

# Biomarkers of brain health

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Christian A. Drevon, professor, MD, PhD

Dept Nutr, University of Oslo (UiO) &  
Vitas Ltd, Oslo Science Park, Norway



**Vitas** ([www.vitas.no](http://www.vitas.no)) analytical contract laboratory, spun out of UiO

- 26 years of existence
- 23 employees & 35 robots
- 5 with PhD & 5 analytical chemists
- Extensive experience with biomarkers on dried blood spots (DBS)

# Keep your brain healthy

1. Mental stimulation
2. Physical exercise
3. Improve your diet
4. Low blood pressure
5. Low blood sugar
6. Low cholesterol
7. Low-dose aspirin?
8. Avoid tobacco
9. Don't abuse alcohol
10. Care for your emotions
11. Protect your head
12. Build social networks

<https://www.health.harvard.edu/mind-and-mood/12-ways-to-keep-your-brain-young>

CAD2

- Get & give stimulation (1, 10, 12)
- Exercise (2, 4)
- Diet (3-6)
- Drugs (8-9)
- Head protection (11)
- Sleep



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**Healthy for the heart & body -->  
healthy the brain!**

# Today's blood analyses

- Visit doctor's office
- Large volume ~ 10 mL
- Expensive & slow response
- Disease-oriented; no lifestyle & nutrition
- Contamination risk
- Require special delivery



# Fingertip sample: dried blood spots (DBS)

- Blood drop (50 uL) on paper
- Regular mail
- Analyses: ELISA, mass spectrometry, chromatography
- The consumer takes the sample without health personnel
- Stable samples on special paper



# Some biomarkers of brain health

- **Vitamin D**; low associated with thin cortex
- **Cholesterol**; vessel health
- Fatty acids (**n-3**); structures & signals
- **HbA1c** glycated haemoglobin, marker of diabetes (chronic plasma glucose conc)
- **Cytokines**; signals from or to the brain
  - BDNF
  - Inflammation; eg IL6, CRP
- **Lipids**; screening & heart health, DAG (36:2) reduced with sleep loss
- A few examples are presented in the next slides

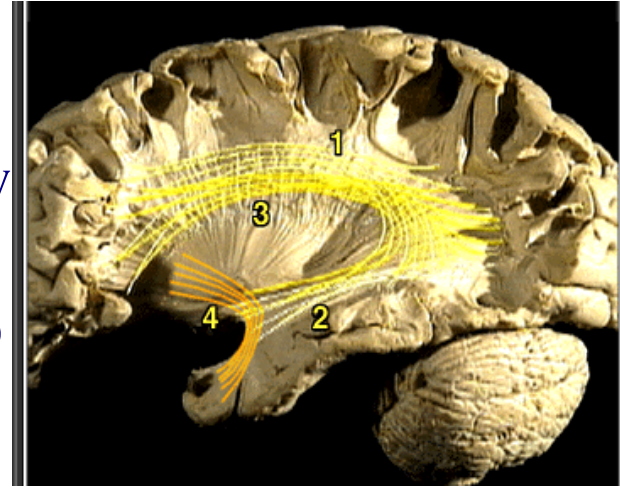
# Magnetic Resonance Imaging (MRI)

- MR at term & 5 months corrected aged
- Feed & wrap
- Noise protection
- Premature infants got:
  1. Regular supply of nutrients
  2. More protein, energy, vitamin A & essential fatty acids (n-3 & n-6)



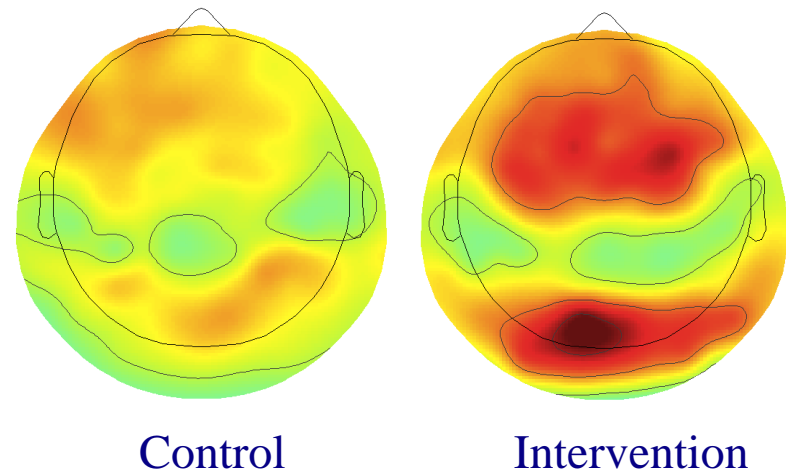
- MRI differences between intervention & regular supply
- White matter more developed in the intervention group
- More **mature brain** in **sup longitud fasciculus (SLF1)**

