Features of hormonal homeostasis under the influence of bioresonance therapy in complex treating hemorrhagic fever with renal syndrome

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In recent years, on the basis of truly innovative technologies, integrative approaches to the prevention and treatment of diseases have been intensively developed, taking into account the reserves of the adaptive capabilities of the body and the levels of their reactivity, the state of the main regulatory systems in terms of their stress and exhaustion (Gotovsky Yu.V. et al., 1998) ...

The purpose Our study was to study the influence of various variants of bioresonance effects on pathogenetic mechanisms reflecting the state of hormonal status in the complex treatment of hemorrhagic fever with renal syndrome (HFRS).

The study included 78 patients with HFRS (observation group I) against the background of the combined use of drug therapy and various options for bioresonance therapy (IA subgroup - resonance frequency therapy, IB - endogenous bioresonance therapy, IC - induction therapy, ID - combined use of resonance frequency therapy, endogenous bioresonance and induction therapy) and 23 patients with HFRS (II comparison group) who are only on drug therapy.

To assess the state of the dynamics of the hormonal status and the effectiveness of treatment in 101 patients with HFRS (men aged 18 to 55 years), the levels of prolactin in the blood plasma were determined, cortisol, thyroid-stimulating (TSH) and thyroid hormones (T_3 and T_4), testosterone, C-peptide, insulin in the dynamics of the disease, depending on the period (high and early convalescence) and the degree the severity of the disease (mild - 29 people, moderate - 43, severe - 29) and in 30 healthy individuals.

The results of our study found that in the initial state in patients with HFRS of both groups, there are significant changes in hormonal homeostasis in the acute period of the disease (Tables 1 and 2.).

Table 1

Initial content of prolactin, cortisol, testosterone, C-peptide, insulin in patients HFRS (groups I and II) in the acute period before treatment

Indicators / Groups	Prolactin, ng / ml	Cortisol, nmol / l	Testosterone nmol / l	C-peptide, nmol / l	Insulin, pmol / l
Healthy faces, n = 30	2.6	267.2	16.1	206.4	60.0
I - group on-observation (A, B, C, D), n = 78	17.6	772.2	15.1	360.4	153.8
Multiplicity levels	6.8	2.9	0.9	1.8	2.6
R	<0.05	<0.05	<0.05	<0.05	<0.05
II - group comparison, n = 23	16.4	796.7	14.7	391.1	160.3
Multiplicity levels	6,7	3.0	0.9	1.9	2.7
R	<0.05	<0.05	<0.05	<0.05	<0.05
R*	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05

Note:
P - value of reliability with the norm;
P * - value of confidence between groups (using the Newman-Keuls coefficient).

table 2

The initial content of thyroid gland parameters in patients with HFRS (groups I and II) in acute period before treatment

Indicators Groups	TSH, mIU / l	T_3 nmol / l	T_4, nmol / l	Coefficient = (T3 + T4) / TSH, conv. units
Healthy faces, n = 30	1.17	1.53	112.3	97.3
I - group on-observation (A, B, C, D), n = 78	2.81	1.20	105.2	37.9
Multiplicity levels	2.4	0.9	0.9	3.0
R	<0.05	<0.05	<0.05	<0.05
II - comparison group, n = 23	2.81	1.22	103.3	37.2
Multiplicity levels	2.4	0.9	0.9	3.0
R	<0.05	<0.05	<0.05	<0.05
R*	> 0.05	> 0.05	> 0.05	> 0.05

Note:
P - value of reliability with the norm;
P * - value of confidence between groups (using the Newman-Keuls coefficient).

As can be seen from Tables 1 and 2, during the peak period in patients with HFRS before treatment with HFRS, in both groups there is a significant increase in comparison with the norm, the concentration of prolactin, respectively, 6.8 and 6.7 times, cortisol - 2.9 and 3 times, TSH - 2.4 and 2.3 times, insulin - 2.6 and 2.7 times and C-peptide - 1.8 and 1.7 times ($p < 0.05$). Testosterone concentration levels, T_3 and T_4 significantly lower than normal values. In this case, the ratio coefficient (T3 + T4) / TSH varies within 3 times the normal range.

