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Endocrinological Psychiatry and Psychology*

by M. BLEULER**

This is the text of a lecture given before the Henry Ford Hospital medical staff by Dr. Bleuler, who is the son of Eugen Bleuler, his predecessor as chairman of psychiatry at the University of Zurich and the man who first named "schizophrenia". It is printed here with Dr. Bleuler's permission.

You have chosen endocrinologic psychiatry as the topic for this morning's discussion. It has been (together with schizophrenia) the main research field of my clinic, the University Clinic Burghölzli in Zürich, for more than 25 years.

In the first part of my survey I want to present the interplay of the sexual hormones with the personality development. In the second part I shall mention the latest studies of our clinic in this field on hyperparathyroidism; and in the third and last part I shall, as far as time allows, formulate some general conclusions from the study of the whole field of endocrinologic psychiatry.

PART I: PERSONALITY DEVELOPMENT

Nowadays we can state quite clearly and simply: Without endocrine puberty no puberty of emotions and character, no adult psychosexuality, no mature ability to love. Men and women who are infantile in their endocrine functions always remain infantile in their psychosexuality and have infantile traits in their whole personality. This is the case, for instance, after castration in childhood, in patients with anorchia, in Turner's syndrome, in hypothyroidism, in eunuchoidism and in extreme starvation. The somatic processes of endocrine puberty are well known: In both sexes the secretion of the gonadotropins of the pituitary and the androgens of the adrenals is increased; in the male, also, the androgens of the testes, and in the female the estrogens and later the progesterone of the ovary. In the male, the androgens stimulate the growth of the testicles, the penis and the prostate and induce the breaking of the voice. In the female the growth of the clitoris and the labia majora are due to the androgens. In the female the estrogens induce the

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growth of uterus, vagina and the labia minora and induce menstruation. In both sexes the androgens induce body hairiness and acne and accelerate body growth. Androgens and estrogens together accelerate bone development.

All those most impressive bodily changes, however, cannot induce psychosexual, emotional, and personal puberty alone. After normal endocrine puberty a man or a woman is not always emotionally and psychologically mature. You all know the many psychiatric patients with emotional infantilism, but without physical infantilism.

Endocrine development in puberty is a necessary prerequisite for psychosexual development, but not a sufficient one. Other prerequisites for mature psychosexuality, and particularly for mature ability to love, are just as important as the endocrine ones. Necessary and important prerequisites are interhuman relationships. Neurotic developments or long-standing stress situations inhibit psychosexual development even in endocrinologically mature patients. Androgens even in high dosage are not able to break through a neurotic blocking of psychosexual development.

Precocious Puberty

Precocious puberty is a common condition. It may start in the third year or even earlier. In the majority of cases it is due to the unknown reasons, in some cases to tumors of the brain or of endocrine glands. As regards endocrine functions such early puberty frequently cannot be distinguished from normal puberty at the normal age. The personality changes, however, are not the same. The psychosexuality remains, as a rule, very infantile, particularly in girls. In striking contrast to the bodily changes, the emotional development, and particularly self-confidence, is often retarded. In many boys with precocious puberty, some sexual instincts are stimulated. They may masturbate, show sexual curiosity or they may even be sexually aggressive toward girls. This is, however, rather the exception than the rule, and even in these cases we cannot observe an adult ability to love. These boys remain emotionally sexualized children. They are not prepared to become men. In some cases a particular acceleration of the intellectual development occurs, but in other cases a retardation. At times they take over some adult mannerisms, gesticulations, or attitudes. At times they like to take part in the conversation of adult people and to use their expressions. On the whole, however, they remain childish.

In some cases of precocious puberty adult psychosexuality never develops. These patients remain infantile their whole life. This is frequently the result of a neurotic development resulting from the traumatism caused by the precocious puberty. In other cases there may be organic reasons, as is suggested by Szentagothai's animal experiments in Budapest: The receptors for estrogens in the hypothalamus of young animals are oversensitive to estrogens. The precocious increase of estrogens in the body may damage nervous systems in the hypothalamus of the human, too, which influence sexuality.

This clinical observation and many others clearly show: Personal development in puberty is by no means due to hormones alone. Just as important are the psychody-

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namics, the interhuman and social relations, probably age itself. And, furthermore, the right harmony between all these different factors is essential.

