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EFEITO DO pH DA SOLUÇÃO DE GONADOTROFINAS SÉRICA E CORIÔNICA SÔBRE O PÊSO DO OVÁRIO E ÚTERO DE RATAS IMATURAS

(EFECT OF pH OF INJECTION VEHICLE ON THE BIOLOGICAL ACTIVITY OF PREGNANT MARE SERUM (P.M.S.) AND CHORIONIC (H.C.G.) GONADOTROPHINS ON THE WEIGHT OF THE OVARY AND UTERUS IN IMMATURE RATS)

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1. INTRODUÇÃO E LITERATURA

A atividade biológica bem como as propriedades físico-químicas das gonadotrofinas parecem sofrer modificações por ação do pH da solução das mesmas. Procurou-se, neste trabalho, analisar a possível influência do pH da solução de gonadotrofinas sérica e coriônica sôbre o pêso do ovário e útero de ratas imaturas.

O efeito do pH das soluções de gonadotrofina sérica e gonadotrofina coriônica, sôbre o pêso uterino de camundongas e ratas imaturas, foi assinalado por alguns autores.

Umberger e Gass (4) demonstraram variações na atividade biológica da gonadotrofina coriônica em ratas imaturas. Com doses de 0,6 U.I., o aumento progressivo do pH da solução determinou maior pêso uterino e porcentagem mais elevada de animais com esfregaço vaginal característico da fase de estro; registraram efeitos negativos em pH 3,2 e máximos com pH 10,8.

Persson e Melander (5-6), em camundongas e ratas, fizeram idênticas observações empregando doses pequenas de gonadotrofina sérica (0,2 U.I.). A solução com pH 7 produziu maior pêso uterino

do que a correspondente com pH 4. Com pH 10 os efeitos foram significativamente maiores do que com pH 4.

Em trabalhos anteriores confirmou-se a influência do pH da solução de gonadotrofina sérica (P.M.S.), bem como da solução de gonadotrofina coriônica (H.C.G.), sôbre a liberação de espermatozóides no sapo (**Bufo marinus** L.) (Tabarelli e cols. (2 - 3).).

2. MATERIAL E MÉTODO

Animais:

Foram utilizadas 171 ratas imaturas da linhagem Wistar, com pêso corpóreo variando entre 40 a 60 g e com 30 dias de idade.

Soluções utilizadas:

A gonadotrofina sérica utilizada foi uma preparação comercial (Maturon-Organon) em ampolas dosando 400 U.I.; cada rata recebeu o total de 1 U.I. do hormônio, diluída em 3 ml do tampão apropriado e injetando-se 1 ml cada 24 horas, pela via peritonial.

A gonadotrofina coriônica utilizada foi uma preparação comercial (Pregnyl-Organon) em ampolas dosando 100 U.I.; cada rata recebeu o total de 0,6 U.I. do hormônio, diluída em 3 ml do tampão apropriado e injetando-se 1 ml cada 24 horas, pela via peritonial.

O pH da solução de gonadotrofinas foi estabelecido dissolvendo-se diretamente nos tampões de Clark e Lubs, com pH 3,7 e 10.

Para cada pH estabeleceu-se um lote testemunho que recebeu sòmente a injeção do tampão.

Pesagem dos ovários e úteros:

Os animais foram sacrificados no 5.º dia do experimento; o ovário e útero, uma vez retirados, foram liberados da gordura, sêcos em papel de filtro e pesados em balança de torção com intervalo de 1 mg.

Análise estatística:

Para a interpretação dos resultados foi feita a análise da variância e, tendo-se encontrado significância, aplicou-se o teste de Duncan, conforme Gomes (1).

3. RESULTADOS

Para a análise da variância, de todos os resultados obtidos, o nível de rejeição adotado foi sempre de 5%.

Os resultados obtidos acham-se nas tabelas de nºs. 1 a 12.

As tabelas 1 e 2 mostram que não há significância nos resultados obtidos, quer sôbre o pêso do ovário, quer sôbre o pêso do útero, nos 3 lotes em que foram divididos os animais, (lote de pH 3, lote de pH 7, lote de pH 10), quando receberam a injeção do tampão sòmente.

