STRESS
Stress

• Definition and types of stress
• Causes of stress
• Effects of stress
• Basic stress medical terminology
• Stress and your health: What the research says
• How to manage stress
Definition & Types of Stress
What is Stress?

• Stress (an experience):
  • The body’s response to physical, mental, or emotional pressure.

• Distress (a feeling):
  • Emotional, social, spiritual, or physical pain or suffering that may cause a person to feel sad, afraid, depressed, anxious, or lonely, and feel unable to cope.
  • Cancer patients, for example, may feel distressed over their diagnosis, physical symptoms, and/or treatment.

Three Types of Stress

• According to the American Psychological Association, there are 3 types of stress:
  • Acute Stress
  • Episodic Acute Stress
  • Chronic Stress

Acute Stress

- Most common form of stress
- Comes from demands and pressures of the recent past and anticipated demands and pressures of the near future.
- Often normal: Like the stress associated with giving a presentation to a large group.

- Excess short-term stress can lead to:
  - Psychological/emotional distress
  - Muscular problems like tension headaches, back pain, jaw pain, etc.
  - Stomach, gut and bowel problems, like heartburn, diarrhea, constipation and IBS.
  - Transient symptoms like high blood pressure, rapid heart beat, chest pain, dizziness, etc.

Episodic Acute Stress

- Frequent acute stress – often related to personality.
- “Type A” personalities – competitive, aggressive, impatient, hurried
- “Worry warts” – always see disasters, foreboding calamities, etc

- Symptoms: Persistent tension headaches, migraines, hypertension, chest pain and heart disease.

Chronic Stress

- Long-term stress, often associated with life situations such as living in poverty, an abusive/unhappy marriage, a war-torn country or working in despised work conditions.
- Can also develop during childhood trauma that persists into adulthood.
- Has serious health effects.
- Can lead to:
  - Bad habits to cope (like smoking, drugs, alcohol, overeating)
  - Suicide
  - Violence
  - Heart attack
  - Stroke
  - Cancer Growth$^2$

Causes of Stress
Causes of Stress

• There is no one thing that causes stress. Everyone reacts differently to situations.
  • Think of the mother who happily and easily manages 4 children, versus the mother who is overwhelmed and stressed out with 1 child.

• Common Causes of Stress
  • Relationship Issues (especially divorce, living with abuse and/or drugs & alcohol)
  • Financial Issues
  • Work Issues
  • Health Issues (especially a potentially fatal diagnosis and chronic pain)
  • Parenting Issues (especially being a single parent)
  • Death (especially losing a family member)
Effects of Stress
Effects of Stress

• Abnormal levels of stress can cause or contribute to¹:
  • Anxiety disorders
  • Depression
  • Substance abuse
  • Skin rashes or hives
  • High blood pressure
  • Cardiovascular Disease
  • Certain GI diseases
  • Cancer
  • Headaches
  • Asthma
  • Fluctuations of blood sugar in people with diabetes.

• There also is scientific evidence showing that people experiencing psychological stress are more prone to developing colds and other infections.

¹https://www.medicinenet.com/stress/article.htm#conclusions_about_the_effects_of_stress
Effects of Stress

• Memory can be affected
  • When stress occurs, the limbic system of the brain is affected, which impacts memory.
    • This is likely one reason why mothers often say they can’t remember a thing!

• Pregnant mothers’ stress levels affect their babies¹
  • Stress hormones like cortisol pass through the blood to the fetus
  • Drugs, alcohol, nicotine and other chemicals from substances used to control the stress are also passed along to the fetus.

Basic Stress Medical Terminology
Stress Hormones

• **Cortisol**, epinephrine (also called adrenaline) and norepinephrine are released in your body under stressful conditions.

• Stress hormones can\(^1\):
  • Increase blood pressure
  • Increase blood sugar
  • Aid in the metabolism of fat, carbohydrates and protein
  • Decrease bone formation
  • *Suppress the immune system*

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Stress Hormones

• Because stress hormones suppress the immune system, it makes people more prone to fall ill to infections (like flu), and have sleep problems, headaches, depression and anxiety.
Dopamine

• Dopamine is a neurotransmitter. It works in various areas of your body (including in your blood vessels, kidneys and pancreas) but is most well known for the effects on your brain. It is associated with increased feelings of happiness and pleasure.

• In blood vessels, dopamine inhibits norepinephrine release.
Epigenetics

- Epigenetics is the study of why genes express
  - Epigenetics studies what factors (like stress, smoking, diet, etc) turn your genes “on” and “off”.

