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# Maternal intake of fish oil during pregnancy and blood pressure in the 19 year old offspring

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The Power of Programming

08-05-2010

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# Background

## N-3 Polyunsaturated fatty acids (PUFA)

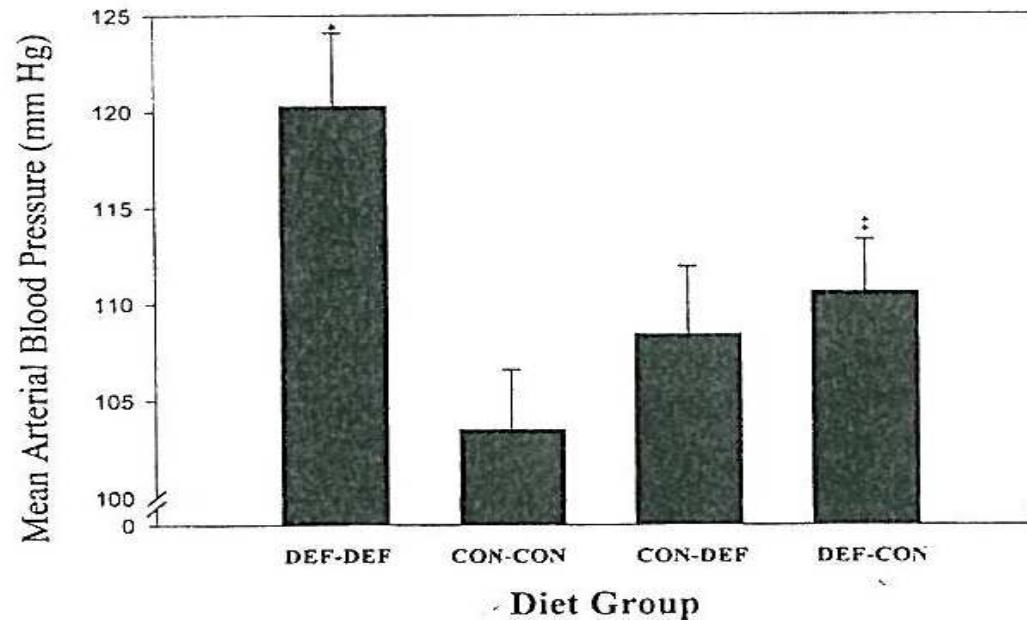
- Essential fatty acids
- Long chain n-3 PUFA mainly found in fatty fish
  - Docosahexaenoic acid (DHA)
  - Eicosapentaenoic acid (EPA)

# Background

## Fetal Programming and N-3 PUFA

- Important constituent of cell membranes
  - Development of different tissues
  - Function of membrane bound receptors and channels
- Precursor of hormones/secondary messengers.
- Energy reserve (adipose tissue)

# Programming of blood pressure and N-3 PUFA



**FIG. 1.** Effect of dietary fatty acid supply on mean arterial blood pressure. Groups are labeled according to the diets consumed before and after 9 wk of age. Diets were semisynthetic premixtures, either supplemented (CON) or deficient (DEF) in n-3 polyunsaturated fatty acids (see Table 1 for details). \*Significantly higher than all other groups ( $P < 0.05$ ); ‡significantly higher than CON-CON ( $P < 0.05$ ).

**DEF=PUFA  
deficient  
diet**

**CON=PUFA  
containing  
diet**

*Armitage et al.  
Lipids. 2003  
Apr;38(4):459-64*

# Programming of blood pressure and N-3 PUFA

**Table 5** Blood pressure (mm Hg) at age 6 years in children who as infants had been randomised to be fed with formula supplemented with long chain polyunsaturated fatty acids or with formula without supplementation

Blood pressure	Supplemented formula (n=65)	Formula without supplementation (n=71)	Mean difference (95% CI)	P value
Mean	74.8	77.8	-3.0 (-5.4 to -0.5)	0.02
Diastolic	57.3	60.9	-3.6 (-6.5 to -0.6)	0.018
Systolic	92.4	94.7	-2.3 (-5.3 to 0.7)	0.132

*Forsyth et al. BMJ. 2003 May 3;326(7396):953.*

# Hypotheses

**Fish oil supplementation during pregnancy  
decreases blood pressure in the 19-20  
year old offspring**

# Randomized controlled trial from Aarhus 1990

- 533 healthy women in third trimester
- Randomised to fish oil (2.7 g n-3 LCPUFA/day), olive oil or no oil (2:1:1)
- Dietary interview before and after delivery

