Fulvic Acids and Viral Infections

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Abstract: Fulvic acids are active principles in humic substances allowing big absorption of mineral ions from soil through vegetables. They are formed by large organic molecules having several reactive sites. Tested in mice and rats with radioactive labeled ions ($^{45}Ca^{2+}$, $^{32}PO_4^{3-}$, $^{59}Fe^{3+}$ and $^{131}I^-$) in drinking water, it has been found that for even concentrations of mineral ions (μg/ml), more than double of them are filtered from stomach to blood serum when calcium and phosphate ions are escorted by fulvic acids, while iron and iodine ions are completely fixed by both blood (red cells) and thyroid gland respectively, also in larger than double proportion. This paper presents the associated effect of fulvic acids ingestion by rats and mice, substantially increasing their T (total) and G immunoglobulins (IgT, IgG) production, which explains the empirical and preliminary, yet not less spectacular results than those obtained by tests in preventing epidemic viral infections in cattle and poultry, and as an effective agent in treating human viral infections such as herpes Zoster, hepatitis and HIV. As a conclusion, these scarce and partial results suggest necessity to initiate a large, and quite reliable medical protocol, not available at the present time.

Keywords: virus, fulvic acids, natural production.

INTRODUCTION

Fulvic acids (FAs) are the active principle in humic substances, which absorb mineral ions from soil to be fixed in vegetables tissues at great proportion [1, 2]. When used as a dietary complement for vertebrates such as cattle, poultry and pigs, they have shown better development and greater resistance to epidemic viral infections. Tested in mice, they increase filtration of mineral ions (Ca^{2+}, HPO_3^{2-}) from digestive track to blood serum, and complete fixation (Fe^{3+}, I^-) in red cells and thyroid, respectively, by a factor larger than double. These results have been obtained by using $^{45}Ca^{2+}$, $^{32}PO_4^{3-}$, $^{59}Fe^{3+}$ and $^{131}I^-$ radiolabeled solutions [3, 4]. This paper continues this research in order to find the action exerted by FAs concerning stronger resistance to epidemic viral infections, empirically shown by some animal species.

EXPERIMENTAL

Fulvi-H, trade mark of FAs licensed in Mexico for human consumption as a dietary complement, has been used. It is a dark, very fine powder, extraordinary soluble in water (750 mg/ml). Laboratory animals were ICR mice and Sprague Dowley rats five weeks old. After two months time periods, blood was individually extracted and centrifuged to quantify total immunoglobulin (IgT) plus G immunoglobulin (IgG) in mice and just IgT in rats blood serum, in order to compare average concentrations in 10 animal groups: one drinking FAs solution as drinking water, versus plain drinking water, both identically fed. Some groups of mice were diminished by serious wounds inflicted in fights. Nevertheless, average calculation was obtained with the rest. Mice IgG concentration was measured by Elisa technique and the corresponding kit (Fig. **1**), while concentration in rats blood serum was measured by refractometer (Fig. **2**).

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RESULTS

Tables **1** to **8** show the action of Fulvi-H on IgG and IgT comparative promotion in mice and rats, as well as the relative weight increase over two months periods for identically fed animals, except for drinking plain water and FA solutions at different concentrations.

DISCUSSION

IgG concentrations obtained by Elisa technique show a larger than IgT statistical variation, which seems to be quite normal, because IgG concentration in blood serum differs among members of same species, and they are negligible when compared to IgT. However, in spite of large statistical variations, average values show a clear-cut general tendency. So, IgT is easier to evaluate by using just a refractometer, although main statistical variation results show smaller, while average values show a more precise effect.

CONCLUSION

According to the reported results, Fulvi-H effect seems to increase the antibody concentration when ingested at proper doses, even when small weight loss occurs. At greater doses, or associated to some mineral ions supplement, their effect concerning IgG and IgT seems to decrease, probably because their great molecules with a lot of reactive terminals form aggregates, i.e. great number of complex compounds with mineral ions. The partial results obtained until now, plus the empirical effects observed in a great number of animal spe-

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cies concerning their resistance to epidemic viral infections, deserve perhaps designing a larger and quite reliable medical protocol for human beings in treating diseases such as HIV, hepatitis C and herpes Zoster [5].

