Computer program aided clinical laboratory prognosis and statistical analysis of semen samples from different animal species

Nabila,M. Abdel-Aliem
Forensic Medicine and Toxicology Fac. of Veterinary Medicine
Zagazig Univ. Banha Branch

Abstract

The aim of this work is the performance of program that can be used for evaluation of laboratory semen .This help in the selections of the best male ;or in studying the effect of toxins on male reproductive system and in the evaluation of imported or frozen semen samples. The purpose of this study is the development of computer program. This program would give prognosis for semen quality through statistical analysis of laboratory data from examined semen samples of different species (rabbit –bull –stallion – ram camel and rat). The program outlined by using DBASIV languge.The program started from dot prompt by statement "DO A1" then press Enter. Screen will be clear and ask from user to write password "PFSE" and press Enter. Another screen will be clear that contain two items "Semen data" and "Evaluation of data" Choise the item semen data by right or lift arrow key and press Enter will appear five selections (Enter data, Correct data, Cancel data, Exit to dot prompt and Exit to DOS) .Selection of any of the above items give the ability to enter data of semen sample; correct such data; delete any data and finally out from program either to dot prompt or to "DOS." Selection of "Evaluation of data " and click Enter will be clear six items (Rabbit; Bull, Ram, Stallion, Camel, Rat). To obtain report that evaluates certain data click on the evaluation of data then choice the name of species from the popup menu by using up/down arrow key. Another screen will be clear that ask about the species. User write the animal species and click Enter so a report contains number of records; prognosis and statistical analysis will be obtain. To judge the quality of such program practically an experimental study was performed. Twenty male mature rats were divided into four groups(each of five) the first second and third groups administered orally (1/5,1/10, and 1/20 LD50) of bentazone herbicide twice weeks for 65 consecutive days. Fourth group kept as control The animals were scarified and semen was examined. Data from laboratory semen examination were evaluated by ordinary method and by using our program the same result was obtained. In addition to prognosis of data will be obtained by our program

Introduction

Health data bank is a system for accepting or storing data concerning defined groups of persons and events in such away that the information may be aggregated according to the user needs **(IFIP/WHO1976). Awerbuch and Lustman, (1987)** described a mathematical model for the description of inhibition zones in a diffusion bioassay; where diffusion equation was mildly non linear and was solved numerically with the aid of a computer.Medical screening of sectors of population is now a routine and vital part of health care **(Chudleigh,.1994).** Program on personal computer was performed for assessment of community 's health status **(Williams, et al. 1995).** CD-ROM software was developed by certain company to help physicians diagnose fetal abnormalities **(Suprgeon, 1996).** A research computer system (OMIS) was performed

which could be used in the solutions of complex problems in hematology; pulmonology, cardiology and oncology depend on clinical laboratory parameter (**Genkin and Emanuel, 1995**). Survival of any species depends on the integrity of its reproductive system. Under normal circumstances germ cells ensure the maintenance of structures and functions in the organism in it's own lifetime and from generation to generation (John, et al 1980). Most reproductive toxicologists seek to determine the effects of chemicals or other factors that alter male reproductive functions. Many chemical adversely affect spermatogenesis and cause testicular atrophy these include pesticides (**Frank,1985**).

Bentazone is a contact herbicide used in groundnuts, peas, phaseolus beans and rice **(Charles, et al 1987)**. **Ugazio, et al (1991)** reported that metabolic transformations render the toxic effects of bentazon more severe. **Neuschi and Kacmar (1993)** mentioned that oral administration of bentazone to rabbits caused CNS depression, rapid onset and high intensity of rigor mortis and loss of appetite. **Saly, et al (1995)** mentioned that bentazone feed to sheep for 84 days caused increase in neutrophils and decrease in lymphocyte percentage were observed while eosinophils, basophils and monocyte remained unchanged. The purpose of study was representing to design a computer program for prognosis of semen through statistical analysis of laboratory data of examined semen samples from different species

Material and methods

Materials:

1-I.B.M.Computer: IBM computer is used for performance of the program.

2-Bentazone herbicide : bentazone herbicide is a contact herbicide with a trade name (Basagran) it's obtained from Smatrade company.

