing **HF**. In small-scale reactions needing much milder conditions, **silver** and **mercury fluorides** can be used.



Potassium fluoride offers a readily available source of fluoride ion and is used extensively in so-called 'Halex' reactions to produce good yields of highly fluorinated products. The desire to obtain better yields under milder conditions has resulted in the development of a number of new reagents such as **TBAF, KF/CaF_2** and **TAS-F.**[2]

A new and easy-to-handle source of nucleophilic fluoride ion is **triethylamine trihydrofluoride** ($Et_3N•3HF$). The versatility of this reagent has been demonstrated in halofluorination reactions of alkenes,[3] quantitative opening of epoxides to fluoroalcohols[4] and the fluoride substitution of activated alcohols.

2. Balz-Schiemann reactions are the classical method for introducing fluorine to an aryl nucleus. An arylamine is converted to a diazonium tetrafluoroborate and then decomposed thermally to the aryl fluoride. Improved yields have been reported in some cases using arenediazonium hexafluoroantimonate or hexafluorophosphate intermediates or by photolytic decomposition of the tetrafluoroborate salt.

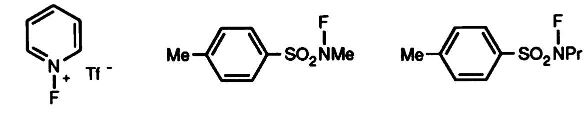


3. Sulfur tetrafluoride and analogs have been used extensively for the conversion of oxygen-containing functional groups to fluorinated substituents. **Sulfur tetrafluoride** itself presents handling and toxicity problems and replacements are continually being sought. Perhaps the best known is **diethylaminosulfur trifluoride** (DAST)[2] which can be used to convert -CHO to $-CHF_2$ and $-CH_2OH$ to $-CH_2F$. Recently, **morpholinosulfur trifluoride**[5] has been reported as a safer alternative to DAST. Other aminosulfur trifluorides are also available.

$$ArCO_2H \xrightarrow{SF_4} ArCF_3 \; ; \; ArCHO \xrightarrow{SF_4} ArCHF_2$$

$$ArCH_2OH \xrightarrow{SF_4} ArCH_2F$$

4. Electrophilic fluorinating agents have been developed as alternatives to elemental fluorine for the selective introduction of fluorine into biologically active molecules. ***N*-Fluoropyridinium triflates** and ***N*-fluorosulfonamides** offer varying fluorination strength by altering the substitution on the molecule.



References:

1) For a more detailed discussion, see Hewitt, C.D.; Silvester, M.J. *Aldrichim. Acta* **1988**, *21*(1), 3.
2) For references, see *Aldrichim. Acta* **1988**, *21*(1), 27.
3) Alvernhe, G.; Laurent, A.; Haufe, G. *Synthesis* **1987**, *6*, 562.
4) *Idem J. Fluorine Chem.* **1986**, *34*, 147.
5) For references, see *Aldrichim. Acta* **1988**, *21*(4), 109.

17,512-9	Antimony pentafluoride	100g $128.80
20,111-1	Antimony trifluoride, 98%	5g $10.00; 100g $21.10; 500g $72.00
14,074-0	Benzoyl fluoride, 99%	25g $22.85; 100g $74.05
19,832-3	Cesium fluoride, 99%	25g $19.90; 100g $58.00
23,525-3	Diethylaminosulfur trifluoride (DAST)	5g $43.40; 25g $133.70
24,821-5	Dimethylaminosulfur trifluoride (methyl DAST)	5g $40.40; 25g $130.60
20,793-4	Fluoboric acid, 48 wt. % in water	25g $10.00; 500g $20.00; 6x500g $88.50
33,483-9	*N*-Fluoro-*N*-methyl-*p*-toluenesulfonamide	1g $16.30; 5g $54.50
33,484-7	*N*-Fluoro-*N*-propyl-*p*-toluenesulfonamide	1g $16.30; 5g $54.50
32,365-9	1-Fluoropyridinium triflate, 99%	250mg $19.60; 1g $54.50
33,926-1	Hydrofluoric acid, 99.99+%	100mL $20.00; 800mL $85.00
18,422-5	Hydrogen fluoride-pyridine	25g $14.30; 100g $35.00
33,932-6	Mercury(II) fluoride, 97%	10g $32.70; 50g $136.20
33,891-5	Morpholinosulfur trifluoride (morph-DAST)	1g $14.00; 5g $45.00
30,759-9	Potassium fluoride, spray-dried, 99%	250g $26.50; 1kg $79.00
31,663-6	Potassium fluoride, 20 wt. % on CaF_2	25g $12.30; 100g $32.10
23,928-3	Potassium hydrogen fluoride, 99%	25g $10.00; 500g $11.70; 2.5kg $42.40
20,092-1	Silver difluoride, 98+%	10g $49.80; 50g $184.00
22,686-6	Silver(I) fluoride, 99%	5g $27.10; 25g $100.80
24,151-2	Tetrabutylammonium fluoride hydrate, 98% (TBAF)	10g $18.40; 100g $125.10
34,464-8	Triethylamine trihydrofluoride, 98%	5g $7.00; 25g $22.00
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