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غازات الدم والاتزان الحامضى القاعدى فى الحمير تحت تأثير أنواع مختلفة من المواد المخدرة

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استخدم فى هذه الدراسة عدد (٩) حمير من الذكور والاناث قسمت الى ثلاث مجموعات كل منها تحتوى على ثلاث حيوانات أعطيت المجموعة الأولى مخدر مكون من الكورال هيدرات مع الكومبلين والثانية الكورال هيدرات مع النوفالجين والثالثة الكورال هيدرات مع نيوبنتال الصوديوم .

وقد سجلت درجات الحرارة ومعدلات النبض والتنفس قبل وبعد التخدير وكذلك الأعراض الاكلينيكية كما أخذت عينات الدم من هذه الحيوانات لدراسة تكونات الاتزان الحمضى والقاعدى وكذلك غازات الدم التى شملت درجة التركيز الهيدروجينى (PH) وضغط ثانى اكسيد الكربون (م٠م٠ ـ زئبق) وضغط الاكسجين (م٠م٠ ـ زئبق) البيكربونات المتزنة (مل /لتر) واجمالى ثانى اكسيد الكربون (مل /لتر) بالاضافة الى الزيادة القاعدية (مل /لتر) .

ولقد وجد أن الحيوانات المخدرة بخليط الكومبلين والكورال هيدرات أظهرت أحسن النتائج الاكلينيكية من ناحية سرعة مفعول المخدر وعمق التخدير وذلك كان بدون متاعب أثناء الحقن .

وكذلك كانت مدة التخدير أطول بالمقارنة بالأنواع الأخرى واستمرت لحوالى الساعة والنصف ولو أن استعمالهم كان مصطحب ببعض التغيرات فى الاتزان الحامضى القاعدى للدم عن استعمال مخلوط المركبات الأخرى .

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BLOOD GASES AND ACID-BASE BALANCE UNDER THE INFLUENCES OF DIFFERENT ANAESTHETIC COMBINATIONS IN DONKEYS

(With 4 Tables & 1 Fig.)

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SUMMARY

Nine donkeys of both sex were used in this investigation. The animals were classified into 3 groups (each of 3 animals). Group I received a mixture of chloral hydrate and combelen. Group II received a combination of chloral hydrate and novalgin. Group III received chloral hydrate and thiopental sodium. Temperature, pulse and respiration rates before and after administration of the anaesthetics were recorded. Clinical signs were also demonstrated.

Blood samples were collected for blood gases and acid-base balance analysis. Blood pH, Pco (mm. Hg), Po (mm. Hg), Hco (mmol/L), Tco (mmol/L) and base excess (mmol/L) were measured using Corning pH - blood gas analyser 168.

Animal anaesthetized by the combined use of combelen and chloral hydrate showed clinically the best desired depth of anaesthesia as onset was rapid without injection discomfort. The anaesthetic period was longer and continued for about 11/2 hour. However their use was accompanied with greater alteration in acid-base values than in the other used anaesthetic combinations.

INTRODUCTION

In daily practice, the choice of a suitable intravenous anaesthetic combinations for donkeys remained up till now an unsolved problem especially when volatile anaesthetics are not avilable.

MILLENBRUCK and WALLINGA (1946) used a mixture of chloral hydrate, magnisum sulphate and pentobarbitone as a general anaesthetic for horses. They claimed that the mixture induced a state of deep general anaesthesia without excitation during induction and floundering was completely absent during recovery. TANTAWY (1980) recommended the use of a mixture of combelen and chlroal hydrate in the donkey as a general anaesthetic than the use of chloral hydrate alone.

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Moreover, the use of thiopentone sodium alone may cause aponea in some animals and recovery is usually violent in nature, induction is also usually associated with excitement (WRIGHT and HALL, 1971). Novalgin is also recommended in veterinary practice and used in combination with anaesthetics as it is a potent sedative and analgesic. TEMIZER (1964) advised its use in combination with nembutal for safe anaesthesia and operation.

