

Hormonoids and Hormones

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ABSTRACT

The field of endocrinology is ever expanding. With a rapid increase in the understanding of different hormones and hormone-like substances, there is a need to update the nomenclature of these chemical messengers. The authors propose a novel term “Hormonoids”, defined as endogenous or exogenous substances that lead to hormone-like effects in the body. These may refer to various neurotransmitters, minerals, alkalis, acids, and vitamins that are not conventionally classified as hormones, but act upon receptors in target areas and are regulated by complex interlinked processes. These are required for homeostasis, and an imbalance in their concentration or activity may lead to dysfunction and disease. They may also be used as pharmacotherapy for these associated disorders.

Keywords: Hormonoids, hormones, hormone-like chemicals, chemical messengers, neurotransmitters

Hormones are chemical messengers produced by specialized cells, glands, or organs that regulate physiological activities such as growth, metabolism, reproduction, and homeostasis¹.

A hormone should have a well-identified source of origin and target of action. Its mechanisms, modes of action, and regulatory pathways are usually well-understood². While this may have been true in the past, modern advances have created a knowledge paradox. The rules of endocrine physiology seem more uncertain as we gain new information and make novel discoveries. We keep learning pleiotropic and nonconventional actions of classic hormones while discovering newer sites of their synthesis and receptors. The classic or binary definitions of hormonal versus nonhormonal substances thus get blurred.

This is especially true in two fields: neuroendocrinology and metabolism. Neurotransmitters, which have distinct actions in the brain and peripheral nervous system,

may or may not be classified as hormones³. Adrenaline, noradrenaline, and dopamine are characteristic models where chemicals work as neurotransmitters as well as hormones. Endorphins and endogenous opioids are other examples.

The field of metabolism is even more complex. Various minerals, alkalis, acids, and vitamins act upon receptors in target areas and are regulated by complex interlinked processes^{4,5}. Though similar to hormones in many aspects, these are not included in traditional lists of endocrinology. The emergence of obesity as a major public health issue has shone the spotlight on yet another aspect of hormonal balance: quantum endocrinology⁶. This concept encourages us to think beyond the linear feedback system of traditional endocrinology and accept complex interplays of hormones, transmitters, and other chemicals.

To this discussion, we add the word ‘hormonoids’. Hormonoids may be defined as endogenous or exogenous substances that lead to hormone-like effects in the body. Hormonoids are required for homeostasis, and an imbalance in their concentration or activity may lead to dysfunction and disease (Table 1). However, they do not necessarily follow the classic vertical, negative feedback mechanisms that hormones do.

Table 1. Examples of Uses of the Word ‘Hormonoid’

- In biochemistry, to describe transmitters and chemicals.
- In physiology, to describe processes and pathways.
- In pharmacology, to describe endocrinotropic drugs.

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Table 2. Classification of Hormonoids

- Minerals: Hydrogen, sodium, potassium, magnesium, calcium, phosphate
- Vitamins: Vitamin D, vitamin E
- Acids, alkalis: Bicarbonate, chloride
- Drugs: Single, dual, and triple peptide agonists for obesity management
- Neurotransmitters

Table 3. Difference Between Hormones and Hormonoids

	Hormones	Hormonoids
Origin	Endogenous, from well described glands of body	Endogenous, from various cells, tissues, organs or exogenous, from diet and external sources
Response	Usually negative feedback; rarely, positive; usually vertical	Complex; horizontal; vertical
Chemical nature	Usually complex proteins, amino acid derivatives or steroids	Can be simple or complex

This term may be used as a noun to classify chemicals that work to regulate homeostatic processes in a manner similar to that of hormones. It may also be viewed as an adjective to describe substances and their action.

"Obesity is influenced by a wide variety of hormones and hormonoids."

"Magnesium is a tightly regulated hormonoid, while albumin is a weakly regulated one."

"Testosterone has hormonal as well as hormonoid actions in the body."

While the above uses are physiological, the word hormonoid also lends itself to use in pharmacology. Hormonoids describe drugs that have endocrinotropic effects and act as agonists or stimulants upon various hormonal receptors (Table 2). The key differences

between hormones and hormonoids are summarized in Table 3.

"A new class of hormonoids, consisting of single, dual and triple peptide agonists, is being developed for use in type 2 diabetes and obesity."

"Love is the best hormonoid: it has an origin, a target, and can have pleiotropic benefits."

CONCLUSION

This brief communication suggests a novel term for substances that are not conventionally classified as hormones, but may have similar effects. They act upon receptors in target areas and are regulated by complex interlinked processes. The usage of this term will enhance the understanding of these chemicals in different pathophysiological processes, and also suggest more rational use in treating different endocrine disorders.

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