Insulin-like growth factor and cognitive function

Insulin-like growth factors (IGFs) are peptides that regulate the growth, metabolism, survival, and differentiation of cells and are regulated by growth hormone. Both IGF-I and IGF-II consist of small peptides that share about 50% homology with proinsulin and are produced chiefly by the liver. IGF-I is an important cell growth regulator, but the role of IGF-II is less clear. IGF-II acts mainly via IGF-I receptors; IGF-II receptors do exist, but their role is believed simply to mop up IGF-II, rather than act as signaling receptors. In contrast with other peptide growth factors, there is considerable evidence indicating that the IGFs play a critical role in determining overall (somatic) body growth in addition to contributing to local tissue regulation. A great deal of associative data show that IGF and IGF receptors, and growth hormone and growth hormone receptors, are located in the parts of the brain that are responsible for learning and memory (such as the hippocampus). It is feasible that early in life, IGFs and growth hormone play a role in the development of these areas of the brain, which could then explain associations between body size and subsequent measures of cognitive functions.

There has also been much speculation that relative IGF-I or growth hormone deficiency could contribute to the deterioration of cognitive functions observed in elderly people. Several studies in the United States have shown that giving growth hormone to elderly people reduces their body fat and increases lean body mass, but these same studies have produced equivocal data about memory function, and the methodology of the studies has been much criticised. Other studies have shown that giving growth hormone to adults with growth hormone deficiency does improve memory and is also associated with greater levels of circulating IGF-I, but controversy remains about what happens to cognitive function when growth hormone is given to children with growth hormone deficiency.

On the basis on these observations, it has been suggested that circulating levels of IGF are related to cognitive function and that the administration of growth hormone may promote better cognitive function. But although IGFs may play a role in brain development early in life, it is much more difficult to come up with a mechanism that could explain how circulating IGF-I and cognitive function are connected in later life.

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