On the other hand, respiratory acidosis can develop during anaesthesia with the use of chloral hydrate, combelen and thiobental sodium (FRITSCH, 1965). The severity of acidaemia is proportional to the depth and length of anaesthesia. TEVIK, et al. (1968) reported a marked decrease in blood pH with marked elevation in the value of carbon dioxide tension under the influence of general anaesthesia with chloroform and halothane. However, the effect of intravenous anaesthesia on acid-base balance and blood gases in donkeys is not as well established.

The aimed of the present study therefore aimed demonstration of the clinical effectiveness of some anaesthetic combinations in donkeys, and also to study the extent of changes in blood gases and acid-base balance parameters under their influence.

MATERIAL and METHODS

The study was carried out on 9 clinically healthy donkeys of different ages, sexes and body weights. The animals were divided into 3 groups (each of 3 donkeys) for comparison between the different anaesthetic combinations. Animals were fasted for about 18 hours before injection. In the first group, a mixture of combelen (Bayer) and chloral hydrate (10%) was administered intravenously in the dose of 0.023 mg/kg b.w. and 4 g/50 kg b.w. respectively. The second group received a mixture of novalgin (20%) and chloral hydrate (10%) intravenously in the dose of 1 ml/10 kg b.w. and 4 g/50 kg b.w. In the third group, a mixture of chloral hydrate (10%) and thiopental sodium was injected slowly intravenously in the dose of 4 g/50 kg b.w. and 10 mg/kg b.w. respectively. Different clinical parameters (temperature, pulse and respiration) were recorded 1/2 h. before injection and 1/2 h., 2 hrs., 4 hrs., 8 hrs. and 24 hrs. after administration. Clinical signs, onset, anaesthetic period and recovery were also demonstrated.

From each animal 1 ml sample of jugular blood was collected anaerobically into a syringe whose dead space had previously filled with 1/1000 sod. heparin. These samples were immediatly placed on ice-bath and processed within 45 minutes of collection. Blood gases measurements were performed using Corning pH-blood gas analyser Model 168. The analyser directly measured at 37°C, blood pH, carbon-dioxide tension (P co_2 mm. Hg), and oxygen tension (P o_2 mm. Hg). Bicarbonate (H co3 mmol/L.), total carbon dioxide (T co_2 mmol/L.) and base excess (B.E. mmol/L.) were calculated automatically by the same apparatus. The pH, Pco_2 and Po_2 were adjusted for each animal rectal temperature using inbilt correction equation.

RESULTS

The anaesthetic characteristics observed in response to the used anaesthetic combinations are mostly summerized in table 1. Clinically, it was found that animals in the first group-received a mixture of combelen and chloral hydrate-showed the best desired depth of anaesthesia as onset was rapid without injection discomfort and the anaesthetic period was longer and continued

for about 1 1/2 h. Although recovery was smooth, it continued for 3 hours. Animals in the second group could be placed in the second degree although muscle relaxation was better than those in animals of group I. The anaesthetic period was shorter and continued for only 1 hour. Moreover the combined use of chloral hydrate and thiopental sodium induced frequent discomfort with moderate excitation during induction. There was no complete muscle relaxation with occasional spontanoeus movements after injection. The anaesthetic period continued for only 45 minutes and recovery was rapid.

The findings of blood gases and acid-base balance in groups I, II and III are presented in tables (2, 3 & 4) and in Fig. 1. The mean values of blood pH, Pco_2, Po_2, Hco_3, Tco_2 and base-excess for the first group before administration of anaesthetics were 7.392, 40.4 mm. Hg, 41.23 mm. Hg, 23.96 mmol/L, 25.36 mmol/L and 1.1 mmol/L respectively. A marked alterations in blood gases and acid-base balance were observed after two hours from injection (Table 2).

