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## PROPOSALS CONCERNING BIOCYBERNETIC REGULATION PRINCIPLES BY DRUGS

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*Abstract.* In order to develop a cybernetic-informational pharmacology, in this paper the author speaks about the principles and modalities used by the biocybernetic regulation mechanisms, in the physiological and pharmacological fields. The author highlights the fact that the drug signals, as the biological signals, regulate the disorders within the feedback and feed-before biocybernetic mechanisms, through iso-, homeo- and allo-, enantio-regulation respectively, based on the four principles (identity, similitude and derivation, contraries respectively). It is emphasized the fact that these four principles and modalities for the regulation are claimed by the two alternative pharmacotherapeutic methods known in medicine, namely homeopathy and allopathy, respectively.

*Key words:* biocybernetic regulation principles, pharmacology, allopathy and homeopathy.

### INTRODUCTION

We have seized the need for a general theory of information and systems to be introduced in modern pharmacology since 1985 and we have elaborated the concept of "cybernetic-informational pharmacology" [2] that we developed theoretically and experimentally (1985-1996).

In this paper, we further discuss about the regulation principles and modalities used by the two cybernetic regulation mechanisms (i.e. feedback and feed-before). In this context we'll draw a parallel between the physiological control modalities and those provided by pharmacotherapeutics (Table 1).

### BIOCYBERNETIC MECHANISMS OF FEEDBACK AND FEED-BEFORE

The regulation mechanisms in the biocybernetic systems are well-known, i.e. the feedback type mechanisms (close circuit mechanisms or reverse con-

nexion or retroaction mechanisms) and feed-before or feed-forward type mechanisms (mechanisms of decision for prevention of possible errors) [1, 12].

As concerns the ratio between these two regulation mechanisms, it was considered that actually the feedback type mechanism is strongly connected with the feed-before one, because the feed-before mechanism is a mechanism for the prevention of the disorders likely to be produced by the environment, while the feedback mechanism is likely to amend the disorders that couldn't be prevented. Thus, the first one is a command mechanism which in fact establishes the relationships between the body and the environment, while the second is a control mechanism which strives to execute the orders given by the prevention mechanism [13].

It was also shown that the feed-before mechanism is very sensitive and, consequently, vulnerable too to the informational overexertion that can affect it [14].

On this line, we want to add that the feed-before mechanism, planned to predict and prevent all possible disorders, beside its "prophylactic" role in the body, determines also the advancement of certain imbalances, overloading the feed-back type mechanisms. Thus, dialectically, the feed-before mechanism is, on the one side, a possibility to improve the cybernetic systems, while on the other side it intrinsically contains one of the imperfections of these systems [3, 5].

#### ISO-, HOMEO-, ALLO-, ENANTIO-REGULATION PRINCIPLES IN THE FIELD OF PHYSIOLOGY AND PHARMACOLOGY

In our studies on cybernetic-informational pharmacology (pharmacocybernetics and pharmacoinformatics), we noticed the relations between contrary and similarity in the regulation of human and animal biocybernetic systems and in their subsystems [3, 4, 5]. In the biocybernetic systems, the errors and disturbances are corrected and prevented through the intervention of the elements of the disturbed circuit as well as of some similar ones and at the same time through the participation of complementary and contrary elements resulted from the systems complementary and antagonic to the disturbed system. The roles played by all these elements are equally important, both those identical of and similar to the disturbed system and those complementary and contrary.

We emphasized the fact that the feedback and feed-before cybernetic mechanisms work with these elements precisely [4, 5]. We stressed that the feedback mechanism operates with the information brought by the selfsame elements of the circuit and some similar ones, while the feed-before mechanism provides complementary and contrary elements beside certain similar ones.

lar), alloregulation (*allos* = different) and enantio-regulation (*enantios* = contrary) respectively.

The principles of correction and prevention of disorders, on which these four regulation modalities are based, may be called:

- the principle of identity (*Aequalia, aequalibus reglantur*);
- the principle of similitude (*Similia, similibus reglantur*);
- the principle of derivation (*Aliena, alienis reglantur*);
- the principle of contraries (*Contraria, contrariis reglantur*).

Consequently, we emphasized that, in the human body, as a hyperintegrated biocybernetic system, four regulation modalities (*izo-, homeo-, allo-* and *enantio-*regulation), based on the four principles (identity, similitude, derivation and contraries respectively), function within the feed-back and feed-before mechanisms [5,6,7] (Table 1).

The endocrine regulation through positive and negative feed-back mechanisms is very well-known [9, 10]. In fact, it is an iso-regulation which operates with elements identical to the system, on the basis of the principle of identity [6, 7].

Table 1

Regulation principles of biocybernetic systems in physiologic and pharmacologic fields

Biocybernetic mechanisms	Feedback	Feed-before (feed-forward)
Principles	- identity - similitude	- derivation - contraries
Modalities	- iso-regulation - homeo-regulation	- allo-regulation - enantio-regulation
Elements	- identical - similar	- complementary - contrary
Claim	- specificity and significance of element	- quantity of element
Quantity of elements	- infinitesimal	- more substantial
Potency	- high	- low
Fields	- physiologic - pharmacologic	- physiologic - pharmacologic

It is worth mentioning that these principles are not only the physiologic regulation ones, but also those claimed by the two alternative pharmacotherapeutic methods known in medicine, namely homeopathy and allopathy.

