

RESULTS

The results of this investigation include the following four groups of observations:

- I - Observation on normally nourished control adult female rats recording the following parameters.
 - a) Plasma proteins.
 - b) Plasma hormones. *Vitamins*
- II - Development of malnourishment in adult female rats receiving protein - deficient diet (7% Casein) and recording the following changes:
 - a) Changes in total body weight.
 - b) Changes in vaginal smear.
 - c) Changes in plasma proteins pattern.
- III - Changes in the following parameters during the observation period in malnourished nontreated control female rats:
 - a) Total body weight.
 - b) Plasma proteins pattern.
 - c) Plasma hormonal pattern. *Vitamins*
- IV - Metabolic effects of daily oral contraceptive dose in normally nourished and malnourished adult female rats by recording changes in the following parameters:

- a) Total body weight.
- b) Vaginal smear cytology.
- c) Plasma proteins pattern.
- d) Plasma hormonal pattern. *Vitamins*

I - Observations on normally nourished control rats

- a) Plasma proteins

The data shown in table (1) display the average normal values for total plasma protein and its fractions during the observation period of 180 days. In this normally nourished group (20% casein diet) which received propylene glycol as vehicle, the values of total plasma protein and its fractions did not show any significant alteration from those obtained in the initial observation. This applies to the total plasma protein as well as the albumin and globulins (α_1 , α_2 , B, γ) and fibrinogen fractions.

- b) Plasma hormonal pattern

Results in table (2) represent the mean values for the plasma gonadotropins (FSH and LH), steroids (estrogen and progesterone) for the control animals receiving propylene glycol as vehicle. The values at the end of the observation period did not show any significant difference from the

Table (1) Collective data showing plasma proteins patterns as percentages of total plasma protein in normally nourished control adult female albino rats during observation period.

Test Parameters	Initial g.p. $\pm$ S.E	PROTEIN PATTERN AS PERCENTAGE OF TOTAL PLASMA PROTEINS $\pm$ S.E DURING OBSERVATION PERIOD FROM INITIAL													
		TIME INTERVALS (IN DAYS)													
		7	15	30	45	60	75	90	105	120	135	150	165	180	
Total protein (mgm/100 ml)	8.41 $\pm$ 0.11	7.67 $\pm$ 0.33 (-2%)	7.99 $\pm$ 0.20 (+2%)	8.05 $\pm$ 0.25 (+3%)	8.11 $\pm$ 0.15 (+4%)	7.98 $\pm$ 0.17 (-2%)	7.52 $\pm$ 0.15 (-4%)	7.68 $\pm$ 0.30 (-2%)	7.48 $\pm$ 0.30 (-4%)	7.64 $\pm$ 0.10 (-2%)	7.56 $\pm$ 0.11 (-3%)	8.13 $\pm$ 0.21 (+4%)	7.62 $\pm$ 0.19 (-3%)		
Albumin (% of total protein)	42.85 $\pm$ 0.89	39.56 $\pm$ 3.63 (-7%)	44.42 $\pm$ 2.52 (+3%)	44.48 $\pm$ 1.38 (+4%)	42.64 $\pm$ 2.44 (+0.2%)	44.79 $\pm$ 2.23 (+5%)	44.98 $\pm$ 1.92 (+5%)	45.49 $\pm$ 2.34 (+6%)	45.91 $\pm$ 2.78 (+7%)	44.96 $\pm$ 2.69 (+5%)	45.58 $\pm$ 1.35 (+7%)	44.18 $\pm$ 2.18 (+3%)	44.55 $\pm$ 1.85 (+4%)		
Globulins (% of total protein) α_1	11.14 $\pm$ 0.49	10.85 $\pm$ 1.13 (-3%)	11.57 $\pm$ 1.24 (+4%)	11.06 $\pm$ 1.03 (-1%)	10.83 $\pm$ 0.95 (-3%)	9.97 $\pm$ 0.88 (-11%)	8.98 $\pm$ 1.29 (-19%)	10.02 $\pm$ 1.21 (-10%)	9.32 $\pm$ 1.19 (-16%)	9.46 $\pm$ 1.17 (-15%)	9.60 $\pm$ 1.04 (-14%)	9.47 $\pm$ 1.43 (-15%)	9.75 $\pm$ 1.24 (-16%)		
α_2	7.10 $\pm$ 0.21	6.98 $\pm$ 0.40 (-2%)	6.95 $\pm$ 0.34 (-2%)	6.81 $\pm$ 0.36 (-4%)	6.40 $\pm$ 0.65 (-10%)	6.32 $\pm$ 0.55 (-11%)	6.19 $\pm$ 0.60 (-13%)	6.22 $\pm$ 0.65 (-12%)	6.18 $\pm$ 0.63 (-13%)	6.23 $\pm$ 0.69 (-12%)	6.44 $\pm$ 0.48 (-9%)	6.30 $\pm$ 0.50 (-11%)	6.59 $\pm$ 0.65 (-7%)		
β	20.35 $\pm$ 0.41	19.23 $\pm$ 0.66 (-6%)	21.51 $\pm$ 2.15 (+8%)	18.66 $\pm$ 0.77 (-8%)	19.69 $\pm$ 0.82 (-3%)	21.46 $\pm$ 1.67 (+6%)	20.66 $\pm$ 0.75 (+2%)	22.32 $\pm$ 1.12 (+10%)	22.28 $\pm$ 1.2 (+7%)	22.41 $\pm$ 1.22 (+10%)	21.77 $\pm$ 1.03 (+7%)	21.94 $\pm$ 1.07 (+8%)	22.19 $\pm$ 0.93 (+9%)		
γ	12.38 $\pm$ 0.50	11.79 $\pm$ 0.69 (-5%)	11.92 $\pm$ 0.70 (-4%)	12.31 $\pm$ 0.9 (-0.6%)	11.30 $\pm$ 0.20 (-9%)	11.12 $\pm$ 0.59 (-10%)	11.09 $\pm$ 0.95 (-10%)	11.14 $\pm$ 1.14 (-10%)	11.86 $\pm$ 1.16 (-4%)	12.39 $\pm$ 0.52 (-1%)	11.60 $\pm$ 0.53 (-6%)	11.85 $\pm$ 0.64 (-4%)	12.64 $\pm$ 0.53 (+2%)		
Fibrinogen	6.38 $\pm$ 0.61	5.99 $\pm$ 0.28 (+6%)	8.74 $\pm$ 1.49 (+33%)	6.09 $\pm$ 0.52 (-5%)	6.66 $\pm$ 0.74 (+4%)	7.54 $\pm$ 0.74 (+18%)	7.17 $\pm$ 0.51 (+12%)	6.49 $\pm$ 0.49 (+2%)	4.69 $\pm$ 1.45 (-26%)	7.87 $\pm$ 1.21 (+23%)	5.01 $\pm$ 1.49 (-21%)	6.26 $\pm$ 0.75 (-2%)	4.68 $\pm$ 1.40 (-27%)		
Alb. / Glob. (A / G) ratio	0.75 $\pm$ 0.03	0.83 $\pm$ 0.05 (+11%)	0.68 $\pm$ 0.10 (-9%)	0.81 $\pm$ 0.07 (+8%)	0.76 $\pm$ 0.07 (+1%)	0.83 $\pm$ 0.06 (+75%)	0.83 $\pm$ 0.06 (+11%)	0.85 $\pm$ 0.07 (+13%)	0.89 $\pm$ 0.08 (+16%)	0.84 $\pm$ 0.08 (+12%)	0.84 $\pm$ 0.04 (+12%)	0.82 $\pm$ 0.07 (+9%)	0.81 $\pm$ 0.05 (+8%)		

† Insignificant

N.B.: Each mean represents 24 animals.

Table 1: Concentration data showing normally control values of plasma gonadotropins (FSH, LH, Estrogen) in normally nourished controls adult female albino rats during observation period.

Test Parameters	Initial gp. X ± SE	MEAN VALUES ± SE AND PERCENTAGE CHANGE FROM INITIAL													
		TIME INTERVALS IN DAYS													
		7	15	30	45	60	75	90	105	120	135	150	165	180	
FSH m.i.u./ml	During "E" 4.04 ± 0.55	3.8 ± 0.31 (- 6 %)	4.03 ± 0.83 (- 0.2 %)	5.26 ± 0.29 (+ 30 %)	4.64 ± 0.64 (+ 15 %)	5.43 ± 0.95 (+ 35 %)	5.03 ± 0.95 (+ 25 %)	5.28 ± 0.79 (+ 31 %)	2.84 ± 0.87 (- 29 %)	3.19 ± 0.70 (- 21 %)	3.25 ± 0.42 (- 20 %)	3.79 ± 0.22 (- 6 %)	3.98 ± 0.09 (- 2 %)	3.21 ± 0.30 (- 21 %)	
	During "Di" 3.17 ± 0.36	3.58 ± 0.39 (+ 13 %)	3.75 ± 0.46 (+ 18 %)	3.62 ± 0.25 (+ 14 %)	3.55 ± 0.18 (+ 12 %)	3.58 ± 1.04 (+ 13 %)	3.5 ± 0.47 (- 10 %)	4.34 ± 1.25 (+ 37 %)	2.37 ± 0.25 (- 25 %)	2.99 ± 0.34 (- 6 %)	2.68 ± 0.42 (- 16 %)	2.94 ± 0.18 (- 7 %)	2.50 ± 0.45 (- 21 %)	2.95 ± 0.64 (- 7 %)	
	LH m.i.u./ml	2.34 ± 0.33 (+ 7 %)	3.49 ± 0.95 (+ 49 %)	2.63 ± 0.53 (+ 12 %)	1.7 ± 0.44 (- 27 %)	3.24 ± 1.1 (+ 39 %)	2.38 ± 0.26 (+ 2 %)	2.48 ± 0.38 (+ 8 %)	2.012 ± 0.38 (- 14 %)	1.55 ± 0.09 (- 34 %)	1.75 ± 0.28 (- 25 %)	1.54 ± 0.28 (- 34 %)	1.44 ± 0.24 (- 39 %)	1.43 ± 0.24 (- 39 %)	
Estrogen pg./ml.	40.47 ± 9.8	36.45 ± 13.4 (- 10 %)	36.97 ± 6.6 (- 14 %)	39.07 ± 4.4 (- 4 %)	39.13 ± 5.7 (- 3 %)	26.26 ± 5.11 (- 35 %)	32.15 ± 7.7 (- 21 %)	33.5 ± 5.05 (- 17 %)	44.0 ± 4.45 (+ 9 %)	28.71 ± 5.9 (- 29 %)	25.19 ± 5.85 (- 38 %)	27.7 ± 4.98 (- 31 %)	32.08 ± 0.6 (- 21 %)	33.36 ± 6.0 (- 17 %)	
	During "E" 16.83 ± 3.79	14.14 ± 4.01 (- 16 %)	15.59 ± 3.91 (- 6 %)	5.30 ± 0.53 (- 68 %)	16.75 ± 2.84 (- 0.5 %)	15.15 ± 1.76 (- 10 %)	19.1 ± 3.91 (+ 13 %)	21.13 ± 4.29 (+ 25 %)	15.03 ± 2.09 (- 11 %)	14.21 ± 2.74 (- 16 %)	14.47 ± 3.65 (- 14 %)	14.67 ± 3.53 (- 13 %)	12.27 ± 3.3 (- 27 %)	14.39 ± 3.84 (- 14 %)	
Progesterone ng./ml.	During "Di" 26.8 ± 3.95	26.6 ± 6.06 (- 0.7 %)	23.04 ± 4.96 (- 14 %)	26.27 ± 4.13 (- 80 %)	5.3 ± 0.53 (- 2 %)	24.28 ± 4.63 (- 9 %)	21.39 ± 3.95 (- 20 %)	25.9 ± 5.53 (- 3 %)	26.87 ± 4.76 (+ 31 %)	26.30 ± 3.24 (- 2 %)	26.56 ± 3.15 (- 1 %)	21.42 ± 5.38 (- 20 %)	21.68 ± 4.72 (- 19 %)	21.25 ± 13.09 (- 2 %)	

† Insignificant N.B.: Each mean represents 24 animals

E: Estrus phase of Estrus cycle of rat.

Di: Diestrus

values obtained initially during the specified phase of estrus cycle.

II - Development of malnourishment in adult female rats receiving protein - deficient diet

There appears to be a wide range of dietary protein (protein intake) to which living animals can adapt and be maintained in good health, restriction of such protein intake in the diet would lead to protein malnourishment. This malnourishment could be detected by observation of signs such as loss of appetite as evidenced by lower food consumption, retardation of growth, loss of body weight, tremors of head and limbs, oedema with muscle wasting, abnormal texture of hair and finally deposits of reddish material about the nostrils. The frequent occurrence of sudden death in such animals was a constant source of concern. Some of these signs are shown in fig. (5), where the malnourished animals B and C could be compared to the normal controls A.

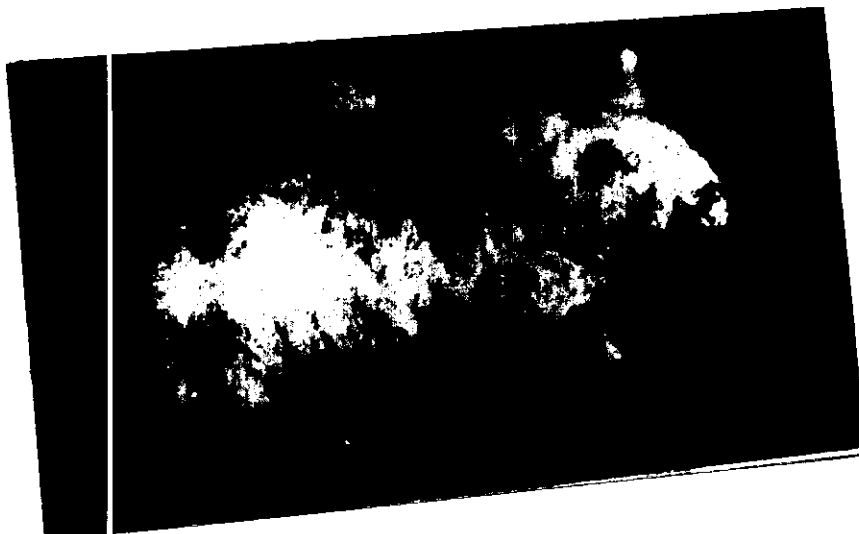
Protein malnourishment was also confirmed by the following:



Fig. (5) A



B



C

a) Change in total body weight

Loss in body weight was progressive and significant or highly significant ($P < 0.0025$ - $P < 0.0005$) table (3) and fig. (6). These results show that the initial body weight was 153.49 ± 1.79 gm. at the start of the experiment, which was reduced to 136.56 ± 2.42 gm. after 90 days, the difference being highly significant ($P < 0.0005$).

b) Changes in vaginal smear

Vaginal smear cytology exhibited marked disturbance of the estrus cycle of the test animals 15 days following the administration of protein deficient diet. The percentage of diestrus phase i.e. cessation of ovulation, increased with progression of experimental period with ultimate cessation of the cycle at diestrus phase in 100 % of animals after 90 days table (3).

c) Changes in plasma protein pattern

The development of protein malnourishment was confirmed by biochemical plasma protein pattern. As can be seen in table (3) significant decrease of total plasma protein content

Table (3) Development of malnourishment in adult female albino rats.

Test parameters	Initial $\bar{X} \pm SE$	Mean value $\pm SE$ and Percentage change from Initial			
		Time intervals (in days) on malnourished diet (7% Casein)			
		15	30	60	75
Body weight (in gm)	153.49 $\pm$ 1.79	148.96 $\pm$ 2.07 (- 3 %) $\dagger$	162.83 $\pm$ 2.25 (+ 6 %) **	142.03 $\pm$ 2.08 (- 7 %) ** $\dagger$	144.26 $\pm$ 2.34 (- 6 %) **
Total plasma protein (gm / 100 ml)	7.15 $\pm$ 0.074	7.15 $\pm$ 0.074 (- 0 %) $\dagger$	—	7.185 $\pm$ 0.14 (- 5 %) $\dagger$	—
Pattern of vaginal smear cytology	A) Diestrus	40 %	70 %	87 %	90 %
	B) Estrus	40 %	20 %	9 %	7 %
	C) Proestrus	20 %	10 %	4 %	3 %
					100 %

$\dagger$ Insignificant

** Highly significant $P < 0.005$

*** Very highly significant $P < 0.0005$ N.B.: Each mean represents 96 animals

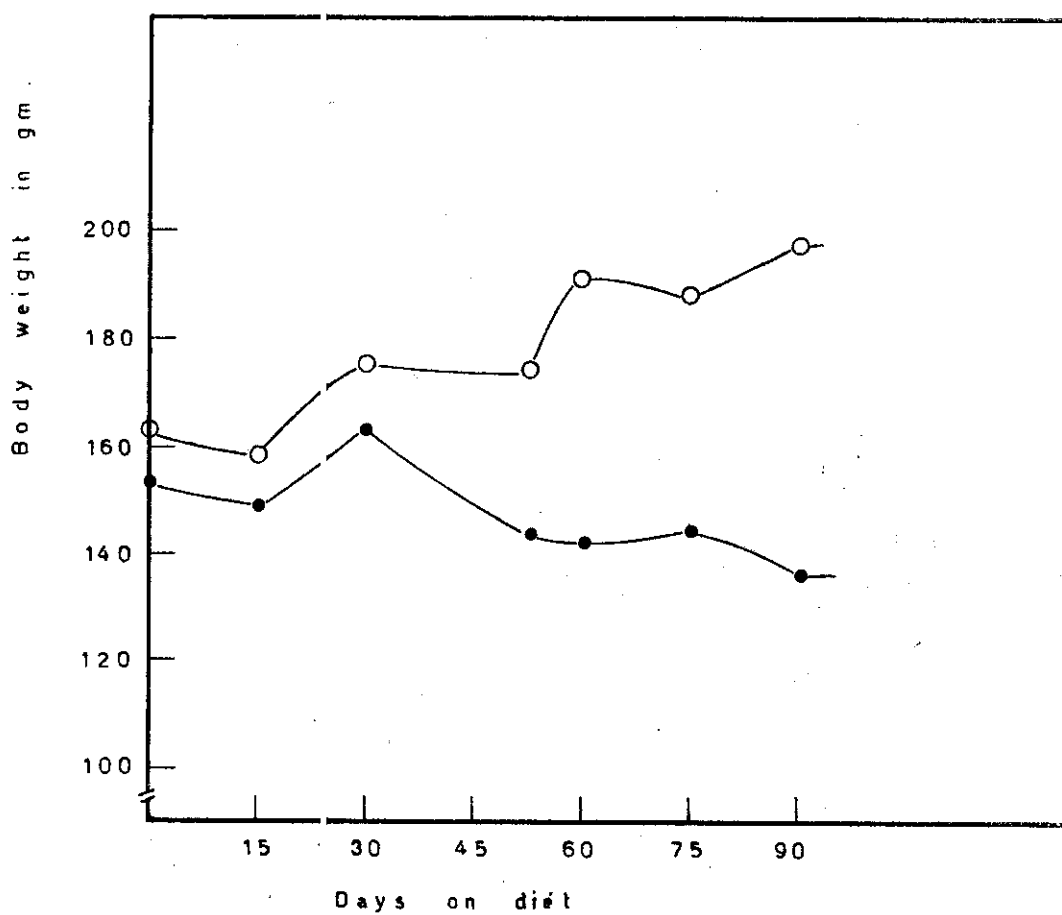


Fig.(6) Changes in body weight during induction of malnourishment ●—●, compared to the normally nourished rats ○—○.

occurred $P < 0.0025$. This decrease was progressive with prolongation of the low-protein diet administration. The percentage decrease reached - 6% after 90 days of continuous feeding. Estimation of protein fractions during development of malnourishment indicated progressive significant and highly significant decrease of albumin $P < 0.0005$ where the percentage decrease noted amounted to -9 % after 90-days. The γ globulin was highly significantly decreased $P < 0.0005$ together with highly significant decrease of the fibrinogen fraction $P < 0.0025$. The percentages of decrease recorded for γ globulin and fibrinogen were -17% and -15% for the 2 fractions respectively after 90 days as shown in table (4) and fig. (7).

The other globulin fractions namely α_1 , α_2 and B exhibited significant and very highly significant increase between $P < 0.0025$ to $P < 0.0005$ for the same period. The percentage increase reached + 40%, + 21% and +17% for the three fractions respectively (see table 4). The decrease of the albumin fraction together with the variations in the globulin fractions resulted into decrease of the albumin / globulin ratio (A/G) which exhibited very highly significant decrease $P < 0.0005$ and a percentage reduction of -15% after 90 days as indicated in table (4) and fig.(7).

Table (4) Changes in plasma proteins fractions as percentages of total proteins $\pm$ S.E. during development of malnourishment at 60 and 50 on protein -deficient diet

CHANGES AS PERCENT OF PLASMA PROTEINS AFTER VARIOUS TIME		15	60	90
PLASMA PROTEIN	PARAMETER			
Albumin	(% of total plasma protein)	43.75 $\pm$.58	38.57 $\pm$.69 (-12%) ***	39.67 $\pm$.83 (-9%) ***
Globulins	(% of total plasma protein)	6.95 $\pm$.26	10.96 $\pm$.34 (+26%) ***	9.76 $\pm$.21 (+40%) ***
- α_2		6.5 $\pm$.21	7.11 $\pm$.24 (+9%) ***	7.85 $\pm$.32 (+21%) ***
- B		20.32 $\pm$.41	21.74 $\pm$.68 (+7%) ***	23.87 $\pm$.60 (+17%) ***
- γ		13.07 $\pm$.35	13.18 $\pm$.34 (+1%) ***	10.82 $\pm$.34 (-17%) ***
Fibrinogen		9.41 $\pm$.23	8.44 $\pm$.37 (-10%) ***	9.03 $\pm$.28 (-4%) ***
Alb. / Glob. (A/G Ratio)		0.78 $\pm$.02	0.63 $\pm$.02 (-19%) ***	0.66 $\pm$.02 (-15%) ***
+ Insignificant		.49	*** Highly significant	*** significant
			*** Very highly significant.	



