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C3-epimer of 25-hydroxyvitamin D_3 in maternal-cord dyads

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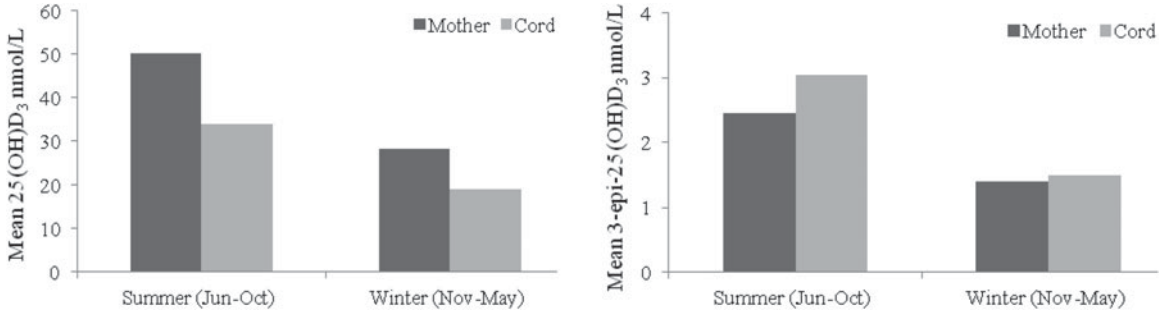
Circulating total serum 25-hydroxyvitamin D (25OHD) is the most appropriate biomarker for the assessment of vitamin D status. Total 25OHD is the sum of $25OHD_2$ and $25OHD_3$ in serum. While the C3 epimer of $25OHD_3$ (3-*epi*-$25OHD_3$) has been detected in serum from adults and infants[1,2], very little is known about the bioactivity of the 3-epi series of vitamin D structural analogs. As a result, 3-*epi*-$25OHD_3$ is not included in the calculation of total 25OHD in serum. The aim of this study was to quantify 3-*epi*-$25OHD_3$ concentrations in maternal-cord dyads around the time of delivery. A total of 82 cord blood samples were collected and within a week of delivery, matched maternal samples were drawn. Serum $25OHD_2$, $25OHD_3$, and 3-*epi*-$25OHD_3$ were extracted, separated and quantified using an LC-MS/MS method, which is traceable to the US National Institute for Standards and Technology (NIST) higher order reference measurement procedure[3].

Mean (SD) of maternal and cord serum $25OHD_3$ concentrations were 38.2 (21) and 25.4 (15) nmol/L, respectively ($P<0.001$). 3-*epi*-$25OHD_3$ was detected in all maternal and cord samples and while there was no significant difference between them ($P = 0.056$), cord 3-*epi*-$25OHD_3$ concentrations were 118% of maternal levels on average. The relative percentage of 3-*epi*-$25OHD_3$ over $25OHD_3$ was significantly higher in cord samples ($P<0.001$), see table.

		Mean	SD	Median	25th	75th	Min	Max
3-epi-$25OHD_3$ (nmol/L)	*Cord*	2.2	1.7	1.7	1.0	2.8	0.3	8.4
	Mother	1.9	1.1	1.7	1.1	2.5	0.4	5.5
Percentage 3-*epi*-$25OHD_3$ over $S25OHD_3$	*Cord*	8.8	4.0	9.9	5.1	11.5	1.0	15.8
	Mother	5.1	1.4	4.9	3.9	5.9	2.3	9.0

Levels of 3-*epi*-$25OHD_3$ in mothers and cords tracked the seasonal variation in $25OHD_3$, see Figure. There were strong associations between maternal and cord concentrations of $25OHD_3$ ($r = 0.868$) and the 3-*epi*-$25OHD_3$ ($r = 0.672$), (both $P<0.001$). In mothers, the association between serum $25OHD_3$ and the 3-*epi*-$25OHD_3$ was $r = 0.902$ and in cord serum was $r = 0.782$ (both $P<0.001$).



The ubiquitous presence of 3-*epi*-$25OHD_3$ in human serum, the strong correlation with $25OHD_3$, and the relatively large proportion of the epimer in cord blood are of interest. Although the concentrations of 3-*epi*-$25OHD_3$ are not currently included in the estimate of total 25OHD, separate quantification of the epimer might be especially important for infants to provide a more complete estimate of total serum 25OHD concentrations, should the epimer have biological function and clinical significance.

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