Systemic Hormones, Neurotransmitters and Brain Development

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Preface

This volume contains the Proceedings of an International Symposium held in Berlin/GDR on September 12–14, 1985. The purpose of this Symposium was to bring together scientists whose work has been directed towards the study on effects of systemic hormones and neurotransmitters on brain development. Two similar Symposia had been organized in Berlin in 1972 and 1978.

For more than a decade, we have distinguished two different actions for neurotransmitters as well as for systemic hormones: (1) transient, i.e. reversible activational or inactivational effects on gene expression and/or enzyme activities throughout life and (2) persistent, i.e. more or less irreversible organizational effects on gene expressibility during critical developmental periods, especially of the brain.

Thus, neurotransmitters and systemic hormones can be regarded as environment-dependent organizers of the brain, which is the central nervous controller of the neuro-endocrine-immune system. Abnormal levels of systemic hormones and/or neurotransmitters, when occurring during brain differentiation, can act as teratogens. They can lead to permanent microstructural changes in the brain which are associated with permanent deviations or dysfunctions of fundamental processes of life, such as reproduction, metabolism, information processing and/or immune responsiveness.

Consequently, many developmental disorders and diseases of the neuro-endocrine-immune system called idiopathic, genuine, primary, essential or cryptogenic thus far can be based on abnormal conditions in the external (i.e. psychosocial or natural) environment and/or the internal (i.e. metabolic and hormonal) environment during critical developmental periods of the brain.

In view of experimental and clinical findings, it was predicted that such developmental disorders and diseases may be preventable by general improvement of the external environment and/or selective correction of the internal environment during critical developmental periods of the brain. Meanwhile, this prediction appears to have been realized – at least to a certain extent – due to some clinical studies.

Thus, our concept for many years that teratology of structures (or structural teratology), i.e. teratomorphology, should be supplemented by teratology of functions (or functional teratology), i.e. teratophysiology, teratopsychology and even by terato-immunology, appears to be of outstanding practical relevance for preventive medicine, which is just supplementing and relieving curative medicine.

In my opinion, millions of human beings are mentally, emotionally or physically handicapped or even disabled and/or die prematurely each year by developmental deviations, disorders or diseases that could be prevented by a neuroendocrine prophylaxis. Thus, a general immune prophylaxis, which is planned by WHO until 1990, is to be completed by a corresponding neuroendocrine prophylaxis. In this context, ten recommendations may be given for prevention or correction of abnormal levels of systemic hormones and/or neurotransmitters during brain development, i.e., by prevention or correction of the following abnormal conditions in pre- and/or early postnatal life: (1) iodine deficiency, (2) hyperinsulinism, mostly induced by gestational diabetes, (3) hypoxia, (4) stress, (5) placental insufficiency and other gestational disorders, (6) quantitative and/or qualitative malnutrition, (7) radiation and pollution with environmental chemicals, (8) misuse of drugs, hormones, alcohol and nicotine, (9) psychosocial deprivation and (10) abnormal levels of systemic hormones and/or neurotransmitters induced by genetic defects (congenital hypothyroidism, congenital adrenal hyperplasia, phenylketonuria and other inborn errors of metabolism).

In this volume, several experimental and/or clinical research groups of three continents give evidence for the great importance of environment-dependent brain development, which is mediated by systemic hormones and/or neurotransmitters, for life-long capabilities of body and mind.

Günter Dörner