The Intake of a Molassed Mineral Block by a Group of Horses at Pasture

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CHAPTER THREE

MATERIALS AND METHODS.

This experiment was designed to determine (a) the intake of a molassed mineral block by horses, in both an indoor and outdoor situation, and (b) the behaviour of the horses towards the mineral block.
The indoor trial was conducted from 20/3/92 to 10/4/92 and the outdoor trial from 19/5/92 to 29/9/92.

INDOOR TRIAL.

Six mature adult mares averaging 560Kg and one pony teaser stallion, weighing 350Kg were used for the purposes of this trial. One of the mares, Rathnew Laser, was in foal, while the other five mares were barren. All horses were housed indoors, but were let out for approximately 5 hours per day for exercise in a bare paddock. They received 3.0Kg of stud cubes and approximately 6.0Kg of hay daily. The composition of the stud cubes and hay can be seen in Appendix 5 & 6.

A molassed mineral block was secured in a tyre and placed in each stable. Blocks were weighed daily to determine intake.

OUTDOOR TRIAL.

The outdoor trial commenced on the 19th of May, when the horses were turned out to pasture. The five barren

mares from the indoor trial were put out with three young horses, who already had access to the mineral block outdoors since March. Horse No.4 was removed from the trial in August due to an injury sustained.

The blocks were manufactured by Uniblock (Ireland) Ltd., Dundalk, Co. Louth, and the composition is given in Appendix 2.

MEASUREMENTS.

SOIL AND HERBAGE.

The objective of this was to assess the major and minor element status of the soil and herbage of the area devoted to the trial. The area consists of four fields, of approximately 2.5 hectares. They are called "Bracken" 1, 2, 3, 4 for identity purposes.

SOIL.

Soil sampling of the total area was carried out in March prior to the commencement of the trial and then again in late September. Each field was sampled in a zig-zag manner, taking about 30 samples. A stainless steel soil corer (12mm bore), was inserted into the soil to a depth of 90mm at random.

HERBAGE.

Samples of mixed herbage were collected from the total area at the same time as that of the soil i.e.

before commencement of the trial in March and again in late September. Samples were collected at random using a sharp, steel scissors in a zig-zag fashion across each field.

Soil and herbage mineral analysis were carried out by Independant Analytical Services at their laboratory in Carlow. The results of the soil analysis are shown in Appendix 3 and 4, while the herbage mineral analysis is given in the results section.

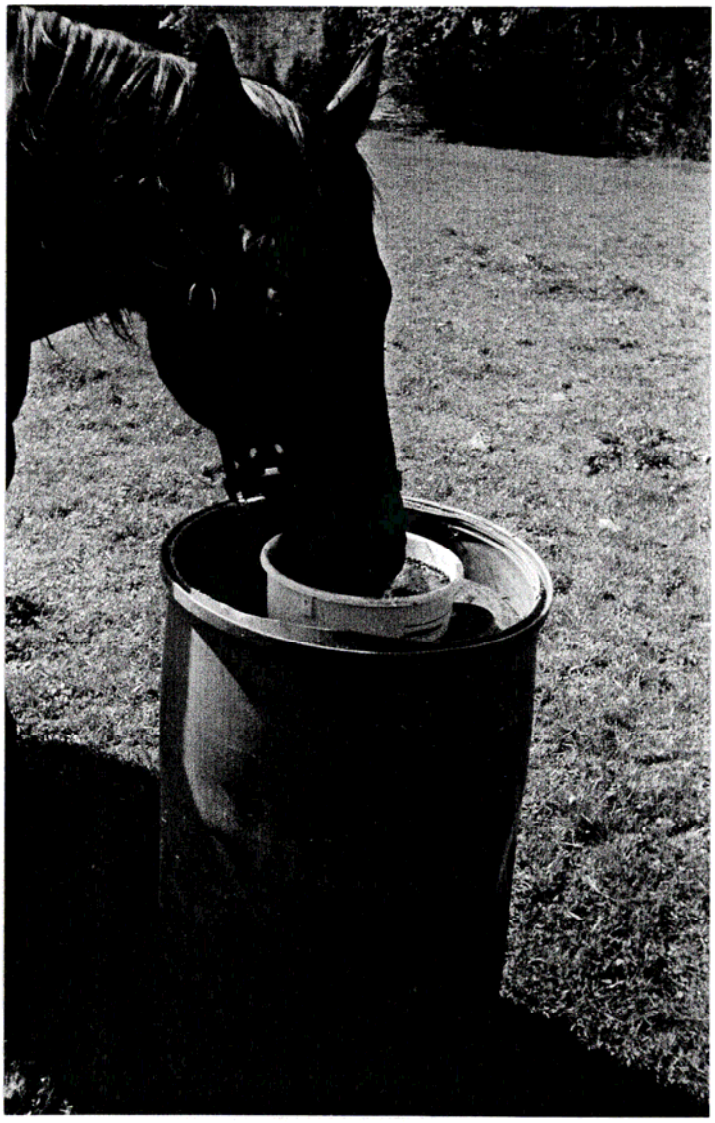
Grass height was measured on a weekly basis, taking random measurements across the field using a ruler. The height was then calculated on a mean weekly basis.