Methods:

A computer program for semen evaluation was written by DBASE IV language depends on ideal semen picture as clear in table(1) according to **(Sbury et al 1978 and Marrow, 1986)**

B-Experimental design Twenty male Albino rats were divided into four groups each of five. First; second; and third groups were given orally by stomach tube 1/5; 1/10 and 1/20 of LD50 of bentazone herbicide respectively **(Charles et al, 1987)** twice a week for 65 consecutive days. Fourth group given distilled water and leave as a control one. Rats were scarified and semen samples were collected from coda epididymies **(Zemjanis, 1970)**. Epididymal contents of each rat were examined for sperm motility; sperm abnormality and sperm count **(Bearden and Fluquary 1980)**.

Statistical analysis was performed by using statistical equations **(Sarhan and Ahmed ,1969)** as follow. Also by our program for semen evaluation performed in this paper.

$$\text{Average} = \frac{\sum x}{n}$$

$$\text{Variance} = \frac{\sum (x-\bar{x})^2}{n}$$

Table (1): Ideal semen picture for different animal species

Semen parameter	Ideal semen picture of different animal species.					
	Rabbit	Bull	Ram	Stallion	Camel	Rat
Ejaculate volume	0.5-1.5ml	2-8ml	0.5-1.5ml	75-100	3ml	-------
PH	7.2-7.8	6.6-6.9	6.6-6.9	7.4	7.8	-------
Mass movement	2-3	2-3	2.5-3	2-3	2-3	----------
Individual motility %	≥70%(good) ≥75%(v.good) >80% excellent	As rabbit	As rabbit	As rabbit	As rabbit	As rabbit
Live sperm %	70% (good) ≥75%(v.good) ≥80%(excellent)	As rabbit	As rabbit	As rabbit	As rabbit	As rabbit
Primary abnormality %	<10	<10	<10%	<10%	<10%	<5
Proximal protoplasmic droplet %	<2%	<2%	<2%	<2%	<2%	---------
Secondary abnormality %	<12%	<10%	<10%	<10%	<10%	<10------ --
Total abnormality %	<20%	<20%	<20%	<20%	<20%	
Sperm cell concentration /ml	150-510x 10^6	1.2X10^9	2X10^9	150x 10^6	1400000-763000	200x10^6

Results

A computer program performed in this study to be a tool of evaluation of laboratory analytical data of semen sample from different animal species

System describtion and manual:

The program written by DATA BASE VI and open by written command "do A1" at the dot prompt and press "Enter" as clear in fig.(1).Fig.(2) will be appear which asking from the user to input the pass word "such pass word is PFSE"and press "Enter".Screen contains two main items " "semen data and evaluation of data" will be appear. Selection of first items "semen data by arrow keys and press "Enter" resulted in clear of "popup menu", which contains five options(Enter data correct data, Cancel data, Exit to dot prompt and Exit to dose)as clear in fig.(3). Select the item "Evaluation of data" by arrow keys and press "Enter" resulted in clear of six items (Rabbit ,Bull, Ram,Stallion, Camel and Rat) as clear in fig.(10).

Input data:

To input data that need to be evaluated select the item " Enter data" and press "Enter"so fig.(4) will be clear contains the massage (to return main menu enter zero); so user will be write a number as (1,2,3 .....etc.) as clear in fig.(5) then click" Enter" .If such number was written before another will clear ; such massage is " This number enter before enter another one ", but if this number is not entered before the "Add Entry" will be appear as in fig.(6). Now user can input data in the empty rectangular area. Such data include Animal species, Ejaculate volume, pH, Mass movement, individual motility, Live sperm , Primary abnormality, Proximal abnormality, Secondary abnormality and Sperm cell concentration. The "ADD ENTRY "screen contain a massage " you want add another data(yes/no)? yes" where if user want to add another data so choice yes and press "Enter" and choice of "No" will result in getting out of such option and returning to Fig. (4).

Correcting data:

The same steps used in input data will be repeated with two exceptions the first is choice of item correct Data and the second is write a number, which entered before as in Fig. (7).

Cancel data:

User need this option "Cancel data" when want to delete data entered before. To make this deletion choice the option cancel data then write the number of record wanted to be deleted then choice yes as shown in (Fig. 8 & 9).

