Stress

Energy mobilization
Increased cardiovascular tone
Immune suppression
Improved cognition
Digestion halted
Growth halted
Reproduction halted

All prepare you for fight or flight

Early stress affects adult

• 17,000 patients described whether they had any of 10 categories of childhood trauma, i.e.: sexual, verbal or physical abuse, divorce, family incarcerations, mentally ill or addict parents, isolation, hunger, poverty.
• Adults with a score of 4 were 7X times more likely to be alcoholics, 6X more likely to have had sex before age 15, 2X as likely to be diagnosed with cancer, 4X as likely to suffer emphysema than those with a score of 0.
• Scores above 6 were 30X more likely to have attempted suicide.
• 3% of students with a score of 0 had learning or behavioral problems in school, and 51% of those with a score of 4 or higher had those problems.
• It isn’t students with low high school grades that tend to drop out. It’s the ones with the low resilience, social skills, motivation, self-control and high pessimism.

Mice fed a high sugar/fat diet only become overweight if they are also stressed.
• Stress increases neuropeptide Y (NPY).
• Blocking NPY in mice that are eating high sugar, high fat diets and receiving stress prevents obesity.
• NPY alone induces obesity.
Stress induces chronically high adrenal ________

- Stress increases cortisol, which is a hormone secreted by the adrenal gland.

Hippocampus has the densest cortisol ________ population

Chronic stress ________ the brain

- Cortisol receptors and neuronal loss are highest in the hippocampus.
- Cognitive loss is associated with neuronal loss in the hippocampus.
- Injections of cortisol increase neuronal loss.
- Elimination of cortisol by removal of the adrenals prevents neuronal loss with chronic stress.

Chronic stress damages the ________

- When brain experiences seizures, hypoxia, or ischemia, there is neuronal loss only if there are adrenal glands.
- These events cause an increase in glutamate, which binds to NMDA receptors and thereby increases intracellular calcium.
- High intracellular calcium increases calcium-activated protease activity, which destroys neurons.

Chronic stress damages the brain

- The neuron can deal with these events if it has sufficient glucose to support the energetically costly defense mechanisms.
- Cortisol make the neurons more vulnerable to damage by decreasing brain glucose transport.
- ________ is then shunted to muscle tissue.

Stress

Glucose transport down

Calcium activates proteases

Decreased ability to deal with Neural challenges

Hypoxia, ischemia, seizures

Glutamate binds to NMDA receptors

High levels of calcium enter cell

Cortisol binds to receptors in hippocampus
________ of chronic stress
• Hippocampal neuronal loss can induce memory problems.
• Dopamine depletion can make it difficult to experience pleasure.
• Norepinephrine depletion diminishes attention.
• Sprouting new neuronal connections in the amygdala may allow stress-producing situations to have a greater effect on the system.

________ of stress-relief drugs
• Alcohol
• Benzodiazepines: Librium, Xanax, Valium (tranquilizers)
• All act by inhibiting neurons in the amygdala, where emotional events are processed.

GABA receptor activation increases __________ ions in the neuron

GABA receptor

________ acts by decreasing Cl⁻ flow into the cells via the GABA receptor.
-binding inhibitor

• Endogenous agent that binds to GABA receptor complex on the same site as the benzodiazepines. It blocks GABA activation of the Cl⁻ channel and increases anxiety. Opposite effect of tranquilizers.

• The differences among people in their responses to stress may lie in different levels of diazepam binding inhibitor.