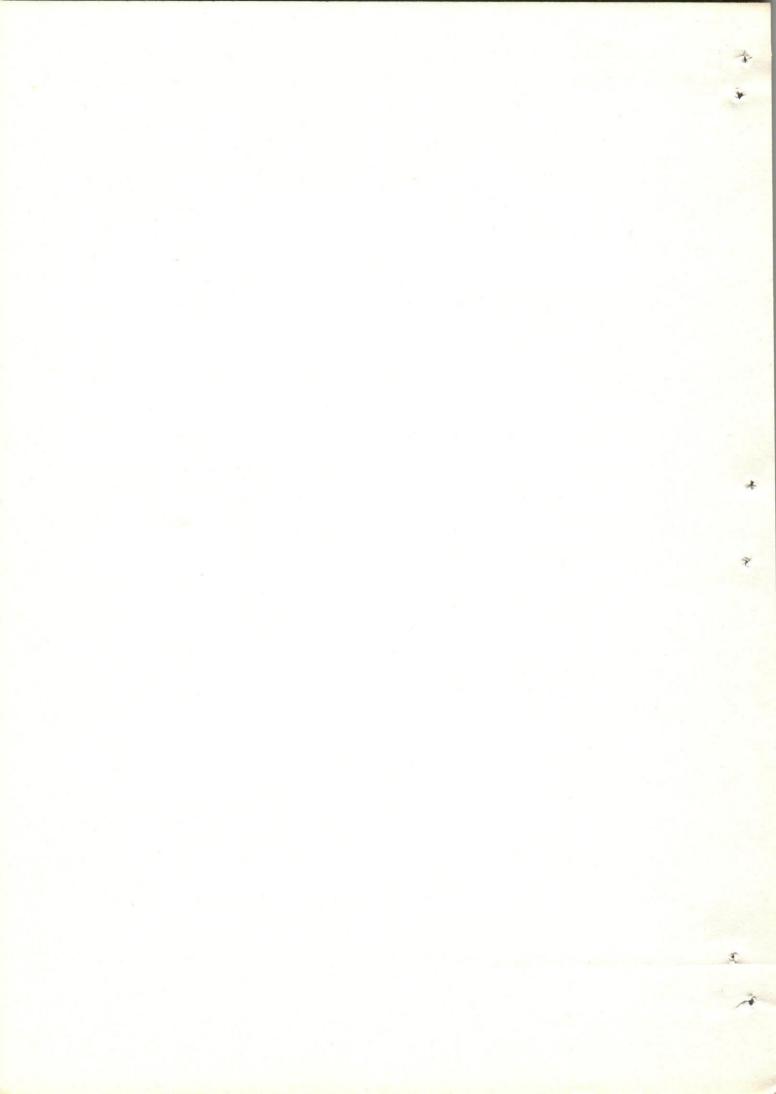
قسم: طب الحيوان وأمراض الد واجنن . كلية: الطب البيطرى - جامعة أسيوط. رئيس القسم: أد . ابراهيم سيكر .

مشاهدات على المنحنى التعادلي للجلوكوز ومستوى الجلوكوز في دم الحمير المعداة تجريبيا بملاريا الخيسول

شروت نافع ، محمد سمير ، أحمد عامر ، طه العسلاوي

لقد سجل الجلوكوز انخفاضا ملحوظا اثناء عد وى الحمسير تجريبيا بطفيل الملاريا . وقد لوحظ أن قيمة جلوكوز الدم بلغت أقصى انخفاض لها بعد العد وى بأربعة الى خمسة أسابيع حيث بلغت . ه مجم/دل و ١٩٠٩/دل علسسى التوالي في الحيوانات المحصنة بمادة الـ ( B. C. G. ) . (B. c. G. الطفيل وطهور الطفيل بتركيز عالى في الدم في هذه المجموعة أيضا . بينما كانت بتركيز عالى في الدم في هذه المجموعة أيضا . بينما كانت القيمة ٢٩٦٦ مجم/دل ، ٨٣٥ مجم/دل في الحيوانات المعالجة بمادة الايميزول والمزالة الطحال منها علسسى التوالي .