BLOCK INTAKE.

A block weighing approximately 12.5 Kg, including container, was placed in the field with the horses. It was placed in a cut-down barrel which contained cement to stabilise it, primarily to prevent access to it by sheep, since it contained high levels of copper. The block was weighed daily throughout the experiment, at a constant time each day, and the weights recorded to determine intake. A new block was introduced when the remaining one fell to approximately 500g in weight. In this way the mineral block was consistantly available to the horses.

Individual horse intake levels were measured using a molassed mineral block which contained 1% chromic oxide. The horses had access to the chromic oxide block seven days previous to the start of a faecal collection trial.

Approximately 500g of faeces was collected each time a horse defaecated over three 18 hour periods (i.e. 4am - 10pm) from the 16th to the 18th of June.



CHAPTER FOUR

RESULTS.

The data relating to daily temperature, hours of sunshine and rainfall is shown in Table 2. The relationship between average ambient temperature and intake is shown in Figure 2 and between average sunshine hours and intake in Figure 3.

TABLE 2 : WEATHER DATA FOR MAY TO SEPTEMBER 1992.

(Data was recorded at Casement Aerodrome Baldonnell, approximately 2 miles from the site of the trial, and obtained from the Meterological Service).

Week Ending	Avg. Temp. Oc	Avg. Sunshine Hours/Day	Total Rainfall (mm/Day)
26/5	14.1	8.80	0.00
2/6	13.4	2.90	24.40 *
9/6	12.7	4.50	15.95
16/6	15.7	7.84	0.00
23/6	13.5	6.47	0.00
30/6	16.4	6.22	1.35
7/7	14.4	1.94	24.25 *
14/7	14.6	4.10	9.20
21/7	16.4	5.94	23.70 *
28/7	14.8	8.21	5.71
4/8	15.1	4.70	6.45
11/8	14.1	3.30	4.70
18/8	13.4	6.60	19.75 *
25/8	14.2	6.90	21.05 *
1/9	11.6	6.10	16.80
8/9	11.1	4.10	14.60
15/9	12.2	2.90	23.80 *
22/9	12.3	3.10	0.00
29/9	10.7	1.60	21.10 *

* 75-90% of the rain fell over 1 or 2 days.

