Correction of iron deficiency anemia by Fe(III) hydroxocomplexes stabilized with humic ligands in rats

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Iron deficiency is the most common cause of anemia. This kind of anemia (iron deficiency anemia, IDA) is usually associated with blood loss. Searching for substances with high iron bioavailability based on alternative ligands stabilizing Fe(III) hydroxocomplexes continues. In this regard, humic substances are promising source of new active pharmaceutical substances (APS).

C100 (Fe(III) hydroxide complex with potassium humate), C50 (Fe(III) hydroxide complex with potassium humate and polymaltose (1:1)), F100 (Fe(III) hydroxide complex with fulvic acids) and F50 (Fe(III) hydroxide complex with fulvic acids and polymaltose (1:1)) samples were used in the investigation of humic iron-containing APSs pharmacodynamic activity. A Wistar rats (♀) model of acute blood loss (1.5% of body weight) was chosen [1]. Blood was taken from the tail vein under anesthesia. The results are presented in table 1.

All studied APSs demonstrate antianemic activity. The most pronounced activity was shown for C100 sample. Less activity was observed for F100 sample. C50 and F50 showed the least activity. It can be assumed that the lowest activity of C50 and F50 is probably due to the synthesis method applicable for these APS (combined matrices). Iron disrupts polymaltose cycles, which reduces the stability of the latter.

Table 1. Influence of acute blood loss and daily (5 days) intragastric administration of C100, C50, F100, F50 samples and reference drug Ferrum Lek® on hematological parameters and serum iron level in rats ($X \pm SE$)

Group of animals	Hematological indicators							
	Before IDA modeling				After course of intragastric administrations			
	HGB, g/L	HCT, %	RBC, $\times 10^{12}/L$	Fe, μM	HGB, g/L	HCT, %	RBC, $\times 10^{12}/L$	Fe, μM
Water (n=5)	193,5 $\pm$ 6,4	55,0 $\pm$ 1,8	9,6 $\pm$ 0,6	58,9 $\pm$ 3,6	147,6 $\pm$ 2,1*	44,3 $\pm$ 0,7*	7,2 $\pm$ 0,1*	37,4 $\pm$ 4,0*
Ferrum lek® (n=5)	195,0 $\pm$ 8,7	59,0 $\pm$ 2,8	10,4 $\pm$ 0,4	43,9 $\pm$ 6,3	156,0 $\pm$ 3,6*	47,2 $\pm$ 4,5*	7,8 $\pm$ 0,2*	46,5 $\pm$ 4,5
C100 (n=5)	185,0 $\pm$ 6,4	56,0 $\pm$ 2,3	10,4 $\pm$ 0,4	52,3 $\pm$ 5,9	176,4 $\pm$ 7,7#	52,7 $\pm$ 2,3#	8,8 $\pm$ 0,4#	50,8 $\pm$ 2,4#
C50 (n=5)	191,0 $\pm$ 13,3	43,6 $\pm$ 1,6	7,8 $\pm$ 0,3	56,3 $\pm$ 7,0	146,0 $\pm$ 2,9*	42,6 $\pm$ 0,8	7,1 $\pm$ 0,3	38,8 $\pm$ 7,3
F100 (n=5)	177,0 $\pm$ 4,7	52,8 $\pm$ 1,5	9,3 $\pm$ 0,2	51,4 $\pm$ 2,9	169,6 $\pm$ 2,0*#	51,7 $\pm$ 0,6#	8,6 $\pm$ 0,1#	51,8 $\pm$ 1,7#
F50 (n=5)	172,1 $\pm$ 3,0	43,5 $\pm$ 2,8	7,9 $\pm$ 0,4	58,7 $\pm$ 3,9	143,6 $\pm$ 6,8*	41,4 $\pm$ 1,9	7,1 $\pm$ 0,4	51,1 $\pm$ 4,4

Notes: 1. * differences with the group "Before IDA modeling" are statistically significant, $p < 0.05$ (Friedman's test). 2. # differences with the "Water" group are statistically significant, $p < 0.05$ (Kruskal-Wallis's criterion).

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References

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