أما المنحنى التعادلي للجلوكوز فلم يتأثر تأثيرا معنويـا خلال التجارب الأربعـة .



Dept. of Medicine & Poultry Diseases, Faculty of Vet. Med., Assiut Univ. Head of Dept. Prof. Dr. I.H. Sokkar.

# OBSERVATIONS ON GLUCOSE TOLERANCE TEST AND BLOOD GLUCOSE LEVELS IN DONKEYS EXPERIMENTALLY INFECTED WITH BABESIA equi

(With 4 Tables and 8 Figures)

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## SUMMARY

Hypoglycaemia was recorded in an experimental study on equine piroplasmosis caused by <u>Babesia</u> <u>equi</u>. A significant dropping in blood glucose level was observed post-infection allover the experimental period. The main glucose level at the 4th and 5th weeks post-injection in BCG vaccinated animals were 50.0 & 60.9 mg./dl, 33.3 mg/dl for BCG vaccinated splenectomized animals and 69.6, 53.8 mg./dl for Imizol treated and Imizol splenectomized groups respectively higher consumption of glucose was obsderved post-splenectomy that may be related to high parasitaemia. However the blood glucose tolerance test was not apparently altared.

### INTRODUCTION

Babesiases have a wide range of disease manifestations partly due to variability of the virulence and partly to other characteristics of strains within each species.

Blood serum glucose level was one of the most important parameters attracted the attention especially in relation to babesial infections. Under anaerobic conditions both infected erythrocytes and free-parasites metabolized glucose at a rate of 129% of that under aerobic conditions "RICKARD (1969), (1970 a) and BRYANT, et al. (1964) ". In another study on Trypanosoma evensi, as a protozoal disease, MALLICK and DWIVEDI (1981) noticed a marked hypoglycaemia in 3 out of 12 infected calves.

The blood glucose level in these animals ranged from 10 - 25 mg.%. The available literature lacks much about the extent of in vivo glucose metabolism under babesial infection. The present study so deals with the blood glucose level and the intravenous blood glucose tolerance (I.V.G.T.T) in an experimental work on equine piroplasmosis (Babesi equi).

# MATERIALS and METHODS

Study was carried out on 15 donkeys of the same age and wieght. Animals were classified into three groups. The 1st. and 2nd. were consisted of 6 animals for each and were used for carrying out the experimental infection while the third group (control one) was consisted of 3 donkeys. The 1st. group was injected with BCG at dose rate 0.3 ml./intradermally and then injected with 98% infected blood. Four weeks after BCG injections 3 animals were splenectomized. The 2nd. group was infected with 98% infected blood then treated with Imizol at a dose rate 2 mg./Kg. B.wt. Two doses with 72 hr. interval were injected I/M. Thereafter 3 out of this group were splenectomized 4 weeks post-treatment. Blood glucose level and

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intravenous glucose tolerance test (I.V.G.T.T.) were estimated in all instances. Glucose tolerance test was applied by injection of 0.5 gm. glucose/kg. B.wt. using a sterile 50% glucose solution and adjusting the rate of flow to require 5 minutes for its administration. Blood samples were taken before injection and 5, 60 and 120 minutes post-injection from which the serum was obtained for colorimetrical estimation of glucose level "BAUER, et al.; (1974) ". The method applied depended on the principale that glucose is converted to gluconic acid in the presence of glucose oxidase (GOD). Hydrogen peroxide formed reacts with the reduced chromogen in the presence of peroxidase. The intensity of the colour produced is proportional to the amount of glucose present in the solution. "The results were experessed in mg./dl.

Statistical analysis was carried out on collected data using the method of SNEDECORE (1956).