Figure 2.
Ambient temperature and Intake

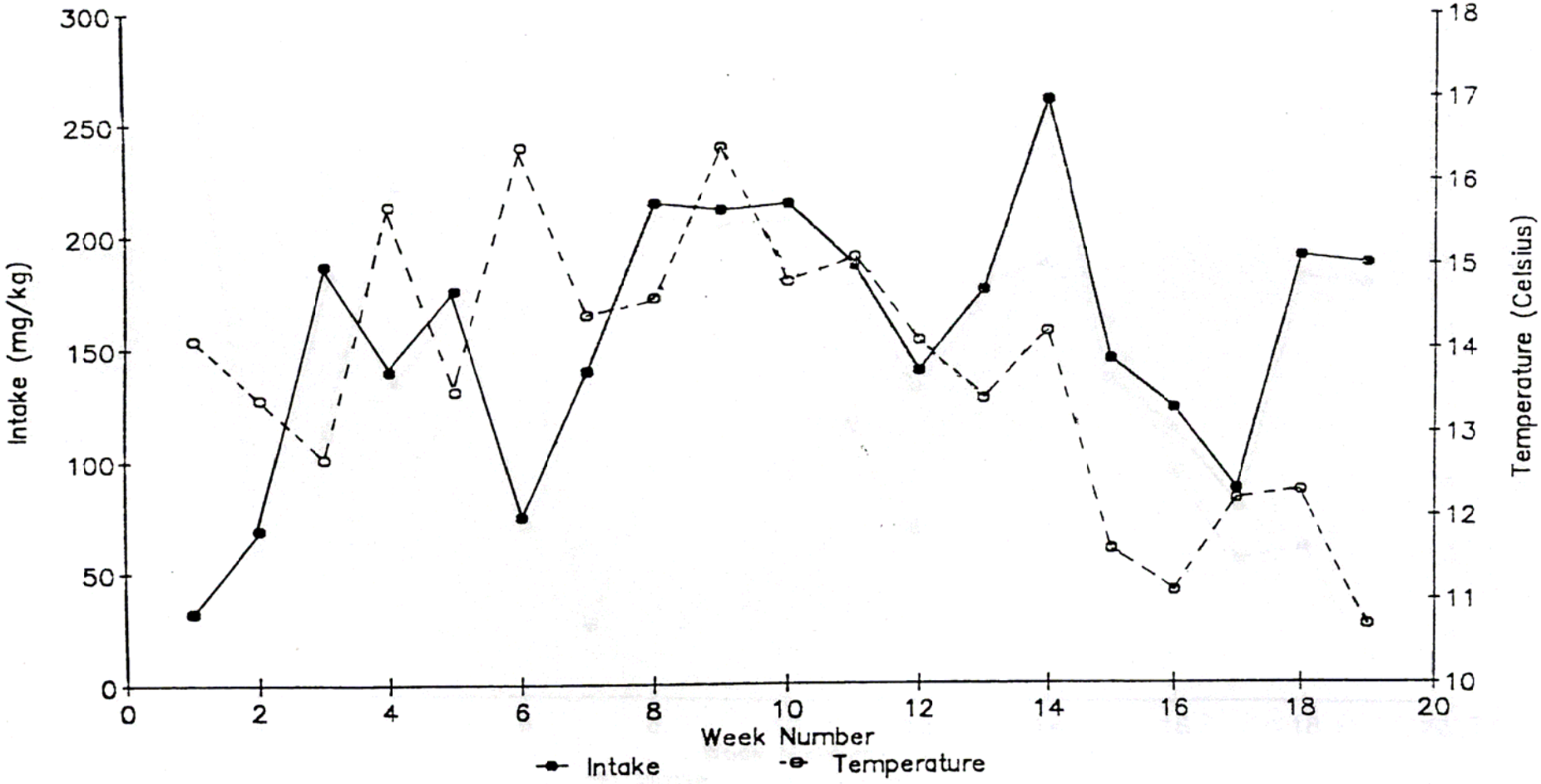