Quite surprising sequelae of lack of correlation between endocrine puberty and life experience can be observed. For instance: In an infantile adult man with anorchia, somatic puberty can be very rapidly induced by injections of sexual hormones. Ejaculations occur early during such an accelerated artificial puberty, but at the beginning ejaculations without any emotional orgasm. They occur as a mere somatic event without any sexual or other feelings. In order to reach a normal orgasmic ejaculation a preparatory phase of experience with one's own developing body is a necessary prerequisite.

Maintenance of Psychosexuality in the Male

I should now like to consider the *maintenance* of adult psychosexuality after puberty. In the male, androgens are not only necessary for development, but also for the maintenance of normal psychosexuality. Castration extinguishes or diminishes the male psychosexuality directed to orgasm in over 95% of all cases. It is also very impressive to hear of the complete extinction of psychosexuality after chemical castration of the male by means of estrogens in high dosage. Within a few days or even a few hours the psychosexuality is extinguished in men put on high dosage of estrogens for prostatic cancer. It has recently also been found possible to replace estrogens with anti-androgens (Cyproteron). The stronger effect of chemical over surgical castration on psychosexuality is probably due to the fact that chemical castration not only suppresses the endocrine function of the testes, but also a part of the endocrine function of the adrenal cortex.

It is well known, however, that psychosexuality is very frequently extinguished in endocrinologically healthy men for a momentary emotional reason or in the course of neurotic development. Male sexual hormones are of no use whatsoever in impotence of endocrinologically healthy men, while they develop psychosexuality together with bodily puberty in endocrine patients with infantilism.

Maintenance in the Female

In the female, the background for maintenance of psychosexuality of the adult is much more complicated and is very different from individual to individual. Both estrogens and androgens help to maintain female psychosexuality. At a later age the androgens become more important. Neither of these sexual hormones are necessary, however, for the maintenance of female psychosexuality, and in this respect male and female nature is quite different. Female psychosexuality is rarely extinguished by castration. Such extinction is more frequent when the psychosexuality has been of abnormal force. It is not even regularly extinguished after both castration and adrenalectomy. We even know of a woman who had adrenalectomy, castration and hypophysectomy yet whose orgasm ability still persisted. Psychodynamics and life experience play a much greater role in the female than in the male in the maintenance of sexual drive.

Treatment of elderly women with high dosages of androgens as a rule stimulates sexuality. Such an influence from the bodily sphere, however, plays a very different

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role in different patients. The way it is accepted by the personality is very individual. In some cases only burning or twitching results in the genital organs which can be a pleasant, an unpleasant or an indifferent sensation. In other cases the drive to masturbate or to sexual relationship is evoked or exaggerated. In neurotic women the sexual sensation is felt as a temptation and an evil influence which must be suppressed, and neurotic development is impaired.

As we have seen, sexual hormones act quite differently on the female personality at different ages:

in childhood they retard and disturb psychosexual development—
at the right moment in puberty they help to develop the child to an adult woman—

at an adult age they help to maintain the adult psychosexuality, but are not a necessary prerequisite—

given to elderly women as medication in large doses, psychosexuality is stimulated, but this has a greatly varying influence on the emotions from person to person.

What we have seen with regard to the interrelationship of sexual hormones and psychic life, is in principle, true for the interrelationship of any hormone and psychic life.

It never happens that an emotion, a drive, an instinct is elicited and maintained by a hormone alone. A hormone is only one influence on the personality. Such a hormonal influence is formed and developed by the personality.

Hormones are of little significance with regard to *direction of sexuality* towards male or female objects. For example it is well known that they have nothing to do with homosexuality and transvestitism. Life experience regarding the social role which parents and tradition attributed to the child, and life experience with sexual organs are of far greater significance in this respect. It is very probable that inherited innate releasing mechanisms, as described by the well-known animal psychologist K. Lorenz, also play a role in the determination of psychosexuality in the direction of normal heterosexuality or of homosexuality. In this respect hormones certainly play no important role. At best only a few observations have been made showing that they may play an insignificant and subordinate part at times.

PART II: HYPERPARATHYROIDISM

I have discussed a chapter of endocrinologic psychiatry which was studied long ago. I should now like to select a recent study from among a great number of topics. It concerns the psychopathology of *hyperparathyroidism*. It has been studied systematically within the last two years and the results have been published at our clinic by Petersen.