### RESULTS

Statistical analysis of the results (Tables 1, 2, 3 and 4) revealed that glucose tolerance test proved normal curves along the experimental period either in BCG, BCG-splenectomized or Imizol and Imizol-splenectomized donkeys (Fig. 1-8). However a hypoglycaemic conditions were evidently present at a late stages of BCG injected animals 4 and 5 weeks post-infection. In BCG splenectomized animals there were also a high consumption of glucose 10 days post splenectomy. (Tables 1,2,3, & 4).

### DISCUSSION

Hypoglycaemia has been ascribed to be an important condition of the host by the presence of the parasites " RICKARD (1969) ". In present study it was noticed that glucose tolerance curves were run in a normal manner (Fig. 1 - 8 ) indicated that the endocrine function of pancrease was not affected. The obtained results were inagreement with that reported by HASSAN (1980) in cattle and buffalo. The author stated that the I.V.G.T.T. was affected in case of pancreatic dysfunction. However hypoglycaemia was observed at the late stages of BCG injected animals 4 and 5 weeks post-infection (50.0 and 60.9 mg./dl respectively). In BCG splenectomized animals there was also a higher consumption of glucose 10 days post splenectomy(33.3 mg./dl blood). It is important to indicate that the glucose consumption ran normally on Imizol treated and Imizol splenectomized animals where it ranged from 69.6 to 141.7 and from 53.8 to 111.8 mg./dl respectively. These results corresponded to those previously obtained by RICKARD (1969, 1970 a & 1970 b). The author found in a study on Babesia rodhaini in rats that the utilization of glucose was increased rapidly in proportion to the number of parasitized R.B.Cs. However FOWLER et al.; (1972) in another study on calves, reported a normal glucose values allover the post-infection period. In Egypt EL-ALLAWY (1973) however in a study on blood glucose level in Babesia bovis and Babigemina. in buffaloe calves reported a significant decrease in blood glucose level. In another study on blood glucose level in clinical cases of bovine Surra (caused by Trypanosoma evansi) MALLICK and DWIVEDI (1981) reported hypoglycaemia in 3 animals from 12 recorded cases.

It could be concluded tht acute or chronic infestation with Bequi affected glucose level in infected donkeys leading to a state of hypoglycaemia. The observed hypoglycaemia could not be attributed to pancreatic dysfunction rather than increased consumption of body sugars. The study revealed also that glucose tolerance test ran normally without delaying in return to the normal. Blood glucose level in contrast was rapidly returned to normal and even to the sub-normal state (Hypoglycaemia) in some cases.

### GLUCOSE TOLERANCE IN DONKEYS

### REFERENCES

- Bauer, J.D.; Ackermann, P.G. and Toro, G. (1974): Clinical Laboratory Methodes. 8th. ed. By The C.V. Mosby Com. Saint-louis.
- Bryant, C. Voller, A. and Smith, M.J.H. (1964): The incorporation of radioactivity from (C14) glucose into the soluble metabolic intermediates of malaria parasites. Am. J. Trop. Med. Hyg. 18, 515-519.
- El-Allawy, T. (1973): Some studies on Bovine piroplasmosis in Assiut Ph.D. Thesis, Fac. of Vet. Med., Assiut Univ., Egypt.
- Fowler, J.L.; Ruff, M.D.; Fernau, R.C. and Ferguson, D.E. (1972): Biochemical parameters of Dogs infected with Babesia gibsoni. Cornell, Vet. J. 62, pp. 412 425.
- Hassan, M.S. (1980): Some studies on pancreatic function in cattle and buffaloe in Assiut. Thesis, Fac. of Vet. Med. Assiut. Univ., Egypt.
- Mallick, K.P. and Dwivedi, S.K. (1981): A note on Blood Glucose Level in Clinical Cases of Bovine Surra. Indian Vet. J. (58). 162-163.
- Rickard, M.D. (1969): Carbohydrate Metabolism in Babesia rodhaini: Differences in the Metabolism of Normal and infected Rat Erythrocytes. Exp. Parasit., 25, 16 31.
- Rickard, M.D. (1970 a): Babesia rodhaini: Carbohydrate Metabolism and Infectivity for Rats of Cells freed from host-Erythrocytes. Exp. Parasit. 27, 136 142.
- Rickard, M.D. (1970 b): Carbohydrate Metabolism in Babesia rodhaini Infection with C14 -Lablled Substrate and Enzyme Assays. Exp. Parasit. 261, 512 520.
- Snedecore, G.M. (1956): Statistical methods 4th. Ed. The lowa state College press Ames. lowa.