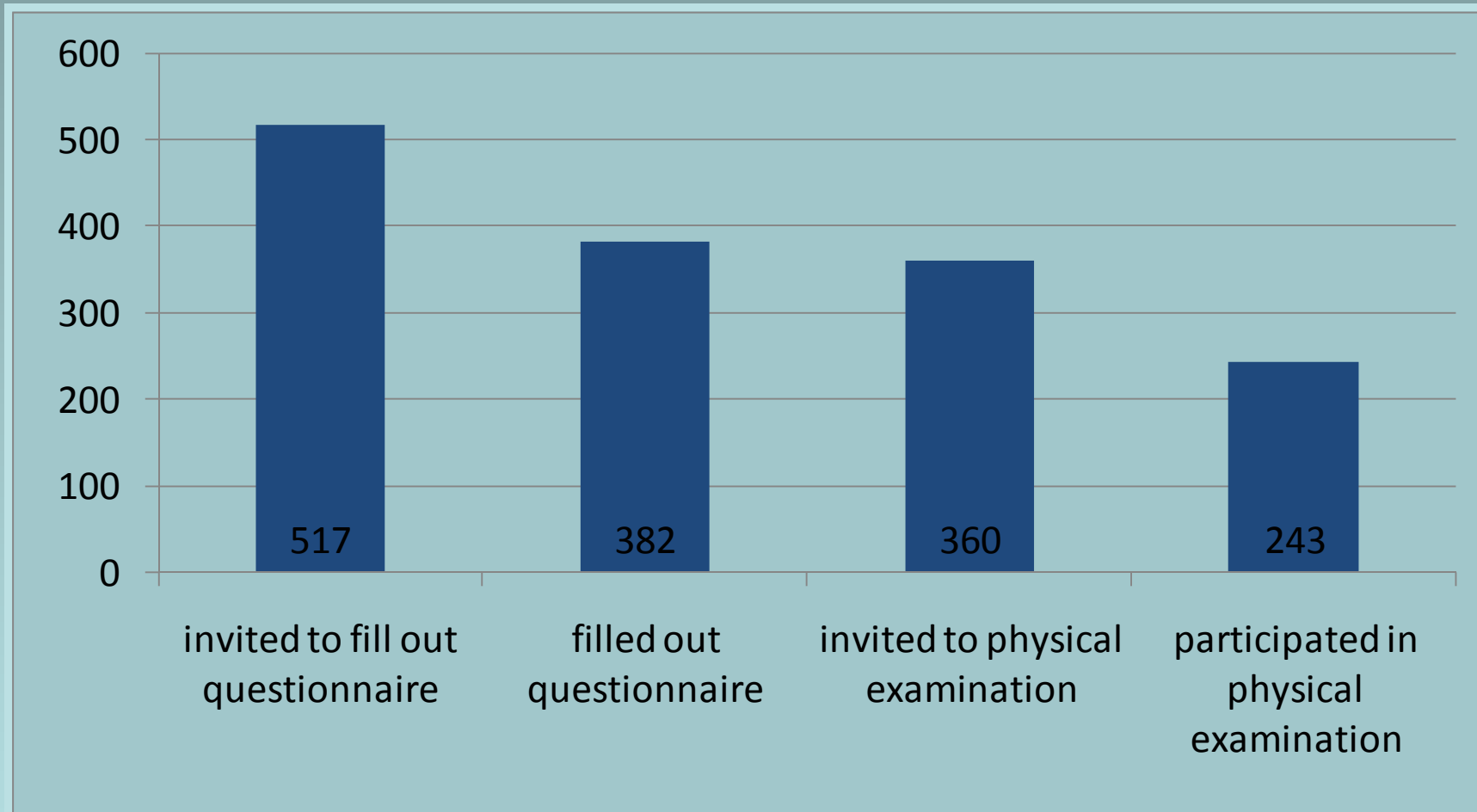
# Follow-up

- 18-19 year old offspring from the randomized controlled trial (n=517)
  - Web-based questionnaire
    - Health
    - lifestyle
  - Physical examination
    - Anthropometry
    - Blood pressure and HRV
    - Blood and urin sampling

# Blood pressure measurements

- 7 minutes rest
- Measured with automatic blood pressure device 3 times (2 minutes in between)
- Mean of the last two measurements used in the analysis

# Participation



# Results

## RCT: Systolic blood pressure

Exposure	Mean Systolic blood pressure (mmHg) (SD)	*Difference in systolic blood pressure (mmHg) (SE)	95% Confidence Interval
Fish oil (n=108)	108.71 (9.64)	-0.48 (1.47)	-3.38-2.41
Olive oil (n=72)	109.19 (9.63)	ref	-
No oil (n=63)	109.02 (10.49)	-0.17 (1.73)	-3.60-3.25

\*Crude difference in blood pressure compared to olive oil

# Results

## RCT: Diastolic blood pressure

Exposure	Mean Diastolic blood pressure (mmHg) (SD)	*Difference in diastolic blood pressure (mmHg) (SE)	95% confidence interval
Fish oil	63.69 (5.75)	1.12 (0.87)	-0.60-2.84
Olive oil	62.56 (5.70)	ref	-
No oil	64.21 (6.28)	1.64 (1.03)	-0.40-3.68

\*Crude difference in blood pressure compared to olive oil

# Conclusion

Fish-oil supplementation during third trimester of pregnancy does not influence offspring blood pressure in adolescence

# Co-Workers

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- Bodil Hammer Bech, MD, Ph.D.
- Erik Berg Schmidt, professor, dr.med.
- Jeppe Hagstrup Christensen, Professor, dr. med.

# Acknowledgement

- EARNEST
- NIH
- The Strategic Research Council
- The Danish Heart Foundation
- The Danish Diabetes Foundation
- The Novonordisk Foundation
- The Aase and Ejnar Danielsens Foundation

