Sleep loss, gut, and oxidative stress

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Disclaimer
This certifies that the views expressed in this presentation are those of the author and do not reflect the official policy of the NIH.

Disclosure
This certifies that I, Dragana Rogulja, have no financial relationship that is relevant to the subject matter of this presentation.
Thanks to

Alex Vaccaro

Yossi Kaplan Dor
Question:
What is the cause of death in sleep-deprived animals?

Idea:
Look all over the body (could there be one cause?)
Sleep is ubiquitous

Keene & Duboue, J Exp Biol 2018
Activation of neuronal population 1

Activation of neuronal population 2

Total daily sleep at 29°C (min)
Sleep deprivation shortens lifespan
Reactive oxygen species (ROS) accumulate in the gut upon sleep deprivation
ROS accumulate in the gut upon sleep deprivation

DHE

\[
\begin{array}{c}
\text{DHE} \\
\text{Oxidized DHE}
\end{array}
\]

\[
\begin{array}{c}
\text{H}_2\text{N}-\text{Ph}-\text{NH}_2 \\
\text{H-Ph-NCH}_2\text{CH}_3 \\
\text{H}_2\text{N}-\text{Ph}-\text{NH}_2 \\
\text{H-Ph-NCH}_2\text{CH}_3
\end{array}
\]

\[
\begin{array}{c}
\cdot\text{O}_2^- \\
\end{array}
\]

\[
\begin{array}{c}
\text{H}_2\text{N}-\text{Ph}-\text{NH}_2 \\
\text{H-Ph-NCH}_2\text{CH}_3 \\
\text{H}_2\text{N}-\text{Ph}-\text{NH}_2 \\
\text{H-Ph-NCH}_2\text{CH}_3
\end{array}
\]

Mean DHE intensity (a.u.)
Sleep deprivation induces oxidative cell damage in the gut

<table>
<thead>
<tr>
<th>DNA damage</th>
<th>Stress granules</th>
<th>Lysosomes</th>
<th>Apoptosis</th>
<th>Necrosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>γH2Av</td>
<td>FMR1</td>
<td>LysoTracker</td>
<td>Cleaved caspase-3</td>
<td>SYTOX Green</td>
</tr>
</tbody>
</table>

Scale bar: 80 µm, 13 µm, 30 µm, 80 µm, 80 µm
Sleep deprivation in mice leads to increased ROS in the gut
Sleep deprivation in mice leads to increased ROS in the gut

With the Greenberg lab: Liz Polina, Cindy Lin
Scholarly articles for oxidative stress fatigue

Oxidative stress levels are raised in chronic fatigue ... - Kennedy - Cited by 382

... fatigue in skeletal muscle: the role of oxidative stress - Gilliam - Cited by 250

Chronic fatigue syndrome: oxidative stress and dietary ... - Logan - Cited by 200
oxidative stress fatigue

About 13,000,000 results (0.47 seconds)

sleep fatigue

About 288,000,000 results (0.70 seconds)

gut fatigue

About 28,500,000 results (0.54 seconds)