Strømme et al. *Neonatology*. 2015, 107, 68-75



- 128 electrodes on the head, along with visual signals
- The intervention group has a larger & more focused visual response in the occipital region than the controls

Blakstad et al. *Neonatology*. 2015, 108, 30-7





Blood markers of fatty acids and vitamin D, cardiovascular measures, body mass index, and physical activity relate to longitudinal cortical thinning in normal aging. Walhovd et al. *Neurobiol Aging*. 2014, 35, 1055-6

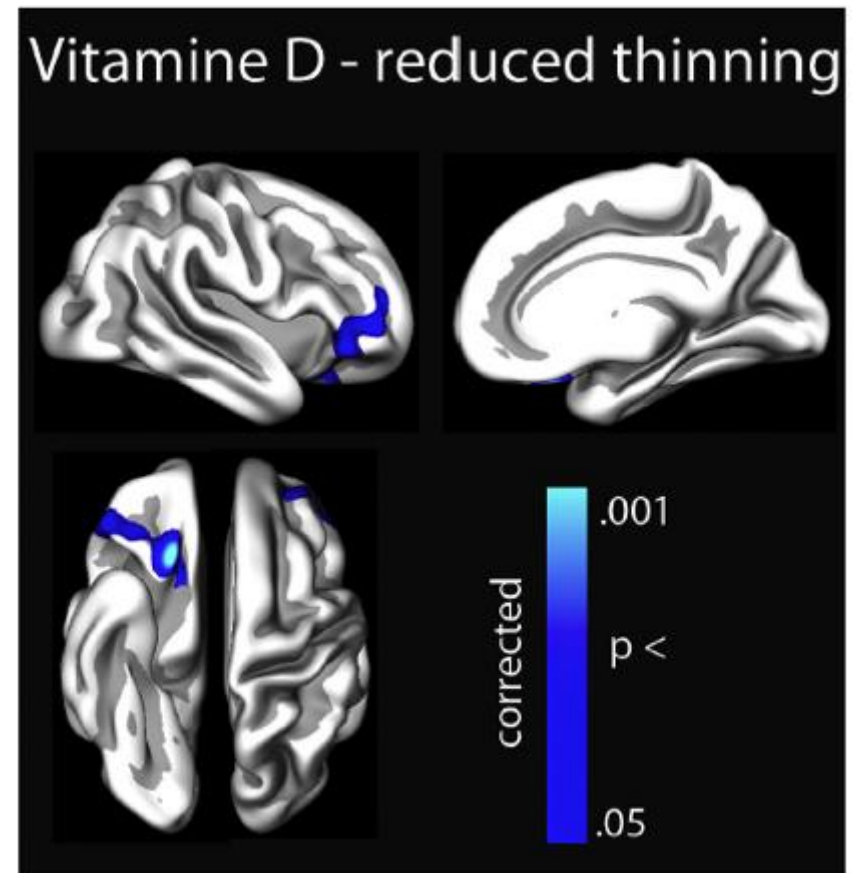
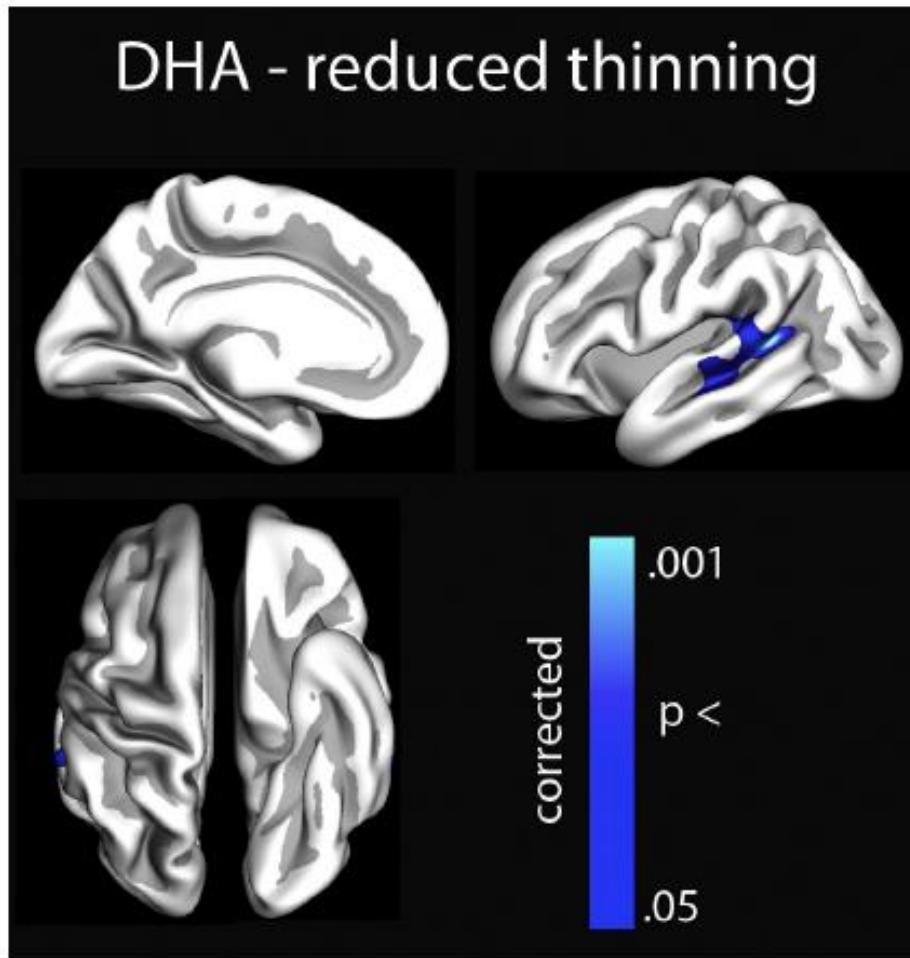