In about two-thirds of the cases a significant psychic alteration is found, but in less than five percent an acute psychosis, of the acute brain syndrome type, breaks out.

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The leading symptoms in the majority of cases are thirst, lack of appetite, and depression. Less frequently than depression is an irritable and explosive mood.

Most hormones act directly on the personality through the brain, not so the parathyroid hormone. The parathyroid is not regulated by the central nervous system as are the pituitary and the endocrine glands which depend on the pituitary.

The psychopathology of hyperparathyroidism depends on the serum calcium level. On the other hand, it is much less dependent on the personality and its psychodynamics than the psychopathology of most other endocrine diseases.

We can speculate as follows: Most already studied hormones are active on specific cerebral systems particularly sensitive to just these hormones. These systems are in connection both with the limbic system and with the brain cortex. It is the physiologic function of the limbic system to work out the endocrine influences and to adapt them to the individual's emotionality and life experiences. In the brain cortex they are regulated in a more complicated way.

The parathyroid hormone does not reach the brain, but it regulates the calcium content of the body. The serum content of calcium influences the nerve synapses of the whole brain and quite directly the thirst centers. This may explain the clinical observation that the effect of parathyroid hormone is more impersonal, less different from individual to individual, than the effect of all the hormones influencing the brain functions and the emotions physiologically.

PART III: PSYCHOPATHOLOGY

I should now like to discuss some more *general problems* of endocrinologic psychiatry.

What is the psychopathology of endocrine diseases?

Men and higher animals have similar endocrine glands and similar hormones. In consequence the hormones influence the biologic background of psychic life which men and animals also have in common. Hormones influence impulsivity, psychological activity, attention and arousal. They also influence biological drives such as the urge to rest and relax or to be active, the urge to protect oneself against heat and cold, somatic sexuality and suppression of sexuality, hunger and satiation, thirst and refusal of liquids, and a primitive drive to mother and to nurse others. Hormones finally influence moods. Apathetic, unstable, irritable, or depressed and anxious moods are frequent in endocrine patients. The changes of impulsiveness, arousability, drives and moods may be lasting, or, which is more characteristic, can start quite suddenly and then without detectable reasons disappear in the same abrupt way.

We can call the psychopathological framework of all these alterations the *endocrine psychosyndrome*. With this expression we do not designate a psychosis, but a personality change. These are the same personality changes known for a long time in localized

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brain diseases, particularly of the brain stem and the frontal lobes. They were first described in detail in patients with encephalitis lethargica. We can observe similar personality changes for instance either after psychosurgical interventions or at the beginning of Huntington's chorea or other systematic degenerative brain diseases.

Real psychoses have become fairly rare in endocrine diseases, since their therapy has made such outstanding progress in the last decades. These psychoses are of the same kind as the acute and chronic cerebral syndromes.

It is easy to explain today the clinical observation that endocrine and cerebral diseases demonstrate the same psychopathology.

Nowadays it has become certain that hormones influence psychic functions by alteration of brain function, or in severe cases even of brain morphology. Nervous systems exist with specific sensibility to specific hormones. Alterations of the concentration of hormones in the blood are registered in these systems and influence their functions. Within recent years one discovery of new and important interrelationships between endocrine and nervous functions follows the other. These discoveries are due to most varied technical methods: Parts of the brain are tested with micro-instillation of hormones, with electric stimulation and coagulation, or by measurement of the size of the nuclei of the nerve cells before and after interventions in the endocrinium. Of great importance also are studies of the correlations between the development of the brain and the endocrine organs in the fetal phase. The rapid progress of our knowledge regarding the interrelationship between nervous and endocrine systems is well illustrated by the comparison of a former classification by Berta Scharrer with a more recent one by Szentagothai and his fellow-workers. Formerly it was a generally held opinion that the gonadotropin secretion of the pituitary is checked by the high content of estrogens in the blood, because this high content is registered by the pituitary itself. Berta Scharrer showed that it is registered by the hypothalamus. Checking of the pituitary gonadotropic function is the consequence of the registration of the high content of estrogens in the hypothalamus and the diminished secretion of gonadotropin-releasing factors of the hypothalamus. Szentagothai and other students of brain physiology showed that there are several other interplays between the nervous and endocrine systems. Elevation of corticoid hormones in the blood checks the secretion of adrenocorticotrophic hormone in the pituitary, because it is registered both in the pituitary itself and in the hypothalamus.

