

Brain-derived neurotrophic factor and suicidal behavior in adolescents

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The problem of adolescent suicide

Adolescent suicidal behavior is a medical and social problem worldwide.^[1-4] The tragedy of pediatric suicide is a national and global phenomenon. Each year about 100 000 adolescents kill themselves worldwide (one every 5 minutes) in the context of 4 million suicide attempts.^[1,2] According to the World Health Organization, it is among the top three causes of death in the population aged 15-34 years.^[1] In the USA, suicide is also a leading cause of death among those aged 15-24.^[5] Twenty percent to 25% of American adolescents have seriously considered suicide and 9% have tried it at least once.^[6] Suicide is rare in prepubertal children, but there is a precipitous rise in prevalence after puberty and through adolescence.

Studies of adolescent suicide

Although there has been an extensive research on the neurobiology of suicidal behavior in adults, few studies have focused on the neurobiological correlates of suicidal behavior in adolescents. Studies of adolescent suicide have mostly been focused on demographic and psychosocial risk factors.^[7-10] Such studies focus on who is at risk, but do not explain why certain adolescents are at risk for suicide. Studies of the neurobiology of adolescent suicide may explain why some adolescents are more suicidal than others and help to find biological markers of suicidal behavior in teenagers. Currently, we do not know the neurobiology of adolescent suicidality. We cannot treat and prevent suicidal behavior in

adolescents if we do not know the psychobiology of youth suicidal behavior. Suicide prevention efforts should be confirmed by scientific knowledge.

Brain-derived neurotrophic factor and adolescent suicidal behavior

Over the past decade the role of brain-derived neurotrophic factor (BDNF) in the pathophysiology of suicidal behavior has attracted attention of scientists.^[11-14] Neurotrophic factors promote neuronal survival, regulate many aspects of neuronal development and function, including synapse formation and synaptic plasticity.^[15] Of various neurotrophic factors, BDNF has attracted a lot of interest because it is involved in the pathophysiology of many psychiatric disorders associated with suicidal behavior including depression, posttraumatic stress, schizophrenia, and obsessive-compulsive disorder. BDNF dysregulation may be associated with increased suicidality independently of psychiatric diagnoses. BDNF plays an important role in the regulation and growth of neurons during childhood and adolescence.^[16] Stressor-sensitive areas are undergoing developmental changes during adolescence. Acute and chronic stress inhibits hippocampal BDNF synthesis during brain development.^[17] The serotonin dysfunction found in adolescent and adult suicidal behavior may be related to the low level of BDNF, which impedes the normal development of serotonin neurons during brain development. A recent study demonstrated a down-regulation of both BDNF and its receptor TrkB in the prefrontal cortex and hippocampus of teenage suicide victims, which suggests that stress and altered BDNF may represent a major vulnerability factor in teenage suicidal behavior.^[18] Possibly, BDNF dysfunction plays a more significant part in the pathophysiology of psychiatric disorders and suicidal behavior in adolescents than in adults.

Future directions

Treatment-induced augmentation of BDNF function may reduce suicidal behavior secondary

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to the improvement in psychiatric disorders. It may also decrease suicidal behavior independently of improvement in psychiatric disorders. It is interesting to speculate that BDNF may be a biological marker of suicidal behavior in adolescents or in certain adolescent populations. Research on BDNF function in suicidal adolescents is one of the important study directions of the pathophysiology of suicidal and self-injurious behavior among young people. More neurobiological studies of psychiatric pathology in pediatric populations are needed.

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