Fig.(7) Percentage changes in plasma proteins pattern of adult female albino rats during development of malnourishment.

III - Changes in the nontreated malnourished rats during the whole observation period

Continuous feeding of low protein diet (7 % casein) to rats following the development of malnourishment resulted in the following observations:

a) Total body weight changes

As shown in table (5) and fig. (8), the body weight of the animals in this group significantly and progressively decreased throughout the whole observation period. The decrease in body weight was calculated on the grounds of percentage decrease from the control normally nourished group at the corresponding time interval. The percentage decrease was significant and very highly significant $P < 0.0025$ to $P < 0.0005$ with a final remarkable decrease by -40%, where the mean body weight of the control animals was 207 ± 8.79 gms. compared to the mean body weight of the malnourished group which reached 125 ± 12.42 gms.

b) Plasma protein pattern

It was noticed that prolonged feeding of low protein diet resulted in further decrease of total plasma protein in the malnourished animals compared to the normally nourished controls during the whole observation period. As

Table (5) Body weight changes in malnourished control (M), normally nourished (N+C) & malnourished (M+C) treated with single daily oral dose of contraceptive in adult female albino rats.

Test groups	Initial $\bar{x} \pm S.E$	MEAN VALUE (in gm) $\pm$ S.E & PERCENTAGE CHANGES FROM CONTROL											
		TIME INTERVALS (IN DAYS)											
		7	15	22	30	37	45	52	60	67	75	82	90
Malnourished (M)	136.56 $\pm$ 2.42	134.65 $\pm$ 3.01 (-1.32%)	142.14 $\pm$ 2.73 (+5.49%)	131.73 $\pm$ 4.51 (-4.41%)	130.27 $\pm$ 5.02 (-4.97%)	129.35 $\pm$ 4.95 (-5.37%)	131.03 $\pm$ 11.31 (+1.29%)	130 $\pm$ 9.87 (-0.75%)	129.54 $\pm$ 5.80 (-0.38%)	129.54 $\pm$ 5.80 (-0.38%)	129.54 $\pm$ 5.80 (-0.38%)	129.54 $\pm$ 5.80 (-0.38%)	129.54 $\pm$ 5.80 (-0.38%)
Normally nourished control (N)	136.83 $\pm$ 2.82	138.42 $\pm$ 5.84 (+1.16%)	152.22 $\pm$ 5.83 (+9.94%)	209.44 $\pm$ 6.53 (+51.33%)	208.67 $\pm$ 6.39 (+51.03%)	215 $\pm$ 6.37 (+52.33%)	214.09 $\pm$ 8.47 (+51.03%)	196.36 $\pm$ 8.79 (-8.51%)	210.45 $\pm$ 8.49 (+5.21%)	207.5 $\pm$ 8.79 (-3.78%)	207.5 $\pm$ 8.79 (-3.78%)	207.5 $\pm$ 8.79 (-3.78%)	207.5 $\pm$ 8.79 (-3.78%)
Normally nourished treated (N+C)	195.53 $\pm$ 3.82	186.67 $\pm$ 5.66 (-4.53%)	180.63 $\pm$ 8.16 (-3.35%)	183.0 $\pm$ 10.31 (+1.26%)	191.82 $\pm$ 10.94 (+4.83%)	203.0 $\pm$ 9.78 (+6.36%)	193.3 $\pm$ 11.31 (-4.79%)	182.44 $\pm$ 10.69 (-5.63%)	181.11 $\pm$ 11.42 (-6.85%)	172.22 $\pm$ 9.13 (-5.54%)	172.22 $\pm$ 9.13 (-5.54%)	172.22 $\pm$ 9.13 (-5.54%)	172.22 $\pm$ 9.13 (-5.54%)
Normally nourished control (N)	196.53 $\pm$ 3.82	198.42 $\pm$ 5.84 (+1.93%)	197.22 $\pm$ 5.83 (-0.61%)	208.44 $\pm$ 6.95 (+5.69%)	210.94 $\pm$ 7.5 (+2.54%)	205 $\pm$ 8.37 (-2.37%)	214.09 $\pm$ 8.47 (+3.01%)	196.36 $\pm$ 8.79 (-8.51%)	210.45 $\pm$ 8.49 (+5.21%)	207.5 $\pm$ 8.79 (-3.78%)	207.5 $\pm$ 8.79 (-3.78%)	207.5 $\pm$ 8.79 (-3.78%)	207.5 $\pm$ 8.79 (-3.78%)
Malnourished treated (M+C)	136.56 $\pm$ 2.42	122.5 $\pm$ 3.27 (-9.52%)	128.75 $\pm$ 8.06 (+4.51%)	130.98 $\pm$ 8.76 (+1.68%)	130.21 $\pm$ 5.15 (-0.58%)	125.0 $\pm$ 4.75 (-3.91%)	123.48 $\pm$ 6.96 (-1.21%)	125.5 $\pm$ 4.84 (+1.54%)	124.33 $\pm$ 5.27 (-0.99%)	125.45 $\pm$ 6.89 (+0.86%)	125.45 $\pm$ 6.89 (+0.86%)	125.45 $\pm$ 6.89 (+0.86%)	125.45 $\pm$ 6.89 (+0.86%)
Malnourished control (M)	136.56 $\pm$ 2.42	134.66 $\pm$ 3.61 (-1.46%)	142.14 $\pm$ 7.39 (+5.49%)	131.43 $\pm$ 6.08 (-4.46%)	128.24 $\pm$ 6.72 (-3.95%)	129.38 $\pm$ 8.15 (-1.62%)	135.83 $\pm$ 11.91 (+4.15%)	130 $\pm$ 9.87 (-3.78%)	127.5 $\pm$ 9.68 (-5.54%)	125 $\pm$ 12.42 (-4.70%)	125 $\pm$ 12.42 (-4.70%)	125 $\pm$ 12.42 (-4.70%)	125 $\pm$ 12.42 (-4.70%)
Malnourished treated (M+C)	136.56 $\pm$ 2.42	122.5 $\pm$ 3.27 (-9.52%)	128.75 $\pm$ 8.06 (+4.51%)	130.98 $\pm$ 8.76 (+1.68%)	130.21 $\pm$ 5.15 (-0.58%)	125.0 $\pm$ 4.75 (-3.91%)	123.48 $\pm$ 6.96 (-1.21%)	125.5 $\pm$ 4.84 (+1.54%)	124.33 $\pm$ 5.27 (-0.99%)	125.45 $\pm$ 6.89 (+0.86%)	125.45 $\pm$ 6.89 (+0.86%)	125.45 $\pm$ 6.89 (+0.86%)	125.45 $\pm$ 6.89 (+0.86%)
Normally nourished treated (N+C)	196.53 $\pm$ 3.82	186.67 $\pm$ 5.66 (-4.53%)	180.63 $\pm$ 8.16 (-3.35%)	183.0 $\pm$ 10.31 (+1.26%)	191.82 $\pm$ 10.94 (+4.83%)	203.0 $\pm$ 9.78 (+6.36%)	193.3 $\pm$ 11.31 (-4.79%)	182.44 $\pm$ 10.69 (-5.63%)	181.11 $\pm$ 11.42 (-6.85%)	172.22 $\pm$ 9.13 (-5.54%)	172.22 $\pm$ 9.13 (-5.54%)	172.22 $\pm$ 9.13 (-5.54%)	172.22 $\pm$ 9.13 (-5.54%)

* Significant $P < 0.05$ ** Highly significant $P < 0.005$ *** Very highly significant $P < 0.0005$ NB: Each mean represents 24 animals
† Insignificant

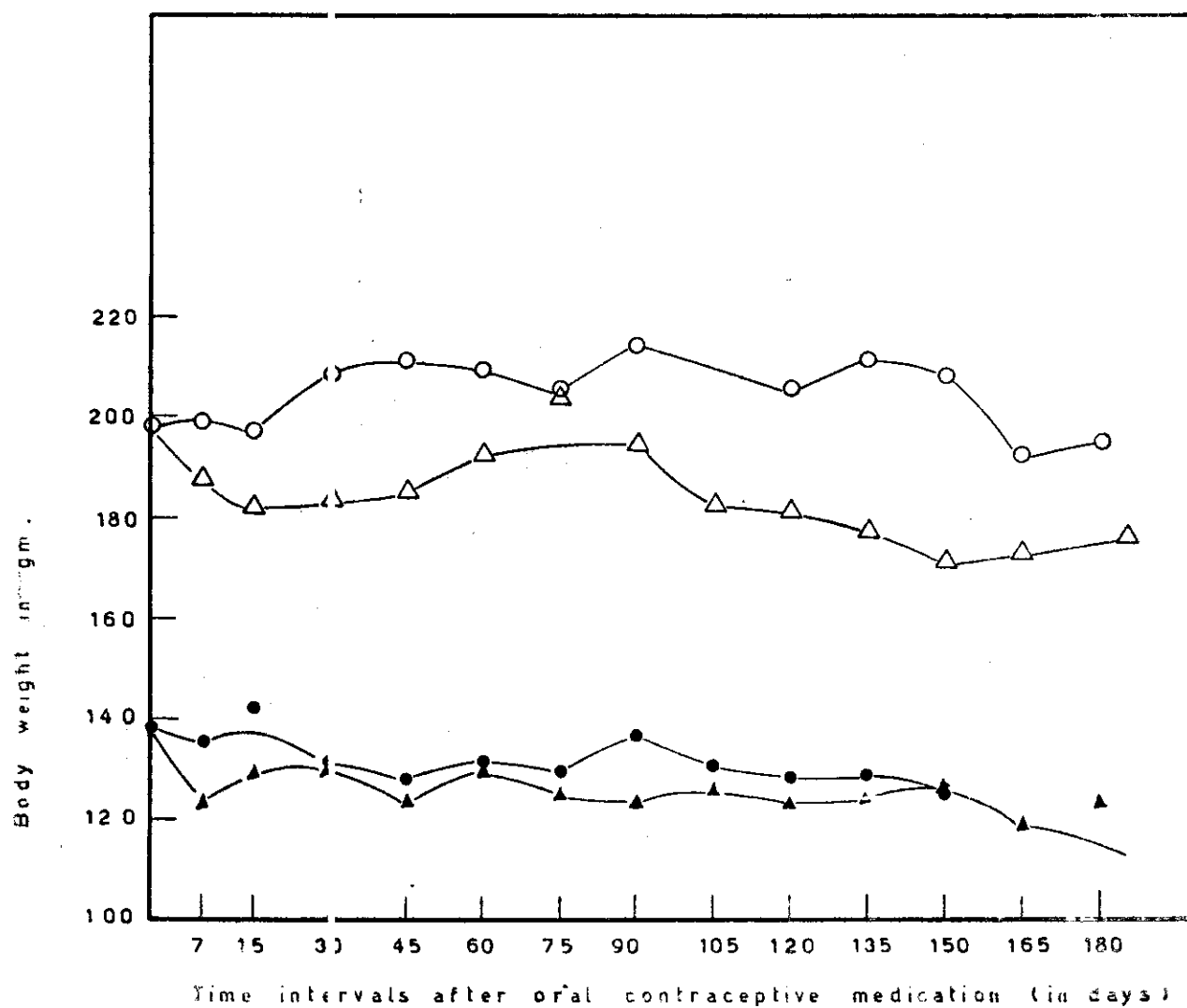


Fig.(8) Body weight changes in o—o Normally nourished control rats (N), Δ — Δ Normally nourished rats + Contraceptive (N+C), $\bullet$ — $\bullet$ Malnourished control rats, $\blacktriangle$ — $\blacktriangle$ Malnourished rats + contraceptive (M+C).

evident in table (6a) and fig. (9), significant and very highly significant decrease of total plasma protein was recorded ranging between $P < 0.0125$ and $P < 0.005$ with a final percentage decrease of -19% at the end of observation period. Protein fractions namely albumin and globulin were decreased as well especially during the first 45 days of observation. The decrease of albumin ranged between insignificant, significant and highly significant values $P < 0.05$ and $P < 0.005$ with a percentage reduction of -16% at the end of observation period. The same pattern was observed with the γ fraction but with a final percentage reduction of -12% at the end of the experiment as presented in table (6a,b) and fig. (9a,b).

On the other hand the other globulin fractions α_1 and α_2 exhibited mostly significant increase especially during the first 45 and 30 days for the two fractions respectively in the malnourished group compared to the normally nourished one. The percentage increase detected amounted to + 19% in case of α_1 being significant $P < 0.05$ and + 7% in case of α_2 as recorded in table (6a) and fig. (9a). The B fraction increased as well during the whole observation period with significant and highly significant values

Table (6) _a Changes in plasma proteins during the observation period of malnourished adult female albino rats (controls)

Test Parameters	Initial $\bar{x} \pm SE$	Test gps	CHANGES AS PERCENT OF PLASMA PROTEINS $\pm SE$ DURING OBSERVATION PERIOD													
			TIME INTERVALS (IN DAYS)													
			7	15	30	45	60	75	90	105	120	135	150	165	180	
Total protein (in gm/100ml)	6.71 $\pm$ 0.11	M	6.52 $\pm$ 0.11 (-14%)	5.74 $\pm$ 0.09 (-25%)	6.52 $\pm$ 0.31 (-19%)	6.34 $\pm$ 0.36 (-21%)	6.60 $\pm$ 0.11 (-18%)	5.75 $\pm$ 0.07 (-28%)	6.32 $\pm$ 0.05 (-16%)	5.99 $\pm$ 0.27 (-22%)	6.39 $\pm$ 0.24 (-15%)	6.54 $\pm$ 0.09 (-14%)	6.15 $\pm$ 0.16 (-19%)	—	—	
Albumin (% of total plasma protein)	39.67 $\pm$ 0.83	M	37.0 $\pm$ 2.72 (-18%)	26.82 $\pm$ 1.67 (-32%)	35.06 $\pm$ 2.03 (-21%)	35.59 $\pm$ 3.07 (-20%)	38.40 $\pm$ 1.53 (-10%)	41.87 $\pm$ 2.04 (-7%)	39.77 $\pm$ 1.87 (-12%)	40.21 $\pm$ 3.44 (-12%)	40.98 $\pm$ 3.38 (-12%)	42.57 $\pm$ 4.04 (-5%)	38.12 $\pm$ 2.40 (-16%)	—	—	
Globulins (% of total plasma protein)	9.76 $\pm$ 0.21	M	11.22 $\pm$ 0.44 (+4%)	16.26 $\pm$ 0.31 (+50%)	14.24 $\pm$ 0.63 (+23%)	13.75 $\pm$ 0.94 (+24%)	12.34 $\pm$ 0.38 (+14%)	8.84 $\pm$ 0.72 (-11%)	8.98 $\pm$ 0.55 (-0.0%)	9.66 $\pm$ 1.61 (-6%)	10.15 $\pm$ 1.21 (+9%)	9.33 $\pm$ 1.66 (-1%)	11.42 $\pm$ 0.77 (+19%)	—	—	
α_2	11.14 $\pm$ 0.24	N	10.97 $\pm$ 0.10	10.85 $\pm$ 1.13	11.57 $\pm$ 1.24	11.06 $\pm$ 1.03	10.83 $\pm$ 0.95	9.97 $\pm$ 0.88	8.98 $\pm$ 1.29	10.02 $\pm$ 1.21	9.32 $\pm$ 1.19	9.46 $\pm$ 1.17	9.60 $\pm$ 1.04	9.47 $\pm$ 1.43	9.35 $\pm$ 1.24	
α_2	7.85 $\pm$ 0.32	M	7.61 $\pm$ 0.39 (+9%)	11.34 $\pm$ 0.63 (+47%)	7.11 $\pm$ 0.34 (+2%)	5.82 $\pm$ 0.77 (-15%)	5.99 $\pm$ 0.19 (-5%)	5.79 $\pm$ 0.26 (-8%)	6.24 $\pm$ 0.49 (+1%)	6.77 $\pm$ 0.49 (+9%)	6.04 $\pm$ 0.71 (-2%)	6.12 $\pm$ 0.76 (-2%)	6.87 $\pm$ 0.48 (+7%)	—	—	
	7.10 $\pm$ 0.21	N	6.98 $\pm$ 0.4	7.69 $\pm$ 0.55	6.95 $\pm$ 0.34	6.81 $\pm$ 0.36	6.40 $\pm$ 0.55	6.32 $\pm$ 0.55	6.19 $\pm$ 0.60	6.22 $\pm$ 0.55	6.18 $\pm$ 0.63	6.23 $\pm$ 0.59	6.44 $\pm$ 0.48	6.30 $\pm$ 0.50	6.59 $\pm$ 0.65	

† Insignificant * Significant $P < 0.05$ ** Highly significant $P < 0.005$ & 0.01 *** Very highly significant $P < 0.0005$

M = Malnourished control rats

N = Normally nourished control rats during diestrus phase.

Table (6) _b Cont

Test Parameters	Initial $\bar{x} \pm SE$	Test gps	CHANGES AS PERCENT OF PLASMA PROTEINS $\pm SE$ DURING OBSERVATION PERIOD													
			TIME INTERVALS (IN DAYS)													
			7	15	30	45	60	75	90	105	120	135	150	165	180	
Globulins B	23.87 $\pm$ 0.60	M	22.72 $\pm$ 1.56 (+16%)	26.63 $\pm$ 0.77 (+24%)	24.59 $\pm$ 2.31 (+32%)	26.34 $\pm$ 1.3 (+34%)	24.07 $\pm$ 0.75 (+12%)	28.47 $\pm$ 0.77 (+38%)	27.44 $\pm$ 0.95 (+23%)	26.74 $\pm$ 0.57 (+19%)	27.23 $\pm$ 0.47 (+22%)	26.95 $\pm$ 0.54 (+20%)	26.38 $\pm$ 0.84 (+21%)	—	—	
	20.35 $\pm$ 0.41	N	19.23 $\pm$ 0.66	21.51 $\pm$ 2.15	18.66 $\pm$ 0.77	19.69 $\pm$ 0.82	21.46 $\pm$ 1.67	20.66 $\pm$ 0.75	22.32 $\pm$ 1.12	22.44 $\pm$ 1.29	22.28 $\pm$ 1.2	22.41 $\pm$ 1.22	21.77 $\pm$ 1.03	21.94 $\pm$ 1.07	22.19 $\pm$ 0.93	
χ	10.82 $\pm$ 0.34	M	9.91 $\pm$ 0.73 (-16%)	10.02 $\pm$ 0.69 (-16%)	11.89 $\pm$ 1.06 (-3%)	10.99 $\pm$ 0.30 (-3%)	12.34 $\pm$ 0.49 (-11%)	8.75 $\pm$ 0.37 (-21%)	11.84 $\pm$ 0.63 (-7%)	9.52 $\pm$ 1.0 (-15%)	10.74 $\pm$ 0.6 (-9%)	9.59 $\pm$ 0.96 (-23%)	10.27 $\pm$ 0.53 (-12%)	—	—	
	12.38 $\pm$ 0.5	N	11.79 $\pm$ 0.69	11.92 $\pm$ 0.7	12.31 $\pm$ 0.90	11.30 $\pm$ 0.80	11.12 $\pm$ 0.59	11.09 $\pm$ 0.96	11.04 $\pm$ 1.09	11.14 $\pm$ 1.14	11.86 $\pm$ 0.16	12.39 $\pm$ 0.52	11.60 $\pm$ 0.53	11.85 $\pm$ 0.64	12.64 $\pm$ 0.53	
Fibrinogen	8.03 $\pm$ 0.28	M	11.54 $\pm$ 1.77 (+93%)	8.93 $\pm$ 0.60 (+5%)	7.11 $\pm$ 0.49 (+17%)	7.5 $\pm$ 0.56 (+13%)	6.96 $\pm$ 0.69 (-9%)	6.28 $\pm$ 0.66 (-12%)	5.73 $\pm$ 0.34 (-12%)	7.09 $\pm$ 0.91 (-51%)	5.27 $\pm$ 0.58 (+18%)	5.44 $\pm$ 0.61 (-31%)	6.95 $\pm$ 0.77 (+39%)	—	—	
	6.38 $\pm$ 0.61	N	5.99 $\pm$ 0.28	8.47 $\pm$ 1.49	6.09 $\pm$ 0.52	6.66 $\pm$ 0.74	7.54 $\pm$ 0.74	7.17 $\pm$ 0.51	6.49 $\pm$ 0.49	4.69 $\pm$ 1.45	4.46 $\pm$ 1.39	7.87 $\pm$ 1.21	5.01 $\pm$ 1.49	6.26 $\pm$ 0.75	4.68 $\pm$ 1.4	
Alb / Glob (A / G) ratio	0.66 $\pm$ 0.02	M	0.60 $\pm$ 0.07 (-26%)	0.37 $\pm$ 0.03 (-46%)	0.55 $\pm$ 0.05 (-32%)	0.57 $\pm$ 0.08 (-30%)	0.63 $\pm$ 0.03 (-17%)	0.73 $\pm$ 0.06 (-12%)	0.67 $\pm$ 0.05 (-19%)	0.69 $\pm$ 0.09 (-19%)	0.70 $\pm$ 0.09 (-20%)	0.77 $\pm$ 0.18 (-8%)	0.62 $\pm$ 0.06 (-26%)	—	—	
	0.75 $\pm$ 0.03	N	0.83 $\pm$ 0.05	0.68 $\pm$ 0.10	0.81 $\pm$ 0.07	0.81 $\pm$ 0.05	0.76 $\pm$ 0.07	0.83 $\pm$ 0.06	0.83 $\pm$ 0.06	0.85 $\pm$ 0.07	0.87 $\pm$ 0.08	0.84 $\pm$ 0.08	0.84 $\pm$ 0.04	0.82 $\pm$ 0.07	0.81 $\pm$ 0.05	