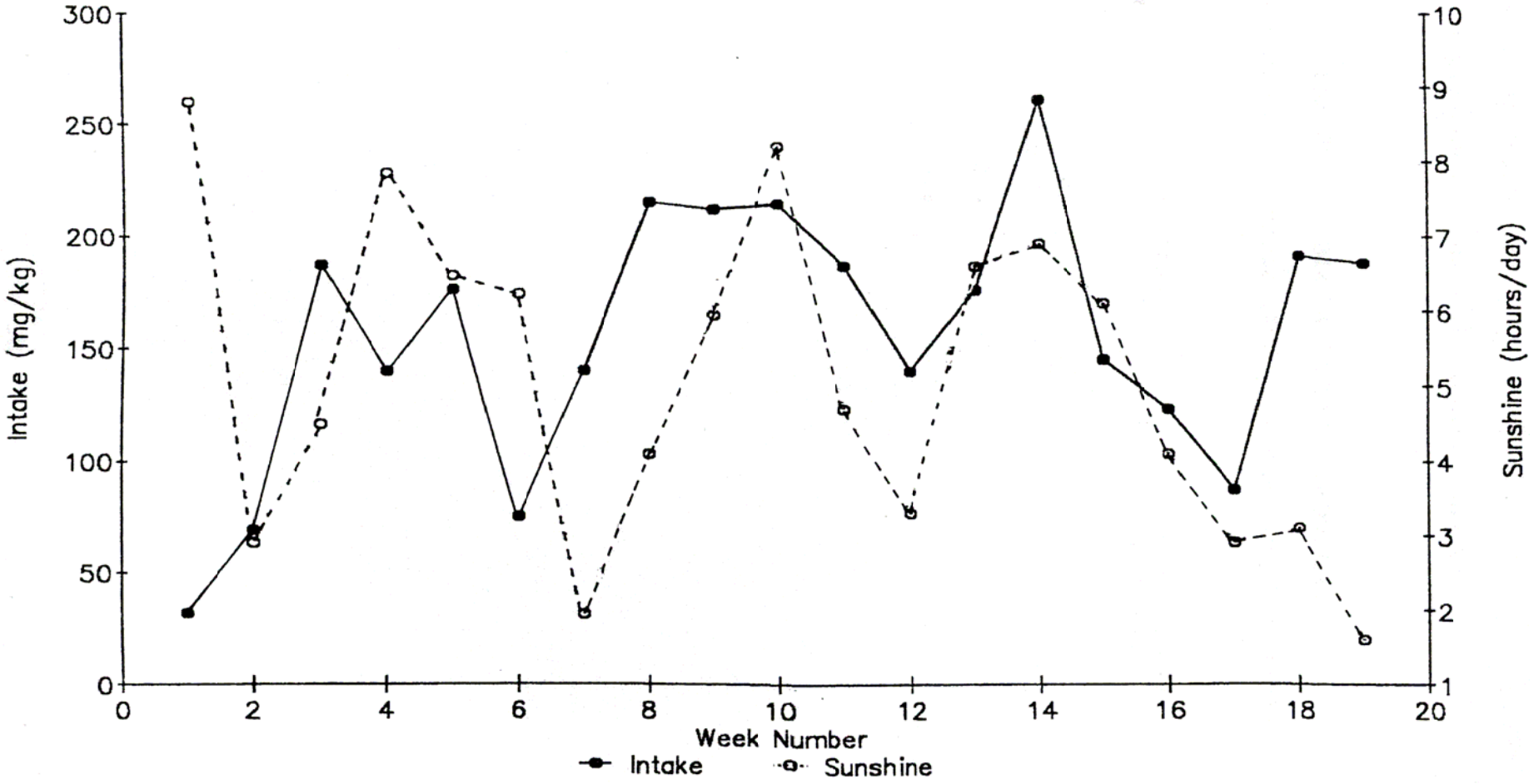


