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Outline of Strontium Monograph
(First Revision)

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I. Introduction

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II. Naturally - occurring levels of Strontium

A. Sea Water
B. Fresh Water
C. Lithosphere
D. Fossils
E. Plant
F. Animals
G. Biogeochemical Aspects of Strontium

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III. Isotopes of Strontium and Calcium

A. Properties of the Nuclides

1. Mass characteristics
2. Radioactive properties, e.g., half-life, decay scheme, type and energy of radiation, etc.
3. Other properties

B. Naturally-occurring Isotopes of Strontium and Calcium.

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1. Frequency of isotopes distribution
2. Geological aspects of isotopes of strontium and calcium.

IV. Chemical and Physical Properties of Strontium and Calcium.

A. Physical Properties
B. Chemical Reactions of Alkaline Earth Group
C. Solubility of Strontium and Calcium Salts
D. Ionization Constants of Strontium and Calcium Complexes.
E. Other Properties

V. Analytical Procedures for Strontium and Calcium.

A. Methods of Separation

1. Solubility procedures
2. Paper chromatography
3. Column chromatography

a. Adsorption
b. Ion exchange

4. Miscellaneous

a. Electro-chromatographic
b. Thermal decomposition

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B. Quantitative Determination

1. Gravimetric methods
2. Titrimetric methods
3. Photometric procedures
4. Electroconductance methods
5. Activation analysis
6. Miscellaneous methods

C. Tissue Analyses for Calcium

1. Bones
2. Serum and Urine
3. Soft Tissues
4. Feces
5. Plant Materials

D. Radioassay for Strontium Isotopes

1. Sr^{85}, Sr^{89}, Sr^{90}- Y^{90}
2. Low-level counting

E. Radioassay for Calcium Isotopes

1. Ca^{45}
2. Ca^{45}

F. Autoradiographic Procedures for Calcium and Strontium

1. General discussion
2. Bone
3. Soft Tissues
4. Plant Materials

G. Histochemistry of Strontium and Calcium.

H. Animal Handling

I. Plant Handling

VI. Theoretical Concepts of Strontium and Calcium Metabolism

A. Competitive Compartments for Ca and Sr (bone, kidney, tissues, endogenous).

B. Concepts of Bone Metabolism

1. Adsorption
2. Ion exchange
3. Growth

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C. Hormonal and Vitamin Interactions

1. Vitamin D
2. Vitamin A
3. Parathormone
4. Cortisone
5. Others

D. Plant Metabolism

1. Soil-plant relations
2. Adsorption
3. Absorption
4. Translocation
5. Localization of Sr and Ca in specific areas.

VII. Metabolism of Sr in Mammals

A. Absorption and Excretion

1. Species differences
2. Effect of age
3. Variables

a. Level of Ca and/or Sr in diet
b. Vitamin effects
c. Other factors: milk, chelating agents, phytates, oxalates.

4. Urinary vs. fecal excretion
5. Excretion patterns vs. body burden

B. Skelatal Metabolism of Sr

1. Time Patters of Accumulation and Removal of Sr.

a. Initial exchange and adsorption
b. Subsequent accretion and crystallization

2. Utilization of Sr for Bone Growth
3. Localization of Sr in Different Bone Areas

a. Autoradiographic patterns including age, dose level, and species effects

4. Availability of Deposited Sr for Removal
5. In vitro Studies with Cartilage and Bone.
6. Others

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C. Milk Secretion of Sr

VIII Metabolism of Sr in Plants and Algae.

A. Plants

1. Absorption

a. Effects of Ca and Sr level in soil
b. Effect of ion exchangers.
c. Effect of nutritive status

2. Translocation
3. Localization (autoradiograms)
4. Utilization for biochemical processes.

B. Algae, Fungi, Bacteria

1. Chlorella studies
2. Brown algae studies
3. Rhizopus nigricans

IX. Metabolism of Sr in Lower Animal Forms

X. Comparative Metabolism of Ca and Sr

A. Vertebrate.

1. Absorption from gastrointestinal tract
2. Bone adsorption
3. Bone accretion
4. Milk secretion
5. Urinary excretion
6. Endogenous excretion

B. Invertabrates

1. Fossil data
2. *In vitro* studies of Odum

C. Plants, algae, bacteria

XI. Radiotoxicity of Sr

A. Mammals

1. Lethal and toxic levels including estimated LD_{50}.
2. Hematological effects.
3. Bone tumur formation
4. Pathology

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B. Plants

1. Lethal and toxic levels
2. Irradiation effects

C. Decontamination procedures

XII. Massive Dose Effects of Sr

A. "Strontium Rickets"

B. Toxicity of High Levels of Sr.

C. Teeth and Bone Growth

XIII. Effect of Strontium on Biological Systems

A. Effects on Blood
B. Effects on Parathyroid and Other Endocrine Glands
C. Effects on Enzymes
D. Effects on Nerves
E. Effects on Respiration
F. Miscellaneous Effects

XIV. General Discussion

XV. Summary

XVI. References

XVII. Index

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