Report about evaluation of data:

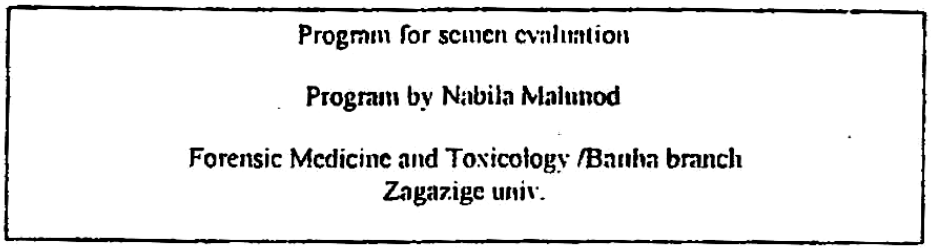
The strategy used to obtain report about semen samples from species is the same. Select the option "Evaluation of data" and press enter, then select the species and press enter as in Fig (10). So screen will appear as from user to write the species user will write the species by capital litter which may be "RABBIT" as in fig (11) then press "Enter". A report for semen evaluation of rabbit will be clear contain number of matching record, prognosis, average and variance as in fig (12).

To judge the quality of such computer program an experimental study was performed. Table (2) showed the effect of different doses of bentazone on semen picture of rats and the control group. Data present in table (2) will be evaluated by ordinary statistical equation as clear in table (3). Also data of table (2) inputted to our program and evaluated as clear in Fig (13). This clarify the number of matching record of each group, prognosis, average and variance of motility, proximal abnormality, secondary abnormality and sperm cell concentration.

```
DO A1
```

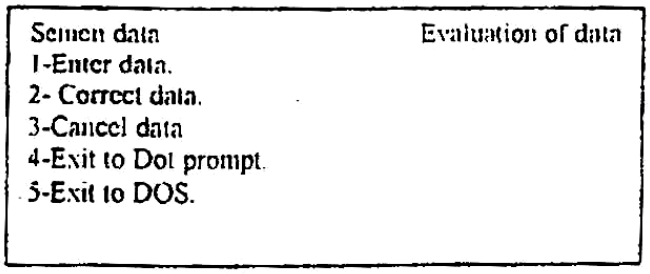
```
Command
```

Fig. (1): Command for starting the program.



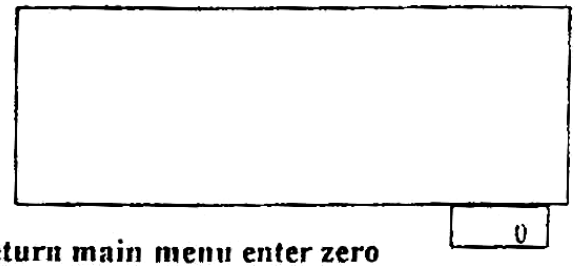
Enter password:

Fig. (2): Screen asks from user to put the password which is "PFSE".



Use up/down arrow keys to high light a choice and press Enter.

Fig. (3):Screen showed six items from which could select any one



To return main menu enter zero

Fig. (4): Ask user to write the record number or write zero to return main menu.

To return main menu enter zero 5

Fig. (5): User enters the record numper.and click Enter.

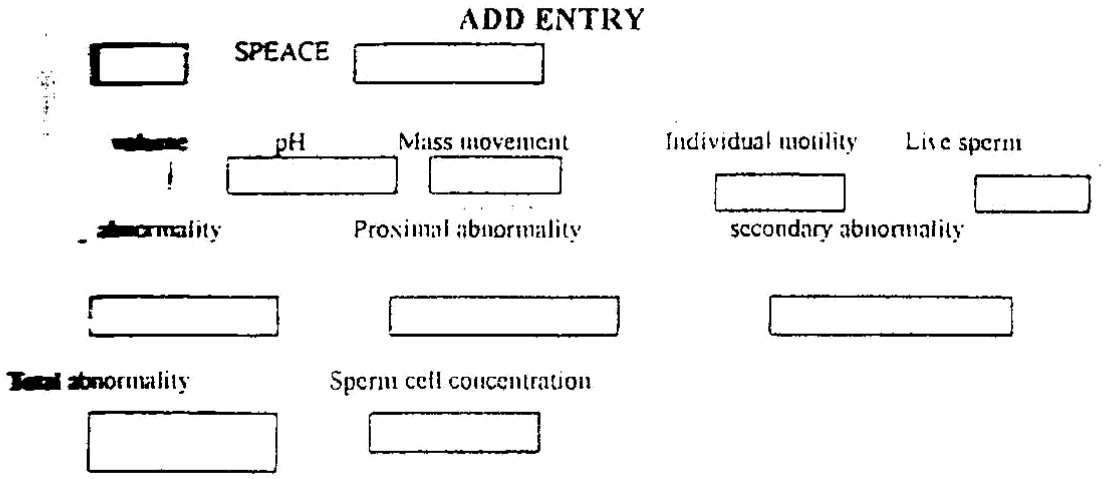


Fig. (6): Screen for input data.

