The Stress-Response

Mobilization of energy

Increased cardiovascular tone

Suppression of digestion

Suppression of growth

Suppression of reproduction

Enhancement of immune system

Analgesia, more efficient clotting

Sharpening of cognition, alertness, pleasure

(Sapolsky, 1992)
The Stress-Response and its Consequences

Adaptive Stress-Response

- Mobilization of energy

Stress-related Disorder

- Myopathy
- Inefficient energy use
- Insulin resistance
- Increased fat deposition (especially abdominal)
The Stress-Response and its Consequences

Adaptive Stress-Response

- Increased cardiovascular tone

Stress-related Disorder

- Hypertension
- Stress...abdominal fat...
  - inflammation...atherosclerosis
- Increased platelet viscosity
The Stress-Response and its Consequences

Adaptive Stress-Response  Stress-related Disorder

Suppression of digestion  Impaired capacity to repair ulcers
The Stress-Response and its Consequences

<table>
<thead>
<tr>
<th>Adaptive Stress-Response</th>
<th>Stress-related Disorder</th>
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<tbody>
<tr>
<td>Suppression of growth</td>
<td>Psychogenic dwarfism</td>
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<tr>
<td></td>
<td>Increased risk of diabetes, hypertension and obesity due to fetal metabolic programming</td>
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<td></td>
<td>Osteoporosis in adults</td>
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The Stress-Response and its Consequences

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<td>Suppression of reproduction</td>
<td>Females: irregular cycles, loss of cycles, failure of implantation of a fertilized egg</td>
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<td></td>
<td>Males: decreased testosterone levels, erectile dysfunction</td>
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<td>Everyone: loss of libido</td>
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# The Stress-Response and its Consequences

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<th>Adaptive Stress-Response</th>
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<td>• Enhancement of immunity</td>
<td>Eventual immune suppression and increased risk of some infectious diseases</td>
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<td>Accelerated telomeric aging</td>
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<td>But a minimal cancer link</td>
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Stress effects on the hippocampus: the realm of memory

Impaired synaptic plasticity
Atrophy of dendritic networks of communication
Fewer new neurons
Dead neurons!
Decreased overall hippocampal volume
Impaired formation and retrieval of long-term memories
The effects of chronic stress in the amygdala: the realm of fear and anxiety

More excitable neurons
More connections among neurons
Result:

More anxiety, faster fear-conditioning, slower habituation
The effects of chronic stress in the mesolimbic dopamine system

Depletion of dopamine
Result:

Loss of the capacity for pleasure: DEPRESSION
The effects of stress in the frontal cortex

Decreased connectivity in neural networks by way of fewer dendritic branches and spines

Recovery that produces a “different” frontal cortex, cytoarchitecturally
Dumb-Ass decisions that seem really insightful at the time you make them
Psychological Modifiers of the Stress-Response

- Outlets for frustration
- Sense of predictability and of control
- A perception of life improving
- Social support

(Weiss, Levine, Sehgman)
Physiologic correlates of low rank in baboons

- Elevated blood pressure
- Reduced HDL cholesterol
- Testicular suppression
- Reduced IGF-I levels
- Reduced lymphocyte count
- Overactive benzodiazepine system

(Sapolsky, Science 2005)
Rank is important, but.....

-- so is the society in which the rank occurs

(Sapolsky, Am J Primatol, 1983)
Rank is important, but.....

-- so is the society in which the rank occurs

-- and the personal experience of both

(Alberts et al, Hormones Behav, 1992)  (Sapolsky, Psychoneuroendo, 1992)
Rank is important, but.....

-- so is the society in which
the rank occurs
-- and the personal experience of both
-- and personality

(Sapolsky, Scientific American, 1991; Sapolsky, Arch Gen Psychiatry, 1997)