Table (1): Glucose Tolerance Values Bebore and After BCG Injection (mg/DI):

| Period                           | Time | Before<br>BCG |       | Days p | ost BCG | inject | ion    |
|----------------------------------|------|---------------|-------|--------|---------|--------|--------|
| Group                            |      | injection     | 15    | 30     | 45      | 60     | 75     |
| Experimental group (Six animals) | Bef. | 106.7         | 97.4  | 57.8   | 87.5    | 88.3   | 63.1   |
| 3 are representative             | 5    | 380.2         | 282.0 | 333.3  | 300.0   | 261.8  | 195.7  |
|                                  | 60   | 156.2         | 89.7  | 148.9  | 154.0   | 126.5  | 56.5   |
|                                  | 120  | 97.4          | 51.3  | 108.9  | 109.3   | 50.0   | 60.9   |
| Control group                    | Bef. | 92.3          | 76.9  | 73.4   | 112.5   | 70.6   | \$52.2 |
| 3 animal)                        | 5    | 342.0         | 323.1 | 979.9  | 350.0   | 258.8  | 160.9  |
| One representative               | 60   | 147.4         | 92.3  | 146.7  | 175.0   | 11.8   | 69.6   |
|                                  | 120  | 94.7          | 69.2  | 119.9  | 137.5   | 88.2   | 47.8   |

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Table (2): Glucose Tolerance Values Before and After BCG Splenectomy (mg/DL):

| Period  |      | Before      | Da    | ys post | splenect | omy   |
|---|------|-------------|-------|---------|----------|-------|
| Group   | Time | splenectomy | 5     | 10      | 15       | 18    |
| Splenectomized group  | Bef. | 62.5        | 85.3  | 50.6    | 115.4    | 115.4 |
| (3 animals)   | 5    | 337.5       | 225.5 | 255.6   | 384.6    | 480.8 |
| one is representative   | 60   | 150.0       | 110.5 | 116.7   | 103.8    | 180.8 |
| este descripto estre esta sono sono sono con este por con | 120  | 125.0       | 104.0 | 33.3    | 69.2     | 115.4 |
| Control group   | Bef. | 50.6        | 69.2  | 92.3    | 157.7    | 73.4  |
| 3 animals)  | 5    | 211.1       | 196.2 | 380.8   | 480.8    | 279.3 |
| One representative  | 60   | 172.2       | 123.1 | 126.9   | 300.0    | 146.7 |
|   | 120  | 100.0       | 103.8 | 73.1    | 203.8    | 119.9 |

Table (3): Glucose Tolerance Values Before and After Imizol Treatment (mg/DL):

| Period                                     |      | Before    |       | Days  | post i | nfection | 1     | and the same of th |
|--|------|-----------|-------|-------|--------|----------|-------|--|
| Group                                      | Time | infection | 4     | 6     | 12     | 16       | 20    | 24   |
| Experimental group                         | В    | 97.4      | 129.2 | 64.3  | 95.5   | 95.5     | 70.6  | 68.1   |
| Six animala                                | 5    | 282.0     | 354.2 | 274.5 | 309.1  | 309.1    | 264.7 | 214.5  |
| 3 are representative                       | 60   | 89.7      | 158.3 | 201.9 | 157.6  | 157.6    | 123.3 | 101.5  |
| සහ රටක | 120  | 78.5      | 141.7 | 129.4 | 121.2  | 121.2    | 82.4  | 69.6   |
| Control group                              | В    | 76.9      | 100.0 | 76.9  | 86.4   | 70.6     | 76.5  | 52.2   |
| animals)                                   | 5 .  | 323.1     | 250.0 | 323.1 | 263.6  | 258.8    | 270.6 | 160.9  |
| is representative                          | 60   | 92.3      | 150.0 | 92.3  | 145.5  | 111.8    | 94.1  | 96.6   |
|  | 120  | 69.2      | 137.5 | 69.2  | 90.9   | 88.2     | 56.5  | 47.8   |