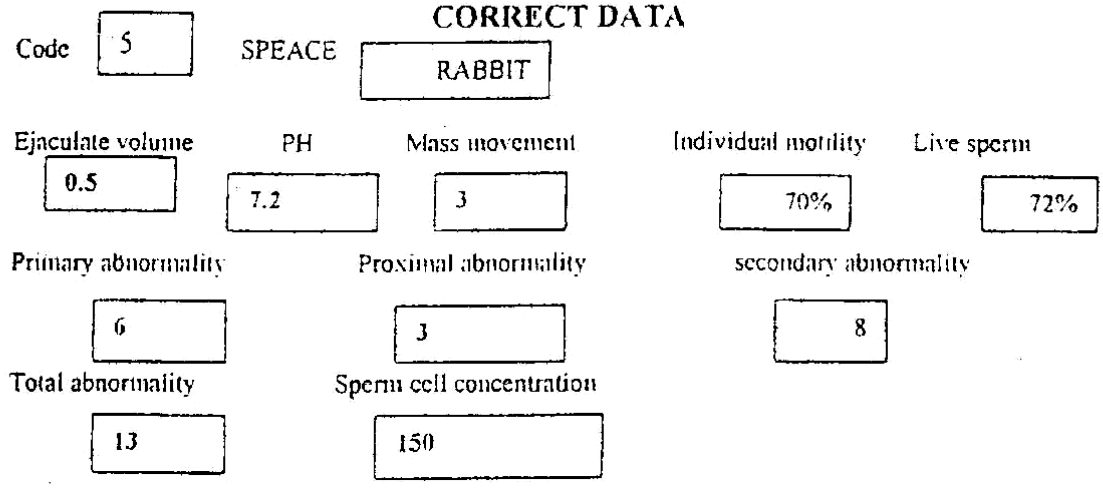


Fig. (7): Screen for correction of data.

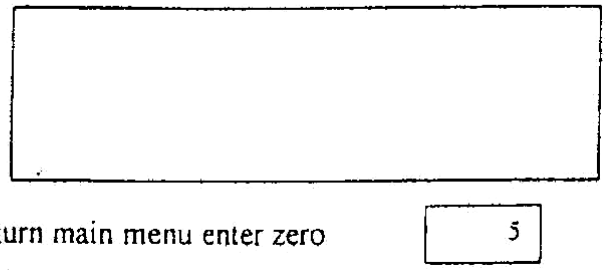


Fig. (8): User enters the record number that will be deleted.and click Enter.

Deletion DATA

Code 5 SPEACE RABBIT

Ejaculate volume	PH	Mass movement	Indevidual motility	Live sp
0.5	7.2	3	70%	

Primary abnormality	Proximal abnormality	secondary abnormality
6	3	8

Total abnormality	Sperm cell concentration
13	150

You want cancel this record (yes/no)? Yes.
Define choice by press spacebar –Then press Enter

Fig. (9): Screen for deletion of data.

Semen data	Evaluation of data
	RABBIT BULL RAM STALLION CAMEL RAT

Use up/ down arrow keys to high light a choice and press Enter.

Fig. (10): To obtain report about semen sample of certain species user select tl species and click Enter.

Please enter spease:

Fig. (11) Ask user to Enter speies name.

Please enter spease: RABBIT

Fig.(12): User writes the species is RABBIT.

Number of matching recored= 4

BAD

Total ejaculate =2.8	Average=0.7	varinnce=0.02
PH=27.5	Average=6.88	variance=0.12
Mass movement=15	Average=3.75	variance=0.69
Individual motility=280	Average=70	variance=37.5
Live sperm=292	Average=73	variance=2.5

Deletion DATA

Code 5 SPEACE RABBIT

Ejaculate volume	PH	Mass movement	Indevidual motility	Live spe
0.5	7.2	3	70%	

Primary abnormality	Proximal abnormality	secondary abnormality
6	3	8

Total abnormality	Sperm cell concentration
13	150

You want cancel this record (yes/no)? Yes.
Define choice by press spacebar –Then press Enter

Fig. (9): Screen for deletion of data.