Figure 3.
Average sunshine hours/day and Intake



The levels of block intake indoors and outdoors during the trial periods are shown in Table 3 and Table 4.

TABLE 3 : BLOCK INTAKE INDOORS.

(Average intake per horse (N=8) per day over four weeks).

Week Ending	Avg. Intake/ Horse/Day (g)
20/3	76
27/3	25
3/4	27
10/4	106

TABLE 4 : BLOCK INTAKE OUTDOORS.

(Average daily intake per horse (N=8) during the grazing period).

Week	Week Ending	Avg. Intake/Horse/Day (g)
1	25/5	32
2	2/6	69
3	9/6	187
4	16/6	140
5	23/6	176
6	30/6	75
7	7/7	140
8	14/7	215
9	21/7	212
10	28/7	215
11	4/8	187
12	11/8	140
13	18/8	176
14	25/8	261
15	1/9	145
16	8/9	123
17	15/9	87
18	22/9	191
19	29/9	188

The height of grass available to the horses in the various paddocks when they were being grazed are shown in Table 5.

TABLE 5 : MEAN HEIGHT OF GRASS AVAILABLE TO THE HORSES.

(Grass measurements taken on a weekly basis).

Field	Week	Avg. Height (cm.).
	1	12.37
Bracken 2	2	11.16
(25/5 - 16/6)	3	13.58
	4	11.79
Bracken 1	5	10.81
(23/6 - 30/6)	6	16.69
	7	10.52
	8	8.58
Bracken 2	9	5.15
(7/7 - 11/8)	10	5.94
	11	5.11
	12	10.58
Bracken 3	13	7.47
(18/8 - 8/9)	14	4.84
	15	11.31
	16	8.42
Bracken 4	17	8.69
(15/9 - 29/9)	18	7.83
	19	6.33

Table 6 shows the effect of weight of block on block intake and the statistical analysis is given in Appendix 10.

TABLE 6 : THE EFFECT OF BLOCK WEIGHT ON TOTAL INTAKE (Kg/day).

Block Weight	Intake (Kg/day) (l.s.m. +/- sem)
<4kg	0.88 +/- 0.08
4 - 12Kg	1.48 +/- 0.06

There is a significant difference ($P<0.001$) between mineral block weight and horse intake. When the block weight is less than 4Kg, the total horse intake is 0.88Kg. When the block weight is greater than 4Kg, the total horse intake is 1.48Kg.

Table 9 shows the average amount of time (mins.), as determined by time lapse photography during the period 6am to 9pm, spent by each horse licking the block. Figure 4 depicts this in histogram form.

Horse No.4 was omitted from this trial due to an injury sustained.

TABLE 9 : AVERAGE AMOUNT OF TIME EACH HORSE SPENT LICKING THE BLOCK.

(Determined by time lapse photography).

Horse No.	Avg. Time Spent at Block/Day (mins.).
2	1.18
5	3.33
6	4.24
7	4.31
8	3.62
9	7.64
10	3.72

