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## METALLIC COMPLEXES OF HYDROXYLATED DERIVATIVES OF VITAMIN D<sub>3</sub>

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As far as we know, very few complexes have been studied using vitamin D or its hydroxylated derivatives as ligands. Barton and Patin used vitamin D<sub>2</sub> (ergocalciferol) to obtain iron carbonyl complexes through the trien system (1) and the same authors synthesized palladium chloride  $\pi$  allyl complexes with calciferol, ergosterol, 3-*epi*-ergosterol and 7-dehydrocholesterol (2). In addition Qitao, using a pH metric method at a constant ionic strength (0.1 mol.l<sup>-1</sup>) concluded that both Ca<sup>II</sup> and Cd<sup>II</sup> give 1:1 (metal:ligand) and 1:2 complexes (3). In this paper, we describe the CoCl<sub>2</sub>:Vit D<sub>3</sub> (or its hydroxylated derivatives) system in aqueous NaCl solutions (9 g.l<sup>-1</sup>) at constant ionic strength of 0.3 mol.l<sup>-1</sup>. The choice of the cobalt as centre of coordination was made because its cation is the central element in vit B<sub>12</sub>. In order to determine the composition of the occurring complexes we have applied the continuous variations method for qualitative determinations (4).

### Experimental

It is well known that vit. D<sub>3</sub> and analogues are not very stable when exposed to air or light, consequently, the solutions were always prepared just before recording spectra. The vit. D<sub>3</sub> or its hydroxylated derivatives were first dissolved in methanol (2.5 cm<sup>3</sup>) under dinitrogen atmosphere and further diluted in 50 cm<sup>3</sup> of sodium chloride solution. The cobalt solution was prepared in the same way in order to obtain the same molarity of the two solutions. The spectra were recorded at 25 °C (298 K) with a *Hitachi U 2000* spectrophotometer.

### Results and discussion

#### *Composition of the complexes*

To draw the curves for the continuous variations we have determined the corrected absorbance  $A_{\text{corr}}$  (5, 6) in order to keep only the spectrum of the complex species ( $m$  is related to the metal and  $v$  to the cholecalciferol) :

$$A_{\text{corr}} = A_{\text{exp}} - (C_m \epsilon_m + C_v \epsilon_v) \quad (\text{where } \epsilon \text{ is the molar extinction coefficient})$$

As the aqueous solutions of cobaltous chloride present a very weak absorption in the visible region because of their low molarity, it can be assumed that  $\epsilon_m \approx 0$ . Thus the chosen wavelengths were around the maximum absorption band of the vitamin D<sub>3</sub> or its derivatives. The figure 1 presents the curves obtained with 24R,25-dihydroxyvitamin D<sub>3</sub>. All the ligands give 1:1 and 1:4 type complexes.

#### *Estimated overall stability constants*

The overall stability constants at 298 K were estimated assuming that at a given wavelength, the observed absorption is due to the free ligand only. The logarithmic values of the overall stability constants,  $\log \beta$  are tabulated below.

LIGAND	$\lambda_{\max}$ (nm)	1:1 type	1:4 type
25 (OH) D <sub>3</sub>	250	$4.7 \pm 0.2$	
1 $\alpha$ ,25 (OH) <sub>2</sub> D <sub>3</sub>	283	$3.6 \pm 0.4$	$16.7 \pm 0.2$
24R,25 (OH) <sub>2</sub> D <sub>3</sub>	301	$4.3 \pm 0.4$	$17.3 \pm 0.4$

### Proposed structures

As the complex species are soluble in aqueous solutions, the hydrophilic moiety of the ligands should be in the outer part of the complex. Therefore, the only coordinating atom is the oxygen of the OH in 3, as shown in figure 2.

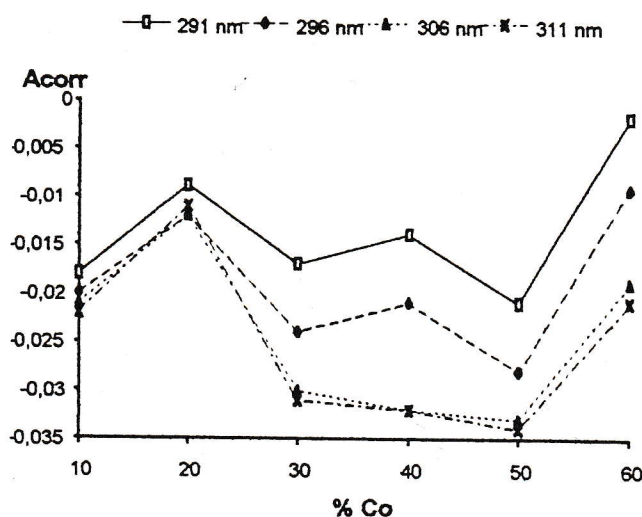


Fig.1 : Continuous variations for 24,25 (OH)<sub>2</sub> D<sub>3</sub>.

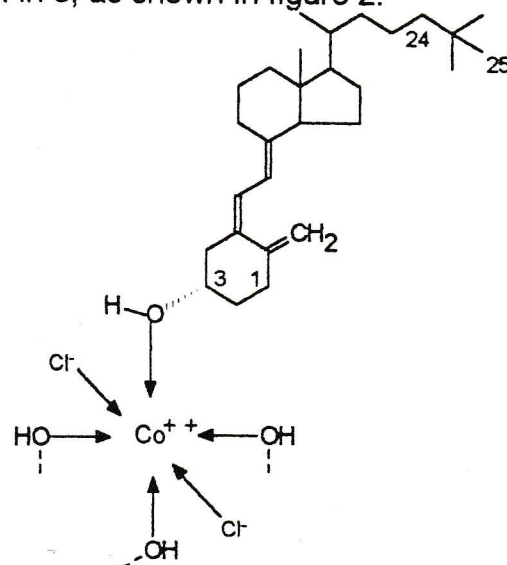


Fig. 2 : Proposed structure for 1:4 type complex.

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