Semen data	Evaluation of data
	RABBIT
	BULL
	RAM
	STALLION
	CAMEL
	RAT

Use up/ down arrow keys to high light a choice and press Enter.

Fig. (10): To obtain report about semen sample of certain species user select tl species and click Enter.

Please enter spease:

Fig. (11) Ask user to Enter speies name.

Please enter spease: RABBIT

Fig.(12): User writes the species is RABBIT.

Number of matching recored= 4

BAD

Total ejaculate =2.8	Average=0.7	variance=0.02
PH=27.5	Average=6.88	variance=0.12
Mass movement=15	Average=3.75	variance=0.69
Individual motility=280	Average=70	variance=37.5
Live sperm=292	Average=73	variance=2.5

abnormality=26	Average=6.5	variance=1.25
[illegible] abnormality=15	Average=3.75	variance=.69
[illegible] abnormality=29	Average=7.25	variance=3.69
[illegible] abnormality =58	Average =14.5	variance=1.25
[illegible] cell concentrationsx10 ^{6} = 550	Average =137.5	variance =1718.75

Use up/down arrow keys to high light a choice and press Enter .

Fig. (13): Report of semen data of rabbit contains number of matching record prognosis; average and variance.

Table (2): Effect of different doses of bentazone on semen picture of rats

Semen picture	Rat number of control group					Rat number of first group					Rat number of second group					Rat number of third group				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Motility%	65	75	70	75	70	65	70	60	65	60	45	35	40	30	45	35	35	20	25	30
Live sperm %	85	78	75	73	72	70	75	74	72	70	70	60	65	64	55	35	45	40	46	34
Proximal abnormality %	4	3	4	4	5	4	6	7	5	8	3	4	5	8	7	9	7	8	7	5
Distal abnormality %	7	3	5	4	6	10	8	2	3	4	13	11	7	8	9	3	11	12	9	13
Sperm cell concentration $x10^6$/ml	250	230	240	220	200	200	180	210	230	210	170	200	130	210	170	100	130	120	130	100

Proximal abnormality=27	Average=5.4	Varience=3.44
Secondary abnormality=48	Average=9.6	Varience=4.64
Sperm cell concentration=8800	Average=176	Varience=784

N.B.: Sperm cell concentration ($x10^6$ ml)

Number of matching record =5
Prognosis of this samples is bad

****

Motility% 145	Average=29	Varience=34
Proximal abnormality=36	Average=7.2	Varience=1.76
Secondary abnormality=48	Average=9.6	Varience=12.64
Sperm cell concentration=1480	Average=296	Varience=124

N.B.: Sperm cell concentration ($x10^6$ ml)

DISCUSSION

Program for semen evaluation are computer based systems: which gives ability to input laboratory data of semen samples (ejaculate volume: motility %-pH- mass movement: individual motility; live sperm: primary abnormalities- proximal abnormality secondary abnormality. total abnormality and sperm cell concentration). However the PFSE program gives some facilities in medical field.The main advantages of PFSE program include low costs limited requirements: case of use by persons less experienced with computers and applicability to specific testing .

Specific facilities include easy augmentation of data input data being modified or deleted without any changes in source programs. Another facility is that data can be put in the program at same time and the report being obtained. Later program software guide the user by asking questions and offering assistance (as shown in Fig.3.6.7). Also by appearing aiding messages such as "use up down arrow keys to highlight a choice and press Enter: Do you want add another data: do you want cancel this record: press space bar to choice" then press "Enter species name "etc.

Main objects contained in the program are the following (1) Number of matching record: (2) prognosis (good. very good. excellent or bad): (3) statistical analysis (sum. average and variance). All the above will be obtained by input laboratory seminal data of certain animal species then choosing of "Evaluation of data " then pressing enter then selecting the species (rabbit: bull: ram: stallion: camel or rat) then pressing Enter. So the report is thus obtained.