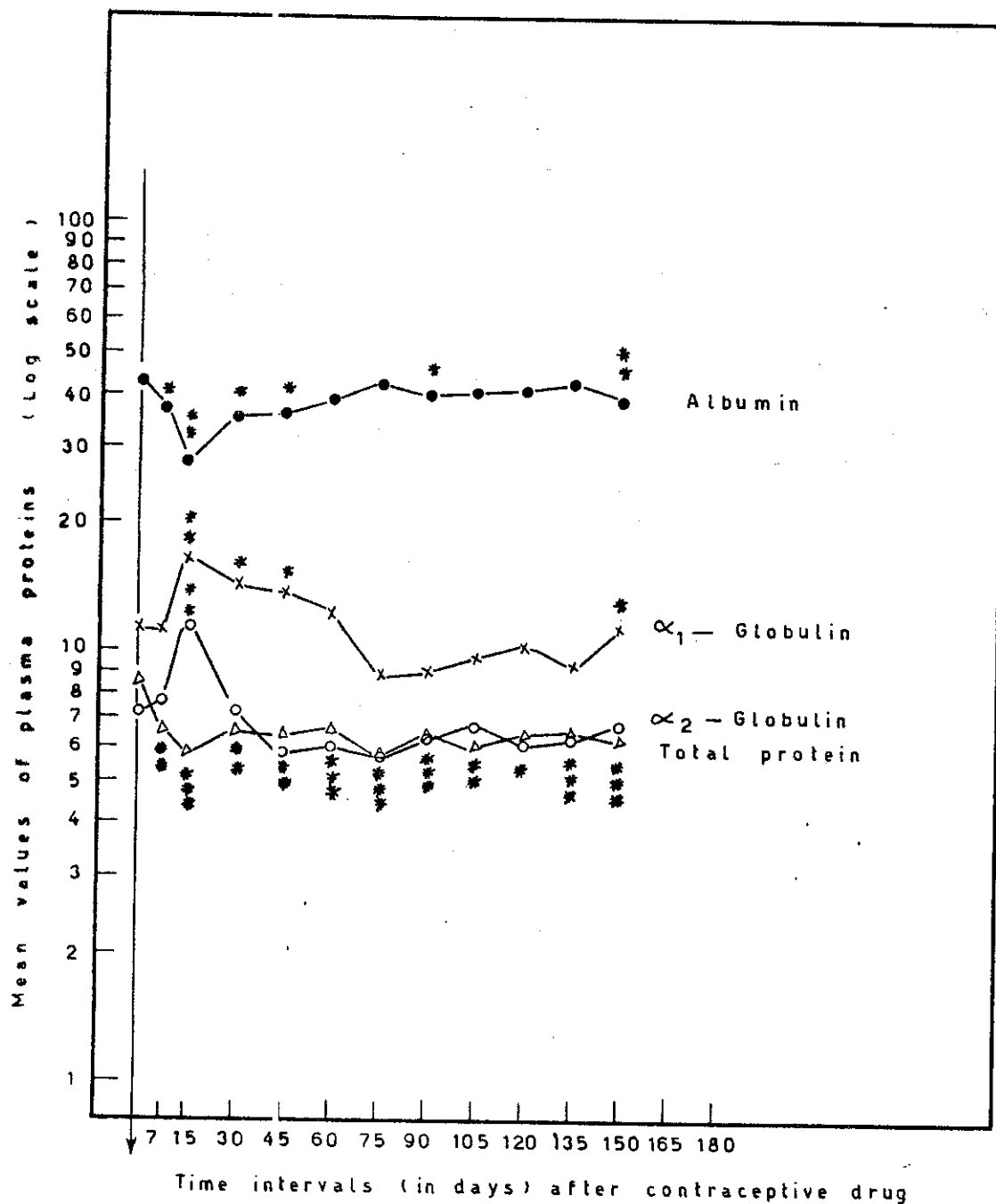


Fig.(9). Changes in plasma proteins during the observation period in malnourished albino rats (controls).

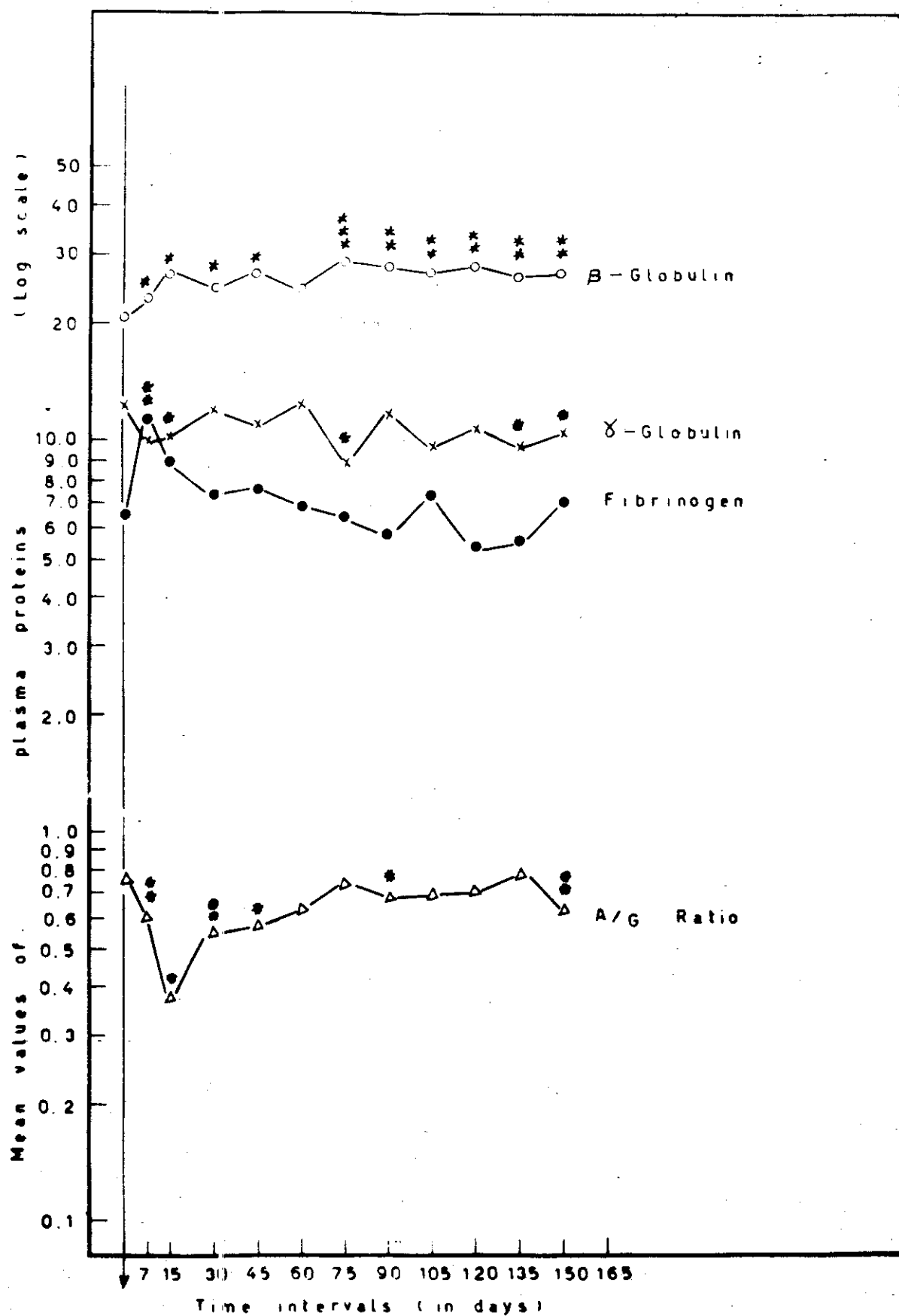


Fig. (9)_b Cont.

recorded ranging between $P < 0.05$ and $P < 0.005$ with a percentage increase of +21% at the end of observation period. Fibrinogen showed fluctuating levels all over the observation period without a detectable pattern.

The marked decrease in the albumin and the changes in the globulin fractions resulted in ultimate decrease of the A/G ratio during the whole observation period where varying decreased levels were recorded. A highly significant percentage reduction was recorded at the end of observation period reaching - 26% ($P < 0.005$). The results for the whole plasma protein pattern are recorded in table (6_{a,b}) and graphically illustrated in fig.(9_{a,b}).

c) Plasma hormonal pattern

As presented in table (7), fig. (10), plasma levels of gonadotropic hormones showed a biphasic pattern during the experimental period. In the first half of observation period a significant increase of both FSH & LH occurred in the malnourished group compared to the normal one; $P < 0.05$ to $P < 0.005$ for FSH and $P < 0.005$ to $P < 0.0005$ for LH with a peak level at day 45 reaching a very high percentage increase of + 350 % in case of LH and +92% in case of FSH.

Table (7) Changes in plasma gonadotropins, (FSH & LH) estrogen and progesterone during observation period of malnourished adult female albino rats (controls).

Test Parameters	Initial $\bar{x} \pm SE$	Test gps	MEAN VALUES $\pm SE$ AND PERCENTAGE CHANGE FROM NORMALLY NOURISHED CONTROL RATS													
			TIME INTERVALS (IN DAYS)													
			7	15	30	45	60	75	90	105	120	135	150	165	180	
FSH m.i.u./ml	3.82 $\pm$ 0.26	M	1.86 $\pm$ 0.19 (-48%)	4.10 $\pm$ 0.88 (+9%)	6.7 $\pm$ 0.32 (+85%)	5.8 $\pm$ 0.22 (+92%)	5.2 $\pm$ 0.44 (+45%)	5.68 $\pm$ 0.76 (+62%)	4.23 $\pm$ 1.07 (+3%)	2.07 $\pm$ 0.32 (-13%)	2.67 $\pm$ 0.29 (-10%)	1.88 $\pm$ 0.25 (-30%)	2.33 $\pm$ 0.048 (-20%)	—	—	
			3.5 $\pm$ 0.39	3.75 $\pm$ 0.46	3.62 $\pm$ 0.25	3.55 $\pm$ 0.18	3.58 $\pm$ 1.04	3.5 $\pm$ 0.47	4.34 $\pm$ 1.25	2.37 $\pm$ 0.25	2.99 $\pm$ 0.34	2.68 $\pm$ 0.42	2.94 $\pm$ 0.18	2.5 $\pm$ 0.45	2.95 $\pm$ 0.64	
LH m.i.u./ml	6.87 $\pm$ 0.99	M	2.69 $\pm$ 0.19 (+8%)	4.64 $\pm$ 0.89 (+33%)	6.65 $\pm$ 1.04 (+153%)	7.65 $\pm$ 0.38 (+350%)	7.84 $\pm$ 0.81 (+142%)	1.92 $\pm$ 0.26 (-19%)	1.83 $\pm$ 0.34 (-26%)	0.714 $\pm$ 0.17 (-65%)	0.89 $\pm$ 0.21 (-43%)	2.16 $\pm$ 0.26 (+23%)	1.78 $\pm$ 0.30 (+16%)	—	—	
			2.5 $\pm$ 0.15	3.49 $\pm$ 0.95	2.83 $\pm$ 0.53	1.7 $\pm$ 0.44	3.24 $\pm$ 1.06	2.38 $\pm$ 0.26	2.48 $\pm$ 0.38	2.012 $\pm$ 0.38	1.55 $\pm$ 0.09	1.75 $\pm$ 0.28	1.54 $\pm$ 0.28	1.44 $\pm$ 0.24	1.43 $\pm$ 0.24	
Estrogen pg/ml	35.72 $\pm$ 5.46	M	11.7 $\pm$ 2.02 (-68%)	23.10 $\pm$ 6.20 (-34%)	37.2 $\pm$ 5.77 (-5%)	26.2 $\pm$ 8.36 (-31%)	16.82 $\pm$ 1.43 (-36%)	19.5 $\pm$ 2.54 (-35%)	16.66 $\pm$ 3.94 (-50%)	17.27 $\pm$ 1.70 (-60%)	11.4 $\pm$ 2.62 (-60%)	10.17 $\pm$ 3.37 (-60%)	12.75 $\pm$ 2.73 (-54%)	—	—	
			36.45 $\pm$ 1334	34.97 $\pm$ 6.6	39.07 $\pm$ 4.4	39.13 $\pm$ 5.7	26.26 $\pm$ 5.11	32.15 $\pm$ 7.07	33.5 $\pm$ 5.05	44.0 $\pm$ 4.5	28.71 $\pm$ 5.9	25.19 $\pm$ 5.65	27.78 $\pm$ 4.98	32.0 $\pm$ 8.6	33.63 $\pm$ 6.01	
Progesterone ng/ml	4.80 $\pm$ 0.59	M	4.31 $\pm$ 0.64 (-85%)	3.86 $\pm$ 1.47 (-83%)	1.45 $\pm$ 0.178 (-72%)	3.79 $\pm$ 0.60 (-86%)	3.10 $\pm$ 1.04 (-87%)	3.45 $\pm$ 0.51 (-84%)	8.93 $\pm$ 2.44 (-56%)	2.32 $\pm$ 0.57 (-91%)	2.84 $\pm$ 0.38 (-89%)	2.37 $\pm$ 0.34 (-91%)	1.2 $\pm$ 0.14 (-83%)	—	—	
			26.6 $\pm$ 6.06	23.04 $\pm$ 4.96	5.3 $\pm$ 0.53	26.27 $\pm$ 4.13	24.28 $\pm$ 4.63	21.39 $\pm$ 3.95	25.91 $\pm$ 5.53	26.87 $\pm$ 4.76	26.30 $\pm$ 3.24	26.56 $\pm$ 3.15	21.42 $\pm$ 5.38	21.68 $\pm$ 4.72	21.25 $\pm$ 13.09	

* Significant $P < 0.05$ ** Highly significant $P < 0.005$ & $P < 0.01$ *** Very highly significant $P < 0.0005$

N = Normally nourished rats.

M = Malnourished control rats.

† Insignificant

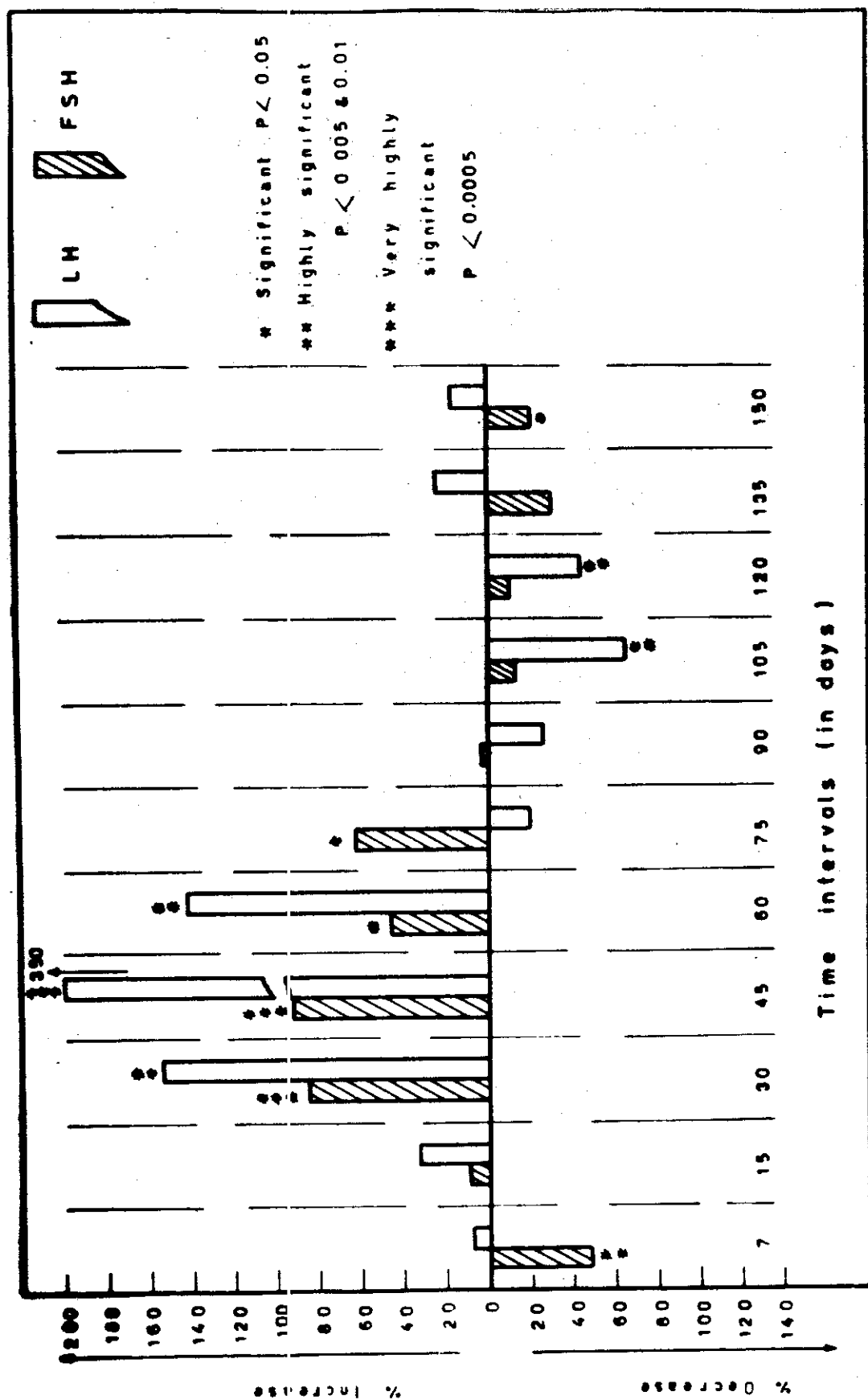


Fig.(10) Gonadotropin hormones (FSH & LH) changes in malnourished rats as percent from those normally nourished control rats over the observation period.

During the second phase however, a highly significant progressive decrease of both hormones occurred. In case of LH the percentage reduction reached -65% and -43% at days 105 and 120 respectively being highly significant $P < 0.01$, reduction in case of FSH was also significant $P < 0.025$ at day 150 with a percentage reduction of -20% as shown in table (7) fig.(10). Plasma levels of steroid hormones i.e. estrogen and progesterone exhibited decreased hormonal levels throughout the whole observation period in the malnourished group compared to the normally nourished animals as presented in table (7) and Fig. (11). Estrogen level was significantly decreased especially at 90 & 105 days $P < 0.05$ to $P < 0.01$ where the percentage reduction recorded was -50% and -60% for the two periods respectively. Plasma progesterone level was decreased as well being very highly significant at most of the time intervals of observation period $P < 0.0005$. The percentage reduction revealed a range between -66% to -91% as recorded in table (7) and fig. (11).

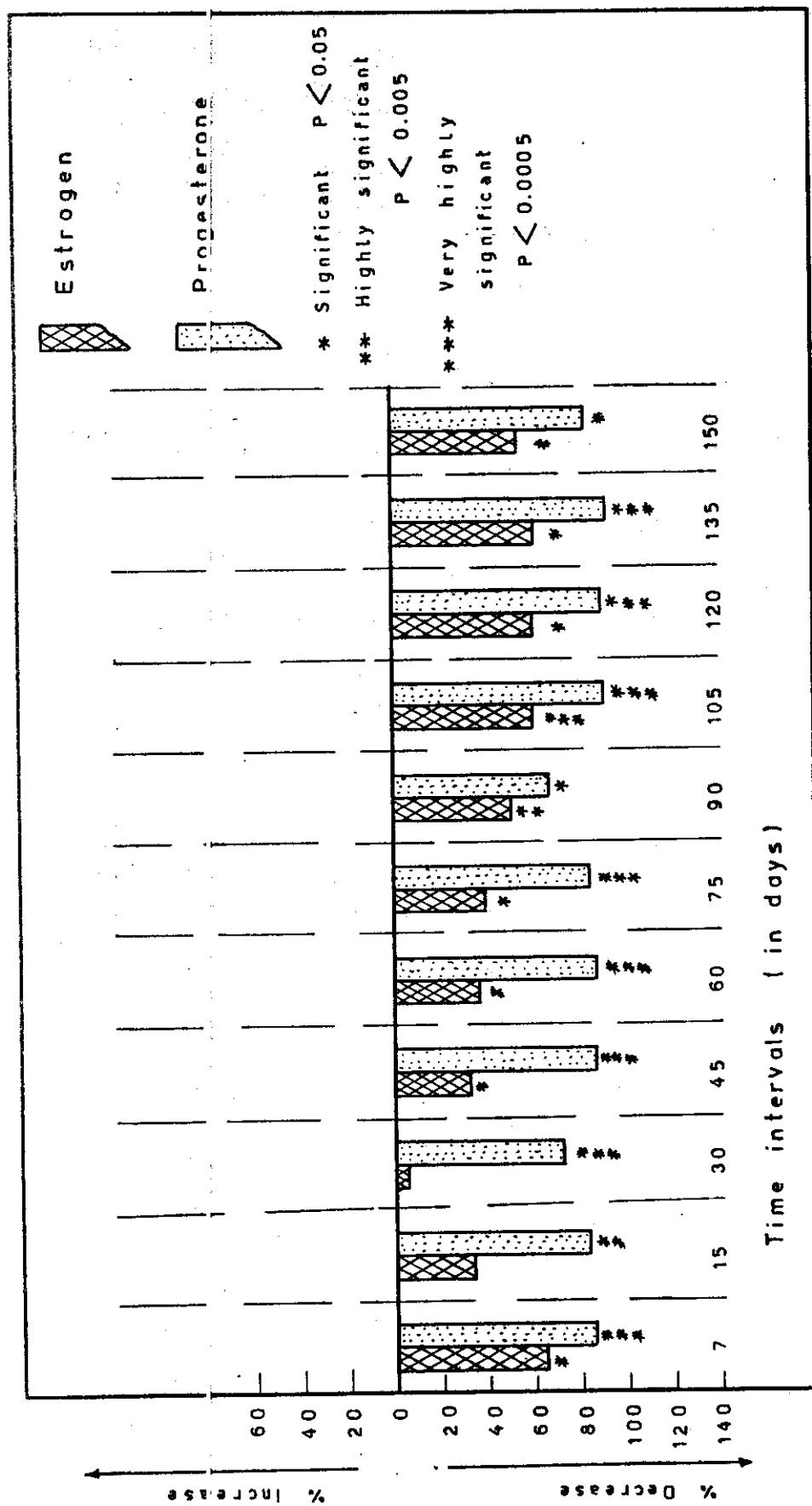


Fig.(11) Percent reduction in plasma estrogen and progesterone in malnourished rats from those normally nourished rats over the observation period.