The mean values of such parameters in group II before administration of anaesthetics were 7.379, 40.53 mm. Hg, 26.5 mm. Hg, 23.91 mmol/L, 25.1 mmol/L and - 0.5 mmol/L respectively (Table 3).

In the third group, the mean values for blood pH, Pco_2, Po_2, Hco_3, Tco_2 and base excess before giving the anaesthetics were 7.385, 46.9 mm. Hg, 31.95 mm. Hg, 26.20 mmol/L, 27.47 mmol/L and 1.2 mmol/L respectively. The effect of the administered drugs on the acid-base balance were presented in table 4.

DISCUSSION

From the clinical pont of view, the combined use of combelen and chloral hydrate proved to induce a satisfactory period of anaesthetization in donkeys than the other used combinations, a fact which is in agreement with TANTAWY (1980). The recorded clinical manifestations resemble those reported by WRIGHT and HALL (1971).

The pronounced hypothermic action especially observed in group I is attributed to the used tranquillizer. It causes excessive loss of heat as a result of depression of the peripheral sympathetic system which gives rise to peripheral vasodilatation as manifested by EL-AMROUSI & SOLIMAN (1965) and KHAMIS (1968). However, the increased pulse and respiratory rates in groups I and II half an hour post-injection could be attributed to the compansatory mechanism of the cardiovascular and respiratory systems due to the respiratory acid-osis (HASKINS, 1977). This was followed by decrease in their rates two hours post-administration as a result of the depression action of chloral hydrate on the central nervous system (WRIGHT & HALL, 1971). In group III, pulse and respiration rates showd no marked alterations in their values as the duration of the anaesthetic period was shorter in comparision with the other two groups.

The shorter anaesthetization period in group III with demonstration of the other undesirable clinical sign in table 1 are due to that these animals received neither a tranquillizer nor a muscle relaxant prior or in combination with the anaesthetic medicament. So, either the administration of premedicaments or the repeated injection of the barbiturate is essential for prolongation of the anaesthetic period for the desired operation time.

Generally, the respiratory system is highly affected by the acid-base balance of the blood. Also, respiratory acidosis is usually developed under the influence of general anaesthesia. In this investigation, blood gases and acid-base balance were severaly affected one hour from administration of the anaesthetics (group I & II). In the first group, the blood pH dropped (7.295) and the base excess reached - 4.7 mmol/L, at the same time carbon dioxide tension was elevated to reach its maximum concentration (60.8 mm. Hg). Similar drop in blood pH values were also observed in group II half an hour from injection which reached 7.237, base excess was dropped to - 3.0 mmol/L and carbon dioxide tension was elevated to 55.2 mm. Hg. These alterations in acid-base balance and carbon dioxide tension are due to respiratory acidosis. Similar results were observed by GATES, et al. (1971).

The recorded marked elevation in carbon dioxide tension (53.23 mm. Hg) with the less changes in pH values and base excess half an hour post-injection in group I could be attributed to the compansatory mechanism of the respiratory system. The later was manifested clinically as a marked increase in the respiratory rate (Table 1). However, animals in this group retained their normal values of acid-base balance after 4 hours post-injection to be appeared clinically quite normal.

In the second group, the values of acid-base balance and blood gases did not severely affectd half an hour from administration. This is also due to the compensatory mechanism of the respiratory system, where a marked polypnae was observed. Moreover, there was a marked reduction in the respiratory rate, dropped blood pH value (7.297) and decreased base excess value (- 3.0 mmol/L) 1 hour post-injection.

From the above mentioned observations, it could be concluded that although the combined use of chloral hydrate and combelen give a longer anaesthetic period than the use of chloral hydrate and novalgin, yet their use is accompanied by greater alteration in acid-base values. Therefore, more attention should be paid to the animal during anaesthetization.

In the third group, there was no marked alterations in the clinical parameters and the acid-base values in spite of the recorded animal discomfort.