- If you have a “bad” gene, like a mutation in a BRCA gene, it does not mean that you will get breast cancer – it means your risk is higher.
  - By age 70, ~50% of women with the BrCA gene will not have breast cancer\(^1\), and by age 80, ~30% will not have breast cancer\(^2\)

- However, if the BrCA gene is expressed (turned “on”) then you will likely get breast cancer.

- Glucocorticoids (mainly cortisol), which are increased under stress, have been found to alter gene expression in the brain\(^5\).

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Angiogenesis and VEGF

• Angiogenesis
  • Angio = vessels and Genesis = new, so angiogenesis means the creation of new blood vessels.

• VEGF (Vascular Endothelial Growth Factor) is like a signal that the body gives out to start producing new blood vessels under certain conditions.
  • Ex: When a blood vessel is blocked to the heart, the heart sends out a signal that it needs more oxygen, VEGF is increased, and new blood vessels – called collateral vessels – are formed around the blockage, allowing blood to get to the heart.
    • But VEGF can grow vessels that are harmful, such as blood vessels that feed tumors
  • For a tumor to grow >1mm, it requires angiogenesis.¹

Stress & Your Health

What the Medical Research Has to Say ...
Stress and Cancer

• There is no strong evidence that stress directly affects cancer initiation. In other words, we don’t have any proof that stress causes cancer.

• However, there is ample evidence that once cancer has been initiated, stress can cause it to progress and metastasize.¹

Stress Hormones and Cancer

- Stress levels of norepinephrine increased the *in vitro* invasiveness of ovarian cancer cells by 89–198%.\(^1\)

Stress Hormones and Cancer

- Patients with cancer recurrence showed higher cortisol levels.¹

Stress Hormones and Cancer

• *During chronic stress situations, elevated levels of glucocorticoids (like cortisol) have been shown to be immunosuppressive.* Breast cancer patients with higher mean diurnal cortisol concentrations also showed suppressed immunity against commonly encountered antigens, suggesting blunting of the cellular immune response.\(^1,^2\)


Stress Hormones and Cancer

• Epinephrine and norepinephrine bind to adrenergic receptors which has been linked to accelerated tumor growth in breast cancer.\textsuperscript{1,2,3}

Stress and Hormones and Cancer

• Catecholamine (stress hormone) levels in the ovaries are known to be increased in response to stress.1-5

Stress Hormones and Angiogenesis

• Both norepinephrine and epinephrine are elevated in ovarian and other peritoneal tissues in preclinical models of chronic stress. These hormonal increases were related to greater tumor burden, which was mediated by increased angiogenesis.¹

Stress Hormones and Angiogenesis

• Studies have found that the stress hormone norepinephrine may promote angiogenesis and metastasis.¹

Stress Hormones and Angiogenesis

• Norepinephrine and epinephrine have been implicated in increasing VEGF levels.

• Norepinephrine has been shown to upregulate VEGF in adipose tissue, in ovarian cancer cell lines and in multiple myeloma cell lines.\(^1,2,3\)

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Dopamine and Cancer

• Under chronic stress, dopamine levels are lower due to decreased release of dopamine.\(^1,2\)

• In blood vessels, dopamine inhibits norepinephrine release.


Depression and Cancer

• *Dopamine inhibits VEGF-induced angiogenesis* by suppressing VEGFR-2 phosphorylation.¹,²,³

Depression and Cancer

- *Dopamine inhibits tumor growth* by suppressing the actions of VEGF on both tumor endothelial cells and bone marrow-derived endothelial progenitor cells.¹

ACE (Adverse Childhood Events) Study

• Studied the effects of childhood trauma (Adverse Childhood Events) on 17,337 adults.
  • 10 categories of trauma were studied:
    • Physical abuse
    • Sexual abuse
    • Emotional abuse
    • Physical neglect
    • Emotional neglect
    • Exposure to domestic violence
    • Household substance abuse
    • Household mental illness
    • Parental separation or divorce
    • Incarcerated household member
  • The number of categories of these adverse childhood experiences was then compared to measures of adult risk behavior, health status, and disease.

ACE Study

• Persons who had experienced four or more categories of trauma, compared to those who had experienced none, had a 4- to 12-fold increased health risk for alcoholism, drug abuse, depression, and suicide attempt.

• The more types of trauma, the higher the risks for ischemic heart disease, cancer, chronic lung disease, skeletal fractures, and liver disease.

ACE Study

• BUT WHY???

STRESS!!!