IV - Metabolic effects of daily oral contraceptive dose
in normally nourished and malnourished adult female
rats

A - Effect on normally nourished rats

a) Effect on total body weight

Total body weight of animals in this group showed some decrease throughout the observation period. This decrease was mostly insignificant except for occasional time intervals at the beginning of observation period namely days 30 and 45 amounting to -12% and -13% respectively $P < 0.025$ and $P < 0.01$ and another period towards the end of experiment at days 135 and 150 with percentage decrease of -16 % and -18% respectively, see table (5) and fig. (8).

b) Effect on vaginal smear cytology

The effect of the drug on the vaginal smear cytology was studied as it reflects its action on the pituitary gonadotropins and hypothalamic releasing factors with consequent rise of estrogen and ovulation. The results in table (8) represent the changes of vaginal smear cytology during the whole observation period of 180 days. Daily administration of the drug resulted in disturbance of the estrus cycle in animals receiving normal diet. During the

Table (8) Effect of single daily oral dose of contraceptive (C) on vaginal smear cytology in estrous cycle of normally nourished adult female albino rats

PATTERN OF VAGINAL		% FREQUENCY OF ANIMALS SHOWING PATTERN OF VAGINAL SMEAR FOLLOWING DRUG.												
		TIME INTERVALS IN DAYS												
SMEAR CYTOLOGY	7	15	30	45	60	75	90	105	120	135	150	165	180	
Proestrus	20%	40%	-	-	-	-	-	-	-	-	-	-	-	
Proestrus+Estrus	40%	-	20%	-	-	-	-	-	-	-	-	-	-	
Estrus	-	20%	40%	60%	83%	80%	100%	100%	100%	100%	100%	100%	100%	
Diestrus+proestrus	20%	20%	-	-	-	-	-	-	-	-	-	-	-	
Dientrus	20%	20%	20%	20%	17%	-	-	-	-	-	-	-	-	
Diestrus-Estrus	-	-	20%	20%	-	20%	-	-	-	-	-	-	-	

first 60 days, mixed vaginal cytology occurred showing unstable estrus phases with definite inclination towards estrus. From day 90 onwards the vaginal smear cytology was that of 100% estrus in all animals with no other fluctuations.

c) Effect on plasma protein pattern

Table (9_{a,b}) & fig. (12_{a,b}) show the changes which occurred in plasma protein pattern. Total plasma protein exhibited insignificant fluctuating levels during the whole observation period except on three occasions where significant increase of + 5% and +8%, ($P < 0.05$) occurred at 60 and 150 days respectively. A highly significant decrease of -11% ($P < 0.005$) was recorded at day 90. The albumin was decreased throughout the whole observation period. The decreased levels recorded varied between insignificant, significant and highly significant levels $P < 0.05$, $P < 0.01$ & $P < 0.005$ and percentage decreases varying between - 3% and -22% with a final decrease of -16 % as shown in table (9_a) and fig. (12_a).

All globulin fractions exhibited tendency to fluctuating levels allthrough the observation period. While α_1 fraction showed tendency to increased levels especially during the first 60 days of observation with significant and

Table (9) ^a Effect of single daily oral dose of contraceptive on plasma proteins pattern in normally nourished adult female albino rats.

adult female albino rats.																
Test Parameters	Initial $\bar{x} \pm SE$	Test gms	CHANGES AS PERCENT OF PLASMA PROTEINS $\pm SE$ DURING TREATMENT													
			TIME INTERVALS AFTER CONTRACEPTIVE DRUG (IN DAYS)													
			7	15	30	45	60	75	90	105	120	135	150	165	180	
Total protein (in gm/100ml)	8.41 $\pm$ 0.11	N+C	7.65 $\pm$ 0.18 (-0.4%) $\uparrow$	7.39 $\pm$ 0.20 (-4%) $\uparrow$	7.81 $\pm$ 0.17 (-2%) $\uparrow$	8.30 $\pm$ 0.12 (+3%) $\uparrow$	8.49 $\pm$ 0.11 (+5%) $\uparrow$	7.63 $\pm$ 0.18 (-4%) $\uparrow$	6.7 $\pm$ 0.19 (-11%) $\uparrow$	7.27 $\pm$ 0.24 (-5%) $\uparrow$	7.37 $\pm$ 0.04 (-1%) $\uparrow$	7.85 $\pm$ 0.16 (+3%) $\uparrow$	8.18 $\pm$ 0.52 (+8%) $\uparrow$	8.26 $\pm$ 0.13 (+2%) $\uparrow$	7.48 $\pm$ 0.21 (-2%) $\uparrow$	
		N	7.62 $\pm$ 0.29	7.67 $\pm$ 0.33	7.99 $\pm$ 0.20	8.05 $\pm$ 0.25	8.11 $\pm$ 0.15	7.98 $\pm$ 0.17	7.52 $\pm$ 0.15	7.68 $\pm$ 0.30	7.48 $\pm$ 0.30	7.64 $\pm$ 0.10	7.56 $\pm$ 0.11	8.13 $\pm$ 0.21	7.62 $\pm$ 0.19	
Albumin (% of total plasma protein)	42.85 $\pm$ 0.89	N+C	41.46 $\pm$ 2.63 (-8%) $\uparrow$	30.86 $\pm$ 2.39 (-22%) $\uparrow$	38.72 $\pm$ 1.68 (-13%) $\uparrow$	39.66 $\pm$ 0.97 (-11%) $\uparrow$	40.21 $\pm$ 1.51 (-6%) $\uparrow$	43.29 $\pm$ 2.38 (-3%) $\uparrow$	42.02 $\pm$ 0.57 (-7%) $\uparrow$	40.58 $\pm$ 1.14 (-11%) $\uparrow$	41.12 $\pm$ 1.43 (-10%) $\uparrow$	41.23 $\pm$ 1.56 (-8%) $\uparrow$	40.21 $\pm$ 0.76 (-12%) $\uparrow$	37.62 $\pm$ 1.63 (-15%) $\uparrow$	37.61 $\pm$ 1.98 (-16%) $\uparrow$	
		N	45.04 $\pm$ 1.46	39.56 $\pm$ 3.63	44.42 $\pm$ 2.52	46.48 $\pm$ 1.38	42.46 $\pm$ 2.49	44.79 $\pm$ 2.23	44.98 $\pm$ 1.92	45.49 $\pm$ 2.34	45.91 $\pm$ 2.78	44.96 $\pm$ 2.68	45.58 $\pm$ 1.35	44.18 $\pm$ 2.18	44.55 $\pm$ 1.85	
Globulins (% of total plasma protein) α_1	11.14 $\pm$ 0.49	N+C	9.84 $\pm$ 0.30 (-9%) $\uparrow$	15.03 $\pm$ 0.73 (+39%) $\uparrow$	14.85 $\pm$ 0.59 (+28%) $\uparrow$	12.79 $\pm$ 0.52 (+16%) $\uparrow$	13.73 $\pm$ 0.29 (+27%) $\uparrow$	11.08 $\pm$ 0.27 (+11%) $\uparrow$	9.79 $\pm$ 0.24 (+9%) $\uparrow$	11.01 $\pm$ 0.19 (+8%) $\uparrow$	10.4 $\pm$ 0.33 (+12%) $\uparrow$	10.04 $\pm$ 0.46 (+10%) $\uparrow$	7.49 $\pm$ 0.25 (-22%) $\uparrow$	8.16 $\pm$ 0.19 (-14%) $\uparrow$	7.79 $\pm$ 0.37 (-17%) $\uparrow$	
		N	10.97 $\pm$ 1.00	10.85 $\pm$ 1.13	11.57 $\pm$ 1.24	11.06 $\pm$ 1.03	10.83 $\pm$ 0.95	9.97 $\pm$ 0.88	8.98 $\pm$ 1.29	10.02 $\pm$ 1.21	9.32 $\pm$ 1.19	9.46 $\pm$ 1.17	9.60 $\pm$ 1.04	9.47 $\pm$ 1.43	9.35 $\pm$ 1.24	
α_2	7.10 $\pm$ 0.21	N+C	6.70 $\pm$ 0.50 (-4%) $\uparrow$	9.75 $\pm$ 1.04 (+27%) $\uparrow$	8.14 $\pm$ 0.29 (+17%) $\uparrow$	5.72 $\pm$ 0.33 (-16%) $\uparrow$	5.72 $\pm$ 0.51 (-11%) $\uparrow$	5.77 $\pm$ 0.76 (-9%) $\uparrow$	6.39 $\pm$ 0.43 (+3%) $\uparrow$	5.75 $\pm$ 0.21 (-8%) $\uparrow$	5.24 $\pm$ 0.17 (-15%) $\uparrow$	4.76 $\pm$ 0.48 (-24%) $\uparrow$	6.66 $\pm$ 0.35 (+3%) $\uparrow$	5.29 $\pm$ 0.33 (-16%) $\uparrow$	6.83 $\pm$ 0.38 (+3%) $\uparrow$	
		N	6.98 $\pm$ 0.40	7.69 $\pm$ 0.55	6.99 $\pm$ 0.34	6.81 $\pm$ 0.36	6.40 $\pm$ 0.65	6.32 $\pm$ 0.55	6.19 $\pm$ 0.60	6.22 $\pm$ 0.65	6.18 $\pm$ 0.63	6.23 $\pm$ 0.69	6.44 $\pm$ 0.48	6.30 $\pm$ 0.50	6.59 $\pm$ 0.65	

NR: Each mean represents 24 animals

NB: Each mean represents 24 animals

* Significant $P < 0.05$ ** Highly significant $P < 0.005$

† Insignificant
N = Normally nourished controls rats.
N+C = Normally nourished + Contraceptive.

Table (9) _b CONT.

CHANGES AS PERCENT OF PLASMA PROTEINS $\pm$ S.E. DURING TREATMENT														
Parameters	Initial $\bar{X} \pm S.E.$	Test	TIME INTERVALS AFTER CONTRACEPTIVE DRUG (IN DAYS)											
			7	15	30	45	60	75	90	105	120	135	150	165
Parameters		gms												
Globulins	20.35 $\pm$ 0.41	N+C	19.99 $\pm$ 1.18 (+ 4%) $\uparrow$	25.41 $\pm$ 1.44 (+ 18%) $\uparrow$	18.65 $\pm$ 0.89 (- 0.1%) $\downarrow$	20.88 $\pm$ 1.07 (+ 6%) $\uparrow$	22.17 $\pm$ 1.37 (- 3%) $\downarrow$	21.98 $\pm$ 0.82 (+ 6%) $\uparrow$	24.25 $\pm$ 0.43 (+ 9%) $\uparrow$	24.78 $\pm$ 1.00 (+ 10%) $\uparrow$	25.58 $\pm$ 1.34 (+ 15%) $\uparrow$	24.72 $\pm$ 1.65 (+ 10%) $\uparrow$	25.94 $\pm$ 0.41 (+ 19%) $\uparrow$	25.05 $\pm$ 0.94 (+ 12%) $\uparrow$
		N	19.23 $\pm$ 0.66	21.51 $\pm$ 2.15	18.66 $\pm$ 0.77	19.69 $\pm$ 0.82	21.46 $\pm$ 1.67	20.56 $\pm$ 0.75	22.32 $\pm$ 1.12	22.44 $\pm$ 1.29	22.28 $\pm$ 1.2	22.41 $\pm$ 1.22	21.77 $\pm$ 1.03	21.94 $\pm$ 1.07
γ	12.38 $\pm$ 0.50	N+C	9.91 $\pm$ 0.54 (- 16%) $\downarrow$	10.76 $\pm$ 0.66 (- 10%) $\downarrow$	11.53 $\pm$ 0.73 (- 6%) $\downarrow$	11.55 $\pm$ 0.76 (+ 2%) $\uparrow$	10.74 $\pm$ 0.61 (- 3%) $\downarrow$	9.63 $\pm$ 0.93 (- 16%) $\downarrow$	11.34 $\pm$ 0.53 (+ 3%) $\uparrow$	11.69 $\pm$ 0.54 (+ 5%) $\uparrow$	13.12 $\pm$ 0.73 (+ 11%) $\uparrow$	12.09 $\pm$ 0.67 (- 2%) $\downarrow$	12.06 $\pm$ 0.38 (+ 4%) $\uparrow$	12.17 $\pm$ 0.40 (+ 20%) $\uparrow$
		N	11.79 $\pm$ 0.69	11.92 $\pm$ 0.70	12.30 $\pm$ 0.09	11.30 $\pm$ 0.80	11.12 $\pm$ 0.59	11.09 $\pm$ 0.96	11.04 $\pm$ 1.09	11.14 $\pm$ 1.14	11.86 $\pm$ 1.16	12.39 $\pm$ 0.52	11.60 $\pm$ 0.53	11.85 $\pm$ 0.64
Fibrinogen	6.38 $\pm$ 0.61	N+C	12.10 $\pm$ 0.68 (+ 102%) $\uparrow$	8.19 $\pm$ 0.32 (- 3%) $\downarrow$	8.06 $\pm$ 0.56 (+ 32%) $\uparrow$	9.39 $\pm$ 0.48 (+ 41%) $\uparrow$	7.43 $\pm$ 0.56 (+ 1%) $\uparrow$	6.21 $\pm$ 0.39 (- 13%) $\downarrow$	6.21 $\pm$ 0.35 (- 4%) $\downarrow$	6.19 $\pm$ 0.43 (+ 31%) $\uparrow$	4.54 $\pm$ 0.36 (+ 2%) $\uparrow$	6.80 $\pm$ 0.37 (- 13%) $\downarrow$	7.63 $\pm$ 0.47 (+ 52%) $\uparrow$	9.72 $\pm$ 0.47 (+ 55%) $\uparrow$
		N	5.99 $\pm$ 0.28	8.47 $\pm$ 1.49	6.09 $\pm$ 0.52	6.66 $\pm$ 0.74	7.54 $\pm$ 0.74	7.17 $\pm$ 0.51	6.49 $\pm$ 0.49	4.69 $\pm$ 1.45	4.46 $\pm$ 1.39	7.87 $\pm$ 1.21	5.01 $\pm$ 1.49	6.26 $\pm$ 0.75
Alb/Glob (A/G) ratio	0.75 $\pm$ 0.03	N+C	0.73 $\pm$ 0.08 (- 12%) $\downarrow$	0.46 $\pm$ 0.05 (- 32%) $\downarrow$	0.64 $\pm$ 0.04 (- 21%) $\downarrow$	0.66 $\pm$ 0.03 (- 19%) $\downarrow$	0.68 $\pm$ 0.04 (- 11%) $\downarrow$	0.77 $\pm$ 0.07 (- 15%) $\downarrow$	0.72 $\pm$ 0.02 (- 13%) $\downarrow$	0.69 $\pm$ 0.03 (- 19%) $\downarrow$	0.71 $\pm$ 0.04 (- 18%) $\downarrow$	0.71 $\pm$ 0.05 (- 15%) $\downarrow$	0.67 $\pm$ 0.02 (- 20%) $\downarrow$	0.61 $\pm$ 0.04 (- 26%) $\downarrow$
		N	0.83 $\pm$ 0.05	0.68 $\pm$ 0.10	0.81 $\pm$ 0.07	0.81 $\pm$ 0.05	0.76 $\pm$ 0.07	0.83 $\pm$ 0.06	0.81 $\pm$ 0.06	0.85 $\pm$ 0.07	0.87 $\pm$ 0.08	0.84 $\pm$ 0.08	0.84 $\pm$ 0.06	0.82 $\pm$ 0.07

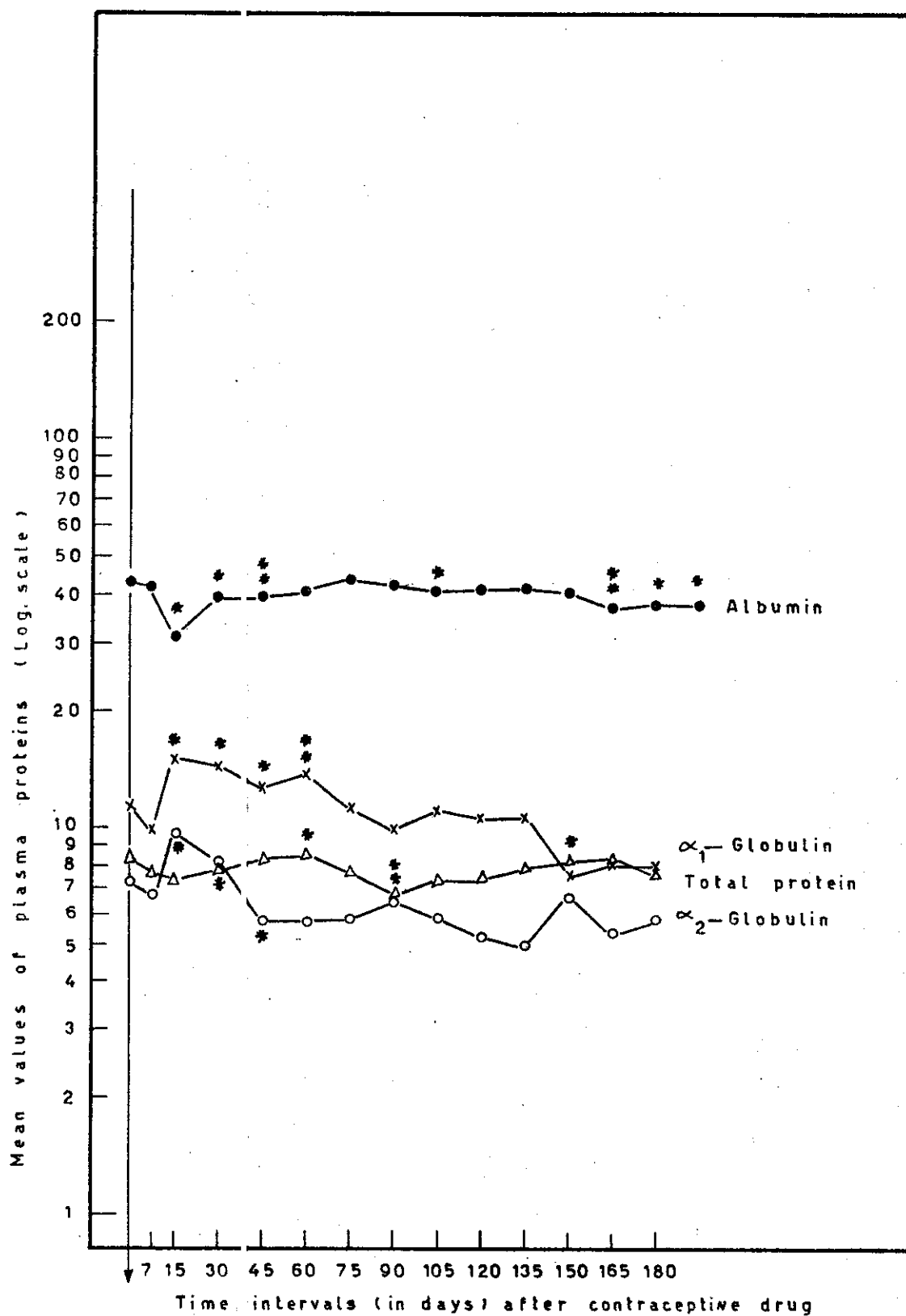


Fig.(12) Effect of daily oral contraceptive dose on plasma proteins pattern in normally nourished rats.