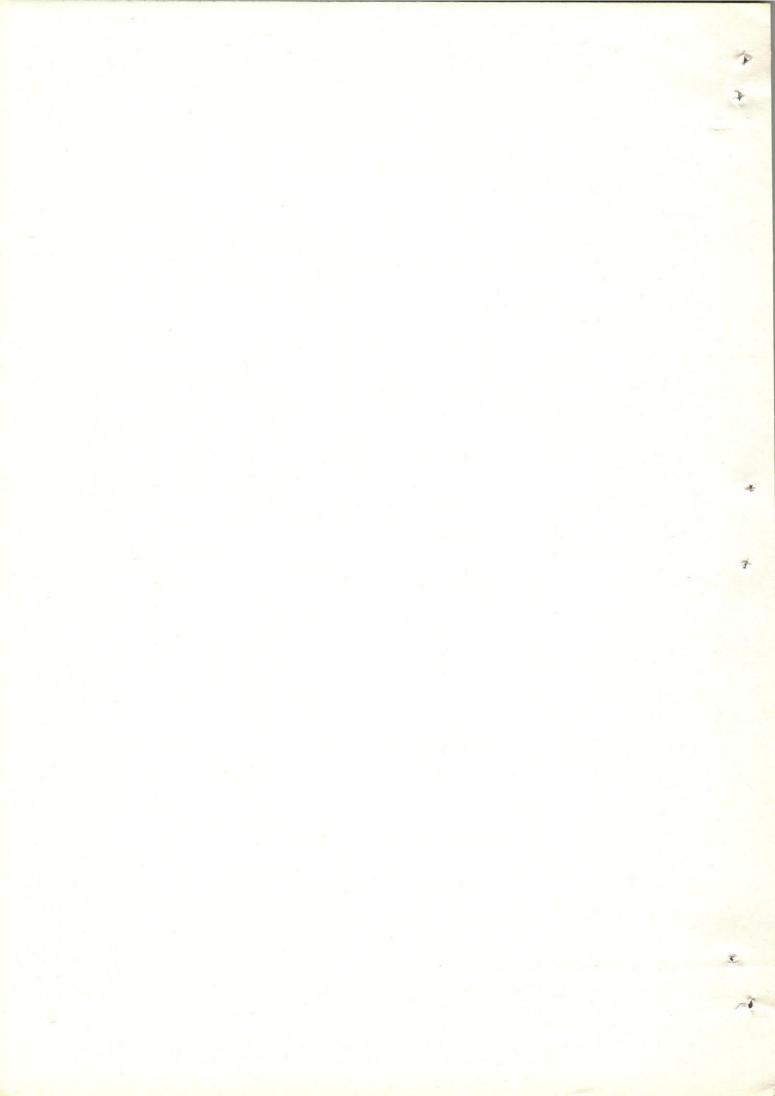
# GLUCOSE TOLERANCE IN DONKEYS

Table (4): Glucose Tolerance Values of Inizol Splenectomized Group (mg/DL):