The results of the study showed that in all patients with HFRS in the acute period disease, dysfunction is observed both in the central and peripheral links of the adaptive-compensatory mechanisms of hormonal regulation. A significant increase in the concentration of prolactin, as well as cortisol, TSH, testosterone, C-peptide and insulin indicates not only the activation of the hypothalamic-pituitary-adrenal system (HPA), but also its links of interaction - the thyroid-stimulating, gonadotropic and glycemic axis. Availability signs of discoordination in the form of an increase in TSH levels with a simultaneous decrease in T levels$_3$ and T_4 confirms the manifestation of the so-called "euthyroid" pathological syndrome.

Thus, impaired neurohumoral regulation in patients with HFRS is a distinctive syndrome, has a phase nature, correlates with the characteristics of the clinical picture and the prognosis of the disease. The greatest difference in the violation of hormonal homeostasis was recorded in the acute period, especially in the initial period of the disease.

Two forms of hormonal regulation were established: expanded in 82 patients with HFRS (81.8%) and reduced in 19 (18.2%).

Expanded regulation was characterized by hyperprolactinemia, increased levels of cortisol, C-peptide, insulin in blood plasma and a change in the pituitary-thyroid axis towards laboratory hypothyroidism or euthyroid syndrome.

With the reduced form, various variants of the hormonal spectrum were recorded, however, hyperprolactinemia and a significant increase in the level of cortisol in the blood plasma were mandatory.

In a comparative analysis of the data obtained in randomized groups (observation group I and comparison group II) of patients with HFRS, the degree of the most significant changes was recorded in group I against the background of various variants of bioresonance effects in the acute and recovery periods of the disease (Tables 3 and 4).

In the acute period, under the influence of resonance-frequency therapy in the complex treatment of patients with HFRS (subgroup IA), statistically significant changes were revealed only in the insulin content, the level of which decreased from the initially increased by + 26.4% (from 155.6 pmol / l to 114, 5 pmol / L, $p < 0.05$).

During the course of complex therapy with the inclusion of endogenous bioresonance therapy (IV subgroup of observation) in patients with HFRS in the acute period, there was a positive trend towards a decrease in the initially elevated levels of prolactin by 21.8% (from 17.9 ng / ml to 14.0 ng / ml , $p < 0.05$), C-peptide by 22.2% (from 353.2 nmol / L to 274.7 nmol / L) and insulin - 31.4% (from 152.9 pmol / L to 104, 9 pmol / L, $p < 0.05$).

Regarding thyrethropic (TSH) and thyroid hormones (T_3 and T_4) there was a clear trend towards a decrease in elevated TSH levels - by 14.9% (from 2.75 mIU / L to 2.34 mIU / L, p> 0.05) and an increase in initially lowered T levels$_3$ by 18.2% (from 1.21 nmol / L to 1.43 nmol / L, p> 0.05) and T_4 by 13.6% (from 103.1 nmol / L to 117.1 nmol / L, p> 0.05). In this case, the value values of the ratio (T3 + T4) / TSH significantly increased by 33.8% (from 37.9 conventional units to 50.7 conventional units, p <0.05).

An identical, but more significant dynamics of changes in hormonal status was observed when using induction therapy (IC subgroup) in the complex treatment of patients with HFRS in the acute period, which manifested itself in a significant decrease in prolactin levels by 21.6% (17.6 ng / ml to 13.8 ng / ml, cortisol by 30.0% (from 794.2 nmol / L to 556.2 nmol / L, p <0.05), C-peptide by 21.8% (361.1 nmol / L to 282.3 nmol / L) and insulin by 31.2% (from 148.6 pmol / L to 102.2 pmol / L, p <0.05) and an increase in the ratio (T3 + T4) / TSH by 29.6% (from 38.0 conventional units to 48.3 conventional units, (p <0.05).

The most noticeable positive shifts in the chain of the studied hormonal parameters were noted under the influence of the combined use of bioresonance therapy (ID subgroup) in the complex treatment of patients with HFRS in the acute period of the disease. We found a significant decrease in the initially elevated levels of prolactin hormones by 36.0% (from 17.2 ng / ml to 11.0 ng / ml, p <0.05), cortisol by 25.5% (from 763.0 to 568.0 nmol / L, p <0.05), insulin by 26.9% (s 157.9 nmol / L to 109.8 pmol / L, p <0.05) against the background of a significant increase in testosterone by 14.7% (from 15.4 nmol / L to 19.2 nmol / L, p <0.05), the ratio (T3 + T4) / TSH by 51.6% (from 38.2 conventional units to 57.9 conventional units, p <0.05) and T_4 by 22.3% (from 103.0 nmol / L to 126.0 nmol / L, p <0.05).