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Table (1)

The anaesthetic characteristics in respone to the used anaesthetic combinations

Time	Group I			Group II			Group III		
	T	P	R	T	P	R	T	P	R
Before	37	50	13	37.5	48	16	36.8	68	16
After									
1/2 h.	36.3	92	26	37.5	42	28	36.5	57	13
1 h.	35.5	84	14	37.2	54	13	36.0	49	10
2 h.	35.2	76	16	37.5	49	13	36.2	50	12
4 h.	36.9	82	12	38.2	43	21	36.8	48	13
8 h.	37.8	68	12	38.2	42	20	36.8	48	13
24 h.	37.8	68	12	38.2	42	26	36.8	48	14

Clinical signs			
Onset	3 minuts	5 minutes	3 minutes
Injection discomfort	absent	absent	frequent
Induction character	smooth	absent	moderate exciation
Muscle relaxation	very good	excellent	not complete
Anaesthetic period	11/2 h.	1 h.	45 minuts
Spontaneous movement after inject.	absent	absent	occasional
Palperal reflex	absent	absent	sluggish
Recovery	after 3 hrs. smooth	after 2 hrs. smooth	after 1 h. hyperreflexia

T : temperature
P : pulse
R : respiration

Table (2)
Group I, mean values of Blood gases and Acid-base balance under the effect of combelen and chloral hydrate

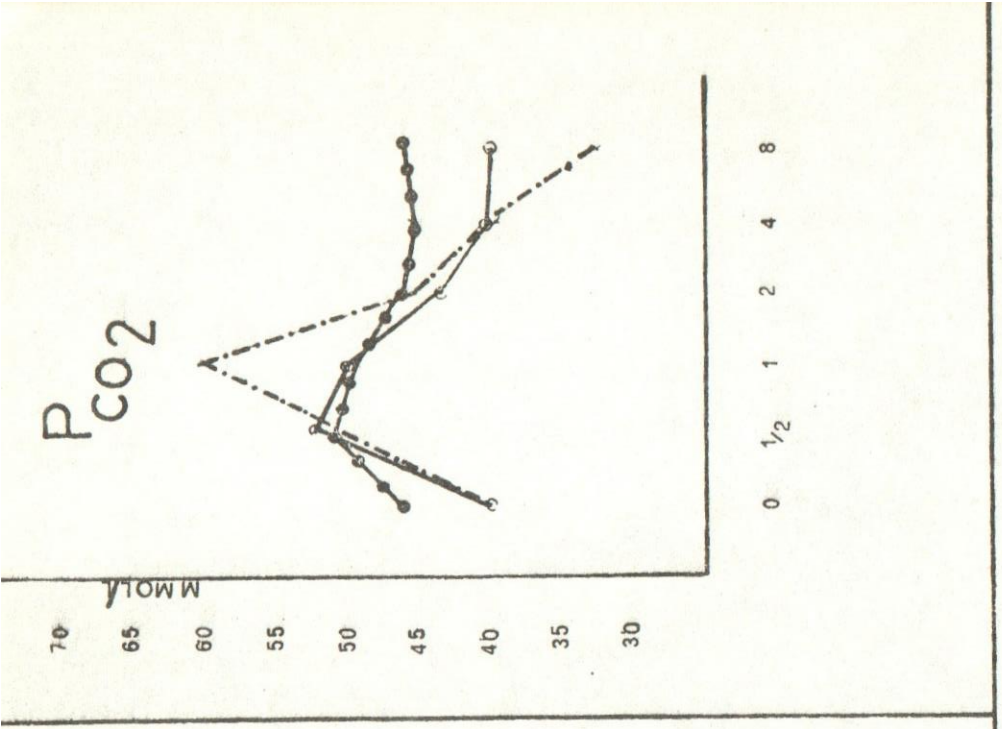
Time	pH	Pco mm. Hg	Po mm. Hg	Hco mmol/L	Tco mmol/L	B.E. mmol/L
Before	7.392	40.4	41.23	23.96	25.36	1.1
After,						
1/2 h.	7.318	53.23	50.36	27.60	29.23	0.8
1 h.	7.259	60.80	53.30	21.60	22.90	- 4.7
2 h.	7.345	45.66	34.33	23.4	23.8	- 3.9
4 h.	7.346	41.6	35.84	23.1	24.9	- 1.3
8 h.	7.401	36.0	39.46	21.4	23.6	+ 1.5

