

On the Front Lines: Addressing Stress, Trauma & Suicide Prevention in Community Responders

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The Neurobiology of Suicide: Science, Treatment and Prevention

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Suicide: National Statistics

- Contemplated suicide: 8,300,000 (2.6%)
 - Suicide plans: 2,300,000 (28%)
 - 0.7% U.S. population
 - Suicide attempts: 1,100,000 (13%)
 - 0.3% U.S. population
 - Suicides: 42,773 (4%)
 - 0.01% U.S. population

“If...Then”

- If
 - People with depression / suicide identified
 - They get to treatment
 - Treatment is done properly
 - Stick with treatment
- Then
 - 80% sustained recovery
 - 90% improved

“If...Then”

Suicides in New York City (Andy Leon):

- Adults: 23.1% receiving treatment
- Ages 18-24: 13.9%
- Not enough people get the treatment they need

Suicide Risk Factors: One Path

- Severe mental disorder (MDD, schizophrenia, substance abuse, etc.)
- AND (OR)**
- Environmental stress (hopelessness)
 - Unemployment
 - Financial problem
 - Separation / loss (e.g., divorce), etc.
 - AND Impulsivity

Serotonin is Involved in Suicide

- People who commit suicide have fewer serotonin neurons in the brain
- Serotonin and its main metabolite (5-HIAA) are lower in people who make suicide attempts
- The more lethal attempts are associated with lower brain serotonin
- Lower serotonin is associated with more impulsive attempts

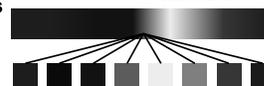
The Serotonin System

- Serotonin is mainly inhibitory in the nervous system
- One important region affected by serotonin: The frontal lobe (prefrontal cortex)
 - Involved in decision-making and social behavior

- Suicidal behavior appears to be related to serotonin activity, but...
- Serotonin deficits predispose to impulsivity, not suicide per se
- This tells us what happens at the “macro” but not the “micro” level
- It tells us what, not why
- It tells us only about one form of suicide

Suicide Phenotypes

- **Genotype:** Genetic makeup
- **Phenotype:** The characteristics that heredity produces
 - Helps divide into genetically distinct groups
- Suicide phenotypes
- Irritability/Anger
- Inattention
- Impulsivity
- Emotional instability
- Mistrust



Is Suicide Genetic?

- Yes, but...not in the way we typically think of genetics
 - Only 1.5% of human DNA is in genes
 - The environment influences behavior, including suicide risk
 - For example, child sexual abuse increases risk 10-14x
 - How does this work?

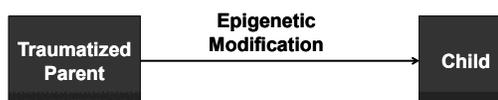
Evidence for Human Transgenerational Transmission

- Dutch “Hunger Winter” famine > ↑ risk F1 mental health & metabolic disease
 - Highest risk first trimester
 - F1 fathers transmitted risk to F2
- Pregnant women exposed to WTC attacks with PTSD > Δ HPA axis function in offspring ↓ cort.

Evidence for Human Transgenerational Transmission

- Female holocaust survivors with PTSD > poorer emotional physical health in offspring
 - Differential methylation GR
 - ↓ cortisol

Intergenerational Effect of Trauma



Suicide Prevention: Treatment

- Clozapine
- Cognitive behavioral therapy
 - Mindfulness-based cognitive therapy
 - Dialectical behavioral therapy
- Lithium
- Ketamine

Brief Cognitive-Behavioral Therapy Effects on Post-Treatment Suicide Attempts in a Military Sample: Results of a Randomized Clinical Trial With 2-Year Follow-Up

Decreased Risk of Suicides and Attempts During Long-Term Lithium Treatment: Meta-analysis

- 31 studies
 - Person years of risk exposure: 85,229
- Effect of lithium treatment:
 - ~80% reduction in suicide risk
 - RR=4.91 (CI=3.82 – 6.81)
 - Attempt-to-suicides: +2.5 fold
 - Decreased lethality
- MDD + bipolar disorder

Summary

- Suicide rates have been increasing over the last 20 years
- Getting the right treatment to the right person reduces risk
 - But...most people who commit suicide are not in treatment
- Need: To use modern prediction algorithms to determine who is at risk > prevention