The dynamics of the revealed hormonal changes under the influence of drug therapy (II comparison group) was recorded to a lesser extent, moreover, an even greater significant decrease in insulin levels by 74.1% (from 160.3 pmol / l to 41.5 pmol / l, p < 0.05 against the background of a downward trend in initially elevated levels of prolactin, TSH and T4.

In a comparative analysis of the final values of the level of the studied hormones, depending on the type of treatment in randomized groups (I observation group and II comparison group) in patients with HFRS in the acute stage of the disease, the best results were stated when using a combined type of bioresonance therapy (resonance frequency, endogenous bioresonance and induction therapy) and endogenous bioresonance therapy in complex treatment (Tables 3 and 4).

Table 3

Comparative dynamics of the content of prolactin, cortisol, testosterone, C-peptide, insulin in patients with HFRS in the acute period under the influence of various types of complex therapy

Indicators / Groups		Prolactin, ng / ml	Cortisol, nmol / l	Testosterone nmol / l	C-peptide, nmol / l	Insulin, pmol / l
Healthy faces, n = 30		2.6	267.2	16.1	206.4	60.0
IA Group observation, n = 18	one	17.5	802.2	15.0	381.8	155.6
	2	14.3	690.6	15.6	348.2	114.5
	R	> 0.05	> 0.05	> 0.05	> 0.05	<0.05
Degree changes, %		- 18.3	- 13.9	+ 4.0	- 8.8	- 26.4
R*		> 0.05	> 0.05	> 0.05	> 0.05	<0.05
IB Group observation, n = 19	one	17.9	729.9	15.1	353.2	152.9
	2	14.0	640.3	15.5	274.7	104.9
	R	<0.05	> 0.05	> 0.05	<0.05	<0.05
Degree changes, %		- 21.8	- 12.3	+ 0.7	- 22.2	- 31.4
R**		> 0.05	> 0.05	<0.05	<0.05	<0.05
IC Group observation, n = 20	one	17.6	794.4	15.0	361.1	148.6
	2	13.8	556.2	16.7	282.3	102.2
	R	<0.05	<0.05	> 0.05	<0.05	<0.05
Degree changes, %		- 21.6	- 30.0	+ 11.3	- 21.8	- 31.2
R***		> 0.05	<0.05	<0.05	<0.05	<0.05

ID Group observation, n = 21	one	17.2	763.0	15.4	345.6	157.9
	2	11.0	568.3	19.2	292.0	109.8
	R	<0.05	<0.05	<0.05	> 0.05	<0.05
Degree changes, %		- 36.0	- 25.5	+ 24.7	- 15.5	- 26.9
R****		<0.05	<0.05	<0.05	<0.05	<0.05
II - group comparisons, n = 23	one	17.7	796.7	14.7	371.1	160.3
	2	15.1	728.7	15.2	348.7	41.5
	R	> 0.05	<0.05	<0.05	<0.05	<0.05
Degree changes, %		- 14.7	- 8.6	+ 10.2	- 6.0	- 74.1

Note: 1 - before treatment; 2 - after treatment; P - value of dostove before and after treatment; R*, P **, P ***, P **** - the significance of the reliability between the corresponding subgroups IA, IB, IC, ID and II - by the comparison group (using the Newman-Keuls coefficient); (-), (+) - the degree of decrease or increase in indicators after treatment in comparison with the initial levels.

Table 4

Comparative. dynamics of the content of TSH, T_3 and T_4 in patients with HFRS in the acute period under the influence of various types of complex therapy