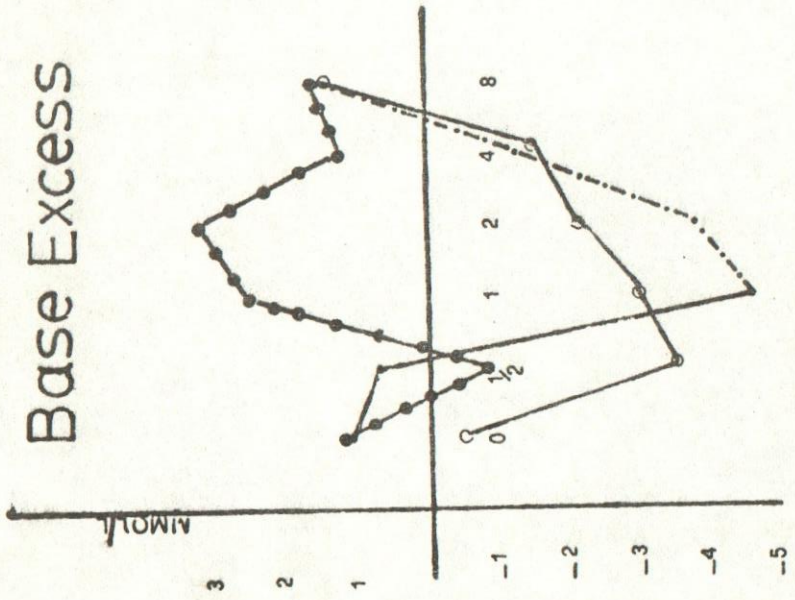
Table (3)
Group II, Blood gases and Acid-base balance under the effect of novalgin and chloral hydrate

