I. Neurotransmitters

1. Neuron
   - Axon
   - Dendrite
   - Cell body
1. Dopamine is made in cell body
2. Dopamine is shipped down the axon
3. Dopamine is released from the terminal
4. Dopamine stimulates dopamine receptors
I. Neurotransmitters

2. Synapse
   - Presynaptic terminal
   - Postsynaptic terminal
   - Receptor
I. Neurotransmitters

B. Neuropharmacology

1. Physiology of neurotransmission – synaptic transmission
   A. Action potential
   B. Transmitter release
   C. Receptor activation
   D. Neurotransmitter inactivation
I. Neurotransmitters

B. Neuropharmacology

2. Sites of rewarding drug action – dopamine, opioid peptide neuron and synapse
   a. Neurotransmitter release
   b. Neurotransmitter reuptake
   c. Receptor agonist or antagonist action
II. Neurochemistry of Drug Reward

A. Mesolimbic dopamine system
   1. Ventral tegmental area
   2. Nucleus accumbens
II. Neurochemistry of Drug Reward

B. Opioid peptide systems
   1. Ventral tegmental area
   2. Nucleus accumbens
   3. Amygdala
Converging Acute Actions of Drugs of Abuse on the Ventral Tegmental Area and Nucleus Accumbens

III. Neural Circuitry of Excessive Behavior

C. Brain Regions by reinforcement and stage of addiction cycle

1. Positive – binge/intoxication- nucleus accumbens
2. Negative – withdrawal/negative affect- amygdala
3. Conditioned – preoccupation/anticipation- frontal cortex and basolateral amygdala
IV. Stress-definitions

1. Nonspecific response to any common demand upon the body (Hans Selye)
2. Alteration in psychological homeostatic processes (Susan Burchfield)
I saw Kazak out of the corner of my right eye. His eyes were pinwheels. His teeth were white daggers. His slobber was cyanide. His blood was nitroglycerine. He was floating toward me like a zeppelin, hanging lazily in the air. My eyes told my mind about him. My mind sent a message to my hypothalamus, told it to release the hormone CRF into the short vessels connecting my hypothalamus and my pituitary gland. The CRF inspired my pituitary gland to dump the hormone ACTH into my bloodstream. My pituitary had been making and storing ACTH for just an occasion. And nearer and nearer the zeppelin came. And some of the ACTH in my bloodstream reached the outer shell of my adrenal gland, which had been making and storing glucocorticoids for emergencies. My adrenal gland added the glucocorticoids to my bloodstream. They went all over my body, changing glycogen into glucose. Glucose was muscle food. It would help me fight like a wildcat or run like a deer. And nearer and nearer the zeppelin came. My adrenal gland gave me a shot of adrenaline, too. I turned purple as my blood pressure skyrocketed. The adrenaline made my heart go like a burglar alarm. It also stood my hair on end. It also cause coagulants to pour into my bloodstream, so in case I was wounded, my vital juices wouldn’t drain away. Everything my body had done so far fell within normal operating procedures for a human machine. But my body took one defensive measure which I am told was without precedent in medical history. It may have happened because some wire shortcircuited or some gasket blew. At any rate, I also retracted my testicles into my abdominal cavity, pulled them into my fuselage like the landing gear of an airplane. And now they tell me that only surgery will bring them down again.

Breakfast of Champions by Kurt Vonnegut
CNS Actions of Corticotropin-Releasing Factor (CRF)

Medulla Oblongata

CRF

Amygdala

Pituitary Gland

Corticotropin (ACTH)

β-Endorphin

Corticosteroids

Behavioral response to stressors

Behavioral activation

Sympathetic Activation

Cardiac output

Stroke volume

Peripheral vascular resistance

Blood glucose

Heart rate

Blood pressure

Adrenal Medulla

Epinephrine

Gastric acid secretion

Gastric emptying
V. Biology of Stress Response

A. Hypothalamus, Pituitary, Adrenal- CRF

1. Hypothalamus
   a. Activation of endocrine (hormonal) stress response
   b. Stimulates release of ACTH from pituitary

2. Pituitary gland – adrenocorticotropin (ACTH)
   a. ACTH stimulates adrenal cortex to produce corticosteroids

3. Adrenal gland – corticosteroids
   a. Glucose metabolism
   b. Lipid metabolism
   c. Mineral and water balance
V. Biology of Stress Response

B. Medulla

1. Activation of Sympathetic NS
2. Stimulates nerve leading to adrenal medulla
3. Release of adrenaline
V. Biology of Stress Response

C. Amygdala

1. Coordinating behavioral responses to stress
2. May be important in aspects of self-regulation failure
Standard Pattern of Affective Dynamics Produced by Novel and Repeated Unconditioned Stimulus

VI. From Moderation to Spiraling Distress

A. Within system neurochemical changes
   1. Dopamine
   2. Opioid peptides

B. Between system neurochemical changes
   1. CRF
Stages of the Addiction Cycle

Preoccupation with obtaining Persistent physical/psychological problems

Persistent desire Larger amounts taken than expected

Tolerance Withdrawal Compromised social, occupational or recreational activities

Da Opioid Peptides

CRF
Allostatic Change in Mood State associated with Transition to Drug Addiction

III. Neural Circuitry of Excessive Behavior

B. Impulsivity-Basal Ganglia
   1. Gating information
   2. ADHD, HD, OCD, Tourette’s
Central Inhibition: The “Gating” System for the Brain

**GATE**

- Motor Activity
  - Posture
  - Movement

- Cognitive, Sensory and Emotional Activity
  - Consciousness

**Gate Control:**
- Involuntary (e.g. Vestibular)
- Voluntary (e.g. Appetitive)

- Preconscious (e.g. Attention)
- Conscious (e.g. Concentration)

**Determinants of Gating Capacity:**
- Genetic
- Developmental
- Environmental
- Pathological
Caudate=corpus striatum=basal ganglia

Cortex striatum pallidum thalamus
PANDAS

Pediatric autoimmune neuropsychological disorder