Indicators / Groups		TSH, mIU / l	T_3 nmol / l	T_4, nmol / l	Coefficient = (T3 + T4) / TSH, conv. units
Healthy faces, n = 30		1.17 ± ± 0.02	1.53 ± ± 0.05	112.3 ± ± 1.21	97.3
IA Group observation, n = 18	one	2.94	1.18	108.5	37.3
	2	2.66	1.26	114.4	43.5
	R	> 0.05	> 0.05	> 0.05	> 0.05
Change rate,%		- 9.5	+ 6.8	+ 5.4	+ 16.6
R*		> 0.05	> 0.05	<0.05	<0.05
IB Group observation, n = 19	one	2.75	1.21	103.1	37.9
	2	2.34	1.43	117.1	50.7
	R	> 0.05	> 0.05	> 0.05	<0.05
Change rate,%		- 14.9	+ 18.2	+ 13.6	+ 33.8
R**		> 0.05	<0.05	> 0.05	<0.05
IC Group observation, n = 20	one	2.83	1.25	106.3	38.0
	2	2.43	1.38	118.3	49.3
	R	> 0.05	> 0.05	> 0.05	<0.05
Change rate,%		- 14.1	+ 10.4	+ 11.3	+ 29.6
R***		> 0.05	<0.05	> 0.05	<0.05
ID Group observation, n = 21	one	2.73	1.19	103.0	38.2
	2	2.20	1.41	126.0	57.9
	R	> 0.05	> 0.05	<0.05	<0.05
Change rate,%		- 19.4	+ 17.6	+ 22.3	+ 51.6
R****		> 0.05	<0.05	> 0.05	<0.05
II - group comparisons, n = 23	one	2.81	1.17	103.9	37.4
	2	2.35	1.12	84.7	36.5
	R	> 0.05	> 0.05	> 0.05	> 0.05
Change rate,%		- 16.4	- 4.3	- 18.5	- 2.3

Note: 1 - before treatment; 2 - after treatment; P is the significance of the validity before and after treatment; P *, P **, P ***, P **** - the significance of the reliability between the corresponding subgroupsIA, IB, IC, ID and II - by the comparison group (using the Newman-Keuls coefficient); (-), (+) - the degree of decrease or increase in indicators after treatment in comparison with the initial levels.

When comparing the dynamics of all analyzed parameters of the hormonal spectrum of groups I and, the most significant shifts were recorded under the influence of complex therapy with the inclusion of endogenous BRT (IB subgroup) and a combined variant of bioresonance therapy (ID subgroup). The use of endogenous BRT (IB subgroup) and combined exposure to BRT (ID subgroup) led to a more significant central homeostatic effect and an improvement in neurohumoral regulation according to the dynamics of a decrease in the initially increased content of PRL and TSH. This was confirmed by comparing the dynamics of a comprehensive assessment of the pituitary the thyroid axis in terms of the degree of changes in the ratio (T3 + T4) / TSH, which, when using endogenous BRT (IB subgroup) increased from the initial 1.4 times ($p < 0.05$), ID subgroup - 1.6 times ($p < 0.05$) compared with the same indicators in the drug therapy group (II comparison group).

When assessing the relationship of hormonal markers testosterone-cortisol, C-peptide-insulin, reflecting the intensity of anabolism-catabolism processes, the most noticeable effect was observed under the influence of induction therapy and the combined variant of BRT (IC and D subgroups). So, when comparing the dynamics of testosterone during the course combined exposure to BRT, its level increased by 1.3 times with a simultaneous equivalent decrease in cortisol levels by 1.3 times, respectively, in the IC and ID subgroups compared with the II comparison group ($p < 0, 05$). With regard to C-peptide and insulin, a significant decrease in insulin secretion was recorded in the drug therapy group (II comparison group), the levels of which were below normal, i.e. 41.5 pmol / l and significantly differed from those of the IC and ID subgroups, respectively, 102.2 pmol / l and 109, 8 pmol / l ($p < 0.05$) at a rate of 60.0 pmol / l. The degree of postsecretory insulin metabolism according to the dynamics of C-peptide again manifested itself as a significant difference in the direction of decrease in comparison with drug therapy (group), respectively, in the B subgroup by 1.3 and 1.2 times - in the D subgroup ($p < 0.05$).

When assessing the effect of combined bioresonance exposure (D subgroup), not only an undoubted advantage was revealed in relation to individual variants of bioresonance therapy (RFT, endogenous BRT, induction therapy) in the corresponding IA, IB, IC subgroups, but also the greatest significance compared with drug therapy (II comparison group). This was confirmed not only by the presence of a significant improvement in central neurohumoral regulation in terms of the dynamics of a decrease in hyperprolactinemia, the content of cortisol, TSH, C-peptide, insulin in blood, a significant increase in the values of the ratio (T3 + T4) / TSH and testosterone, but also in terms of the leveling of hormonal imbalance in patients with HFRS I observation group. However, upon completion of the course variants of bioresonance effects, there was no normalization of the studied hormonal spectrum when compared with the standard indicators.

