

the lower the phosphate concentration is in the surroundings, even in the presence of O_2 . If such an organism exists, and can be found, it would solve what now seems to be riddle No. 1 in the regulation of the present composition of air and seawater.

Detailed calculations, and discussion will be published elsewhere.

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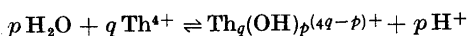
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Studies on the Hydrolysis of Metal Ions. 53. Preliminary Note on the Hydrolysis of Thorium(IV)

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The hydrolysis of thorium has been studied by many authors, with varying results. (For detailed references see the IUPAC tables of Stability Constants).¹ We shall write, as usual, β_{pq} , for the equilibrium constant of



and denote the complex as the (p,q) complex. Schaal, Faucherre and Souchay² deduced that (8,4) is the predominating complex from freezing-point and glass electrode data. Hietanen³ suggested, as an approximation, a series with $(3n, n+1)$. In solutions with 0.5 and 0.7 M Th^{4+} self-medium Hietanen and Sillén found evidence for (1,2) and (2,2). Kraus and Holmberg⁵ from glass electrode data concluded that the mononuclear (1,1) and (2,1), the binuclear (2,2), and in addition other,

undesignated complexes exist. Lefevbre,⁶ from the same data, calculated the equilibrium constants for (2,1), (2,2) and (12,5) and found evidence for a heptanuclear complex (18–21,7).

The generalized least squares program LETAGROP has recently been improved by Ingri and Sillén,⁷ and provided with procedure, MIKO for elimination of negative formation constants.

In the last few years, we have collected data on thorium hydrolysis, using the improved techniques (for instance coulometry for the lowest Th concentrations) which have been developed in this laboratory especially by Georg Biedermann. The medium has been 3 M NaCl and the temperature 25°C. Preliminary LETAGROP calculations have been made on these new data, which cover a range of total concentration B of Th from 0.0001 M to 0.100 M. The calculations are not yet completed, but we think some preliminary results may be of interest. We found the following equilibrium constants, with the standard deviations σ :

$$\begin{aligned} 10^{10}\beta_{21} &= 8.9 \pm 2.9; 10^3\beta_{12} = 2.24 \pm 0.81; 10^5\beta_{22} = 1.98 \pm 0.07; \\ 10^9\beta_{32} &= 1.47 \pm 0.22; 10^{37}\beta_{14,6} = 2.96 \pm 0.39; 10^{41}\beta_{15,6} = 4.28 \pm 0.69. \end{aligned}$$

The computer has rejected the following complexes, which thus do not lead to any improvement in the interpretation of the present data: (1,1), (6,3), (8,4), (9,4), (11,5), (12,5), (16,6), (17,7) and (20,8). If we transform to logarithms and give 3 σ we get the following preliminary values:

$$\begin{aligned} \log \beta_{21} &\approx -9.1 (< -8.7); \log \beta_{12} \approx -2.65 (< -2.33); \log \beta_{22} = -4.70 \pm 0.05; \\ \log \beta_{32} &= -8.83 \pm 0.21; \log \beta_{14,6} = -36.53 \pm 0.19; \log \beta_{15,6} = -40.37 \pm 0.23. \end{aligned}$$

As far as the calculations have now proceeded the data seem to indicate, besides the mononuclear $Th(OH)_2^{2+}$, three binuclear complexes (1,2), (2,2) and (3,2), and two hexanuclear complexes, (14,6) and (15,6). Thus a group of six Th atoms seems to be stable, just like groups of 7 Mo, or 6 Nb, or 10 V, which have all proved to exist in several states of protonation. Georg Lundgren⁸ has found octahedral "(12,6)" complexes $Ce_6O_4(OH)_4^{12+}$ and $U_6O_4(OH)_4^{12+}$ in the crystal structures of sulfates. It seems likely that the Th atoms form similar octahedra, and one need not be surprised if the state of protonation is different in the sulfate crystals from that in our solutions.

A full report of the data and the complete calculations will be published in due time. This work has been supported by *Statens naturvetenskapliga forskningsråd* (Swedish natural science research council). We wish to thank Dr. Georg Biedermann for helpful advice in the experiments.

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Fatty Acid Esterification in Man during Fat Absorption

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Previous studies in man have demonstrated that dietary cholesterol is largely absorbed through the lymphatics and that the major portion is esterified during the absorption phase.¹⁻³

During the investigation of the effect of the dietary fatty acids on the fatty acid composition of the lipids in the thoracic duct lymph in man, it was noted by Blomstrand and Dahlbäck that the lymph triglycerides and the cholesterol esters were highly influenced by the dietary fat.¹ In animal studies good evidence has been reported to support the theory that endogenous and exogenous cholesterol passes into the intestinal mucosa as free chole-

sterol and there becomes esterified with certain long chain fatty acids.⁴⁻⁶

Experiments in rats have shown that the chylomicron cholesterol ester formation has a specificity for oleic acid relative to the other fatty acids tested.⁷ On the other hand, chylomicron triglyceride formation showed no specificity for one fatty acid relative to another with the exception of slight discrimination against stearic acid.

This paper gives a report of investigations conducted in man in order to study the fatty acid specificity of the mechanisms involved in the lymph cholesterol esters and triglyceride formation during fat absorption. The distribution of mass and radioactivity in the fatty acids of cholesterol esters and triglycerides of human thoracic duct lymph is given after feeding a mixture of ¹⁴C-labelled palmitic, oleic and linoleic acid as free acids. The results indicate strongly that in man there is a preferential incorporation of oleic acid into lymph cholesterol esters relative to other fatty acids tested.

Experimental. The patient in this study was a forty-eight year old woman with a previous operated breast cancer and with pulmonary metastases. She had no signs of gastrointestinal dysfunction. She was in good condition during this study. In connection with scalene lymph node biopsy the thoracic duct was cannulated with a polyethylene tubing. After fasting overnight the patient was fed a liquid formula meal containing 15 μ C palmitic acid-1-¹⁴C + 2 g palmitic acid, 15 μ C oleic acid-1-¹⁴C + 2 g oleic acid and 15 μ C linoleic acid-1-¹⁴C + 2 g linoleic acid together with 18 g of egg white and 20 g of dextrose mixed in 150 ml of water. (The labelled material was obtained from Radiochemical Centre, Amersham, England.)

The lymph was collected for one hour periods in plastic containers. The lipids were extracted with chloroform:methanol 2:1 and were separated into their various lipid classes by a combination of column and thinlayer silicic acid chromatography.⁸

A preparative Pye argon chromatograph equipped with a strontium detector and a pyrex glass splitter was used. The glass splitter was connected by means of silicon rubber fittings to a stainless tube filled in the first section with copper oxide and in the second section with reduced iron. The stainless tube was heated to 800°C by means of an electronically controlled furnace. The radioactivity of the ¹⁴CO₂ peak was assayed by a 10 ml internal flow proportional counter⁹ at room tem-