As a result, we sustain the reality that the two pharmacotherapeutic methods, the allopathic and homeopathic ones, make use of mechanisms, modalities and principles for the regulation of disorders, whose efficacy was checked by the perpetuation of the human biocybernetic system [8]. Obviously, this perpetuation is limited between birth and death, because of the above mentioned imperfections of the human biocybernetic system itself [14]. One of these imperfections resides in the fact that the feed-before mechanism was scheduled to anticipate possible disorders, with the possibility to bring about *a priori* too numerous preventive elements without a real justification, as we have already shown.

We also noticed that the regulation based on the principle of similitude, within the feedback mechanisms, develops under physiologic conditions, with infinitesimal deviations of the quantity of selfsame element or element similar to the subsystem. While the prevention or regulation of disturbances based on the principles of contraries, triggered by the feed-before mechanism, in limit situations, when the regulation through specific elements or elements similar to the systems could be or even is obsolete, is achieved through the release of complementary and contrary elements from the complementary and antagonist subsystems in, physically, more substantial quantities [7].

Consequently, we draw the attention on the particularity fact that, within the feed-back mechanism, the importance for the system of the informational specificity and significance of the identic or similar regulating element prevails over the quantity of information (dose, dilution). As a result, we emphasize that in the feed-back biocybernetic mechanisms operates one of the general laws of information: "maximum significance, minimum quantity, maximum effect" [11].

We wish to stress that this phenomenon, extended from the field of physiological regulation to medicine, may acquire a special therapeutic value. On the basis of this real biocybernetic-informational phenomenon, we can explain, from the point of view of cybernetic-informational pharmacology, the potency and high efficacy of the drugs acting, within the feedback mechanisms, on "translator" presynaptic receptors, as element similar to the specific elements (mediators) of the disturbed subsystem [7].

We should add that the principle of "similitude" is the pharmacotherapeutic principle used by the homeopathic therapeutic method, while the allopathic method generally employs the principle of "contraries".

However, we highlight the fact that drugs acting within the feedback

turbance of the functional tone of that subsystem. A very significant example is the antihypertensive allopathic drug clonidine. This drug acts as an element similar to the chemical neuromediator noradrenaline (NA), having thus the possibility to stimulate the presynaptic "translator" modulating receptors of the alpha-2-adrenergic subtype, triggering in this way the negative feedback mechanism in the adrenergic synapse, with a reequilibration of the chemical neuromediator and thus of the functional tone of the sympathetic system involved in the regulation of blood pressure. For the very reason that clonidine acts on the basis of the principle of "similitude" within a feed-back mechanism, the doses of clonidine used may be very low compared with the usual doses of allopathic antihypertensive drugs, i.e. doses of about 1 microgram/kg body (Fig. 1).

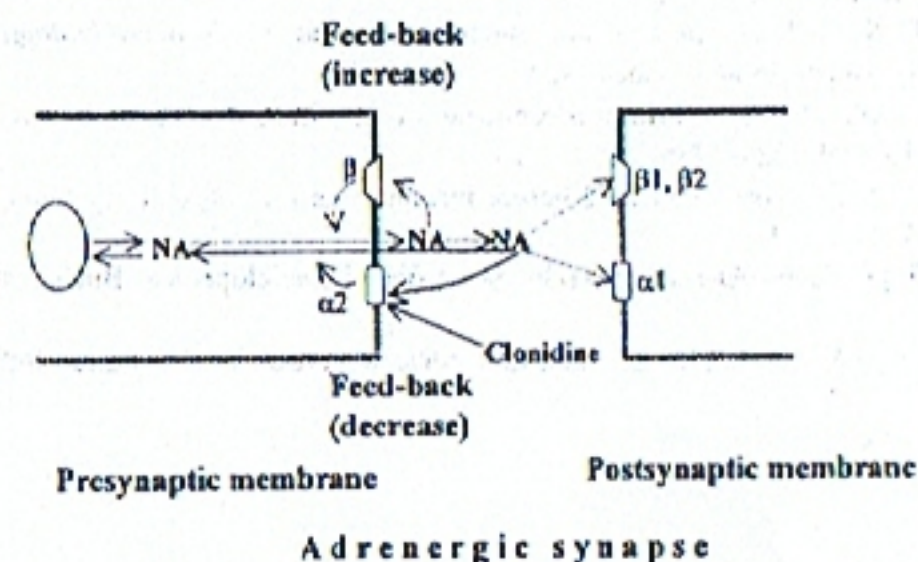


Fig. 1. - Iso- and homeo-regulation modalities of adrenergic synapse. NA = noradrenaline;  $\alpha_1, \beta_1, \beta_2$  = effective receptors;  $\alpha_2, \beta$  = modulating receptors.

In conclusion, we can say that in the functioning of the human and animal biocybernetic systems, regulation through identical and similar elements is as important and significant as regulation through complementary and contrary elements, in both physiologic and pharmacologic fields.

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