Stress and Bad Habits

• Certain bad habits – particularly those that can affect your body’s level of stress hormones and neurotransmitters – are increased under times of stress.
Stress and Bad Habits

• For example, eating increases dopamine (the “happy” neurotransmitter in the brain), so this is why people often turn to food when stressed.

• Many drugs such as amphetamines (meth) and cocaine can lower the stress response and make the user feel better, which is likely why many trauma sufferers use drugs.
Mental Health and Cancer

• The results of 165 studies indicate that stress-related emotions like depression, hopelessness, helplessness, etc are associated with higher cancer incidence in initially healthy populations

• 330 studies noted poorer survival in cancer patients with negative emotions

• 53 studies found higher cancer mortality

Mental Health and Cancer

• Stressful life experiences are related to poorer cancer survival and higher mortality

• Stress-prone personality or unfavorable coping styles and negative emotional responses or poor quality of life were related to higher cancer incidence, poorer cancer survival and higher cancer mortality.

• Psychosocial factors are associated with a higher incidence of lung cancer and poorer survival in patients with breast, lung, head and neck, hepatobiliary, and lymphoid or hematopoietic cancers.

Mental Health and Cancer

• Sustained negative moods (like helplessness, hopelessness and depression) may provide the strongest links to cancer progression.\(^1\)-\(^4\)

• This might be because ...
  • They do not seek treatment when they become ill
  • They give up prematurely
  • They fail to adhere to therapy
  • They engage in risky behaviors such as drug use
  • They do not maintain a healthy lifestyle

Mental Health and Cancer

• Cancer patients with previous emotional problems face a 2.6 times greater hazard of dying than patients without prior problems over 19 months after diagnosis.

Mental Health and Cancer

• Social isolation has been linked with increased rates of cancer mortality.¹
  • 25% overall increased risk of cancer mortality
  • 39% increased risk of cancer mortality in women

Rat Park Study

• Rats were isolated in cages or put into “rat park”.
  • Rat Park had lots of rats living together, allowing for socialization and mating, with exercise wheels and balls to play with and plenty of room.

Rat Park Study

In Summary...

The following stress-related factors have been linked to worse cancer outcomes, including increased recurrence, decreased survival and increased risk of death:

• ↑Epinephrine
• ↑ Norepinephrine
• ↑ Cortisol
• ↑ Angiogenesis

The following factors have been linked to better cancer outcomes:

• ↑Dopamine
• ↑ Social Support
How to Manage Stress
Factors Influencing Your Ability to Handle Stress

- Adequate social support
- Your nutritional status
- Emotional well-being
- Overall health and fitness levels
- The amount of sleep and rest you get
How to Lower Stress Levels

• Build strong relationships and social supports. Social support and stress reduction are associated with lower cortisol levels.¹

• High levels of social support have been linked to improved clinical outcomes in cancer patients.²⁻⁴

**Eat an “Epigenetic Diet”**

The following foods have been shown to likely contribute to positive epigenetic alterations and possibly reverse abnormal epigenetic states:

- Green tea
- Grapes
- Peanuts
- Mulberries
- Cranberries
- Blueberries
- Turmeric
- Curry
- Soy Beans
- Fava Beans
- Broccoli
- Cabbage
- Kale
- Watercress
- Brazilian nuts
- Chicken & meat*
- Garlic
- Beans
- Grains
- Fortified breakfast cereals
- Pastas
- Green vegetables
- Coffee
- Cashews
- Tomatoes
- Parsley
- Milk Thistle
- Rosemary

* Have selenium, but chicken and meat have been associated with heart disease and cancer, so best to get selenium from Brazil nuts.
How to Lower Stress Levels

• Get help
  • Find a counselor or psychologist in your area, ideally one who specializes in your situation (health-related stress, marital strife, family issues, work issues, etc)

• Get group support
  • There are many support groups for all kinds of issues. It can be very comforting to meet other people who are going or have gone through the same thing(s) you are facing. Such people can provide insight and help that others won’t be able to give.
How to Lower Stress Levels

• Get plenty of exercise
  • Get out in nature – walk in the park
  • “Ground” yourself by walking barefoot (or sitting or lying so your bare skin touches the ground)
How to Lower Stress Levels

• Rest your mind/Get good sleep
  • Cut back on caffeine
  • Remove distractions from your bedroom like TVs, computers, etc.
  • Go to bed at the same time each night
How to Lower Stress Levels

• Learn to meditate
• Do yoga
• Cultivate your spiritual/religious practice