Pelo exame da tabela 3 verifica-se que a gonadotrofina coriônica (Pregnyl-Organon), quando injetada em solução de pH 3, pH 7 e pH 10, tem ação diferente sôbre o pêso do ovário, o que não acontece com o pêso do útero visto na tabela 4.

Pelo teste de Duncan, aplicado aos dados da tabela 3, as médias dos lotes que receberam o hormônio em solução de pH 7 e pH 10 diferem significativamente da média do lote que recebeu o hormônio em solução de pH 3.

As médias dos lotes de pH 7 e pH 10 não diferem significativamente entre si.

Por outro lado, a gonadotrofina sérica (Maturon-Organon), quando injetada em solução de pH 3, pH 7 e pH 10, não tem ação diferente sôbre os pesos do ovário e do útero, pois as médias dos pesos do ovário e do útero, não diferem significativamente entre si (tabelas 5 e 6).

Quando se fêz a análise da variância com os dados da tabela 7, verificou-se significância do resultado. Pelo teste de Duncan, as médias dos lotes testemunho e do que recebeu Pregnyl não diferem significativamente entre si, mas diferem significativamente do lote que recebeu Maturon.

A tabela 8 mostra que não há significância entre os lotes que receberam Pregnyl e Maturon em solução de pH 3 sôbre o pêso do útero em relação ao lote testemunho.

Na tabela 9, as médias dos pesos dos ovários dos lotes injetados com Maturon e com Pregnyl, em solução de pH 7, não diferem significativamente pelo teste de Duncan, entre si, mas diferem significativamente da média do lote testemunho.

Na tabela 10 observa-se, pelo teste de Duncan, que a média dos pesos uterinos do lote que recebeu Maturon em solução de pH 7 difere significativamente da média de pesos do útero do lote testemunho, não diferindo significativamente da média dos pesos uterinos do lote que recebeu Pregnyl. A média dos pesos uterinos do lote

que recebeu Pregnyl não diefere significativamente da média dos pesos uterinos do lote testemunho.

Na tabela 11, a média dos pesos dos ovários dos lotes que receberam Maturon em solução de pH 10 e Pregnyl em solução de pH 10, diferem significativamente da média dos pesos dos ovários do lote testemunho, mas não diferem significativamente entre si.

Na tabela 12, a média dos pesos dos úteros do lote testemunho difere significativamente da média dos pesos dos úteros do lote que recebeu Pregnyl em solução de pH 10, média esta que não difere significativamente da média dos pesos dos úteros do lote que recebeu Maturon em pH 10, a qual não difere significativamente da média do lote testemunho.

TABELA 1. EFEITO DO pH SÔBRE PÊSO DE OVÁRIO (mg)

LOTE: TESTEMUNHO (injeção do tampão)

ANIMAL N.º	pH 3	pH 7	pH 10
1	37,0	36,0	36,5
2	42,0	30,0	33,5
3	32,0	35,0	39,0
4	32,0	35,0	23,0
5	28,0	24,0	23,0
6	26,0	23,0	24,0
7	32,0	18,0	15,0
8	32,0	16,0	18,0
9	18,0	20,0	16,0
10	22,0	29,0	18,0
11	16,0	18,0	16,0
12	35,0	15,0	20,0
13	28,0	15,0	29,0
14	16,0	22,0	16,0
15	21,0	17,0	16,0
16	16,0	22,0	28,0
17	19,0	25,0	17,0
18	19,0	23,0	15,0
19	19,0	15,0	18,0
$\bar{x}$	25,78	23,05	22,15

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	136,03	68,01	1,18
Dentro	54	3.087,14	57,16	
Total	56	3.223,17		

TABELA 2. EFEITO DO pH SÔBRE O PÊSO DE ÚTERO (mg)

LOTE: TESTEMUNHO (injeção do tampão)