| Period                |      | Before    |       |       | н               | Days post splenectomy             | t splen    | ec tomy |       |       |       |
|-----------------------|------|-----------|-------|-------|-----------------|-----------------------------------|------------|---------|-------|-------|-------|
| Group                 | Time | infection | 2     | 4     | 8               | 12                                | 16         | 20      | 24    | 28    | 32    |
| Eplenectomized Group  | 80   | 69.6      | 65.3  | 117.6 | 117.6 23.5      | 44.1                              | 50.0       | 53.8    | 57.7  | 15.4  | 22.4  |
| () donkeys)           | U1   | 234.8     | 226.5 | 235.3 | 235.3 152.9     | 129.4                             | 272.2      | 307.7   | 315.4 | 192.3 | 154.1 |
| Cne is representative | 60   | 100.0     | 111.8 | 111.6 | 111.6 76.5      | 82.4                              | 61.1       | 115.5   | 111.5 | 100.0 | 76.1  |
|                       | 120  |           | 105.9 | 111.8 | 111.8 76.5      | 56.8                              | 56.8 100.0 | 96.2    | 53.8  | 0.00t | 70.1  |
| Control group         | ㅂ    | 50.6      | 69.2  | 92.3  | 92.3 157.7 73.4 | 92.3 157.7 73.4 112.5             | 112.5      | 76.5    | 62.5  |       | 69.2  |
| (3 animals)           | UI   | 1.112     | 196.2 | 360.B | 4EC.8           | 360.8 4EC.8 279.3 350.0           |            | 264.7   | 337.5 | 291.5 | 169.2 |
| is representative     | 60   | 172.2     | 123.1 | 126.9 | 300.0           | 126.9 300.0 146.7 175.0           | 175.0      | 129.4   | 150.0 |       | 69.2  |
|                       | 120  | 100.0     | 103.8 | 73.1  | 03.8            | 73.1 .03.8 119.9 137.5 56.8 124.0 | 137.5      | 56.8    | 124.0 |       | 58.8  |