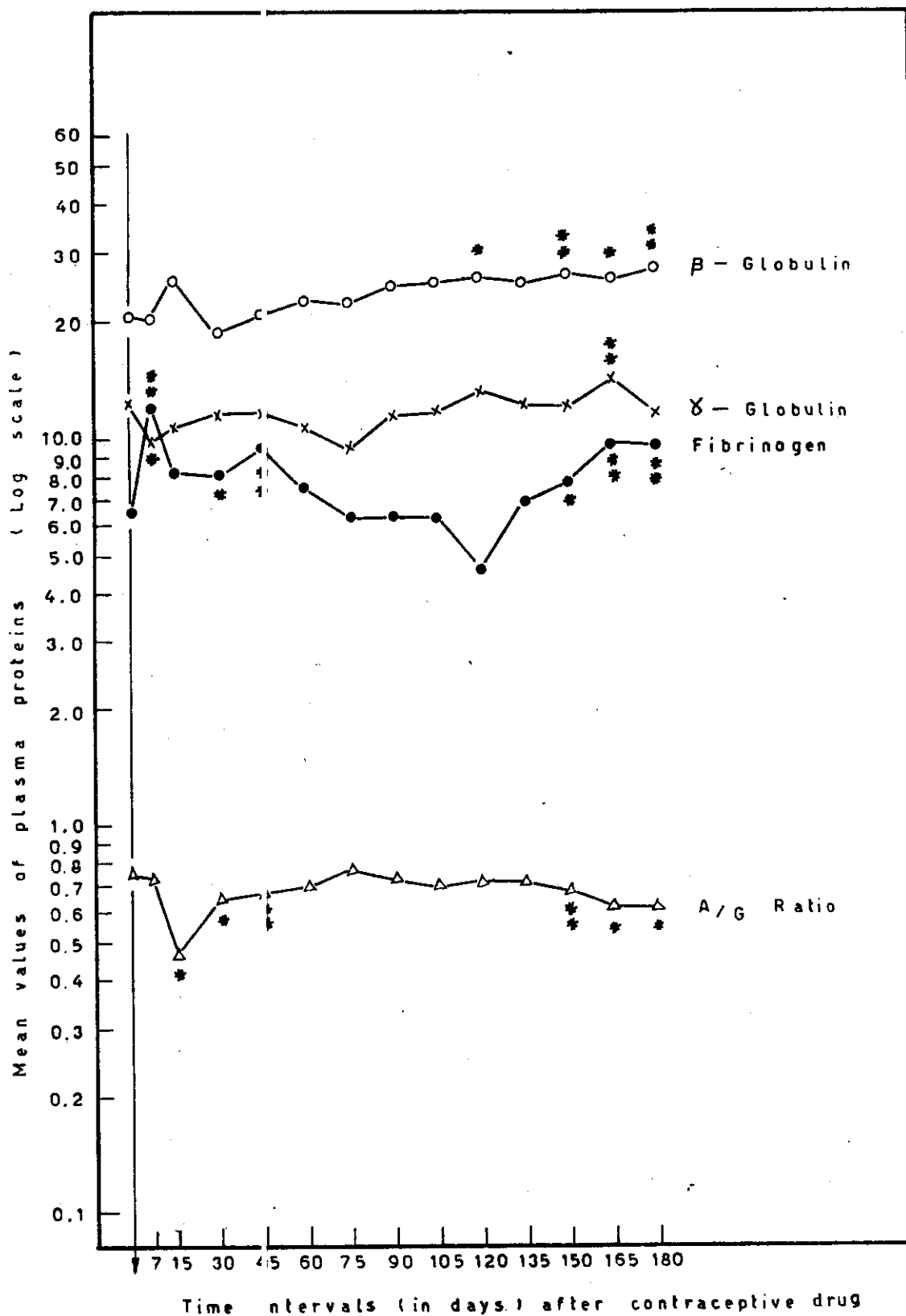


Fig. (12)_b Cont.

highly significant levels $P < 0.05$ and $P < 0.01$ and percentage increase ranging between +16% and +39%, α_2 and γ fractions exhibited mostly fluctuating insignificant levels during the whole observation period with no detectable pattern. The B fraction as well as the fibrinogen were mostly increased with negligible significant levels at some time intervals as shown in table (9_b) and fig. (12_b). The resultant decrease of albumin and changes of the globulin fractions led to decreased A/G ratio all over the experimental period though the levels recorded varied between insignificant, significant and highly significant levels, $P < 0.05$, $P < 0.01$ and $P < 0.005$ and the percentage reduction ranged between - 11 % and -32% with a final reduction of -25%, at the end of experiment, see table (9_b) fig. (12_b).

d) Effect on plasma hormonal pattern

The changes that occurred in plasma hormonal pattern are shown in table (10) and fig. (13). Plasma FSH exhibited initial decreased levels at days 7 and 15 followed by the hormone increase during the period between 30 and 90 days being significant at days 60 and 75, $P < 0.05$ and $P < 0.005$ with maximum percentage increase of + 70% at day 60. Insignificant decreased levels were recorded from day 90 till the end of experimental period.

Table (10) Effect of single daily oral dose of contraceptive on plasma gonadotropins plasma estrogen and progesterone hormones in normally nourished adult female rats.

Test Parameters	Initial $\bar{X} \pm SE$	Test gps	MEAN VALUES $\pm SE$ AND PERCENTAGE CHANGE FROM CONTROL													
			TIME INTERVALS OF POST CONTRACEPTIVE TREATMENT													
			7	15	30	45	60	75	90	105	120	135	150	165	180	
FSH m.i.u./ml	4.04 $\pm$ 1.54	N+C	2.5 $\pm$ 0.57 (-34%)	2.82 $\pm$ 0.26 (-30%)	5.78 $\pm$ 0.30 (+10%)	5.46 $\pm$ 0.59 (+18%)	9.29 $\pm$ 0.69 (+70%)	6.83 $\pm$ 0.64 (+36%)	6.2 $\pm$ 0.25 (+17%)	2.13 $\pm$ 0.25 (-25%)	2.96 $\pm$ 0.52 (-7%)	2.81 $\pm$ 0.59 (-16%)	3.78 $\pm$ 0.17 (-0.2%)	3.7 $\pm$ 0.36 (-7%)	3.1 $\pm$ 0.24 (-3%)	
		N	3.8 $\pm$ 0.31	4.03 $\pm$ 0.83	5.76 $\pm$ 0.29	4.64 $\pm$ 0.64	5.43 $\pm$ 0.95	5.03 $\pm$ 0.64	5.28 $\pm$ 0.79	2.84 $\pm$ 0.86	3.79 $\pm$ 0.70	3.25 $\pm$ 0.42	3.79 $\pm$ 0.22	3.98 $\pm$ 0.09	3.21 $\pm$ 0.30	
LH m.i.u./ml	2.73 $\pm$ 0.44	N+C	2.22 $\pm$ 0.25 (-11%)	3.33 $\pm$ 0.34 (-5%)	2.1 $\pm$ 0.59 (-20%)	2.51 $\pm$ 1.35 (+48%)	1.17 $\pm$ 0.78 (-63%)	2.25 $\pm$ 0.55 (-6%)	1.90 $\pm$ 0.29 (-23%)	1.033 $\pm$ 0.22 (-49%)	1.03 $\pm$ 0.32 (-34%)	1.54 $\pm$ 0.23 (-12%)	1.59 $\pm$ 0.29 (+10%)	2.4 $\pm$ 0.47 (+40%)	1.67 $\pm$ 0.45 (+17%)	
		N	2.5 $\pm$ 0.15	3.49 $\pm$ 0.95	2.63 $\pm$ 0.53	1.7 $\pm$ 0.44	3.24 $\pm$ 1.06	2.38 $\pm$ 0.28	2.48 $\pm$ 0.38	2.012 $\pm$ 0.38	1.555 $\pm$ 0.09	1.75 $\pm$ 0.28	1.56 $\pm$ 0.28	1.44 $\pm$ 0.24	1.43 $\pm$ 0.24	
Estrogen pg/ml	40.47 $\pm$ 9.85	N+C	12.05 $\pm$ 1.4 (-67%)	29.52 $\pm$ 4.7 (-16%)	29.63 $\pm$ 4.48 (-24%)	32.4 $\pm$ 4.71 (-17%)	14.3 $\pm$ 1.57 (-46%)	29.95 $\pm$ 5.25 (-7%)	19.34 $\pm$ 4.4 (-42%)	22.69 $\pm$ 4.97 (-48%)	13.99 $\pm$ 0.83 (-5%)	12.87 $\pm$ 1.48 (-49%)	13.61 $\pm$ 3.26 (-5%)	13.02 $\pm$ 3.6 (-59%)	18.83 $\pm$ 4.28 (-44%)	
		N	36.45 $\pm$ 13.4	34.97 $\pm$ 6.6	39.07 $\pm$ 4.4	39.13 $\pm$ 6.7	26.26 $\pm$ 5.11	32.15 $\pm$ 7.07	33.5 $\pm$ 5.05	44.0 $\pm$ 4.5	28.71 $\pm$ 5.9	25.19 $\pm$ 5.65	27.97 $\pm$ 4.98	32.0 $\pm$ 8.6	33.63 $\pm$ 6.01	
Progesterone ng/ml	16.83 $\pm$ 3.79	N+C	15.18 $\pm$ 4.15 (+7%)	18.22 $\pm$ 2.51 (+16%)	2.54 $\pm$ 0.95 (-52%)	17.81 $\pm$ 4.86 (+20%)	17.14 $\pm$ 2.66 (-13%)	9.23 $\pm$ 2.59 (-52%)	18.19 $\pm$ 3.67 (-14%)	8.064 $\pm$ 2.02 (-46%)	6.33 $\pm$ 0.66 (-55%)	4.65 $\pm$ 0.81 (-86%)	3.69 $\pm$ 0.77 (-75%)	3.48 $\pm$ 0.44 (-72%)	2.47 $\pm$ 0.52 (-83%)	
		N	14.14 $\pm$ 4.0	15.69 $\pm$ 3.91	5.30 $\pm$ 0.53	16.75 $\pm$ 2.84	15.15 $\pm$ 1.76	19.1 $\pm$ 3.91	21.13 $\pm$ 4.29	15.03 $\pm$ 2.09	14.21 $\pm$ 2.74	14.47 $\pm$ 3.61	14.67 $\pm$ 3.53	12.27 $\pm$ 3.30	14.39 $\pm$ 3.84	

* Significant $P < 0.05$ ** Highly significant $P < 0.005$ & 0.01 N.B.: Each mean represents 24 animals
N = Normally nourished control rats during estrus phase. N+C = Normally nourished rats + Contraceptive drug.

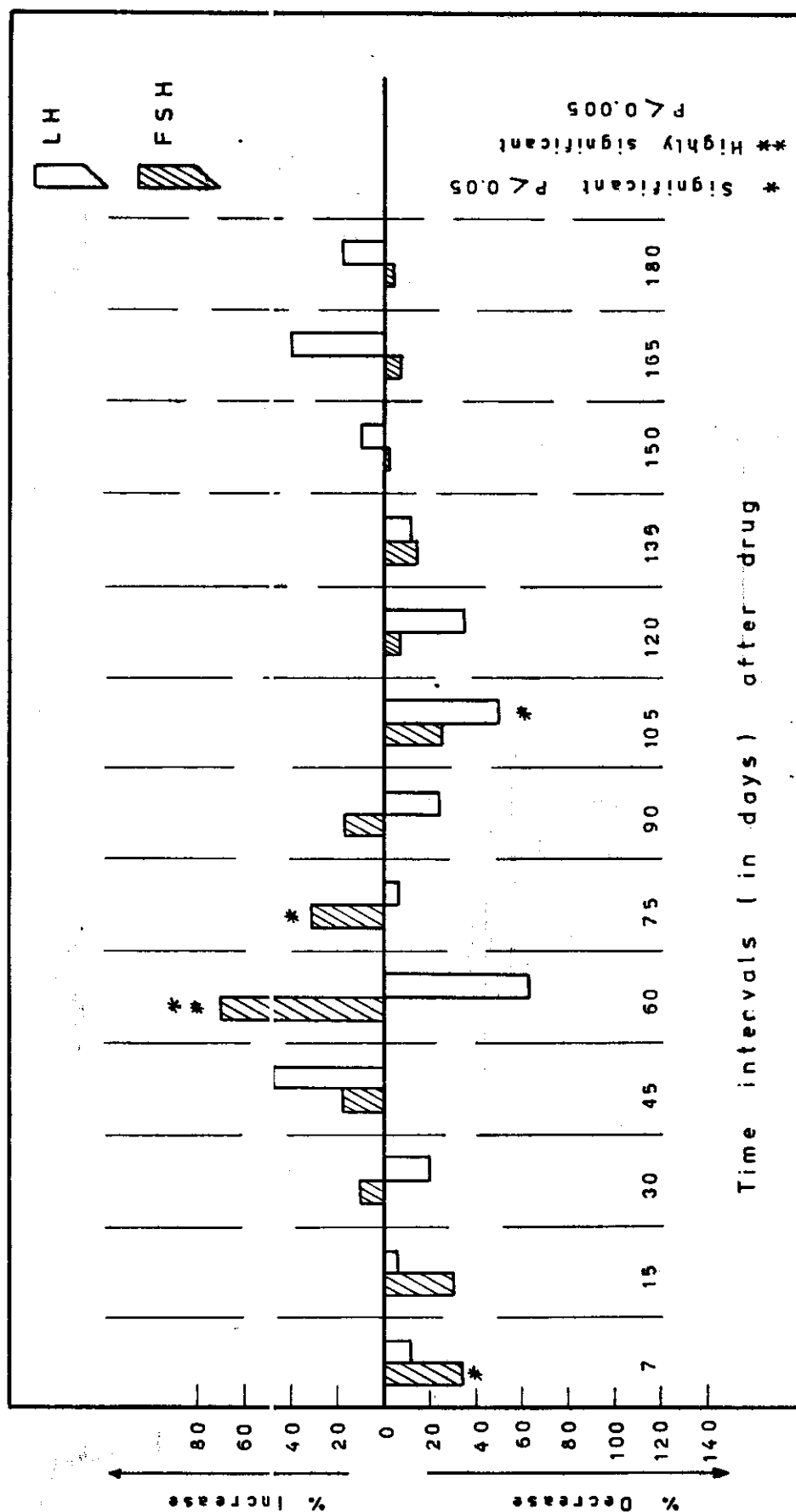


Fig.(13) Plasma gonadotropin hormones (FSH & LH) changes in normally nourished treated rats as percent from those normally nourished control rats over 180 days.

Decreased levels of LH were recorded from the start of experiment till day 150 where after insignificant increased levels were recorded as evident in table (10) and fig. (13).

On the other hand plasma estrogen decreased throughout the experimental period especially from day 90 onwards. As shown in table (10) and fig. (14) the decrease observed was significant and highly significant during the previously mentioned time interval $P < 0.05$ and $P < 0.005$ with percentage decrease ranging between -42% and -59% and a final decrease of - 44 % at the end of experiment.

Progesterone was mostly insignificantly increased during the first phase of the experiment followed by significant and highly significant decrease from day 75 till the end of observation period $P < 0.05$ and $P < 0.01$. The percentage reduction varied between - 46% and -83% which was recorded at the end of experiment as shown in table (10) and fig.(14). All the above mentioned data in the different parameters for this group were relevant to the values recorded in the control normally nourished animals.

B - Effect on malnourished rats

a) Effect on total body weight

As shown in table (5) and fig. (8), no significant

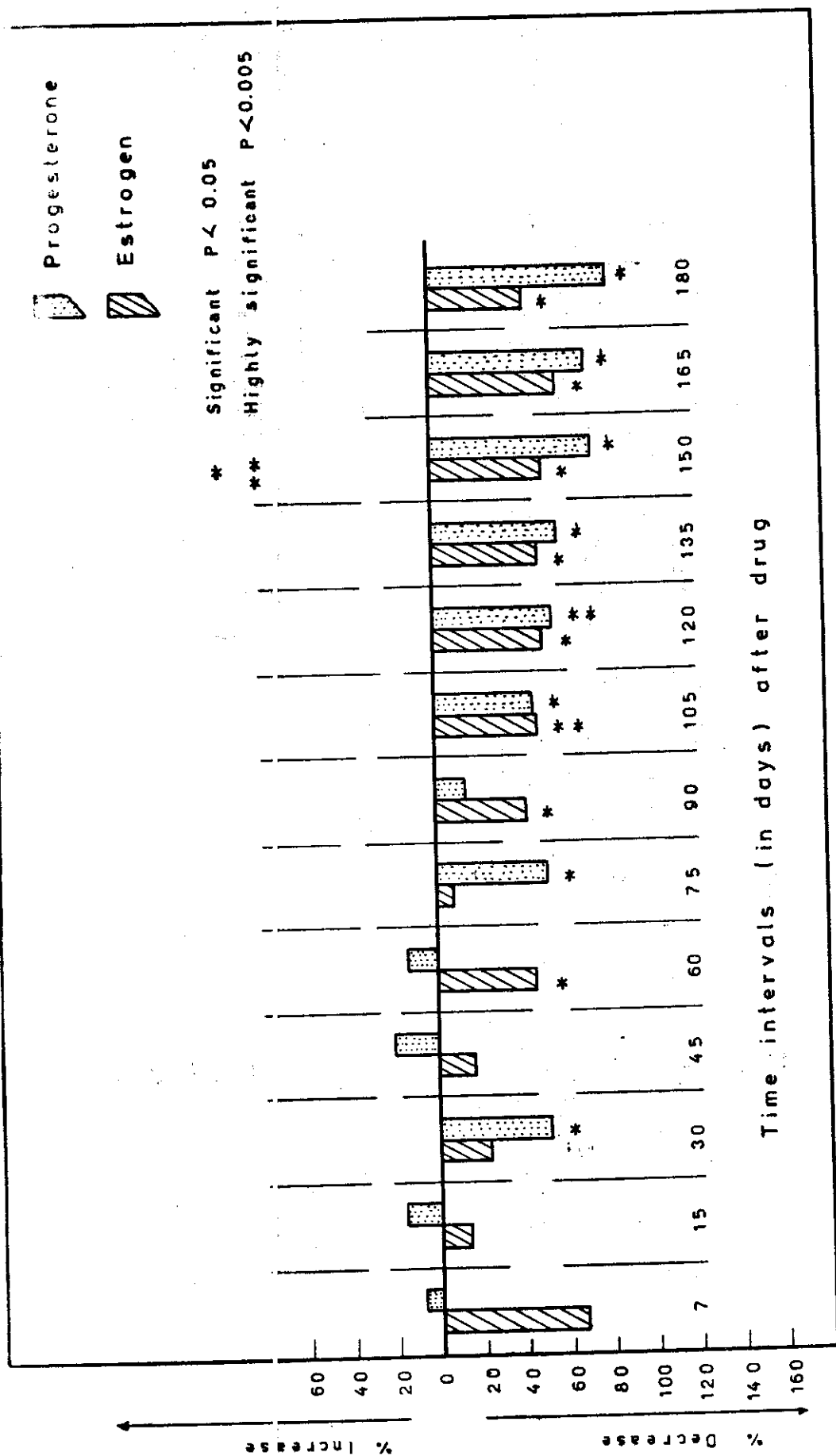


Fig.(14) Plasma estrogen and progesterone in normally nourished treated rats as percent from those normally nourished control rats over 180 days.

difference was observed in the malnourished animals receiving daily contraceptive dose compared to the malnourished group which received no drug. Though there has been a reduction in the total body weight allthrough the observation period, yet this reduction was insignificant. On the other hand comparing the change in total body weight of the malnourished treated group with that of the normally nourished one receiving the same dose of contraceptive, very highly significant reduction occurred during the whole observation period $P < 0.0005$ with percentage reduction ranging between - 27% and -33% as shown in table (5) and fig. (8).

b) Effect on vaginal smear cytology

While continuous feeding of low-protein diet resulted in cessation of the estrus cycle at the diestrus phase in 100 % of animals, administration of daily oral dose of the contraceptive drug to the malnourished animals resulted in alteration of the diestrus phase towards other phases of the cycle mainly estrus. As shown in table (11) the change started after 7 days of treatment where 67 % of the animals exhibited estrus phase. The percentage increased with the prolongation of treatment untill day 75, 100 % of the animals showed estrus to the end of observation period. Administration of the same dose of drug to the normally nourished

Table (11) Effect of single daily oral dose of contraceptive on vaginal smear cytology
in malnourished adult female albino rats

PATTERN OF VAGINAL		% OF ANIMALS SHOWING PATTERNS OF VAGINAL SMEAR AT TIME INTERVALS (INDAYS) FOLLOWING DRUG													
SMEAR CYTOLOGY		7	15	30	45	60	75	90	105	120	135	150	165	180	
Proestrus		-	14%	-	-	-	-	-	-	-	-	-	-	-	
Proestrus → estrus		-	-	20%	17%	-	-	-	-	-	-	-	-	-	
Estrus		67%	72%	80%	83%	86%	100%	100%	100%	100%	100%	100%	100%	100%	
Diestrus → Proestrus		-	-	-	-	-	-	-	-	-	-	-	-	-	
Diestrus		33%	14%	-	-	-	-	-	-	-	-	-	-	-	
Diestrus - Estrus		-	-	-	-	14%	-	-	-	-	-	-	-	-	

animals caused change of the estrus cycle from the normal pattern towards complete estrus at day 90. It is obvious that daily administration of the drug caused change of the estrus cycle's phases towards estrus in both normally nourished and malnourished groups, but the change occurred earlier in the latter group being originally disturbed due to the low protein feeding, see tables (8) and (11).

c) Effect on plasma protein pattern

Tables (12_{a,b}) and fig. (15_{a,b}) illustrate the results achieved for the plasma protein pattern. Total plasma protein significantly increased during the observation period $P < 0.005$, 0.01 and $P < 0.0005$ with percentage increase of + 19% at day 150, in the malnourished treated group compared to the malnourished nontreated animals.

The albumin as well as the globulin fractions showed fluctuating levels without being significant except for α_1 which was mostly increased during the whole observation period. The same was observed in the A/G ratio.