ANIMAL N.º	pH 3	pH 7	pH 10
1	32,0	89,0	57,0
2	49,0	65,0	35,0
3	32,0	36,0	90,0
4	42,0	50,0	39,0
5	37,0	25,0	20,0
6	35,0	33,0	32,0
7	140,0	64,0	61,0
8	137,0	94,0	52,0
9	160,0	76,0	81,0
10	305,0	154,0	63,0
11	59,0	70,0	82,0
12	135,0	53,0	42,0
13	262,0	115,0	91,0
14	51,0	42,0	39,0
15	55,0	65,0	58,0
16	54,0	22,0	273,0
17	39,0	238,0	40,0
18	41,0	56,0	31,0
19	39,0	44,0	34,0
$\bar{x}$	89,52	73,21	64,21

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	6.257,94	3.128,97	0,77
Dentro	54	218.251,06	4.041,68	
Total	56	224.509,00		

TABELA 3. EFEITO DO pH SÔBRE O PÊSO DE OVÁRIO (mg)

LOTE: H.C.G. (gonadotrofina coriônica)

ANIMAL N.º	pH 3	pH 7	pH 10
1	26,0	30,5	41,0
2	25,0	40,5	24,0
3	13,5	29,5	35,0
4	27,5	44,0	39,0
5	26,0	30,0	23,0
6	23,5	33,0	36,0
7	36,0	26,0	47,0
8	24,0	37,5	43,0
9	22,0	30,0	36,0
10	29,5	46,0	28,0
11	26,0	28,0	44,0
12	20,0	37,0	35,0
13	26,0	27,0	25,0
14	24,0	33,0	23,0
15	27,0	33,0	31,0
16	26,0	19,0	33,0
17	20,0	30,0	30,0
18	37,0	25,0	31,0
19	19,0	24,0	26,0
$\bar{x}$	25,15	31,73	33,15

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	692,24	346,12	7,92 *
Dentro	54	2.358,75	43,68	
Total	56	3.050,99		

TABELA 4. EFEITO DO pH SÔBRE O PÊSO DO ÚTERO (mg)

LOTE: H.C.G. (gonadotrofina coriônica)

ANIMAL N.º	pH 3	pH 7	pH 10
1	48,0	100,0	120,0
2	43,0	105,0	92,0
3	53,0	104,5	87,0
4	38,0	82,0	119,0
5	40,5	72,0	45,0
6	34,5	123,0	124,0
7	195,5	56,5	309,0
8	31,0	114,5	61,0
9	29,0	116,0	118,0
10	54,0	81,0	56,0
11	66,0	77,0	122,0
12	69,5	114,0	71,0
13	264,0	129,0	149,0
14	60,0	166,0	121,0
15	105,0	111,0	116,0
16	153,0	96,0	134,0
17	52,0	143,0	111,0
18	145,0	132,0	133,0
19	56,0	133,0	140,0
$\bar{x}$	80,89	108,18	117,26

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	13.615,42	6.807,71	2,59
Dentro	54	141.554,59	2.621,38	
Total	56	155.170,01		

TABELA 5. EFEITO DO pH SÔBRE O PÊSO DE OVÁRIO (mg)

LOTE: P.M.S. (gonadotrofina sérica)

ANIMAL N.º	pH 3	pH 7	pH 10
1	24,0	22,0	25,0
2	34,0	25,0	26,0
3	36,0	29,0	31,0
4	37,0	33,0	57,0
5	32,0	44,0	45,0
6	21,0	45,0	38,0
7	35,0	55,0	26,0
8	36,0	23,0	43,0
9	33,0	41,0	29,0
10	22,0	33,0	25,0
11	28,0	30,0	28,0
12	31,0	30,0	33,0
13	32.0	38,0	24,0
14	30,0	39,0	24,0
15	26,0	38,0	39,0
16	30,0	46,5	17,0
17	23,0	28,0	24,0
18	25,0	30,0	21,0
19	29,0	25,0	24,0
$\bar{x}$	29,68	34,44	30,47

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	247,63	123,81	1,82
Dentro	54	3.667,30	67,91	
Total	56	3.914,93		

TABELA 6. EFEITO DO pH SÔBRE O PÊSO DE ÚTERO (mg)

LOTE: P.M.S. (gonadotrofina sérica)