Nevertheless, it can be considered that the greatest effect of bioresonance effects on hormonal homeostasis in the acute period of HFRS is associated with the summation of certain types of BRT as a result of a positive effect on the central and peripheral links of the endocrine system, causing clear dynamics towards the normalization of neurohumoral regulation.

This was confirmed when comparing the final results of treatment and depending on the severity of HFRS (mild, moderate, severe). Once again, the best therapeutic effect was recorded when using a combined type of bioresonance therapy (ID Group).

During the period of early rehabilitation in patients with HFRS, upon completion of the course combined option (endogenous BRT and induction therapy) and its assessment a month later, statically significant recovery of the analyzed parameters of the hormonal spectrum was observed in most cases.

Table 5

Comparative dynamics of the content of prolactin, cortisol, testosterone, C-peptide, insulin, TSH, T_3 and T_4 in the acute period in patients with HFRS, depending on the severity of the the influence of various types of complex therapy

Indicators	Degree gravity	IA subgroup n = 18	IB subgroup n = 19	IC subgroup n = 20	ID subgroup n = 21	II subgroup n = 23
Prolactin, 2.6 ng / ml	Easy	13.4	13.3	13.2	8.1 *	13.4
	Average	14.1	13.8	13.6	11.4 *	15.7
	Heavy	15.5	15.0	14.6	13.5 *	16.5
Cortisol, 267.2 nmol / l	Easy	634.6	601.1	500.1 *	505.5 *	644.9
	Average	660.7	632.4 *	548.3 *	581.4 *	764.7
	Heavy	776.3	685.8	621.2 *	617.8 *	746.7
Testosterone, 16.1 nmol / l	Easy	16.0	17.0 *	17.1 *	19.8 *	15.8
	Average	15.7	16.6	16.7	19.3 *	15.2
	Heavy	15.1	15.9	16.0	18.5 *	14.6
C-peptide, 206.4 nmol / l	Easy	324.3	259.7	272.0	212.2	290.2
	Average	347.1	274.4	281.2	245.6 *	367.4
	Heavy	373.2	288.6	294.3	288.9 *	388.7
TSH, 1.17 mIU / L	Easy	107.4 *	94.7 *	101.5 *	90.8 *	45.1
	Average	116.1 *	108.6 *	105.8 *	98.1 *	40.5
	Heavy	120.0 *	109.9 *	107.8 *	101.7 *	38.6
T_3, 1.53 nmol / l	Easy	2.25	1.84	2.28	1.58 *	2.05
	Average	2.80	2.36	2.49	2.29	2.33
	Heavy	2.92	2.85	2.51	2.63	2.67

P * - the value of the reliability between the corresponding subgroups IA, IB, IC, ID and II - by the comparison group (using the Newman-Keuls coefficient)

The level of PRL returned to normal in 14 (43.8%) patients in group and only in 1 (2.9%) patient in group; in terms of the mean value, the level of PRL in group was 5.8 ng / ml, and in group - 12.2 ng / ml (norm 2.6 ng / ml). Identical shifts occurred in the change in cortisol levels, which reached the normal level in the group in 18 (56.3%) patients, in the group - 3 (10.3%) patients, the mean values of cortisol were, respectively, 252.5 nmol / l and 507.7 nmol / l (the norm is 267.2 nmol / l) when the levels of cortisol in blood plasma approach the upper limit of the norm in the I observation group, which did not happen in the II comparison group. With regard to changes in C-peptide and insulin, the following regularity was manifested, the level of C-peptide remained somewhat increased against the background of a sharp increase in insulin by 66.8% ($p < 0.05$) in the observation group and vice versa, its significant decrease by 40.4% ($p < 0.05$) in the II comparison group. Moreover, hypoinsulinemia in patients with HFRS II of the comparison group was accompanied by its clinical symptoms - hypoglycemia, a sharp increase in appetite.

A significant difference was recorded between the levels of testosterone in the blood in the and II groups, respectively (15.3 nmol / L and 19.2 nmol / L, $p < 0.05$) at the norm (16.1 nmol / L) and clinical signs of erectile dysfunction in patients II comparison group. We did not specifically study this issue, since the level of gonadotropic hormones (LGS, FSH) was not analyzed. It can only be assumed that a low testosterone level, reflecting and determining the degree of a man's desire, coincides with clinical complaints about the impossibility of fulfilling it.