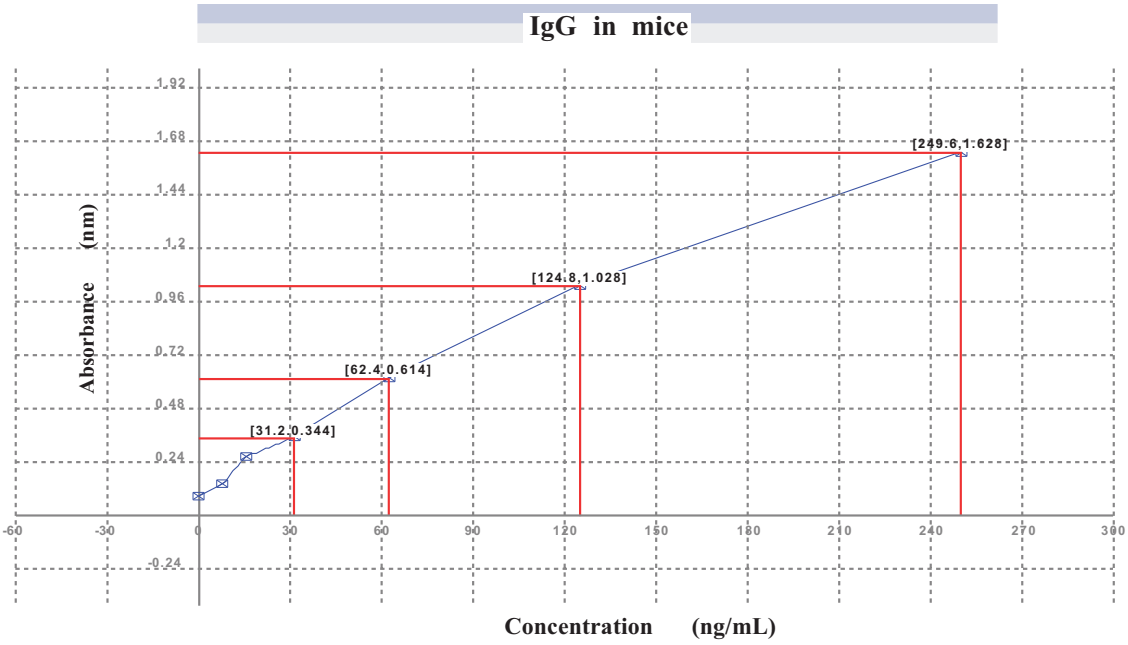

Fig. (1). Elisa standard curve of IgG in mice.

Fig. (2). Refractometer and scale used to measure IgT in blood serum.

Table 1. Concentrations of Mice IgG and IgT with and Without FA, Concentration of FA = 15 mg/mL (1/50 of Saturation)

	IgG with FA	IgG without FA	Total Ig (IgT)	
			With FA	Without FA
Mice	IgG (mg/mL)	IgG (mg/mL)	IgT (mg/mL)	IgT (mg/mL)
1	8.320	2.794	62	58
2	16.276	1.864	60	54
3	13.773	12.922	70	52
4	2.332	2.970	74	64
5	4.988	5.369	60	70
6	5.150	2.015	72	70

Table 1. Contd…..

7	5.259	7.997	76	68
8	3.906	6.106	70	70
9		21.269		72
10		6.997		60
Average ($\overline{X}$)	**7.50±4.16**	**7.03±4.32**	**68±5.4**	**63.8±5.2**
Std. Dev. (σ)	**4.978**	**6.039**	**6.414**	**7.330**

$$\text{IgG increment} = \frac{7.501 - 7.031}{7.031} \times 100 = 6.68\% \quad \text{IgT increment} = \frac{68 - 63.8}{63.8} \times 100 = 6.58\%$$

Table 2. Mice Weight Loss During a Two Months Period with and Without FA

	With FA	**Without FA**
Mice	**Weight (g)**	**Weight (g)**
1	43.6	42.6
2	40.2	41.6
3	43.7	52.6
4	43.8	43.8
5	40.8	41.1
6	38.4	45.2
7	44.8	40.5
8	45.7	44.4
9		45.4
10		43.7
Average ($\overline{X}$)	**42.52±2.1**	**44.09±2.5**
Std. Dev. (σ)	**2.527**	**3.431**

$$\text{weight loss} = \frac{44.09 - 42.52}{42.52} \times 100 = 3.7\%$$

Table 3. Mice IgG Concentration Without FA, with FA and with FA + Minerals, Concentration of FA = 6.75 mg/mL (1/111 of Saturation)

	Without FA	**With FA**	**With FA + minerals**
Mice	**IgG (mg/mL)**	**IgG (mg/mL)**	**IgG (mg/mL)**
1	8.296	18.280	12.049
2	11.215	41.919	13.814
3	7.593	30.131	19.283
4	15.223	17.419	38.047
5	2.528	12.381	14.156
6	2.636	15.955	22.662
7	4.072	27.439	11.906
8	3.457	37.187	10.053

Table 3. Contd…..

9	2.590	39.531	
Average ($\overline{X}$)	**6.4±3.5**	**26.6±8.6**	**17.7±7.7**
Std. Dev. (σ)	**4.524**	**11.158**	**9.201**

Table 4. Mice IgT Concentration Without FA, with FA and with FA + Minerals, Concentration of FA = 6.75 mg/mL (1/111 of Saturation)

	Without FA	**With FA**	**With FA + minerals**
Mice	**IgT (mg/mL)**	**IgT (mg/mL)**	**IgT (mg/mL)**
1	58	66	66
2	62	68	70
3	48	66	70
4	62	76	62
5	54	65	70
6	60	76	62
7	70	72	70
8	72	70	68
9	61	68	
Average ($\overline{X}$)	**60.75±6.56**	**69.66±3.21**	**66.50±2.93**
Std. Dev. (σ)	**7.851**	**4.183**	**3.505**