On the other hand comparing the changes that occurred in the malnourished treated group with those observed in the normally nourished treated animals, total plasma protein

Table (12) Effect of single daily oral dose of contraceptive on plasma proteins pattern in malnourished adult female albino rats

female albino rats																
Test Parameters	Initial $\bar{x} \pm SE$	Test gps.	CHANGES AS PERCENT OF PLASMA PROTEINS $\pm SE$ DURING TREATMENT													
			TIME INTERVALS AFTER CONTRACEPTIVE DRUG (IN DAYS)													
			7	15	30	45	60	75	90	105	120	135	150	160	180	
Total protein (mgm/100ml)			6.33 $\pm$ 0.13 (-3%)	6.39 $\pm$ 0.11 (+11%)	6.76 $\pm$ 0.23 (+4%)	7.27 $\pm$ 0.15 (+15%)	7.42 $\pm$ 0.19 (+12%)	6.5 $\pm$ 0.23 (+13%)	6.25 $\pm$ 0.17 (-4%)	5.89 $\pm$ 0.15 (-21%)	6.75 $\pm$ 0.12 (+15%)	7.35 $\pm$ 0.08 (+9%)	7.32 $\pm$ 0.15 (+19%)	7.47 $\pm$ 0.12	6.89 $\pm$ 0.18	
	6.7 $\pm$ 0.11	M	6.52 $\pm$ 0.11	5.74 $\pm$ 0.09	6.52 $\pm$ 0.31	6.34 $\pm$ 0.36	6.60 $\pm$ 0.11	5.75 $\pm$ 0.07	6.32 $\pm$ 0.05	5.99 $\pm$ 0.27	6.39 $\pm$ 0.24	6.54 $\pm$ 0.09	6.15 $\pm$ 0.16			
Albumin (% of total plasma protein)		M+C	35.72 $\pm$ 3.29 (-3%)	26.55 $\pm$ 1.78 (-24%)	38.49 $\pm$ 2.76 (+10%)	36.27 $\pm$ 2.34 (+2%)	38.02 $\pm$ 1.09 (+1%)	44.84 $\pm$ 2.59 (+17%)	39.71 $\pm$ 0.95 (-12%)	39.10 $\pm$ 0.63 (-3%)	40.05 $\pm$ 1.17 (+1%)	40.77 $\pm$ 0.52 (+1%)	41.33 $\pm$ 1.09 (+8%)	39.03 $\pm$ 1.65	41.59 $\pm$ 2.27	
	39.67 $\pm$ 0.83	M	37.0 $\pm$ 2.72	26.82 $\pm$ 1.63	35.06 $\pm$ 2.03	35.59 $\pm$ 3.07	38.40 $\pm$ 1.53	41.87 $\pm$ 2.04	39.77 $\pm$ 1.87	40.21 $\pm$ 3.44	40.58 $\pm$ 3.38	42.57 $\pm$ 4.04	38.12 $\pm$ 2.40			
Globulins (% of total plasma protein) α_1		M+C	15.94 $\pm$ 1.13 (+42%)	16.86 $\pm$ 0.34 (+4%)	14.56 $\pm$ 0.31 (+3%)	15.03 $\pm$ 0.38 (+9%)	13.08 $\pm$ 0.52 (+5%)	10.06 $\pm$ 0.47 (+14%)	9.72 $\pm$ 0.55 (+8%)	12.02 $\pm$ 0.53 (+24%)	10.30 $\pm$ 0.54 (+1%)	8.39 $\pm$ 0.50 (-10%)	10.93 $\pm$ 1.07 (-4%)	9.82 $\pm$ 1.29	9.93 $\pm$ 1.27	
	9.76 $\pm$ 0.21	M	11.22 $\pm$ 0.44	16.24 $\pm$ 0.31	14.24 $\pm$ 0.63	13.75 $\pm$ 0.94	12.34 $\pm$ 0.38	8.84 $\pm$ 0.72	8.98 $\pm$ 0.55	9.66 $\pm$ 1.61	10.15 $\pm$ 0.121	9.33 $\pm$ 1.66	11.42 $\pm$ 0.77			
α_2		M+C	6.88 $\pm$ 0.57 (-10%)	11.07 $\pm$ 0.89 (-2%)	7.56 $\pm$ 0.56 (+6%)	6.59 $\pm$ 0.29 (+13%)	6.07 $\pm$ 0.35 (+1%)	5.31 $\pm$ 0.68 (-8%)	6.68 $\pm$ 0.21 (+7%)	6.43 $\pm$ 0.97 (-5%)	5.71 $\pm$ 0.45 (-5%)	6.39 $\pm$ 0.25 (+4%)	7.09 $\pm$ 0.35 (-3%)	7.39 $\pm$ 0.29	7.47 $\pm$ 0.34	
	7.85 $\pm$ 0.32	M	7.61 $\pm$ 0.39	11.34 $\pm$ 0.63	7.11 $\pm$ 0.34	5.82 $\pm$ 0.77	5.99 $\pm$ 0.19	5.79 $\pm$ 0.26	6.24 $\pm$ 0.49	6.77 $\pm$ 0.49	6.04 $\pm$ 0.71	6.12 $\pm$ 0.76	6.87 $\pm$ 0.48			

very highly significant $P < 0.0005$

† Insignificant

M = Malnourished control rats.

M+C = Malnourished + Contraceptive drug.

* Significant P < 0.05 ** Highly significant P < 0.005 & 0.01 *** Very highly significant P < 0.0005

NB: Each mean represents 24 animals.

Table (12) b CONT

Test Parameters	Initial $\bar{x} \pm SE$	Test g.p.s.	CHANGES AS PERCENT OF PLASMA PROTEINS $\pm SE$ DURING TREATMENT												
			TIME INTERVALS AFTER CONTRACEPTIVE TREATMENT (IN DAYS)												
			7	15	30	45	60	75	90	105	120	135	150	165	180
Globulins β	23.87 $\pm$ 0.60	M+C	22.20 $\pm$ 1.05 (-2%) $\uparrow$	27.47 $\pm$ 1.72 (+3%) $\uparrow$	21.06 $\pm$ 0.99 (-12%) $\uparrow$	21.98 $\pm$ 1.09 (-17%) $\uparrow$	21.85 $\pm$ 0.52 (-9%) $\uparrow$	25.09 $\pm$ 1.38 (-12%) $\uparrow$	24.21 $\pm$ 0.89 (-12%) $\uparrow$	24.78 $\pm$ 0.70 (-7%) $\uparrow$	27.33 $\pm$ 0.68 (+4%) $\uparrow$	28.21 $\pm$ 0.47 (+5%) $\uparrow$	26.33 $\pm$ 0.42 (-02%) $\uparrow$	27.30 $\pm$ 0.57	26.16 $\pm$ 0.71
		M	22.72 $\pm$ 1.56	26.62 $\pm$ 0.77	24.59 $\pm$ 2.31	26.34 $\pm$ 1.3	24.07 $\pm$ 0.75	28.47 $\pm$ 0.77	27.44 $\pm$ 0.95	26.74 $\pm$ 0.57	27.23 $\pm$ 0.47	26.95 $\pm$ 0.54	26.38 $\pm$ 0.84	—	—
χ	10.82 $\pm$ 0.34	M+C	9.21 $\pm$ 0.55 (-7%) $\uparrow$	9.39 $\pm$ 0.75 (-6%) $\uparrow$	11.17 $\pm$ 1.57 (-6%) $\uparrow$	12.43 $\pm$ 0.69 (+13%) $\uparrow$	11.80 $\pm$ 0.59 (-4%) $\uparrow$	8.72 $\pm$ 1.16 (-0.3%) $\uparrow$	12.77 $\pm$ 0.84 (+8%) $\uparrow$	11.47 $\pm$ 0.81 (+20%) $\uparrow$	10.32 $\pm$ 0.86 (+2%) $\uparrow$	11.07 $\pm$ 0.43 (+15%) $\uparrow$	10.63 $\pm$ 0.81 (+4%) $\uparrow$	11.39 $\pm$ 0.55	11.06 $\pm$ 0.70
		M	9.91 $\pm$ 0.73	10.02 $\pm$ 0.69	11.89 $\pm$ 1.06	10.99 $\pm$ 0.30	12.34 $\pm$ 0.49	8.75 $\pm$ 0.37	11.84 $\pm$ 0.63	9.52 $\pm$ 1.0	10.74 $\pm$ 0.5	9.59 $\pm$ 0.96	10.27 $\pm$ 0.53	—	—
Fibrinogen	8.03 $\pm$ 0.28	M+C	10.05 $\pm$ 0.77 (-13%) $\uparrow$	8.57 $\pm$ 1.23 (-4%) $\uparrow$	7.16 $\pm$ 0.49 (-1%) $\uparrow$	7.69 $\pm$ 0.59 (+3%) $\uparrow$	8.38 $\pm$ 0.47 (+22%) $\uparrow$	5.99 $\pm$ 0.76 (-5%) $\uparrow$	6.92 $\pm$ 0.62 (+21%) $\uparrow$	6.11 $\pm$ 0.49 (-14%) $\uparrow$	5.69 $\pm$ 0.49 (+8%) $\uparrow$	5.17 $\pm$ 0.36 (+5%) $\uparrow$	3.97 $\pm$ 1.07 (-43%) $\uparrow$	5.01 $\pm$ 0.64	3.79 $\pm$ 0.47
		M	11.54 $\pm$ 1.77	8.93 $\pm$ 0.60	7.11 $\pm$ 0.49	7.51 $\pm$ 0.58	6.86 $\pm$ 0.69	6.26 $\pm$ 0.66	5.73 $\pm$ 0.34	7.09 $\pm$ 0.91	5.27 $\pm$ 0.58	5.44 $\pm$ 0.61	6.95 $\pm$ 0.77	—	—
Alb./Glob (A/G) ratio	0.66 $\pm$ 0.02	M+C	0.62 $\pm$ 0.07 (+3%) $\uparrow$	0.37 $\pm$ 0.03 (-0.0%) $\uparrow$	0.64 $\pm$ 0.07 (+16%) $\uparrow$	0.59 $\pm$ 0.05 (+2%) $\uparrow$	0.64 $\pm$ 0.03 (+2%) $\uparrow$	0.83 $\pm$ 0.097 (+14%) $\uparrow$	0.66 $\pm$ 0.02 (-2%) $\uparrow$	0.85 $\pm$ 0.02 (-6%) $\uparrow$	0.67 $\pm$ 0.03 (-4%) $\uparrow$	0.69 $\pm$ 0.01 (-10%) $\uparrow$	0.71 $\pm$ 0.03 (+15%) $\uparrow$	0.65 $\pm$ 0.04	0.72 $\pm$ 0.06
		M	0.60 $\pm$ 0.07	0.37 $\pm$ 0.03	0.55 $\pm$ 0.05	0.57 $\pm$ 0.08	0.63 $\pm$ 0.03	0.73 $\pm$ 0.06	0.67 $\pm$ 0.05	0.69 $\pm$ 0.09	0.70 $\pm$ 0.09	0.77 $\pm$ 0.18	0.62 $\pm$ 0.06	—	—

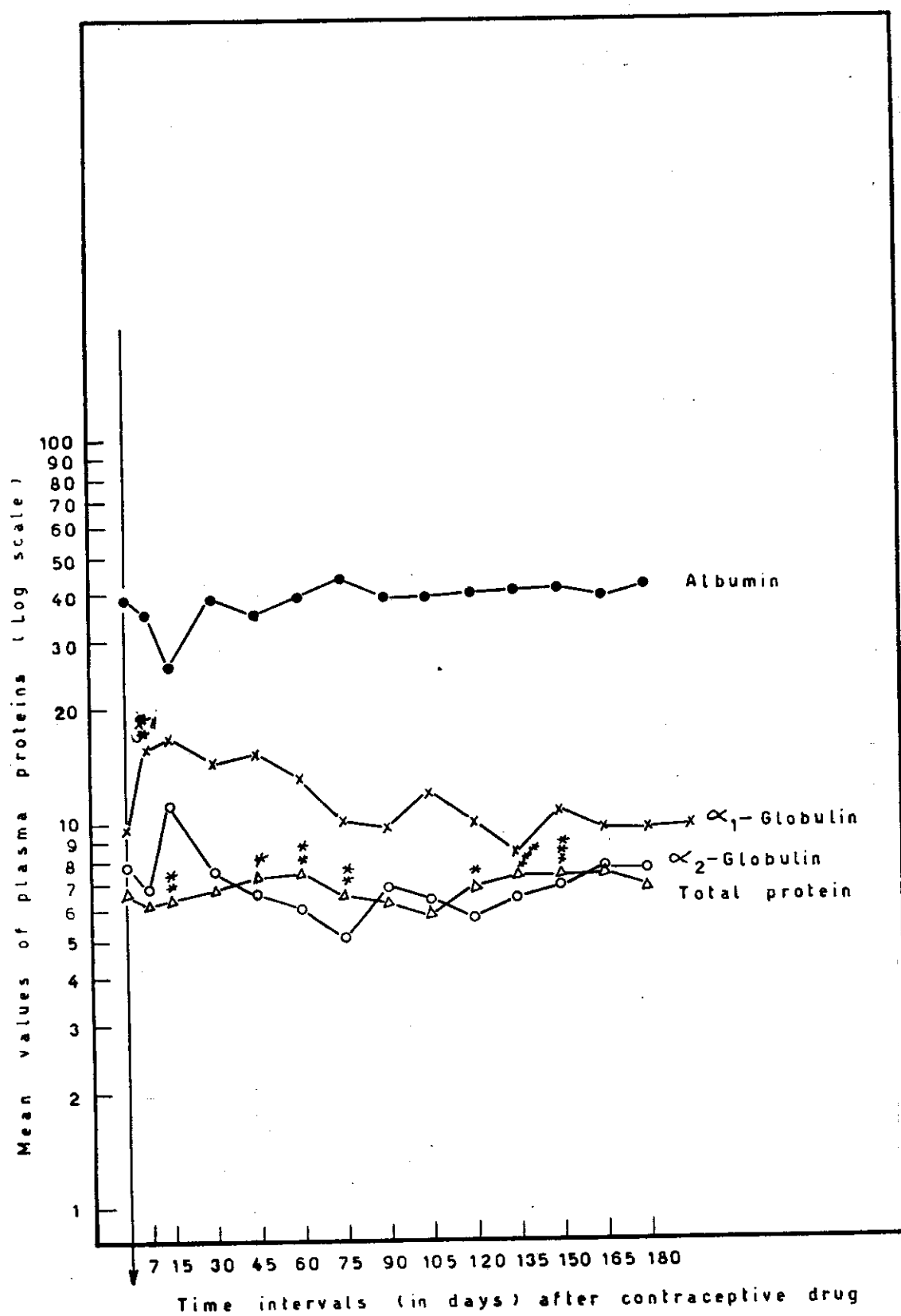


Fig. (15). Effect of daily oral contraceptive dose on plasma proteins pattern in malnourished rats.

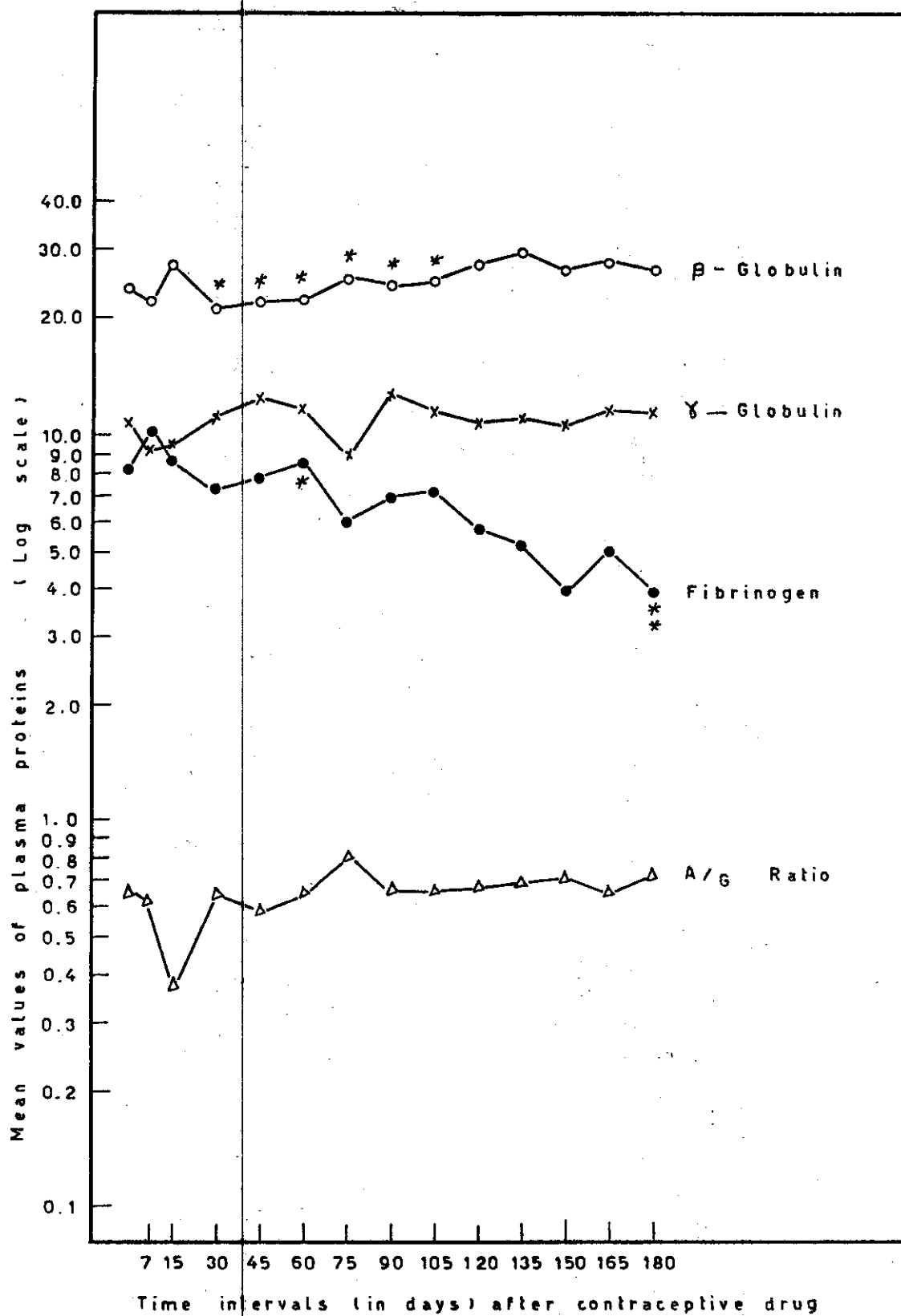


Fig. (15)_b Cont.

was highly significantly decreased $P < 0.005$, < 0.01 and $P < 0.0005$ and percentage reduction ranging between - 7 % and -19 % as shown in table (14_a) and fig. (18_a). The albumin was mostly decreased with insignificant values recorded. The globulin fractions exhibited different mostly insignificant fluctuating patterns. As shown in table (14_{a,b}) and fig. (18_{a,b}) the α_2 fraction was increased with significant values recorded towards the end of observation period especially at days 135 and 165. The B fraction was generally insignificantly increased while the γ fraction was insignificantly decreased during the whole observation period. The A/G ratio was also mainly decreased corresponding to the changes observed in the albumin as well as the globulin fractions.

d) Effect on hormonal pattern

As shown in table (13) and fig. (16) plasma FSH and LH levels were initially elevated at the beginning of experimental period followed by decreased levels at the time interval 30 to 60 in the malnourished treated group compared to the malnourished nontreated one. FSH did not significantly decrease while LH significantly decreased

Table (13) Effect of single daily oral dose of contraceptive on plasma gonadotropin hormones (FSH & LH) estragen & progesterone hormones in malnourished adult female albino rats.