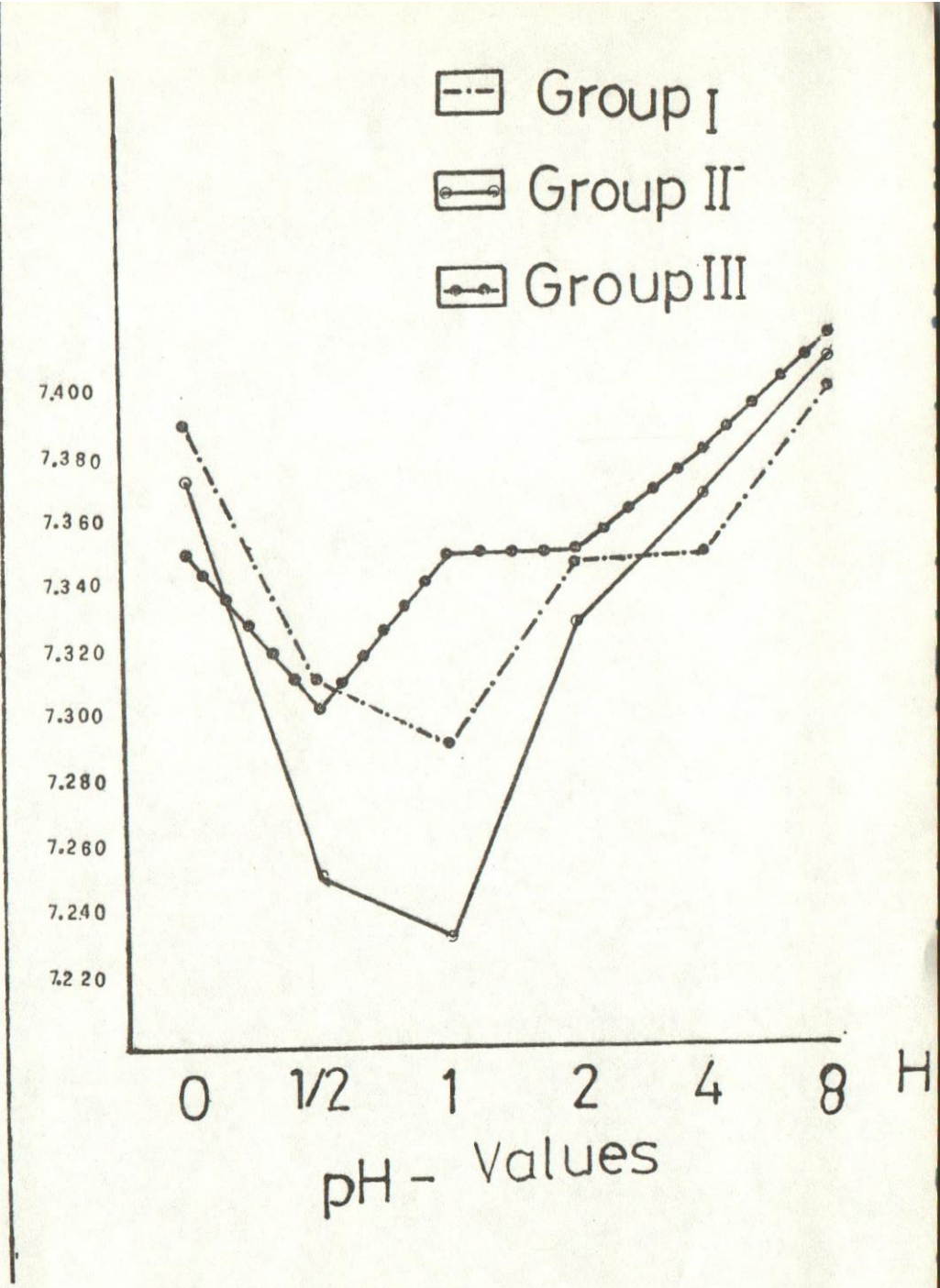
Time	pH	Pco mm. Hg	Po mm. Hg	Hco mmol/L	Tco mmol/L	B.E. mmol/L
Before	7.379	40.53	26.5	23.91	25.1	- 0.5
After						
1/2 h.	7.258	55.2	38.9	24.36	26.06	- 3.5
1 h.	7.297	50.13	35.6	24.46	25.9	- 3.5
2 h.	7.327	44.23	29.2	23.16	24.56	- 2.1
4 h.	7.353	40.16	32.73	23.76	25.30	- 1.5
8 h.	7.385	40.55	30.41	24.30	26.00	+ 1.5

Table (4)
Group III, Mean values of Blood gases and Acid-base balance under the effect of chloral hydrate and thiopental sodium

Time	pH	Pco mm. Hg	Po mm. Hg	Hco mmol/L	Tco mmol/L	B.E. mmol/L
Before	7.354	46.9	31.95	26.20	27.47	1.2
After						
1/2 h.	7.305	52.1	49.8	26.15	27.8	- 0.8
1 h.	7.356	50.5	41.85	28.25	29.8	2.5
2 h.	7.351	45.8	38.7	27.63	29.1	3.1
4 h.	7.381	46.8	37.1	26.5	28.0	1.3
8 h.	7.398	46.9	38.2	26.7	28.2	1.5


P_{CO_2}
mmol/l
70
65
60
55
50
45
40
35
30
0
1/2
1
2
4
8


Base Excess
mmol/l
3
2
1
0
1/2
1
2
4
8
-1
-2
-3
-4
-5


Group I
Group II
Group III
7.400
7.380
7.360
7.340
7.320
7.300
7.280
7.260
7.240
7.220
0
1/2
1
2
4
8
H
pH - Values