PRENATAL HEALTH

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MOTHER PROVIDES DHA AND ARA DURING TWO IMPORTANT PERIODS OF LCPUFA ACCUMULATION BY HER OFFSPRING

Synthesis of DHA and ARA From Precursor 18-Carbon Fatty Acids is Very Poor



Preformed

DHA and ARA are selectively transported across the placenta



Preformed

DHA and ARA are in Human Milk and US Formulas since 2002

USUAL DHA INTAKE AROUND THE WORLD

WHO/FAO/ISFFAL recommend 200-300mg for all adults but at least 200 mg/day for pregnancy and lactation



Poudel-Tandukar 2011; Lakin 1998; Innis 2003; Helland 2001; Benisek 2000

HIGHER MATERNAL DHA STATUS IN PREGNANCY IS LINKED TO:

- Lower infant distractibility (cognitive function) and other evidence of higher cognitive function to age 3 y
- Reduction in very preterm birth
- Autonomic nervous system
- Improves tolerance to stress (mom and baby)
- Reduces wheeze/asthma
- Programs offspring for lower BP with overweight
- Higher fat free mass at 5 years

Distractibility: 12 mo, 18 mo, 2 yr, 2.5 yr



FOUR CLINICAL TRIALS FIND LOWER <u>EARLY</u> PRETERM DELIVERY WITH DHA OR EPA SUPPLEMENTATION

TRIAL	Ν	DHA/EPA (g)	Subject selection	Delivery <34 wks (% Cont/Supp)
Bulstra-Ramakers 1994	64	0/3.0	Selected for IUGR +/- PIH in a previous pregnancy	19.3 vs 9.4
Olsen 2000	797	0.9/1.3	Substudies of twins, or preterm delivery, IUGR, PIH in a previous pregnancy	14.9 vs 10.6
Makrides* 2010	2399	0.8/0.1	Selected from healthy women carrying singleton	2.25 vs 1.09
Carlson** 2013	301	0.6/0	Selected from healthy women carrying singleton	4.8 vs 0.6

*Just finished recruitment for ORIP (n=5544) **We have recruited n=270 of ~n=1260 for ADORE

ESTIMATED PUBLIC HEALTH SIGNIFICANCE IF ALL US PREGNANT WOMEN TOOK 600 MG/D DHA

- Post hoc analysis of hospitalization for delivery and the year following delivery of the 197 mothers-infants in KUDOS who delivered at the University of Kansas Hospital:
- Showed a savings of \$1484/dyad with DHA supplementation including the cost of supplementation
- Extrapolating to nearly 4 million deliveries per year suggest a possible savings to the US health care system of up to \$6 Billion with universal supplementation <u>for hospitalization</u> <u>costs alone.</u>

Shireman et al., PLEFA 2016

WHEEZE/ASTHMA IN CHILDREN EXPOSED TO DHA IN UTERO *Bisgaard et al., NEJM, December 2016

	NEJM (COPSAC)*	KUDOS (unpublished)
Location	Copenhagen	Kansas City
# Children	695	231
# (%) Black children	Unknown	72 (31%)
Start DHA Supplement	24 wks gestation	14 wks gestation
Daily DHA Dose	2.4 g (888 mg DHA)	600 mg DHA
DHA/placebo	Fish Oil/olive oil	Algal oil/soy-corn oils
Duration of follow up	5 years	6 years
Wheeze/asthma	16.9 vs 23.7% (p=0.035)	18.6 vs 24.5% (p=0.270)
Effect size similar	28.7% decrease	24.1% decrease

HOPE TRIAL: FETAL HEART RATE VARIABILITY FROM 24 – 36 WEEKS GA



Fetal overall HRV (log SDNN) and short-term HRV (log RMSSD)

Gustafson et al., PLEFA 2013

DHA AND MATERNAL PERCEIVED STRESS IN BLACK WOMEN



Keenan et al., Ob Gyn 2014; 124:1080-1087.

DHA Supplementation in Black Women and Birth Weight



F (1,40) = 6.09, p = .018, cohen's d = .77, controlling for gestational age; n for placebo = 13; n for active =30; error bars represent standard error for the mean within each group

Psychoneuroendocrinology, Volume 71, 2016, 170–175

INFANT CORTISOL RESPONSE TO STRESSOR



Psychoneuroendocrinology, Volume 71, 2016, 170–175

SYSTOLIC BLOOD PRESSURE (MM HG)



Group x weight status x age interaction (P<0.001).

Overweight/obese children in the placebo group had significantly higher SBP than overweight/ obese children of DHAsupplemented women.

*Weight status at 5 years; Manuscript in preparation

DIASTOLIC BLOOD PRESSURE (MM HG)



Group x weight status x age interaction (P<0.001).

Overweight/obese children in the placebo group had significantly higher DBP than overweight/ obese children of DHAsupplemented women.

*Weight status at 5 years, Manuscript in preparation

AIR DISPLACEMENT PLETHYSMOGRAPHY

measures fat mass and fat free mass by volume of air displaced – results equivalent to underwater weighing but more convenient





Bod Pod[™]

DHA (3-WAYS OF LOOKING AT DHA EXPOSURE) AND 5-Y BODY COMPOSITION AJCN (in press)

Dependent	Independent variable			
variable	DHA Status Indicator			
		β	95% CI	P-value
Fat free	DHA group vs. placebo			
mass (kg)	(Intent-to-treat)	4.14	-0.29 to 8.58	0.067
Fat free mass (kg)	Maternal RBC DHA at delivery (%)	1.00	-0.00 to 2.00	0 052
		1.00	0.00 to 2.00	0.052
Fat free mass (kg)	Change in maternal RBC DHA (%)	I.28	0.33 to 2.23	0.0088



Go trials (catch a fish) = 74% of trials n=51

No-Go trials (do NOT catch the shark) = 26% of trials n=18

Liao et al., Devel. Sci 2016





N2; related to response inhibition or conflict monitoring P2 and P3; response inhibition

SUMMARY

- Lower infant distractibility (cognitive function) and other cognitive: benefits up to ~ 3 yrs
- Reduction in very preterm birth
- Autonomic nervous system suggested by early results
- Improved tolerance to stress (mom and baby) suggested by early results
- Reduces wheeze/asthma
- Programs offspring for lower BP with overweight
- Higher fat free mass at 5 years