Test Parameters	Initial $\bar{X} \pm SE$	Test g.p.s.	MEAN VALUES $\pm SE$ AND PERCENTAGE VARIATION FROM MALNOURISHED CONTROLS												
			TIME INTERVALS AFTER CONTRACEPTIVE TREATMENT (IN DAYS)												
			7	15	30	45	60	75	90	105	120	135	150	165	180
FSH m.i.u./ml	3.82 $\pm$ 0.26	M+C	3.78 $\pm$ 0.61 (+103%)	3.29 $\pm$ 0.35 (-20%)	6.63 $\pm$ 0.45 (-1%)	6.7 $\pm$ 0.57 (-2%)	5.14 $\pm$ 0.79 (-1%)	7.67 $\pm$ 0.45 (+35%)	4.56 $\pm$ 0.75 (+7%)	2.37 $\pm$ 0.21 (+15%)	2.77 $\pm$ 0.34 (+4%)	3.77 $\pm$ 0.42 (+101%)	3.79 $\pm$ 0.47 (+63%)	3.97 $\pm$ 0.08	3.23 $\pm$ 0.21
		M	1.86 $\pm$ 0.19	4.1 $\pm$ 0.88	6.7 $\pm$ 0.32	6.8 $\pm$ 0.22	5.2 $\pm$ 0.44	5.68 $\pm$ 0.78	4.23 $\pm$ 1.07	2.07 $\pm$ 0.32	2.67 $\pm$ 0.29	1.88 $\pm$ 0.25	2.33 $\pm$ 0.065	—	—
LH m.i.u./ml	6.87 $\pm$ 0.99	M+C	3.91 $\pm$ 0.5 (+45%)	7.42 $\pm$ 1.56 (+60%)	1.77 $\pm$ 1.2 (-73%)	2.48 $\pm$ 0.95 (-58%)	2.4 $\pm$ 0.75 (-69%)	2.28 $\pm$ 0.24 (+19%)	2.33 $\pm$ 0.34 (+27%)	1.46 $\pm$ 0.29 (+104%)	0.67 $\pm$ 0.39 (-25%)	2.30 $\pm$ 0.41 (+7%)	2.30 $\pm$ 0.32 (+28%)	0.61 $\pm$ 0.058	0.69 $\pm$ 0.16
		M	2.69 $\pm$ 0.19	4.69 $\pm$ 0.89	6.65 $\pm$ 1.04	7.65 $\pm$ 0.38	7.48 $\pm$ 0.81	1.92 $\pm$ 0.26	1.83 $\pm$ 0.34	0.714 $\pm$ 0.17	0.89 $\pm$ 0.21	2.16 $\pm$ 0.25	1.78 $\pm$ 0.30	—	—
Estrogen pg/ml	35.72 $\pm$ 5.4	M+C	9.56 $\pm$ 1.84 (-18%)	22.45 $\pm$ 1.8 (-3%)	18.48 $\pm$ 3.19 (-50%)	24.54 $\pm$ 3.38 (-6%)	11.59 $\pm$ 1.8 (-31%)	19.43 $\pm$ 5.17 (-0.4%)	15.71 $\pm$ 2.56 (-6%)	15.25 $\pm$ 4.60 (-12%)	8.13 $\pm$ 1.96 (-29%)	5.55 $\pm$ 2.43 (-45%)	3.56 $\pm$ 1.21 (-72%)	9.67 $\pm$ 1.3	11.0 $\pm$ 4.86
		M	11.7 $\pm$ 2.02	23.1 $\pm$ 6.20	37.2 $\pm$ 0.77	26.2 $\pm$ 8.36	16.82 $\pm$ 1.43	19.5 $\pm$ 2.54	16.66 $\pm$ 3.94	17.27 $\pm$ 1.70	11.4 $\pm$ 2.62	10.17 $\pm$ 3.37	12.75 $\pm$ 2.73	—	—
Progesterone ng/ml	4.80 $\pm$ 0.59	M+C	4.75 $\pm$ 1.30 (+16%)	3.0 $\pm$ 0.92 (-22%)	0.74 $\pm$ 0.17 (-48%)	2.20 $\pm$ 0.29 (-42%)	1.86 $\pm$ 0.34 (-39%)	2.34 $\pm$ 0.45 (-32%)	11.23 $\pm$ 1.86 (-26%)	1.39 $\pm$ 0.25 (-40%)	2.35 $\pm$ 0.28 (-17%)	2.69 $\pm$ 0.22 (+13%)	2.62 $\pm$ 0.38 (+118%)	1.21 $\pm$ 0.11	1.15 $\pm$ 0.14
		M	4.11 $\pm$ 0.64	3.86 $\pm$ 1.47	1.46 $\pm$ 0.178	3.79 $\pm$ 0.60	3.10 $\pm$ 1.04	3.45 $\pm$ 0.51	8.93 $\pm$ 2.44	2.32 $\pm$ 0.57	2.84 $\pm$ 0.38	2.37 $\pm$ 0.34	1.2 $\pm$ 0.14	—	—

N.B. Each mean represents 24 animals

† Insignificant * Significant P < 0.05 ** Highly significant P < 0.005

M = Malnourished control rats.

M+C = Malnourished + contraceptive drug

Table (14) Comparative effect of single daily oral dose of contraceptive on plasma proteins pattern in normally nourished and malnourished adult female albino rats.

Test Parameters	Initial $\bar{X} \pm SE$	CHANGES AS PERCENT OF PLASMA PROTEINS $\pm SE$ DURING TREATMENT												
		TIME INTERVALS AFTER CONTRACEPTIVE DRUG (IN DAYS)												
		7	15	30	45	60	75	90	105	120	135	150	165	180
Total protein (mgm/100ml)														
	5.7 $\pm$ 0.11	5.39 $\pm$ 0.13 (-17%)	5.67 $\pm$ 0.11 (-13%)	7.27 $\pm$ 0.15 (-12%)	7.48 $\pm$ 0.19 (-13%)	6.50 $\pm$ 0.23 (-15%)	6.25 $\pm$ 0.17 (-7%)	5.89 $\pm$ 0.15 (-19%)	6.79 $\pm$ 0.12 (-8%)	7.35 $\pm$ 0.08 (-6%)	7.32 $\pm$ 0.15 (-11%)	7.47 $\pm$ 0.12 (-10%)	6.89 $\pm$ 0.18 (-8%)	
Albumin (% of total plasma protein)														
	8.41 $\pm$ 0.11	7.65 $\pm$ 0.18	7.39 $\pm$ 0.20	7.81 $\pm$ 0.17	8.30 $\pm$ 0.12	8.49 $\pm$ 0.11	7.63 $\pm$ 0.18	6.70 $\pm$ 0.19	7.27 $\pm$ 0.24	7.37 $\pm$ 0.04	7.85 $\pm$ 0.16	8.18 $\pm$ 0.52	8.26 $\pm$ 0.13	7.48 $\pm$ 0.21
	39.67 $\pm$ 0.83	35.72 $\pm$ 3.29 (-14%)	26.65 $\pm$ 1.78 (-14%)	38.92 $\pm$ 2.76 (-1%)	36.27 $\pm$ 2.34 (-9%)	44.85 $\pm$ 2.59 (+3%)	39.71 $\pm$ 0.95 (-6%)	39.19 $\pm$ 0.63 (-3%)	40.05 $\pm$ 1.17 (-3%)	40.77 $\pm$ 0.52 (-1%)	41.33 $\pm$ 1.09 (+3%)	39.03 $\pm$ 1.65 (+4%)	41.58 $\pm$ 2.27 (+10%)	
	42.85 $\pm$ 0.89	41.46 $\pm$ 2.63	30.86 $\pm$ 2.39	38.72 $\pm$ 1.58	39.66 $\pm$ 0.97	40.21 $\pm$ 1.52	43.29 $\pm$ 2.38	42.02 $\pm$ 0.57	40.58 $\pm$ 1.14	41.12 $\pm$ 1.43	41.23 $\pm$ 1.56	40.21 $\pm$ 0.76	37.62 $\pm$ 1.63	37.61 $\pm$ 1.98
Globulins (% of total plasma protein)														
	9.67 $\pm$ 0.21	15.94 $\pm$ 1.13 (+62%)	16.86 $\pm$ 0.34 (+12%)	14.5 $\pm$ 0.31 (-2%)	15.03 $\pm$ 0.38 (+17%)	13.08 $\pm$ 0.52 (-5%)	10.06 $\pm$ 0.47 (-9%)	9.72 $\pm$ 0.55 (-1%)	12.02 $\pm$ 0.53 (+9%)	10.30 $\pm$ 0.54 (-1%)	8.39 $\pm$ 0.50 (-19%)	10.93 $\pm$ 1.07 (+46%)	9.82 $\pm$ 1.29 (+20%)	9.93 $\pm$ 1.27 (+27%)
	11.14 $\pm$ 0.49	9.64 $\pm$ 0.30	15.03 $\pm$ 0.73	14.85 $\pm$ 0.59	12.79 $\pm$ 0.52	13.73 $\pm$ 0.29	11.08 $\pm$ 0.27	9.79 $\pm$ 0.24	11.01 $\pm$ 0.188	10.39 $\pm$ 0.33	10.40 $\pm$ 0.46	7.49 $\pm$ 0.25	8.16 $\pm$ 0.19	7.79 $\pm$ 0.37
	7.82 $\pm$ 0.32	6.88 $\pm$ 0.57 (+3%)	11.07 $\pm$ 0.89 (+13%)	7.56 $\pm$ 0.56 (-7%)	6.59 $\pm$ 0.29 (+14%)	6.07 $\pm$ 0.35 (+6%)	5.31 $\pm$ 0.68 (-8%)	6.68 $\pm$ 0.68 (+5%)	6.43 $\pm$ 0.96 (+12%)	5.71 $\pm$ 0.45 (+9%)	6.39 $\pm$ 0.25 (+34%)	6.39 $\pm$ 0.25 (+6%)	7.39 $\pm$ 0.29 (+40%)	7.47 $\pm$ 0.34 (+9%)
	7.10 $\pm$ 0.21	6.70 $\pm$ 0.50	9.75 $\pm$ 1.04	8.14 $\pm$ 0.29	5.75 $\pm$ 0.33	5.72 $\pm$ 0.51	5.77 $\pm$ 0.79	6.39 $\pm$ 0.43	5.75 $\pm$ 0.21	5.24 $\pm$ 0.17	4.76 $\pm$ 0.49	6.66 $\pm$ 0.35	5.29 $\pm$ 0.33	6.89 $\pm$ 0.38

† Insignificant * Significant $P < 0.05$ ** Highly significant $P < 0.005$ & 0.01 *** Very highly significant $P < 0.0005$
 N+C=Normally nourished+contraceptive M+C=Malnourished rats + contraceptive N.B: Each mean represents 24 animals.

Table (14/b) CONT.

Test Parameters	Initial $\bar{X} \pm SE$	Test gps.	CHANGES AS PERCENT OF PLASMA PROTEINS DURING TREATMENT												
			TIME INTERVALS OF AFTER CONTRACEPTIVE DURING (IN DAYS)												
			7	15	30	45	60	75	90	105	120	135	150	165	180
Globulins	23.87 $\pm$ 0.60	M+C	22.20 $\pm$ 1.05 (+11%)	27.47 $\pm$ 1.77 (+8%)	21.06 $\pm$ 0.99 (+13%)	21.98 $\pm$ 1.09 (+5%)	21.85 $\pm$ 0.52 (-1%)	25.09 $\pm$ 1.38 (+14%)	24.20 $\pm$ 0.89 (-2%)	24.78 $\pm$ 0.70 (-0.6%)	27.33 $\pm$ 0.68 (+7%)	28.21 $\pm$ 0.46 (+14%)	26.33 $\pm$ 0.42 (+2%)	27.30 $\pm$ 0.57 (+9%)	26.16 $\pm$ 0.71 (-2%)
		N+C	19.99 $\pm$ 1.18	25.41 $\pm$ 1.45	18.65 $\pm$ 0.88	20.86 $\pm$ 1.07	22.17 $\pm$ 1.37	21.88 $\pm$ 0.82	24.25 $\pm$ 0.43	24.78 $\pm$ 1.0	25.58 $\pm$ 1.34	24.72 $\pm$ 1.65	25.94 $\pm$ 0.41	25.05 $\pm$ 0.94	26.79 $\pm$ 1.23
γ	10.82 $\pm$ 0.34	M+C	9.21 $\pm$ 0.55 (-7%)	9.39 $\pm$ 0.75 (-13%)	11.17 $\pm$ 1.57 (-3%)	12.43 $\pm$ 0.69 (+8%)	11.80 $\pm$ 0.59 (+10%)	8.72 $\pm$ 1.16 (-7%)	12.77 $\pm$ 0.84 (+13%)	11.47 $\pm$ 0.81 (-2%)	10.92 $\pm$ 0.66 (-17%)	11.07 $\pm$ 0.43 (-8%)	10.63 $\pm$ 0.81 (-12%)	11.39 $\pm$ 0.55 (-20%)	11.06 $\pm$ 0.70 (-3%)
		N+C	9.91 $\pm$ 0.54	10.76 $\pm$ 1.61	11.53 $\pm$ 0.73	11.55 $\pm$ 0.76	10.74 $\pm$ 1.51	9.36 $\pm$ 0.83	11.34 $\pm$ 0.53	11.69 $\pm$ 0.54	13.12 $\pm$ 0.73	12.09 $\pm$ 0.67	12.06 $\pm$ 0.36	14.17 $\pm$ 0.40	11.45 $\pm$ 0.65
Fibrinogen	8.03 $\pm$ 0.28	M+C	10.05 $\pm$ 0.77 (-17%)	8.57 $\pm$ 1.23 (+5%)	7.16 $\pm$ 0.49 (-11%)	7.69 $\pm$ 0.58 (-18%)	8.38 $\pm$ 0.47 (+13%)	5.99 $\pm$ 0.76 (-4%)	6.92 $\pm$ 0.62 (-11%)	6.11 $\pm$ 0.49 (-1%)	5.89 $\pm$ 0.49 (+25%)	5.17 $\pm$ 0.36 (-24%)	3.97 $\pm$ 0.43 (-48%)	5.04 $\pm$ 0.64 (-49%)	3.79 $\pm$ 0.47 (-60%)
		N+C	12.10 $\pm$ 0.68	8.19 $\pm$ 0.32	8.06 $\pm$ 0.56	9.39 $\pm$ 0.48	7.43 $\pm$ 0.56	6.21 $\pm$ 0.59	6.21 $\pm$ 0.35	6.19 $\pm$ 0.43	4.54 $\pm$ 0.36	6.80 $\pm$ 0.37	7.63 $\pm$ 0.47	9.72 $\pm$ 0.47	9.54 $\pm$ 1.05
Albu/Gbb (A/G)	0.55 $\pm$ 0.02	M+C	0.62 $\pm$ 0.07 (-15%)	0.37 $\pm$ 0.03 (-20%)	0.64 $\pm$ 0.07 (-0.0%)	0.58 $\pm$ 0.05 (-12%)	0.64 $\pm$ 0.03 (-6%)	0.83 $\pm$ 0.097 (+8%)	0.86 $\pm$ 0.02 (-8%)	0.65 $\pm$ 0.02 (-6%)	0.67 $\pm$ 0.03 (-6%)	0.69 $\pm$ 0.01 (-3%)	0.71 $\pm$ 0.03 (+6%)	0.65 $\pm$ 0.04 (+7%)	0.72 $\pm$ 0.06 (+18%)
		N+C	0.77 $\pm$ 0.08	0.46 $\pm$ 0.05	0.64 $\pm$ 0.04	0.66 $\pm$ 0.03	0.68 $\pm$ 0.04	0.77 $\pm$ 0.07	0.72 $\pm$ 0.02	0.69 $\pm$ 0.03	0.71 $\pm$ 0.04	0.71 $\pm$ 0.05	0.67 $\pm$ 0.02	0.61 $\pm$ 0.04	0.61 $\pm$ 0.05

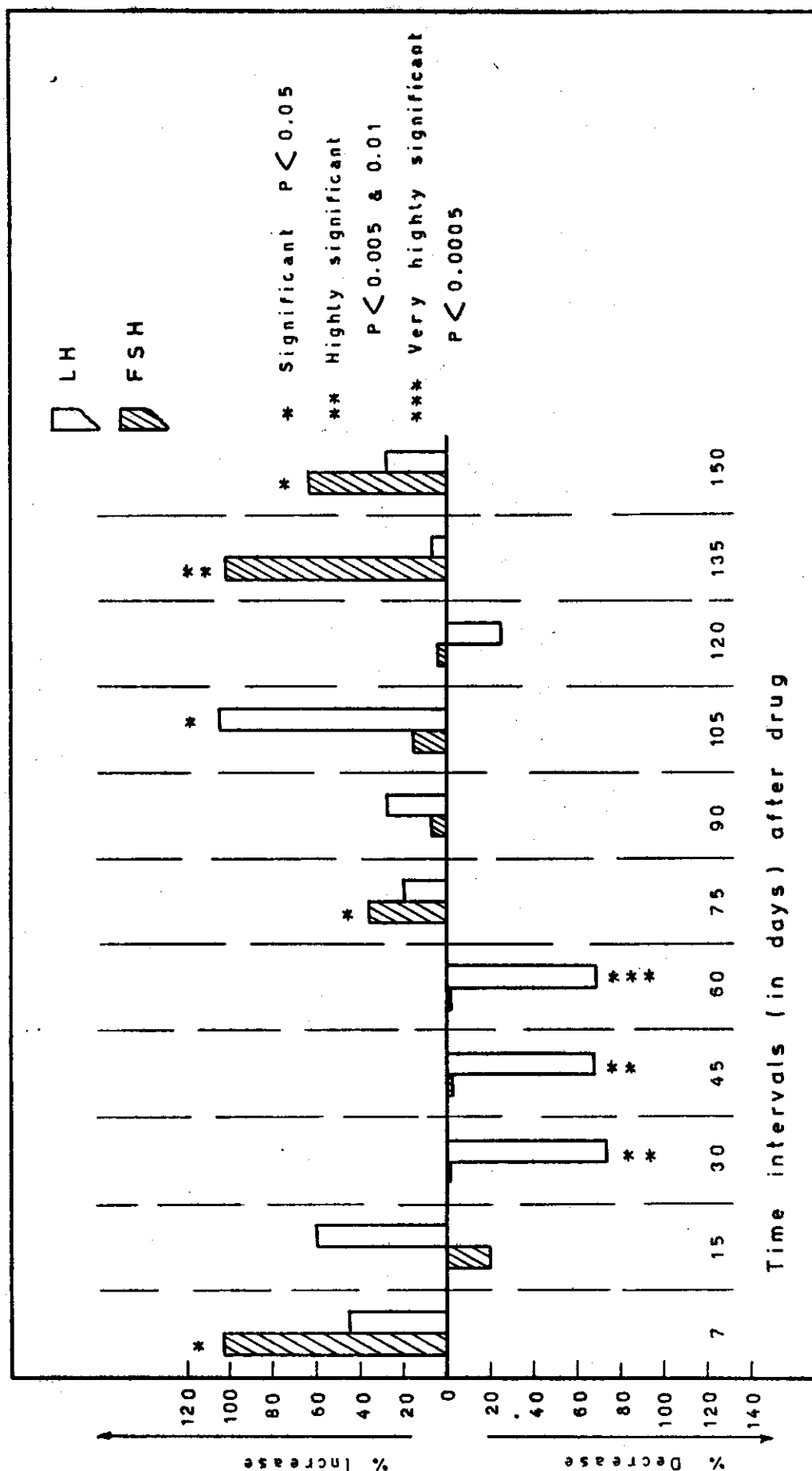


Fig.(16) Plasma gonadotropin hormones (FSH & LH) changes in malnourished treated rats as percent from those malnourished control rats all over the observation period.

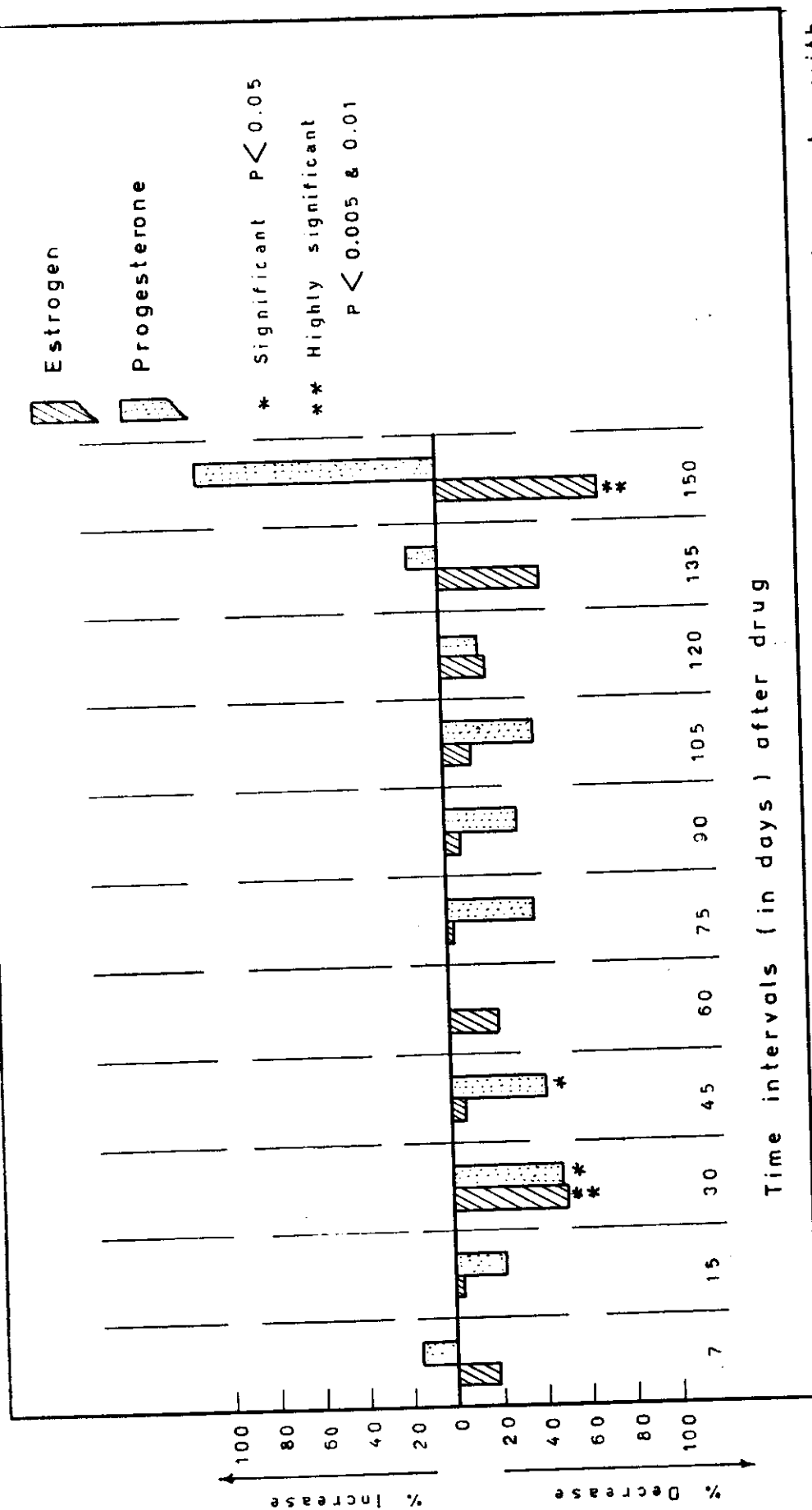


Fig.(17) Plasma estrogen and progesterone changes in malnourished treated rats with contraceptive as percent from those malnourished control rats over the observation period.