Data of semen samples from rats administered different doses of bentazone were evaluated by statistical methods equations as compared with that of the program PFSE. Showed that evaluation proved similar by the two methods. Further more in addition to the report. the computer program for seminal evaluation also gives prognosis about the input data

This research clearfiy the role of bentazone (Basgran) herbicide on male reproductive efficiency The sperm motility , proximal and secondary abnormality and sperm cell concentration were decreased compared to control The effect of bentazone on semen picture of Albino rats is dose dependent These results agree with (Dixon, 1980 and Frank,1985) The latter authers recorded that herbicide is one of chemicals affected male reproductive system This may be attributed to metabolic transformation of bentazone ,which render the toxic effects to be more severe(Ugazig et al, 1991)

References

Awebuch, A.and Lustman, C. (1987): A mathematical model for determining minimal inhibitory concentrations (MICS) via diffusion assays. J.Theor.Biol.21 (2); 219-230

Beardea, H.J.and Fluquary, J. (1980):"Applied animal reproduction" Reston published CO .Jnc.Reston. Virginia p.158-160

Carhan, A.A. and Ahmed, S.M (1969): Design and experimental analysis chapter 2 P 13. 14

Charles, R.; Worthing, B.S.C.; Phil, D. (1987): The pesticide manual world compendium", 8th Edition. P.63

Chadleigh, M.F. (1994): Hazard analysis of a computer based medical diagnostic system compute. Methods-programs. Biomed. 44(1): 45-54

Frank,C.L.U. (1985): Basic toxicology fundamentals. target organs and risk assessment. Chapter (18): Reproductive, cardiac and immune systems.p.249 1st Ed. Press Rowan.

Genkin,A.A.and Emanuel,V.L. (1995): The binary ratio methods: new possibilities n solution of research and differential diagnosis Task.Klin.Lab.Diagn. (5) 41-45

John,D.M.D; Curits,D.K.and Mary,O.A. (1980): Casarett and doull's toxicology The basic science of poisons. Chapter 15" Toxic responses of the reproductive system" Robert L Dixon. Second Ed p.332. 338

IFIP/WHO, (1987): Working groun reports Health data banks. P.6-

Marrow, D.A. (1986): Current therapy in theriogenology (vol.2) Second Ed. W.B. Saunders Company.

Neuschi, J.and Kacmar, P. (1993): Acute oral toxicity of bentazone on herbicide developed in Czechoslovakia in pheasants and rabbits in the clinical symptoms of poisoning.Vet.Med.38, 115-121

Salisbury G.W., Van D demark N.L. and Lodge J.R. (1978): Physiology of reproduction and artificial insemenation of cattel 2nd Ed W. H. Freeman and Company san francisco.

Saly, J.;Kacmar, P.; Neuschi,J.and Jantosovic, J. (1995): The effect of bentazone TP, a herbicide on hematologic indicators in sheep during acute and subchronic poisoning. Vet.Med.40 (2): 49-52.

Suprogeon, D. (1996): Canadian firm's software helps physicians diagnose fetal abnormalities. Can.Med.Assoc.J.1, 154(11): 1733-1734

Ugazio, G;Bosio,A;Burdino.E;Ghigo, L.and Nebbia,C.(1991): Lethality, hexobarbital narcosis and behavior in rats exposed to atrazine ,bentazon or molinate.Res Commun.Chem. Pathol. Pharmacol. 74(3):349-361

Williams,R.L;Flocke,S.A; Zyzanski, S.J.;Mettee,T.M.and Martin, K.B. (1995):A practical tool for community- oriented primary care community diagnosis using a personal computer. Fam.Med.27 (1): 39-43

Yalow, R.;Berson,S.(1971): Introduction and general considerations, In: Odellwd,Doughaday,W.H.(Eds): Principles of competitive protein binding assays. J.B.Lippin Cott Co., philadelphia.p.1-19

Zemjanis,R.(1970): In animal reproduction.2nd ed. The williams and wilkins company, baltimore.rences

الملخص العربي

تصميم برنامج على الحاسب الآلي للتقييم والتحليل الإحصائي لعينات سائل منوي لأنواع مختلفة من الحيوانات سبق فحصها معمليا

