TiO2-nanowired delivery of cerebrolysin thwarts exacerbation of sleep deprivation induced decline in regional brain derived neurotrophic factor, brain pathology and behavioral dysfunctions following emotional stress

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Sleep deprivation (SD) is a serious problem in military personnel during combat operations. Normally they have only a few hours of sleep under severe stressful conditions. In this innovation we demonstrated that a combination of emotional stress and sleep deprivation (SD) exacerbates brain pathology and behavioral dysfunction in a rat model. Thus, in these animals several fold increase in BBB permeability to Evans blue albumin (EBA) and radioiodine ([131]-I) was observed in several brain regions associated with neuronal injuries as compared to normal animals after SD. Behavioral disturbances were also exacerbated in this model. Interestingly, the brain derived neurotrophic factor (BDNF) levels showed greater decline in stressed animals after SD. Treatment with cerebrolysin (2.5 ml/kg, i.v.) in normal rats 4 to 6 h after SD significantly increased BDNF levels and reduced brain pathology. However, in stressed rats after SD TiO2 nanowired cerebrolysin (2.5 ml/kg, i.v.) is needed to enhance BDNF levels and attenuate brain pathology. TiO2 nanowired cerebrolysin also improved behavioral functions significantly in stressed rats after SD. These observations are the first to show that nanodelivery of cerebrolysin has profound neuroprotective effects in SD following emotions stress, not reported earlier.

Brain derived neurotrophic factor

Brain pathology

Cerebrolsyin

Immobilization stress

Nanodelivery

Sleep deprivation in Military

Animals

Brain

Rats

Sleep research

Brain pathologies

Brain-derived neurotrophic factors

Cerebrolsyin

Nanodelivery

Sleep deprivation

Pathology