ANIMAL N.º	pH 3	pH 7	pH 10
1	27,0	42,0	49,0
2	42,0	133,0	42,0
3	33,0	47,0	41,0
4	180,0	73,0	111,0
5	88,0	225,0	50,0
6	23,0	357,0	51,0
7	26,0	316,0	64,0
8	35,0	110,0	114,0
9	49,0	216,0	45,0
10	50,0	54,0	41,0
11	40,0	114,0	34,0
12	55,0	64,0	55,0
13	120,0	99,0	228,0
14	140,0	136,0	188,0
15	147,0	98,0	138,0
16	128,0	142,0	210,0
17	155,0	123,0	79,0
18	170,0	105,0	69,0
19	155,0	108,0	64,0
$\bar{x}$	87,52	134,84	88,05

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	28.055,00	14.027,50	2,91
Dentro	54	259.667,22	4.808,65	
Total	56	287.722,22		

TABELA 7. EFEITO DO pH SOBRE O PÊSO DE OVÁRIO (mg)

LOTE: pH 3

ANIMAL N.º	P.M.S.	H.C.G.	Testemunho
1	24,0	26,0	36,5
2	34,0	25,0	33,5
3	36,0	13,5	39,0
4	37,0	27,5	23,0
5	32,0	26,0	23,0
6	21,0	23,5	24,0
7	35,0	36,0	15,0
8	36,0	24,0	18,0
9	33,0	22,0	16,0
10	22,0	29,5	18,0
11	28,0	26,0	16,0
12	31,0	20,0	20,0
13	32,0	26,0	29,0
14	30,0	24,0	16.0
15	26,0	27,0	16,0
16	30,0	26,0	28,0
17	23,0	20,0	17,0
18	25,0	37,0	15,0
19	29,0	19,0	18,0
$\bar{x}$	29,68	25,15	22,15

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	545,5	272,75	7,26 *
Dentro	54	2.026,7	37,53	
Total	56	2.572,2		

TABELA 8. EFEITO DO pH SÔBRE O PÊSO DE ÚTERO (mg)

LOTE: pH 3

ANIMAL N.º	P.M.S.	H.C.G.	Testemunho
1	27,0	48,0	32,0
2	42,0	43,0	46,0
3	33,0	53,0	32,0
4	180,0	38,0	42,0
5	38,0	40,5	37,0
6	23,0	34,5	35,0
7	26,0	195,5	140,0
8	35,0	31,0	137,0
9	49,0	29,0	160,0
10	50,0	54,0	305,0
11	40,0	66,0	59,0
12	55,0	69,5	135,0
13	120,0	264,0	262,0
14	140,0	60,0	51,0
15	147,0	105,0	55,0
16	128,0	153,0	54,0
17	155,0	52,0	39,0
18	170,0	145,0	41,0
19	155,0	56,0	39,0
$\bar{x}$	87,52	80,89	89,52

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	775,73	387,865	0,086
Dentro	54	242.554,7	4.491,75	
Total	56	250.312,0		

TABELA 9. EFEITO DO pH SÔBRE O PÊSO DE OVÁRIO (mg)

LOTE pH 7

ANIMAL N.º	P.M.S.	H.C.G.	Testemunho
1	22,0	30,5	36,0
2	25,0	40,5	30,0
3	29,0	29,5	35,0
4	33,0	44,0	35,0
5	44,0	30,0	24,0
6	45,0	33,0	23,0
7	55,0	26,0	18,0
8	23,0	37,5	16,0
9	41,0	30,0	20,0
10	33,0	46,0	29,0
11	30,0	28,0	18,0
12	30,0	37,0	15,0
13	38,0	27,0	15,0
14	39,0	33,0	22,0
15	38,0	33,0	17,0
16	46,5	19,0	22,0
17	28,0	30,0	25,0
18	30,0	25,0	23,0
19	25,0	24,0	15,0
$\bar{x}$	34,44	31,73	23,05

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	1.346,48	673,24	11,39 *
Dentro	54	3.191,89	59,10	
Total	56	4.538,37		

TABELA 10. EFEITO DO pH SÔBRE O PÊSO DE ÚTERO (mg)