With FA

$$\text{IgT increment} = \frac{69.66 - 60.75}{60.75} \times 100 = 14.66\% \quad \text{IgG increment} = \frac{26.6 - 6.4}{6.4} \times 100 = 315.62\%$$

With FA + minerals

$$\text{IgT increment} = \frac{66.5 - 60.75}{60.75} \times 100 = 9.46\% \quad \text{IgG increment} = \frac{17.4 - 6.4}{6.4} \times 100 = 171.87\%$$

Table 5. Mice Weight Increase During 2 Months Without FA, with FA and with FA + Minerals, Concentration of FA = 6.75 mg/mL (1/111 of Saturation)

	Without FA		**With FA**		**With FA + minerals**	
	Weight (g)		**Weight (g)**		**Weight (g)**	
Mice	Initial	Final	Initial	Final	Initial	Final
1	27.0	45.3	26.8	44.2	28.6	43.4
2	26.8	41.8	28.7	44.8	27.7	42.2
3	26.7	45.9	27.2	41.5	29.4	41.8
4	26.9	45.8	27.7	44.5	28.5	43.9
5	26.5	42.0	27.3	41.6	28.6	45.2
6	27.8	41.8	30.5	39.7	28.6	43.1
7	28.9	44.9	26.3	38.9	28.1	42.2
8	26.3	41.3	27.9	41.2	28.6	46.6
9	26.2	37.2	27.0	32.0	27.7	

Table 5. Contd…..

Average ($\overline{X}$)	**27.0±0.65**	**42.8±2.19**	**27.7±0.96**	**40.9±3.03**	**28.4±0.40**	**43.5±1.38**
Std. Dev. (σ)	**0.849**	**2.861**	**1.252**	**3.947**	**0.528**	**1.650**

$$\text{weight increment without FA} = \frac{42.8 - 27.0}{27.0} \times 100 = 58.52\%$$

$$\text{weight increment with FA} = \frac{40.9 - 27.7}{27.7} \times 100 = 47.65\%$$

$$\text{weight increment with FA + minerals} = \frac{43.5 - 28.4}{28.4} \times 100 = 53.16\%$$

Table 6. Mineral Concentrations Added to FA

Salt	Mineral	Concentration (mg/mL)
$FeSO_4 \cdot 7H_2O$	Fe^{2+}	0.0372
$MgSO_4 \cdot 7H_2O$	Mg^{2+}	0.0182
$CaCl_2 \cdot 2H_2O$	Ca^{2+}	0.0505
K_2HPO_4	K^+	0.0851
$MnCl_2 \cdot 4H_2O$	Mn^{2+}	0.0024
Na_2SeO_4	Se^{6+}	0.0041
KI	I^-	0.1528

Table 7. IgT Initial and Final Concentration in Rats After 2 Months with and Without FA, Concentration of FA = 10 mg/mL (1/75 of Saturation)

	Without FA			**With FA**	
	IgT (mg/mL)			**IgT (mg/mL)**	
Rats	**Initial**	**Final**	**Rats**	**Initial**	**Final**
1	66	68	11	70	70
2	70	69	12	65	70
3	66	63	13	68	68
4	64	67	14	62	70
5	60	64	15	68	68
6	64	66	16	60	69
7	66	70	17	62	72
8	68	70	18	64	72
9	70	68	19	62	71
10	66	70	20	62	70
Average ($\overline{X}$)	**66±2.13**	**67.5±1.79**	**Average ($\overline{X}$)**	**64.3±2.38**	**70±1.01**
Std. Dev. (σ)	**2.98**	**2.50**	**Std. Dev. (σ)**	**3.33**	**1.41**

$$\text{IgT increment without FA} = \frac{67.5 - 66}{66} \times 100 = 2.3\%$$

$$\text{IgT increment with FA} = \frac{70 - 64.3}{64.3} \times 100 = 8.86\%$$

Table 8. Initial and Final Weight After 2 Months with and Without FA, Concentration of FA = 10 mg/mL (1/75 of Saturation)

	Without FA			With FA	
	Weight (g)			Weight (g)	
Rats	**Initial**	**Final**	**Rats**	**Initial**	**Final**
1	303	400	11	311	400
2	324	409	12	305	396
3	310	424	13	305	411
4	307	396	14	302	377
5	301	409	15	315	382
6	312	468	16	312	414
7	280	396	17	311	379
8	316	463	18	302	405
9	323	416	19	303	379
10	325	431	20	313	374
Average ($\bar{X}$)	**309.9±9.58**	**421.2±18.6**	**Average ($\bar{X}$)**	**307.9±3.56**	**391.7±10.87**
Std. Dev. (σ)	**13.39**	**26**	**Std. Dev. (σ)**	**4.97**	**15.2**

$$\textbf{weight increment without FA} = \frac{\textbf{421.2 - 309.9}}{\textbf{309.9}} \times \textbf{100} = \textbf{35.91\%}$$

$$\textbf{weight increment with FA} = \frac{\textbf{391.7 - 307.9}}{\textbf{307.9}} \times \textbf{100} = \textbf{27.21\%}$$

CONFLICT OF INTEREST

None declared.

ACKNOWLEDGEMENTS

None declared.

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