But this is not all: There are at least two more feed-back pathways. In the portal system of the pituitary there is also a flow of blood from the pituitary to the hypothalamus. The content in this blood of adrenocorticotrophic hormone influences the secretion of the corticotrophin-releasing factors of the hypothalamus.

And even more: The functional condition of the adrenal cortex also causes repercussions in the brain through nervous pathways. These pathways go from the adrenal cortex to the ventromedial nucleus of the hypothalamus. (If the nervous communications between adrenal cortex and ganglion coeliacum of the autonomic nervous system

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are interrupted, the nuclei of the nerve cells of the ventromedial nucleus of the hypothalamus are increased in size. Unilateral adrenalectomy has a unilateral effect on the size of nuclei of the nerve cells in the ventromedial nucleus.)

There is no doubt: There are most different and most varied communications between endocrine glands and the central nervous system. We can no longer be astonished that endocrine disturbances do influence the brain and therefore also psychic functions.

Endocrine Influences

In disturbances of drives and instincts such as in poriomania, dipsomania, many toxicomanias, and also alcoholism, mild endocrine peculiarities often play a role. This role varies from one individual case to the other. Endocrine influences in these cases are more easily detected in women than in men. We often found in such cases endocrinologically rooted troubles of the menstrual cycle, precocious amenorrhea, mild hyperthyroidism, changes in androgen production with hirsutism, and so on.

Neurotic personality developments in severe endocrine diseases are the exception and not the rule. Most varied mild endocrine peculiarities, however, are found in a minority of neurotic patients and sometimes have psychodynamic significance. Such endocrine peculiarities are, for instance, late or early puberty, hirsutism, infantilism, and so on. It is astonishing that severe anomalies like pseudohermaphroditism or Turner's syndrome do not lead to a neurotic development, but only to simple and direct psychological reactions. These observations show the truth of an old psychodynamic rule: *What makes us suffer with our whole heart is not a danger with regard to future neurotic development; on the other hand: What tears in two our wants, desires, and fears, our whole personality, is a danger with regard to neurotic morbidity.* If a man is both emotionally and physically infantile, he hardly becomes neurotic; if he is infantile only either in the emotional sphere or in his bodily development, the contradictory qualities are a dangerous background as concerns neurotic morbidity.

Much more could be said regarding endocrinologic findings in psychiatric patients, and still more regarding psychopathologic findings in endocrine patients. Our present knowledge concerning the psychopathology of endocrine patients could easily fill a handbook. However, I should like to utilize the remainder of our time to discuss less pathology than endocrine influences on the healthy personality. I shall forego presenting you with our detailed studies on long series of endocrine patients with different specific endocrine diseases, for instance on patients with hyperparathyroidism, with Addison's disease, with Cushing's disease, after hypophysectomy, after adrenalectomy, after castration, and so on.

The observations of endocrinologic psychiatry throw light on the biologic background of our psychic life. They help us to a conception of the manifold nature of human personality. We have the hormones in common with animals. And we have already noticed: The hormones are active on those psychological backgrounds which we also have in common with them: on hunger, thirst, desire to rest or to move, desire to

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seek the right temperature, sexuality directed to orgasm, general arousal or apathy, elementary emotions such as fear or rage. We might label these aspects of psychologic life as "biologic id". On the other hand, endocrine disturbances do not touch directly what we consider as merely human. They do not touch imagination, intellectual life, artistic susceptibility, human love, self-denial and devotion. These are also the mental regions in which schizophrenic life goes on — which is not directly influenced by the hormones. What only belongs to the human and never to the animals is not affected directly by endocrine functions. It may only temporarily disappear under the influence of endocrine drives and moods or suffer in the course of general brain damage.