Obviously, the increase in testosterone in patients with HFRS in the observation group is due to impaired central regulation, since the prolactin level of 5.2 ng / ml approached normal values (2.6 ng / ml), while in the II comparison group it remained increased in 2 , 1 time (12.2 ng / ml, $p < 0.05$) in the absence of dynamics on the part of testosterone levels.

Table 6

Comparative dynamics of the content of prolactin, cortisol, testosterone, C-peptide, insulin in patients with HFRS during early convalescence, depending on the type complex therapy

Indicators / Groups		Prolactin, ng / ml	Cortisol, nmol / l	Testosterone nmol / l	C-peptide, nmol / l	Insulin, pmol / l
Norm						
I group observation n = 32	one	11.0	568.3	19.2	292, 0	109.8
	2	5.8	251.5 *	16.7 *	216.7 *	70.4 *
	R	<0.05	<0.05	> 0.05	<0.05	<0.05
Change rate,%		- 47.3	- 55.8	+ 13.1	- 25.8	- 35.9
R*		<0.05	<0.05	<0.05	<0.05	<0.05
II group comparisons n = 29	one	15.1	728.7	15.2	348.7	41.5
	2	12.2	507.7	15.3	327.8	40.3
	R	> 0.05	<0.05	> 0.05	> 0.05	> 0.05
Change rate,%		- 19.3	- 30.4	+ 0.01	- 6.0	- 2.9

Note: 1 - before treatment; 2 - after treatment; P is the significance of the validity before and after treatment; P * - the value of reliability between groups (using the Newman-Keuls coefficient);
(-), (+) - the degree of decrease or increase in indicators after treatment in comparison with the initial levels;
* P - value of reliability in a separate group with a norm.

Table 7

Comparative dynamics of the content of TSH, T_3 and T_4 in patients with HFRS during the early convalescence depending on the type of complex therapy

Indicators / Groups		TSH, mIU / l	T_3 nmol / l	T_4 nmol / l	Coefficient = (T3 + T4) / TSH, conv. units
Norm		1.17	1.53	112.3	97.3
I group observation n = 32	one	2.21	1.40	126.0	56.8
	2	1.24 *	1.59 *	122.3 *	99.1 *
	R	<0.05	> 0.05	> 0.05	<0.05
The degree of change %		- 43.9	+ 13.5	+ 3.0	+ 74.4
R*		<0.05	> 0.05	<0.05	<0.05
II group n = 29	one	2.35	1.12	84.7	36.5
	2	2.01	1.26	91.1	46.0
	R	> 0.05	<0.05	<0.05	<0.05
The degree of change %		- 14.5	+ 12.5	+ 18.5	+ 26.1

Note: 1 - before treatment; 2 - after treatment; P is the significance of the validity before and after treatment; P * - the value of reliability between groups (using the Newman-Keuls coefficient);
(-), (+) - the degree of decrease or increase in indicators after treatment in comparison with the initial levels;
* P - value of reliability in a separate group with a norm.

It seems legitimate to put forward a hypothesis about the dissociation of these parameters, which is associated not with hormone genesis, but with effective correction as a result of bioresonance effects on the pathogenetic basis of capillary toxicosis, which causes a disruption of blood supply to arterioles and venules, leading to impaired microcirculation and deterioration of erection. The only significant parameter of the copulatory cycle that distinguishes the compared groups of patients is erection, the leading role of the vascular component in which is undoubted, and therefore the positive dynamics of copulatory function in the I observation group indirectly confirms the significant effect of BRT on the microvasculature as a whole.

It was found that the dynamics of the hormonal profile had an independent significance and correlated with the severity of HFRS. However, the most prognostically significant was the dynamics of recovery prolactin, plasma cortisol and the ratio (T3 + T4) / TSH.

During the course of exposure using the combined BRT option, the total score hormonal spectrum was characterized by a simultaneous increase in both catabolic (cortisol, T_3, T_4), and anabolic (C-peptide, insulin, testosterone) markers with a predominance of catabolic hormones in the acute period of HFRS, and anabolic orientation during the period of convalescence.

Thus, with an infectious process hormones neuroendocrine system are considered as vectors that summarize the complex relationships of the infectious agent and neurohumoral homeostasis. The use of various options for endo- and exogenous bioresonance therapy in the complex treatment and rehabilitation of patients with HFRS has a beneficial effect on hormonal homeostasis as an adaptive regulator, which ultimately leads to the normalization of neurohumoral regulation in the concerned central and peripheral links of the endocrine system as a whole.

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