LOTE pH 7

ANIMAL N.º	P.M.S.	H.C.G.	Testemunho
1	42,0	100,0	89,0
2	133,0	105,0	65,0
3	47,0	104,5	36,0
4	73,0	82,0	50,0
5	225,0	72,0	25,0
6	357,0	123,0	33,0
7	316,0	56,5	64,0
8	110,0	114,5	94,0
9	216,0	116,0	76,0
10	54,0	81,0	154,0
11	114,0	77,0	70,0
12	64,0	114,0	53,0
13	99,0	129,0	115,0
14	136,0	166,0	42,0
15	98,0	111,0	65,0
16	142,0	96,0	22,0
17	123,0	143,0	238,0
18	105,0	132,0	56,0
19	108,0	133,0	44,0
$\bar{x}$	134,84	108,18	73,21

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	36.304,27	18.152,13	5,03 *
Dentro	54	194.619,80	3.604,07	
Total	56	230.924,07		

TABELA 11. EFEITO DO pH SÔBRE O PÊSO DE OVÁRIO (mg)

LOTE pH 10

ANIMAL N.º	P.M.S.	H.C.G.	Testemunho
1	25,0	41,0	36,5
2	26,0	24,0	33,5
3	31,0	35,0	39,0
4	57,0	39,0	23,0
5	45,0	23,0	23,0
6	38,0	36,0	24,0
7	26,0	47,0	15,0
8	43,0	43,0	18,0
9	29,0	36,0	16,0
10	25,0	28,0	18,0
11	28,0	44,0	16,0
12	33,0	35,0	20,0
13	24,0	25,0	29,0
14	24,0	23,0	16,0
15	39,0	31,0	16,0
16	17,0	33,0	28,0
17	24,0	30,0	17,0
18	21,0	31,0	15,0
19	24,0	26,0	18,0
$\bar{x}$	30,47	33,15	22,15

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	1.249,92	624,96	8,94 *
Dentro	54	3.775,00	69,90	
Total	56	5.024,22		

TABELA 12. EFEITO DO pH SÔBRE O PÊSO DE ÚTERO (mg)

LOTE pH 10

ANIMAL N.º	P.M.S.	H.C.G.	Testemunho
1	49,0	120,0	57,0
2	42,0	92,0	35,0
3	41,0	87,0	90,0
4	111,0	119,0	39,0
5	50,0	45,0	20,0
6	51,0	124,0	32,0
7	64,0	309,0	61,0
8	114,0	61,0	52,0
9	45,0	118,0	81,0
10	41,0	56,0	63,0
11	34,0	122,0	82,0
12	55,0	71,0	42,0
13	228,0	149,0	91,0
14	188,0	121,0	39,0
15	138,0	116,0	58,0
16	210,0	134,0	273,0
17	79,0	111,0	40,0
18	69,0	133,0	31,0
19	64,0	140,0	34,0
$\bar{x}$	88,05	117,26	64,21

Fonte	G.L.	S.Q.	Q.M.	F
Entre	2	26.829,78	13.414,89	4,13 *
Dentro	54	175.325,80	3.246,77	
Total	56	202.155,58		

4. COMENTÁRIOS

Os resultados ora obtidos confirmam as observações de Umberger e Gass (4) sôbre o pêso uterino de rata imatura utilizando a gonadotrofina coriônica, bem como os de Persson e Melander (5-6) sôbre o pêso do útero e dos ovários de ratas e camundongas imaturas trabalhando com gonadotrofina sérica.

O mecanismo responsável por êsses efeitos é ainda obscuro. Segundo os autores acima citados, a alteração na atividade do hormônio fundamenta-se em um processo reversível não destrutivo, fato êste confirmado com a gonadotrofina sérica sôbre a espermoliberação no sapo (2).

5. SUMMARY

Systemic investigations on the effect of pH on the biological activity of pregnant mare serum and chorionic gonadotrophins have been carried out using intact immature rats.

With the P.M.S. the uterine and the ovarian weight responses showed the lowest values at pH 3 and pH 10 and highest values at pH 7, at moderate doses of hormones. However, the observed differences were not statistically significant.

With the H.C.G. the uterine and ovarian weight responses showed the lowest values at pH 3 and highest values at pH 7 and pH 10.

Significant difference in the ovarian weight response between pH 3 and those of the pH 7 — pH 10 could be demonstrated, whereas no significant difference was found with the results obtained in the uterine weights groups.

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