Fig. 2. Higher levels of vitamin D was related to less cortical thinning in right lateral prefrontal cortex.

Fig. 1. Higher docosahexaenoic acid (DHA) level was related to less thickness change in a cluster in the left middle and superior temporal cortex. Abbreviation: DHA, docosahexaenoic acid.

Blood markers of fatty acids and vitamin D, cardiovascular measures, body mass index, and physical activity relate to longitudinal cortical thinning in normal aging. Walhovd et al. *Neurobiol Aging*. 2014, 35, 1055-6

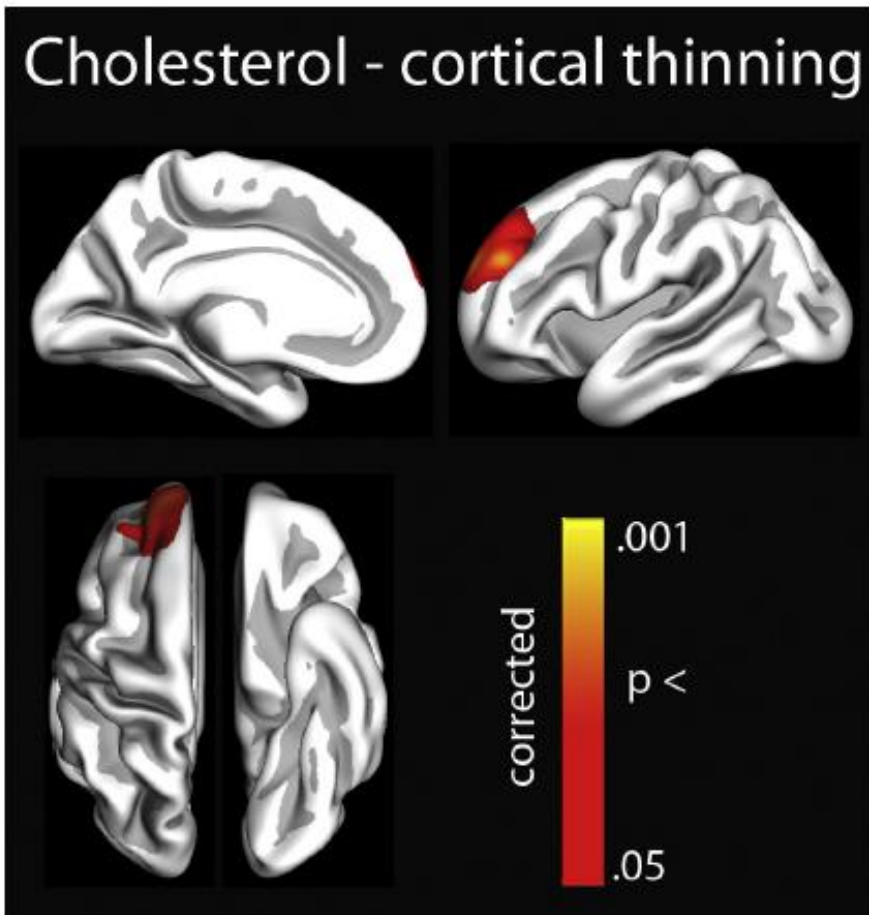