The "biologic id" does not mean exactly the same as Freud's psychoanalytic "id". The two conceptions include common aspects of psychic life, but each of them also contains aspects not belonging to the other: The psychoanalytic id contains the dreamy, symbolic life expressing our nature and our surroundings in pictures and symbols. This world of dreams, of mysticism, of autistic wishes and fears, the archaic thinking, only belongs to human psychology. This world is a large part of Freud's psychoanalytical id, but it does not belong to the biologic id and it is not influenced by hormones. The psychoanalytic id, however, also contains biologic drives and instincts, as Freud taught. While the biologic id only contains a part of the psychoanalytic id, the biologic id, also reaches into the life of the ego and even super-ego. We do not consider nowadays the conscience and the super-ego only as a consequence of education, but we have recognized that even in biology each drive arouses a counter-reaction. Sexuality is not only controlled by the ego and the super-ego as they have developed psychodynamically, but also by biologic feed-back mechanisms. No elementary drive exists without biologic control. The blocking of sexual drives by biological feed-back is demonstrated again and again in endocrine patients. In this way, the biologic id reaches far into the conscious ego and super-ego.

Influence of Therapeutic Drugs

It may well be that the effect of hormones shows in principle what therapeutic drugs may influence in the psychic functions and what they cannot influence. They do influence the degree of wakefulness, of vigilance, of attention, of arousal, as well as biologic drives and instincts, but their effect does not reach into the regions of intellect and of human imagination.

I should like to mention the question of whether in the everyday life of the healthy, an influence of endocrine functions on the emotional life, and of the emotional life on endocrine functions does exist. Many studies prove that emotional agitation in the healthy alters many endocrine functions immediately. It is particularly well demonstrated that the adrenal cortex and the adrenal medulla are stimulated by the most varied emotional agitations. It is also certain that emotions may stimulate the endocrine functions of the testes and the ovaries, the secretion of the growth hormone and, in some, but not all, healthy people, the thyroid. They also have a well-known influence on sugar metabolism. In more recent studies the 17 hydroxycorticosteroid level in the blood plasma has been measured. These studies confirmed that psychologic stress immediately stimulates the adrenal cortex. Furthermore, they demonstrated that the adrenocortical

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function is diminished if the attention is directed towards an interesting, but harmless topic not arousing great emotions. Recently, a temporal correlation has been found between so-called paradoxical sleep with its rapid eye movements and phases of highly stimulated adrenocortical function. One might speculate as to whether adrenocortical function has anything to do with the mysterious function of dreams as concerns the definite retention and integration of memories supposed to take place during paradoxical sleep. It is also certain that the echoing of the emotions in the endocrine system is a very personal one. Williams has described the "biochemical individuality" of the human. Within its framework there exists an "endocrinologic individuality", that is, each human being responds emotionally in his own personal way with stimulation of endocrine functions and vice-versa.

So we know much concerning the effects of emotions on the endocrine functions in the healthy, but we do not know much of the effects of hormones on emotions in the healthy. The emotional effects of hormonal injections — of catecholamine, of corticoids, of thyroxine, for instance, have only been observed with highly unphysiologic dosages.

With regard to this question I should like to discuss one further observation: Nowadays we can observe many patients in whom an endocrine gland has been removed or has lost its function and in whom hormonal substitutional therapy replaces natural endocrine function, for instance hypophysectomized, adrenalectomized, thyroidectomized and castrated patients. The therapy of substitution is able fully to compensate the somatic effect of the natural hormones. The question arises: What changes are observed in the emotional life of these patients lacking an endocrine gland and whose somatic functions are kept intact by substitutional therapy?

It is certain that in all these cases severe mental and emotional disturbances are prevented as well as somatic disturbances. As far as our experience goes, the replacement therapy, however, does not prevent certain mild alterations of the emotional personality. These patients seem to lose something of their personal profile. Their emotional life becomes more flat and colourless. Their relationships with other people are correct, but they lack real warmth of heart and enthusiasm. They resemble patients after successful psychosurgery. This can easily be explained: In these patients the emotions have no effect upon the endocrine functions and, therefore, it must be assumed, there is no echoing of endocrine changes in the emotional life.

Summary

I hope to have demonstrated: Endocrinology is not of primary importance for psychiatry nor is psychiatry for endocrinology. The study of the interplay of endocrine and psychic functions, however, is useful in the diagnosis and in the therapy of some patients. In the field of endocrinologic psychiatry clinical research and research on cerebral physiology are supplementary one to the other and have reached new insight in common. Our knowledge of the psychology of the healthy and of the normal personality development can be widened and improved if we consider the effect of endocrine functions on some prerequisites of psychic life.

