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STEROID HORMONES AND CNS

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ABSTRACT

It is now well established that the brain is a target for sex steroidal hormones trough genomic and non-genomic mechanisms of action. Experimental studies indicate that estrogen deprivation causes a decrease in brain neuro transmitters and that estrogens can reverse such changes. Post-menopausal women often suffer from brain disfunctions that may cause mood changes, decreases in cognition and memory, etc. Estrogen replacement may improve such disorders in many women suggesting that these hormones have an effect in brain organization.
Furthermore, estrogens maintain brain circulation and have pronounced effects in lipoprotein metabolism, thus contributing to a better brain function. There is growing evidence that estrogens given to postmenopausal women may decrease and ameliorate their symptomatology.
Therefore, hormone replacement therapy given to postmenopausal women has positive effects on CNS derived symptoms, in the short term, and may have preventive actions in the long term.

TEXT

The Central nervous system (CNS) and steroid hormones are two enormous and complexes fields of modern physiology with a very rapid and intensive accumulation of new data and novel concepts.
The study of the hormonal modulation of CNS functions is an even more complicated endeavour.
The precise extrapolation from neuroanatomy and neurobiochemistry into mental performance is a very difficult task in view of so many external confounding factors.

In vitro experiments and *in vivo* studies in animals, or the visualisation of mental performance in humans with the help of new dynamic imaging techniques, are opening new horizons in the understanding of the effects of hormone deprivation, or replacement, in human psychic functioning. The published observations are so abundant that it is not easy to accurately review all of them. Nevertheless, there are some wee-established findings:

1. The brain has well identified anatomical structures that are related to defined motor, sensitive and psychic functions. This was established through stereotaxic experimentally induced lesions in animals or by the localisation of traumatic or tumoral lesions in the human brain.

2. *In vitro* studies with cell cultures from different cerebral nuclei have identified several molecules that were shown to act as neurotransmitters within the neuronal network.

3. Histochemical studies have characterised the predominant localisation of these neurotransmitters in certain nuclei and zones of the brain.

4. The pharmacological modulation of such neurotransmitters (release, uptake, etc) causes changes in psychic functions (mood, memory, cognition, etc).

5. Sex steroid hormones interfere with brain neurotransmitters. They act by genomic and non-genomic mechanisms. In so doing they affect mental performance.

6. Sex steroid hormones have nerve growth factor-like activity in neuronal cell cultures.

7. Brain function, during tests of mental performance, has been visualised and shown to be affected by the administration of steroid hormones (positron emission tomography and dynamic magnetic resonance imaging).

8. Hormone Replacement Therapy (HRT) improves brain circulation, decreases lipoprotein oxidation and protects the brain from oxygen free radicals.

9. HRT in postmenopausal women, or after castration, improves mood and mental performance with restoration to almost normal function.

10. Postmenopausal women under long term HRT have some degree of protection from depression and dementia, and have better cognition, memory and sleep quality.

11. Every practitioner experienced in the administration of HRT to postmenopausal women is well aware of the fact that, other than the relief of vasomotor symptoms, the first improvement noticed and reported by those women is in their mood, mental performance and quality of life.

Hundreds of studies could be quoted in support of each of the above statements. Instead, references shall only be made to some of the more updated and comprehensive reviews, as a source of important information.

For the clinician, what matters in a very pragmatic way is that the HRT he knows should be prescribed for the primary and secondary prevention of cardiovascular diseases and osteoporosis has another very important additional benefit at the CNS level, again both for symptom relief and primary/secondary prevention.

In postmenopausal women the overall benefit / risk assessment of HRT is well established. Be it for primary or secondary prevention, in addition to symptom relief, it is nowadays accepted as being a standard of good clinical practice.

The theoretical discussion of the validity of many epidemiological studies, as well as a number of clinical trials and in vitro studies, on the effects of steroid hormones on the CNS is no doubt very important. Nevertheless, the recommended doses for HRT will remain the same. The schemes of administration will not change. The reasons for using HRT my be increased, but certainly not decreased, no matter what the practitioner thinks about the effect of estrogens on the CNS.

In practical terms, what is already known today about this fascinating new field will certainly aid the practitioner in explaining to his clients another major reason why they should start and adhere to long-lasting HRT under the usual medical supervision. HRT has definite positive effects on CNS and on the prevention of disease, in the both the short and the long term.

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