Biomarkers of brain health
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Vitas (www.vitas.no) analytical contract laboratory, spun out of UiO
• 26 years of existance
• 23 employees & 35 robots
• 5 with PhD & 5 analytical chemists

CAI
• 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

Healthy for the heart & body --> healthy the brain!
Todays 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 personelle
- Stable samples on special paper

Vitas analyzes > 200 analytes also antibodies to covid-19 on DBS
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)**

Strømmen 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

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. 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.

**Fig. 2.** Higher levels of vitamin D was related to less cortical thinning in right lateral prefrontal cortex.
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. Abbreviation: BMI, body mass index.

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