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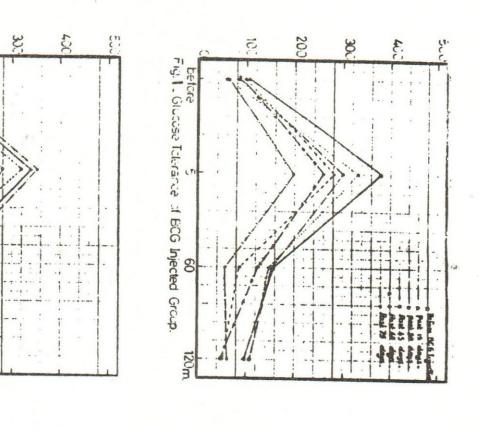
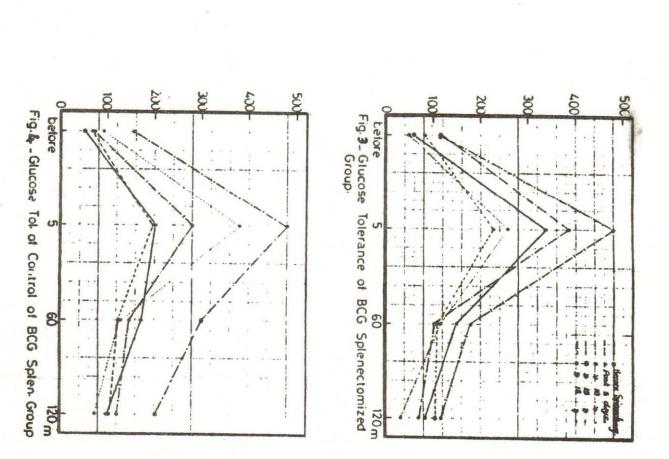
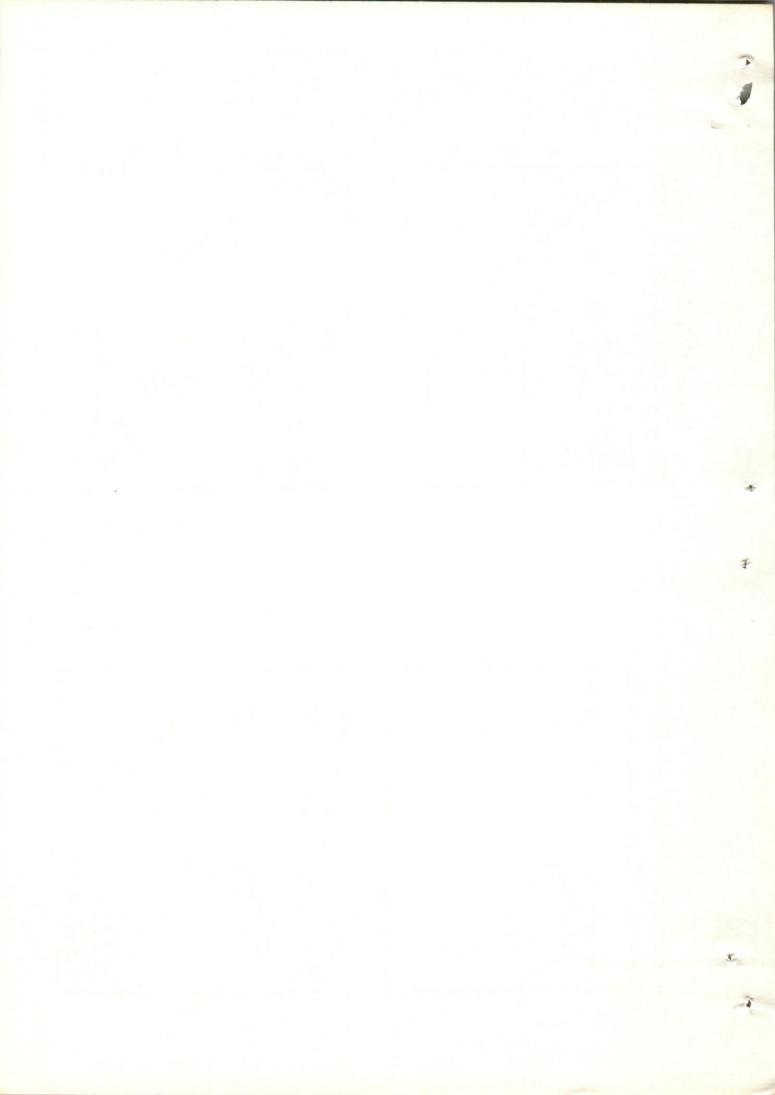
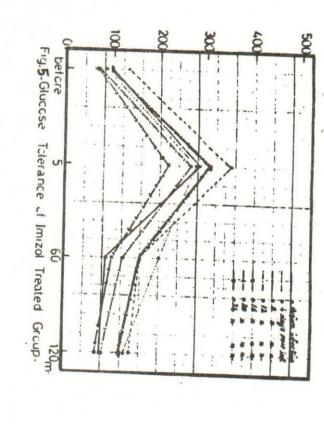


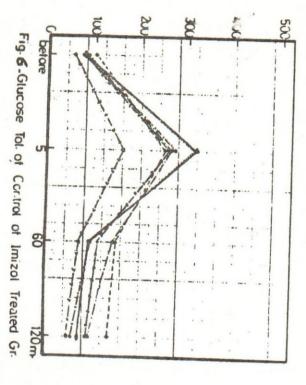
Fig 2-Glucose Tal of Control of BCG Inj. Group

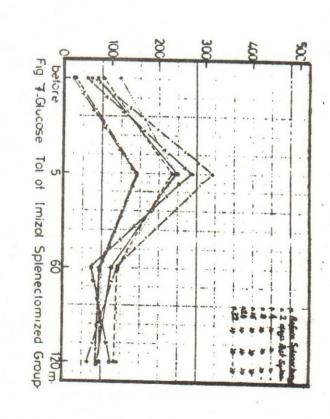
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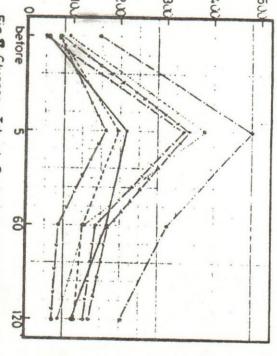


Fig. 8-Glucose Tol. of Control of Imizol Splenect Gr.

