Brain Health and Seafood Omega-3 fats

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Seafood Nutrition Partnership
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Every person with a brain deserves good nutrition!
Global Burden of Psychiatric Disorders

The burden of mental, neurological, and substance use disorders increased by 41% between 1990 and 2010 and now accounts for one in every 10 lost years of health globally.

2010 $2.5–8.5 trillion in lost output was attributed to mental, neurological and substance use disorders.

2030 This sum is expected to nearly double if a concerted response is not mounted.

“Emerging evidence also suggests that relationships may exist between eating patterns and some neurocognitive disorders and congenital anomalies.”

“Limited evidence suggests that dietary patterns emphasizing seafood, vegetables, fruits, nuts, and legumes are associated with lower risk of depression in men and non-perinatal women. However, the body of evidence is primarily composed of observational studies and employs a range of methodology in study design, definition, and measurement of dietary patterns and ascertainment of depression/depressive signs and symptoms.”
Looking beyond dietary patterns for depression.

1. Dietary patterns
   Healthy
   Mediterranean

2. Specific foods
   Fish
   Olive oil

3. Specific nutrients (blood status)
   n-3 HUFAs

4. Randomized Controlled Trials/ meta-analyses
   n-3 HUFAs vs.
   placebo

5. Mechanistic basis
   Multiple synergistic processes
Mediterranean Diet
Major Depression

People regularly consuming Mediterranean diet were ~30% less likely than their peers to have depression.

a meta-analysis including n=9 studies
Fish Consumption
Depression

People regularly consuming high levels of fish were nearly **20%** less likely than their peers to have depression.

a meta-analysis including n=26 studies, n=150,278

Blood levels of EPA and DHA are lower in people with major depression.

n=14 studies with n=3,318 participants
g= 0.85, p<0.0000

Lin et al., Biol Psychiatry (2010)
EPA\textbar{}DHA in RCTs

Major Depression

EPA-enriched formulations appear to be effective for clinically significant depression.

Effects at least as strong as conventional therapies.

Hallahan et al. (Hibbeln group) Br J Psychiatry (2016)
Effect Sizes of Studies of Omega-3 Fatty Acids for Major Depression

Classification of studies by patient type and EPA or DHA predominant interventions

Hallahan, Davis, (Hibbeln group) Br J Psychiatry (2016)
Classification of studies by patient type and EPA or DHA predominant interventions

Effect Size (Hedges g)

<table>
<thead>
<tr>
<th>Clinical DHA</th>
<th>Clinical EPA</th>
<th>Non-clinical DHA</th>
<th>Non-clinical EPA</th>
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<tr>
<td>Favors Omega-3 (Benefit)</td>
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<td>Strong Effect</td>
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<td>Mild Effect</td>
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<td>Favors Placebo</td>
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Hallahan, Davis, (Hibbeln group) *Br J Psychiatry* (2016)
Effect Sizes of Therapies for Clinically Significant Major Depression

- **EPA**: Favors Placebo
- **DHA**: Favors Omega-3 (Benefit)

Hallahan, Davis, (Hibbeln group) *Br J Psychiatry* (2016)
NORAA Trial
Neuroimaging Omega-3 and Reward in Adults with ADHD

Do omega-3 fats restore brain reward response?
- Anticipation of reward – fMRI Monetary Incentive Delay Task
- 36 adults with ADHD (aged 18-55) enrolled

Baseline testing -
fMRI - MID, other tasks
Then - randomized to receive either:

ACTIVE smoothie
3 g of omega-3 HUFA (EPA+DHA)

PLACEBO smoothie
3 g of macadamia nut oil (16:1n-7)

Final visit - 16 weeks
- Repeat baseline testing, fMRI - MID, other tasks
- Subtract final (minus) baseline measures
Brain regions that were activated are involved in:

- Emotional responses to reward
- Attentional processes related to reward
- The meaning of reward (salience network)

DHA + EPA improves the reward responses in Adults with ADHD

Substantial activation in the DHA|EPA group
(change from baseline, MID task)
No change in the placebo group

Activated brain regions were the bilateral insular cortex and the superior temporal cortex

Brain regions that were activated are involved in:
- Emotional responses to reward
- Attentional processes related to reward
- The meaning of reward (salience network)

Gow et al (Hibbeln Lab) unpublished, 2017
Mauritius Child Health Project

Age 8-16,
Randomized, stratified by age, gender
Blinded, 38.7% Creole, 61.3% Indian

\[ n=95 \text{ omega-3, } n=89 \text{ placebo} \]
6 mo. intervention, 6 mo. follow up
Child Behavior Checklist (parent)

Omega-3 specific

1 gm omega-3 or placebo
200 ml smoothie
116 Kcal
Vitamin D (17%)
Antioxidants

Raine, Hibbelsn et al 2014
Parents were less psychopathic when their children took omega-3’s

*Parent Psychopathic Personality Inventory*

Raine, Hibbeln et al, 2014
Reductions of Intimate Partner Psychological Aggression among caregivers when their children receive 1 gm/d of omega-3’s

~ 25% reduction at 12 m, Group X time p<0.01, n=121

Reductions in child externalizing behaviors (Child Behavior Checklist) were correlated with reduction in Intimate Partner Aggression (XXX), only in the omega-3 group.

**Omega-3 group, r = 0.40, p <0.01**

Placebo group r =0.13, p =ns

Portnoy, Raine, Liu, Hibbeln, 2018  Aggressive Behavior
Thank you
The emerging and compelling evidence for nutrition as a crucial factor in the high prevalence and incidence of mental disorders suggests that diet is as important to psychiatry as it is to cardiology, endocrinology, and gastroenterology.