Fig. 3. Higher levels of cholesterol were related to more cortical thinning in a cluster in the left hemisphere.

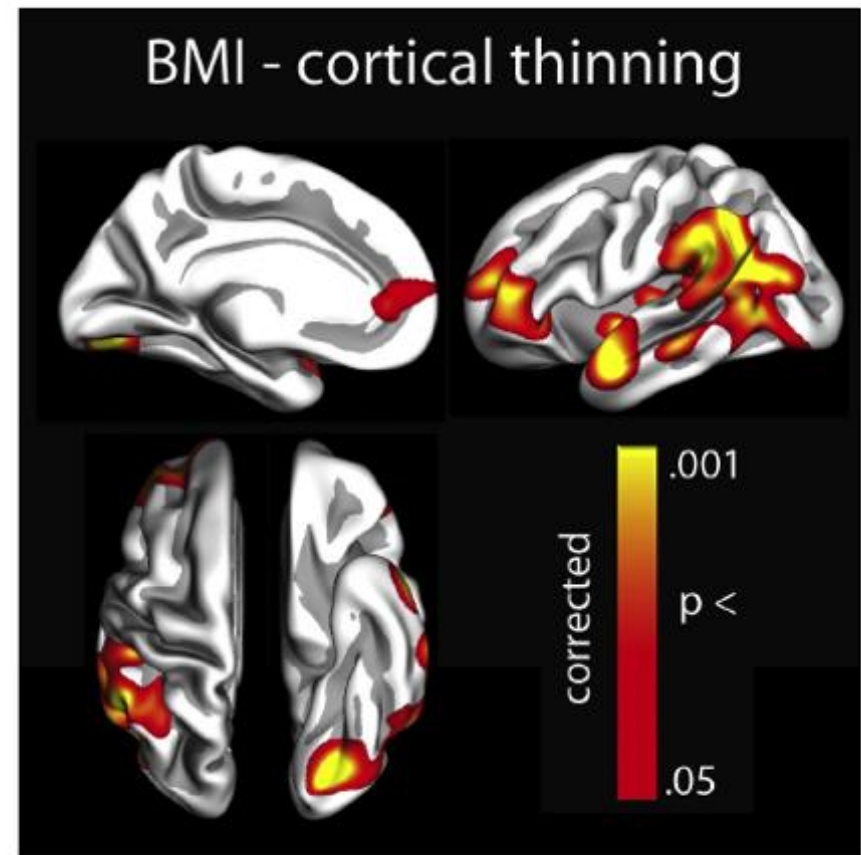


Fig. 4. Higher body mass index (BMI) was related to more cortical thickness reduction in the left hemisphere. Abbreviation: BMI, body mass index.



# Sum up

- Many of the present markers of brain health are markers of general health
- What is healthy for the body is good for the brain
- We are searching for more specific markers of the brain, perhaps
  - DAG
  - BDNF
- *Thanks for your attention – questions may go to [c.a.drevon@medisin.uio.no](mailto:c.a.drevon@medisin.uio.no)*