نبيلة محمود عبد العليم

قسم الطب الشرعي والسموم كلية الطب البيطري بمشتهر – جامعة الزقازيق فرع بنها

تمت محاولات كثيرة كان الهدف منها هو إدخال الكمبيوتر في مجال الطب وقد اتسمت هذه المحاولات بالعمل الشاق والمضني وأدت إلى نتائج مرضية.أجري هذا البحث بغرض تصميم برنامج يمكن بواسطته تقييم بيانات عينات سائل منوي فحصت معمليا بالإضافة إلى تحليلها إحصائيا لأعطاء المتوسط الحسابي والتباين. تم كتابة البرنامج بلغة" دى بيس ٤". قسمت النتائج إلى أربع مستويات ممتاز-جيد جدا-جيد- رديء عتمادا على تغذية البرنامج بالقراءات المثلى لكل تحليل.فعلى سبيل المثال إذا كانت النسبة المئوية للحركة أكبر من أو تساوى ٧٠%تكون العينة جيدة . إذا كانت اكبر من أو تساوى ٧٥% تعني إن العينة جيدة جدا إذا كانت أكبر من أو تساوى ٨٠% تكون العينة ممتازة وما دون ذلك تكون العينة رديئة.مع الأخذ في الاعتبار بقى نتائج التحليل مثل الكمية ودرجة الحموضة ونسبة الحركة الكلية ونسبة الحركة الفردية ونسبة الحيوانات الحية والتشوهات الأولية والثانوية و نسبة تركيز المني المنوي.يبدأ تشغيل البرنامج من نقطة توجيه الأوامر" IXO A1" والضغط على مفتاح الإدخال. تظهر شاشة بها اسم البرنامج والمبرمج ويطلب من المستخدم إدخال كلمة السر بالحروف الكبيرة"PFSE" والضغط على مفتاح الإدخال تظهر شاشة بها الاختيارين "بيانات السائل المنوي" و "تقييم البيانات" يمكن اختيار أحدهم باستخدام مفاتيح السهم اليسار واليمين والضغط على مفتاح الإدخال . عند اختيار "بيانات السائل المنوي " تظهر قائمة بها خمسة اختيارات وهي " إدخال بيانات " تعديل بيانات " حذف بيانات" " الخروج إلى نظام التشغيل دوس" "الخروج إلى نقطة توجيه الأوامر" . يمكن استخدام أحد هذه الاختيارات باستخدام مفاتيح السهم المتجة لأعلى ولأسفل والضغط على مفتاح الإدخال. عند اختيار " إدخال البيانات" تظهر شاشة تطلب إدخال رقم السجل والشرط الوحيد ألا يكون سبق إدخاله ثم الضغط على مفتاح الإدخال لتنتقل إلى شاشة تسمح بكتابة بيانات العينة رقم واحد مثلا منضمنا كتابة نوع الحيوان . يمكن إدخال بيانات لأنواع مختلفة من الحيوانات دون الخوف حدوث خطأ. يمكن عن طريق إختيار " تعديل البيانات" أو" حذف البيانات" إجراء تعديل أو حذف سجل أو أكثر. للحصول على تقرير خاص ببيانات سبق إدخالها يتم تحديد الأختيار "تقييم البيانات" ثم الضغط على مفتاح الإدخال .تظهر قائمة منسدلة بها أنواع الحيوانات وهي(الأرنب- الثور- الخروف- الحصان الجمل-الفأر) .يتم تحديد نوع الحيوان ثم الضغط على مفتاح الإدخال.تظهر شاشة بطلب البرنامج من المستخدم إدخال نوع الحيوان مثل "الأرنب" ثم الضغط على مفتاح الإدخال. يظهر على الشاشة تقرير يحتوى على عدد السجلات تقييم لتلك البيانات (جيد- جيد جدا- ممتاز أو رديء) ثم المتوسط الحسابى والتباين لكل قراءات خاصة بتحليل معين يلاحظ أنه عند طلب تقرير لنوع من الحيوانات لم يتم إدخال بياناته تظهر جملة لا توجد بيانات خاصة بهذا النوع . ولتأكد من كفاءة هذا البرنامج تم تقييم بيانات لسائل منوي أخذ من فئران حقنت بجرعات من مبيد الحشائش البنتازون .تم الحصول على نتائج متماثلة مع تلك المأخوذة عند استخدام المعادلات الإحصائية الخاصة بالمتوسط الحسابى والتباين.يمكن الاستفادة من هذا البرنامج في حالات اختيار أفضل الطلائق أو حالات دراسة التأثير السام لبعض المواد على الكفاءة التناسلية لذكور هذه الحيوانات .كما يمكن إستخدامة في تقييم عينات السائل المنوي المستوردة أو المجمدة.