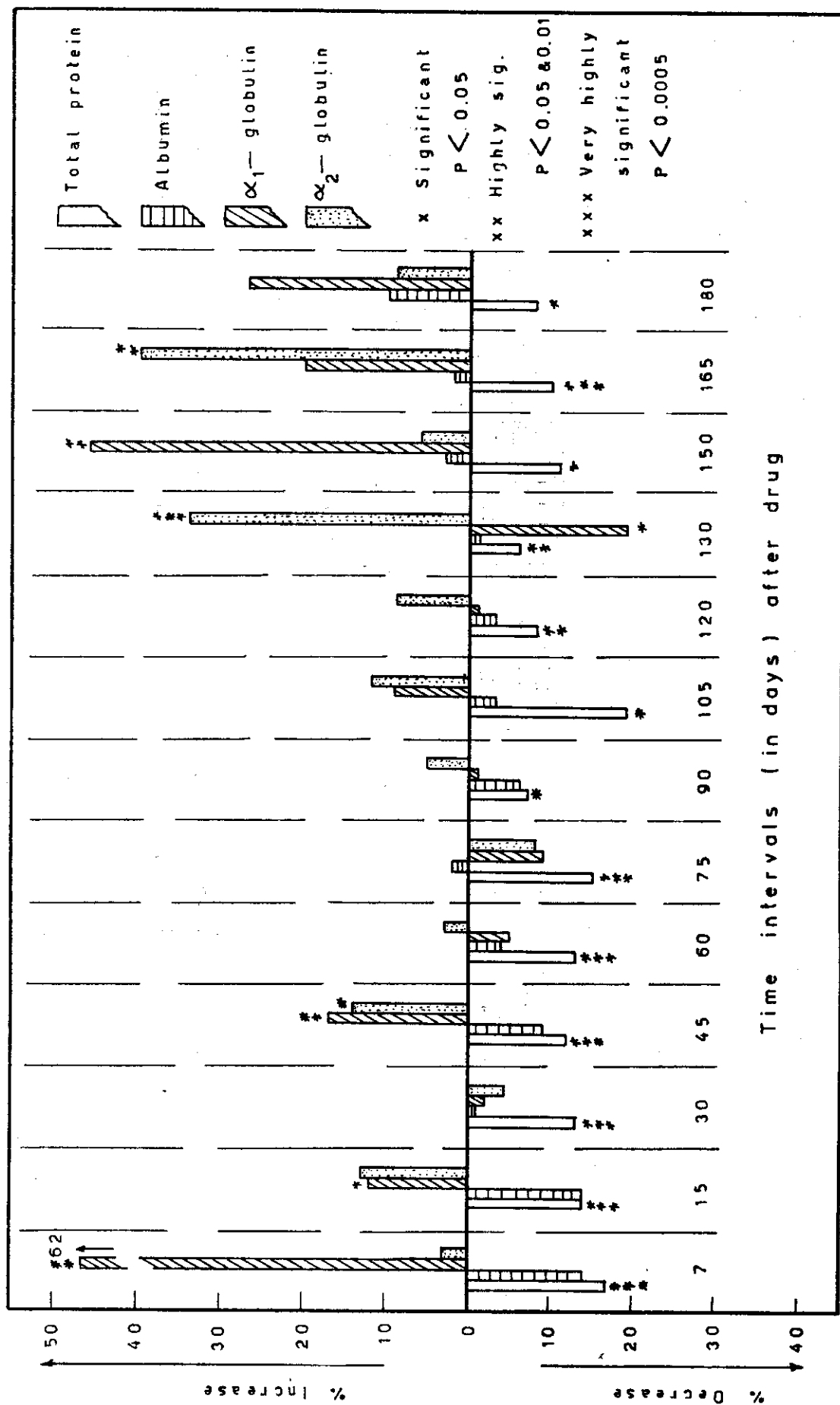


Fig. (18) Plasma proteins (total & fractions) in treated malnourished rats as percent from those normally nourished rats over 180 days.

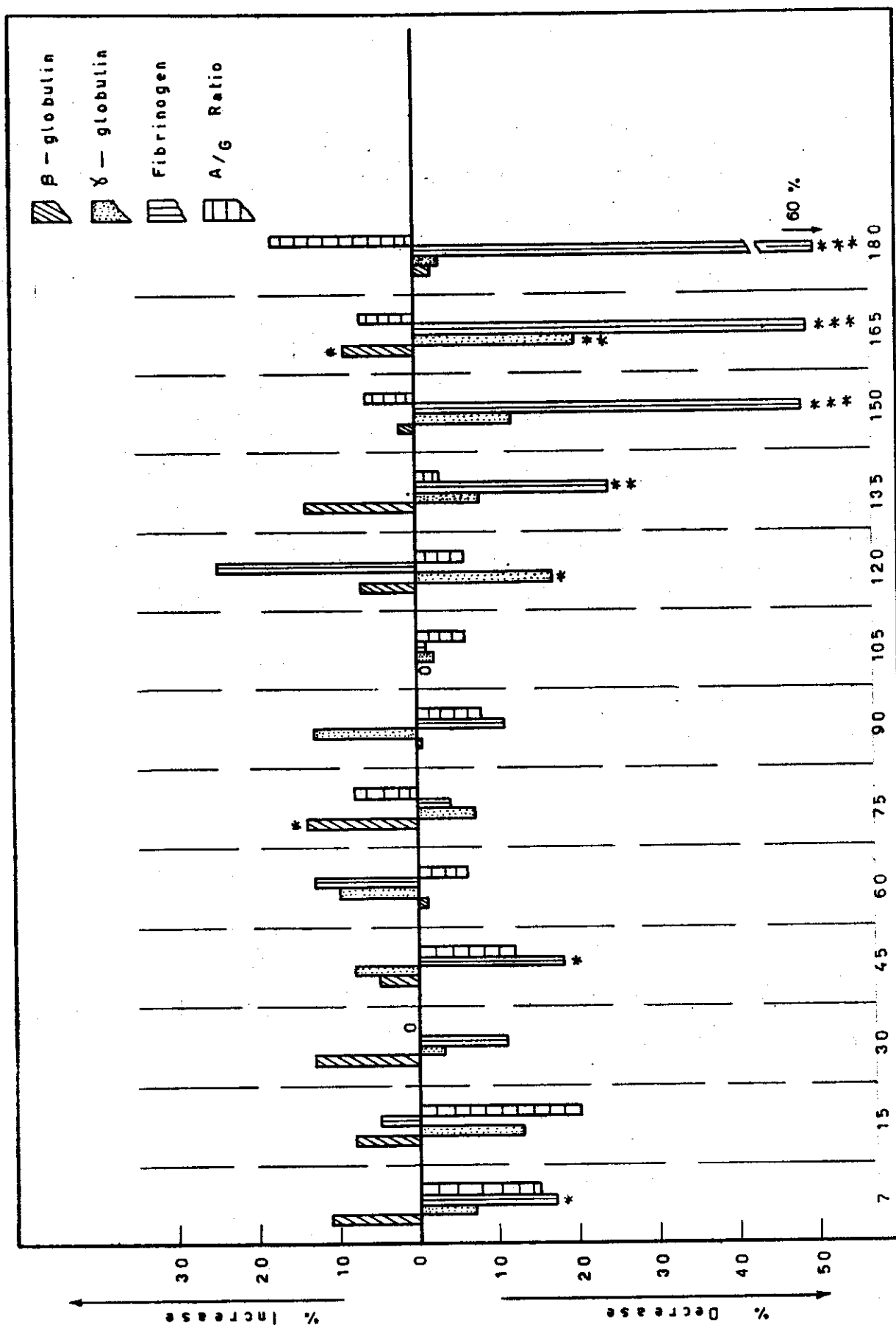


Fig. (18)_b Cont.

$P < 0.005$ & $P < 0.0005$ where the percentage reduction amounted to - 73 % and - 69 % at days 30 and 60 respectively. This was followed by insignificant increase of both hormones from day 75 until the end of experiment except for FSH which showed significant increase by + 101 % and +63 % at days 135 and 150 respectively.

Estrogen and progesterone decreased almost insignificantly during the whole observation period. Significant levels were only recorded at day 30 in case of estrogen with a percentage decrease of - 50 % ($P < 0.01$) and at days 30 and 45 in case of progesterone, $P < 0.05$ and $P < 0.025$ with percentage reduction of -48% and -42% as shown in table (13) and fig. (17). Comparing the effect of the contraceptive drug on the hormonal pattern of the malnourished animals to its effect on the normally nourished groups, FSH mostly increased throughout the observation period interrupted by decreased levels at the period between 90 to 120 days. LH was significantly increased at the beginning of observation period showing high percentage increase of + 76 % and +123% at days 7 and 15 ($P < 0.025$ and $P < 0.01$) and insignificant increase thereafter till day 105. This was followed by decrease of the hormone level especially at the last two time

intervals namely 165 and 180 days where the percentage decrease amounted to - 75 % and - 59 % ($P < 0.05$ and $P < 0.0125$) see table (15) and fig. (19).

Estrogen and progesterone were both decreased through the whole experimental period. The decrease was much more pronounced in the case of progesterone where highly significant decrease occurred $P < 0.005$ and $P < 0.0005$ with percentage reduction ranging between - 38 % and - 89 % at the different time intervals of observation period as shown in table (15) and fig. (20).

Collective data for the comparative changes that occurred in the malnourished treated group, the malnourished nontreated as well as the normally nourished treated groups, for all studied parameters are included in the appendix.

Table (15) Comparative effect of single daily oral dose of contraceptive hormones (FSH & LH), estrogen and progesterone in normally nourished and malnourished adult female albino rats.

Test Parameters	Initial $\bar{x} \pm SE$	Test gps.	MEAN VALUES $\pm SE$ AND PERCENTAGE VARIATION													
			TIME INTERVALS OF POST CONTRACEPTIVE TREATMENT IN DAYS													
			7	15	30	45	60	75	90	105	120	135	150	165	180	
FSH m.i.u./ml	3.82 ± 0.26 4.04 ± 1.54	M+C N+C	3.78 ± 0.16 (+51%)	3.29 ± 0.35 (+39%)	6.83 ± 0.45 (+15%)	6.7 ± 0.57 (+23%)	5.12 ± 0.79 (-44%)	7.67 ± 0.45 (+12%)	4.56 ± 1.75 (-27%)	2.37 ± 0.21 (-11%)	2.77 ± 0.32 (-17%)	3.77 ± 0.42 (+34%)	3.78 ± 0.47 (+32%)	3.97 ± 0.08 (+7%)	3.23 ± 0.24 (-4%)	
			2.5 ± 0.57	2.82 ± 0.26	5.78 ± 0.3	5.46 ± 0.59	9.24 ± 0.69	6.83 ± 0.64	6.2 ± 0.25	2.13 ± 0.25	2.96 ± 0.52	2.81 ± 0.58	3.78 ± 0.17	3.7 ± 0.36	3.1 ± 0.24	
LH m.i.u./ml	6.87 ± 0.997 2.73 ± 0.44	M+C N+C	3.91 ± 0.5 (+76%)	7.42 ± 1.56 (+123%)	1.77 ± 1.2 (-16%)	2.48 ± 0.95 (-1%)	2.4 ± 0.75 (+105%)	2.28 ± 0.24 (+1%)	2.38 ± 0.34 (+22%)	1.46 ± 0.29 (+41%)	0.67 ± 0.39 (-35%)	2.31 ± 0.41 (-50%)	2.2 ± 0.32 (-36%)	0.61 ± 0.098 (-78%)	0.89 ± 0.16 (-59%)	
			2.22 ± 0.52	3.33 ± 0.34	2.1 ± 0.59	2.51 ± 1.35	1.17 ± 0.78	2.25 ± 0.55	1.9 ± 0.29	1.03 ± 0.23	1.03 ± 0.32	1.54 ± 0.23	1.89 ± 0.29	2.4 ± 0.47	1.67 ± 0.44	
Estrogen pg/ml	35.72 ± 5.4 40.47 ± 9.85	M+C N+C	9.56 ± 1.84 (-20%)	22.45 ± 1.8 (-31%)	18.48 ± 3.19 (-38%)	24.84 ± 3.38 (-24%)	11.59 ± 1.8 (-19%)	19.43 ± 5.17 (-38%)	15.71 ± 2.56 (-19%)	15.25 ± 4.67 (-33%)	8.13 ± 1.96 (-42%)	9.55 ± 2.49 (-57%)	3.86 ± 1.21 (-74%)	9.67 ± 1.3 (-29%)	11.0 ± 4.86 (-47%)	
			12.05 ± 1.4	29.52 ± 4.76	29.63 ± 4.46	32.40 ± 4.73	14.3 ± 1.57	29.95 ± 3.25	19.34 ± 4.40	22.69 ± 4.97	13.99 ± 0.83	12.87 ± 1.46	13.81 ± 3.26	13.02 ± 3.65	18.83 ± 4.28	
Progesterone ng/ml	4.8 ± 0.59 15.18 ± 4.15	M+C N+C	4.75 ± 1.30 (-67%)	3.0 ± 0.92 (-83%)	0.74 ± 0.17 (-70%)	2.20 ± 0.29 (-88%)	1.89 ± 0.34 (-89%)	2.34 ± 0.45 (-74%)	11.23 ± 1.86 (-38%)	1.39 ± 0.25 (-83%)	2.35 ± 0.28 (-63%)	2.69 ± 0.22 (-42%)	2.62 ± 0.38 (-29%)	1.21 ± 0.11 (-65%)	1.15 ± 0.14 (-53%)	
			3.48 ± 0.44	2.47 ± 0.52												

*** Very highly significant $P < 0.0005$ † Insignificant
 $P < 0.005$ & 0.01

† Insignificant

*** Very highly significant

p < 0.0005

p < 0.005 & 0.01

** Highly significant

p < 0.05

* Significant

M+C = Normally nourished rats + Contraceptive drug

M+C = Malnourished rats + Contraceptive drug

N.B. : Each mean represents 24 animals

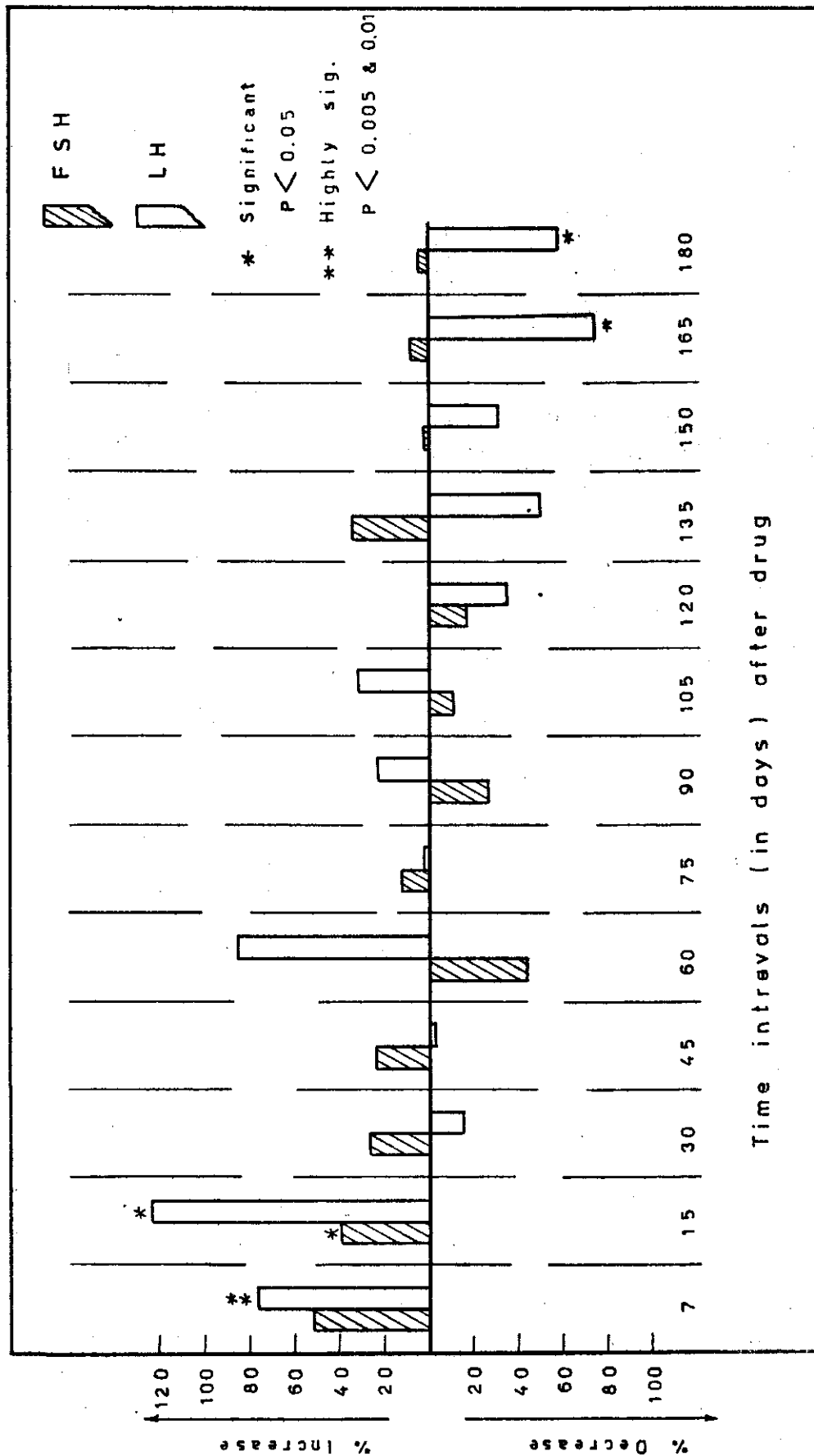


Fig.(19) Plasma gonadotropins (FSH & LH) changes in malnourished rats taking daily contraceptive dose as percent from those normally nourished rats under the same treatment over 180 days.

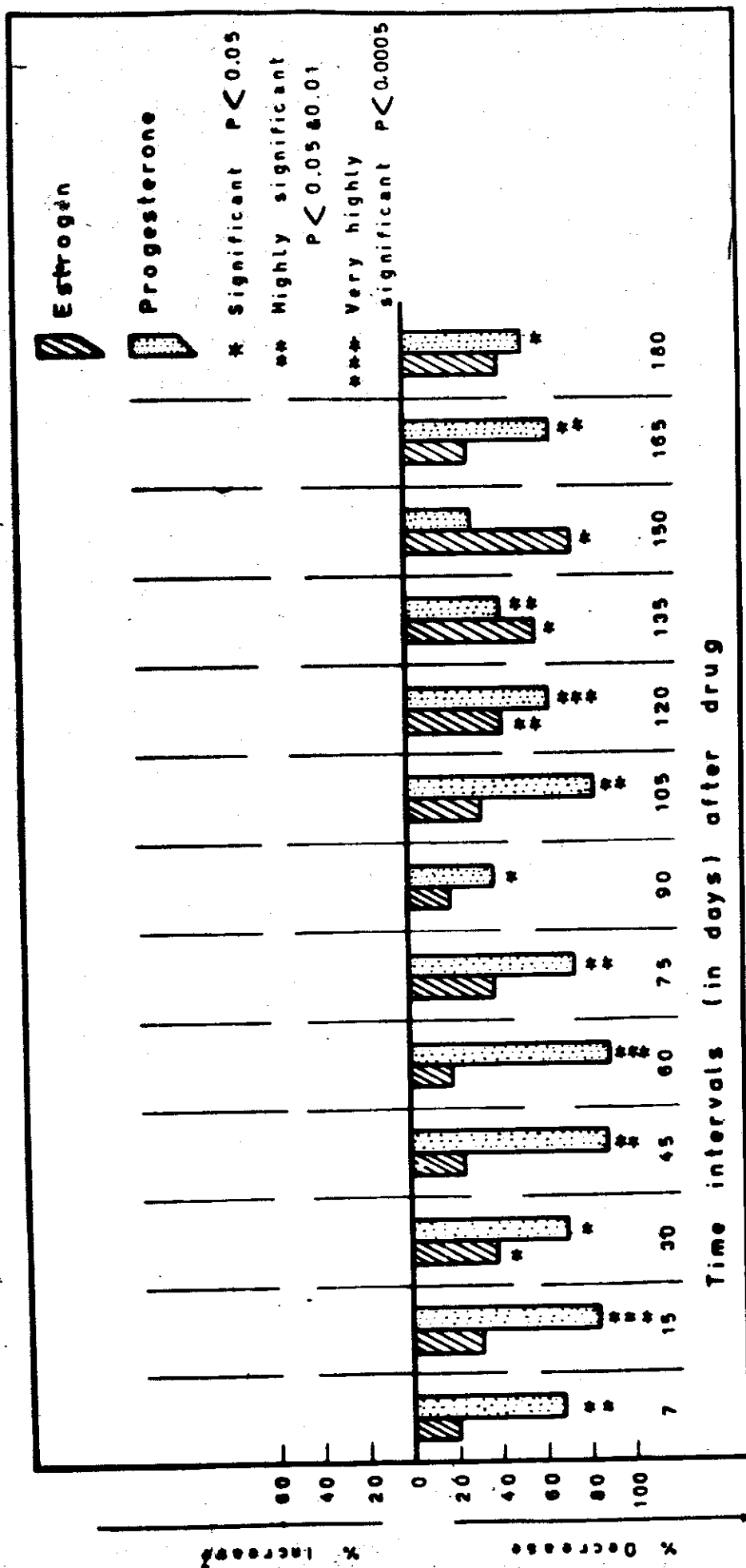


Fig. (20) Percent reduction in plasma estrogen and progesterone in malnourished rats taking daily contraceptive dose from, those normally nourished rats under the same treatment over 180 days.