Figure 4. Frequency of Visits to Block
Observations over 14 days; 6am to 9pm

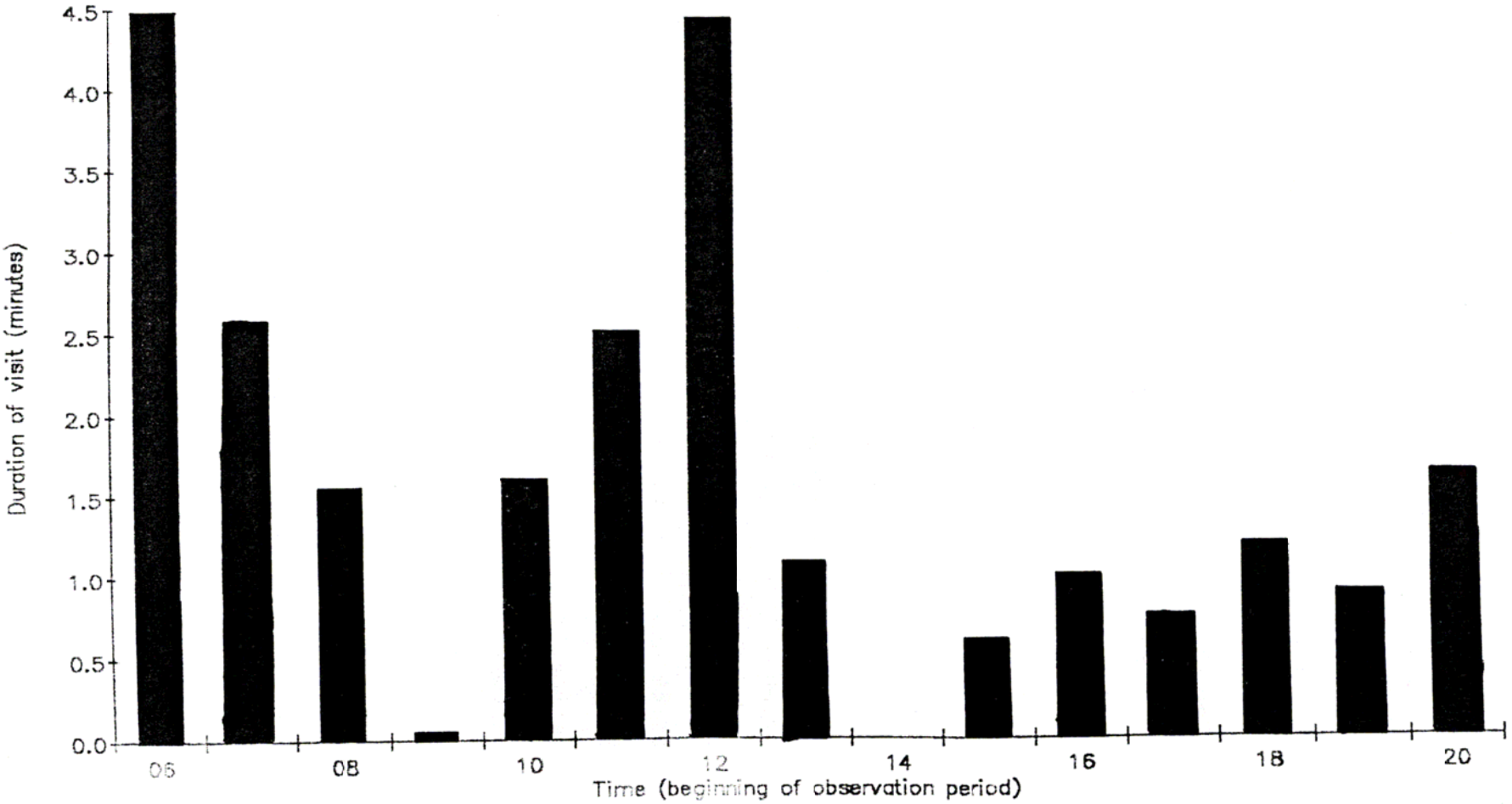


Table 10 gives the calculated individual intake of block for each horse using the levels of chromium obtained in the faeces of individual horses over the three day collection period (16/6/92 - 18/6/92). Detailed calculations are given in Appendix 11.

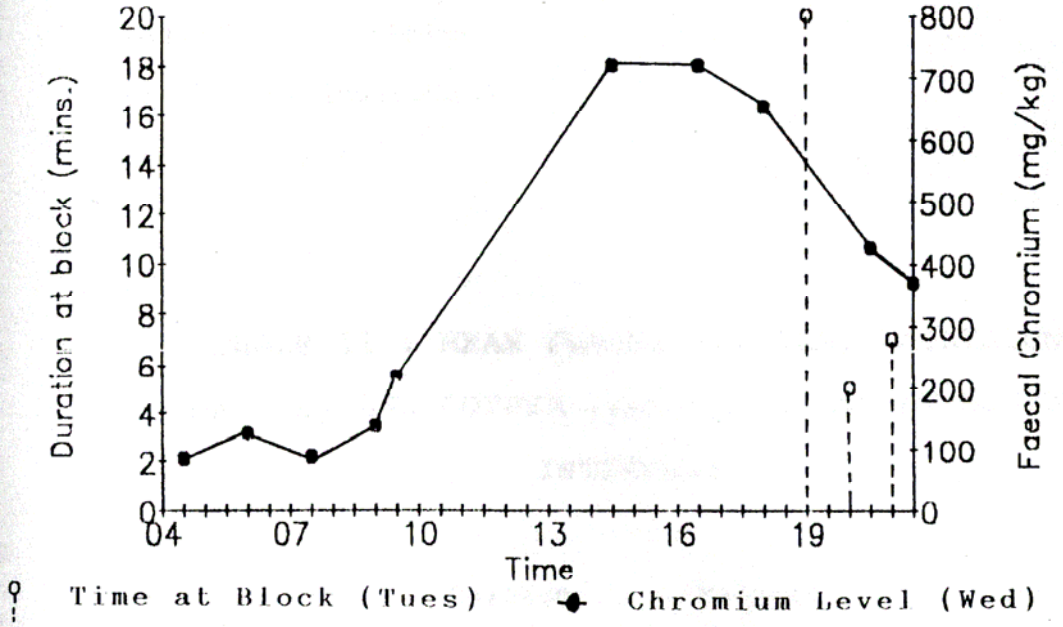
TABLE 10 : CALCULATED INDIVIDUAL INTAKE OF MINERAL BLOCK USING CHROMIUM ANALYSIS.

	Intake (g)		
Horse No.	Day 1	Day 2	Day 3
2	40.86	30.14	23.25
4	110.22	107.02	113.59
5	60.98	56.03	76.20
6	50.26	83.91	109.85
7	75.23	70.14	95.64
8	35.12	72.87	103.55
9	212.81	283.00	204.91
10	112.00	31.60	100.14

Figures 5a and 5b show the time (mins.) spent at the block by the horses on the Tuesday and Wednesday and the faecal cromium level obtained on the Wednesday and Thursday.

Figure 5a : Time Spent at Block (Tuesday)

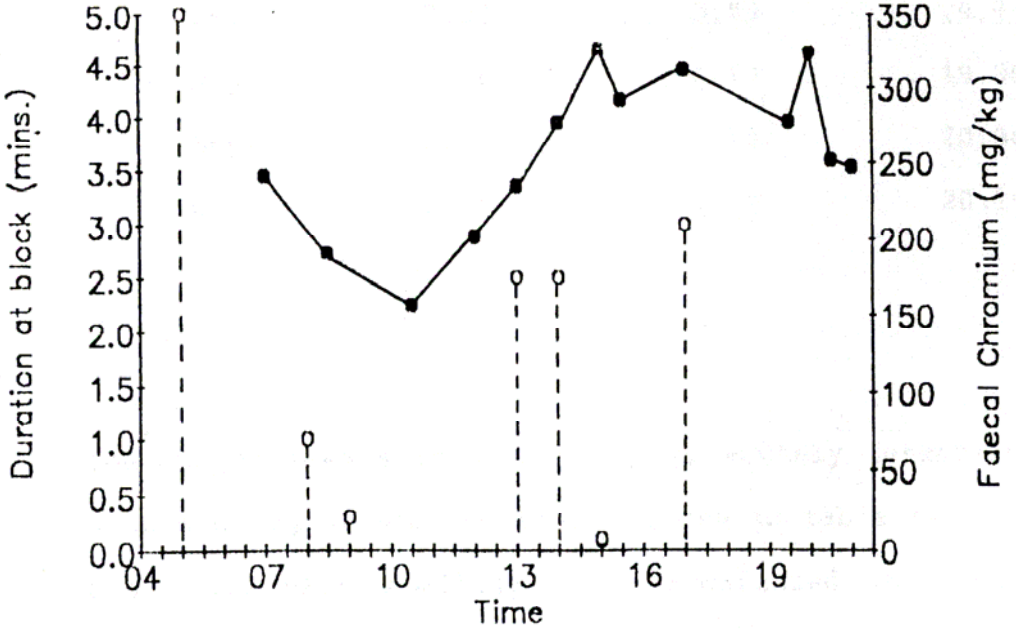
Faecal Chromium Output (Wednesday)



Time at Block (Tues) — Chromium Level (Wed)

Figure 5b : Time Spent at Block (Wednesday)

Faecal Chromium Output (Thursday)



Time at Block (Wed) — Chromium Level (Thur)

Table 11 shows the mean monthly plasma levels of calcium, magnesium and copper of the horses over the period of the trial. The individual levels for each horse are contained in Appendix 9.

TABLE 11 : MEAN PLASMA CALCIUM, MAGNESIUM (mmol/L) AND COPPER (umol/L) TAKEN AT MONTHLY INTERVALS.

	Calcium	Magnesium	Copper
Mar.	2.71	0.69	14.12
April	2.89	0.74	18.35
May	3.11	0.62	19.03
June	2.65	0.62	24.41
July	2.83	0.59	19.34
Aug.	2.76	0.63	18.30
Sept.	2.77	0.62	20.90
Oct.	2.80	0.59	20.10

The copper levels in hair taken at monthly intervals from mane and leg of each horse are given in Table 12.
Blood and hair sampling was discontinued in August for horse no.4 as this horse was removed from the trial due to injury.