Research Article

Depressive and Anxious Effect after the Injection of Streptozotocin in Wistar Rats

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ABSTRACT

Our problem is to evaluate the behavioral effects following the injection of streptozotocin (STZ) in rats of the Wistar strain. Diabetes was induced by a single intraperitoneal injection of streptozotocin (STZ) at a dose of 60 mg / kg in 4-7days. Our results show an appearance of anxiety disorders 24 hours after the injection of STZ (J02) before the installation of diabetes. An alteration of locomotor and exploratory activities in diabetic rats compared to the cotrol. Weight change in diabetic rats compared to controls and variation of glycemia in diabetic rats compared to controls.

Keywords: Diabetes, behavioral disorders, ponderal evolution, Open Field test.

INTRODUCTION

The induction of experimental diabetes in animals by chemicals that selectively destroy pancreatic β cells is very convenient and their use is simple. The most common substances for inducing diabetes in rats are alloxan and streptozotocin.

STZ is a reference substance for the experimental study of diabetes[1, 2]. This endocrine disorder is characterized by the destruction of β cells Langerhans responsible for insulin deficiency [3].

To investigate the etiology of the disease and because of the Gravitee its many metabolic and neurodegenerative effects in 1974 Portha[4] established diabetes in rats clinically by administration of streptozotocin, a substance that has selective toxicity on â cells of the islets of Langerhans in the endocrine pancreas thereby inducing insulin-dependent diabetes [5].

The intraperitoneal administration of Streptozotocin (SZT) at a rate of 60 mg/Kg of body weight induces an experimental diabetes mellitus in 4-5 days.

Diabetes induces a disorder in the regulation of carbohydrate metabolism to a possibility of screening for psychiatric disorders such as depression, anxiety and behavioral problems [5, 2].

In this context, we have developed a study on the anxiety and depressive behavior observed following the injection of streptozotocin in wistar rats before the installation of diabetes.

- The first objective is to measure the blood glucose and follow the weight change in wistar rats.

- The second objective is to study the neuropsychological behavior of rats following the injection of Streptozotocin, by the Open Field test.

MATERIALS AND METHODS

Animals

The biological material base that we have chosen is the rat *Rattus rattus* of the Wistar strain from Pasteur Institute in Algiers. The rats are nocturnal mammals of the order of rodents. Upon their arrival, the rats weighed an average of 180 grams, and at the time of the experiment, they weighed on average 260 ± 38 grams. The rats were acclimated under standardized conditions of natural photoperiod, an average temperature of 22 ± 4º C and humidity of 50-70%. After an adaptation period of three weeks, we have selected 24 females based on weight which we separated into three experimental groups each include eight .we separated into 3 experimental lots: control group (T) n=8 rats, vehicle control group(C) n = 8 and diabetic group (D) n=8.

Treatment of Animals

Administration of streptozotocin

Streptozotocin (STZ) is a chemical commonly used in animal models for the study of diabetes [6]. Diabetes was induced in rats by intraperitoneal injection of STZ (Sigma Lowis ST, Mo) at a dose of 60 mg / kg body weight [7] dissolved in a 0.1M sodium citrate buffer pH 4.5.

The test of open field (Open Field, OF)

The OF test, first described by Hall in 1934 [8], the device is a Plexiglas platform (70cm x 70cm x 40cm) divided into central and peripheral area. Each rat was placed individually in the center of the floor for 5 minutes and allowed exploration. An animal considered anxiety will tend to prefer the peripheral zone Parameters measured the time spent in the center, time spent in the periphery or the distance traveled and the number of recovery [9].

Determination of glycemia

glycemia (expressed in g / l) from the tail vein.

From each rat to day 4. Caudal punctures were done gently to minimize stress.

Statistical analysis of results

Results are presented as mean ± SEM and shown in histograms. A comparison test was used medium. The test T of Student with the MINITAB program for comparing two averages.

RESULTS

Weight change

During the experiment, the body weight of the rats (expressed in grams) of the three lot (T, VT, D) was taken daily and presented on day 1, 2, 3, 4 and 5 (Figure 1).

After the injection of streptozotocin, the results show a drop in weight of the lot D compared to other lot. The statistical analysis showed a significant difference ($p<0.05$) in these diabetic rats, compared to control rats (T).

Our results showed no significant difference between control group (T) rats and vehicle control group VT (Figure1).

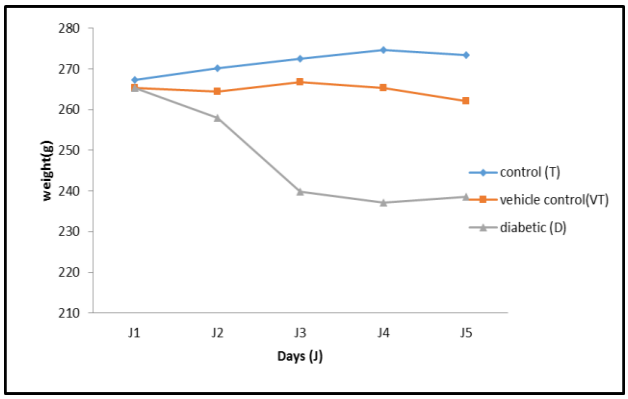

Figure 1: Weight change of rats during the 5 days (after injection of streptozotocin).

Ns: non-significant difference P > 0.05; *P < 0.05; **P < 0.01; ***P < 0.001

Effect on glycemia

Figure 2 shows the glucose concentration in the blood (g / l) of the three groups T, CV and D.Glycemia increased significantly ($p<0.001$) for a period of 4 days in comparison to the control.

STZ causes a very highly significant increase in blood glucose in diabetic rats (D) compared to controls (figure 2).

(T : 0,56± 0,06 vs VT : 0,67± 0,07), (T : 0,56± 0,06 vs D : 2, 90± 0,42).

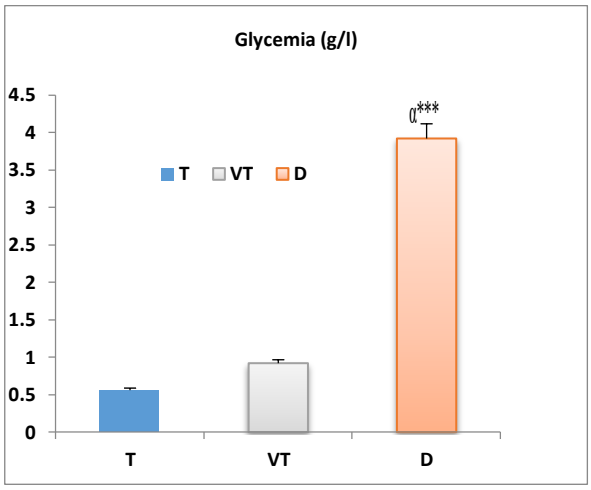

Figure 2: Variation in blood glucose at day 4 in control (T) rats, VT rats and diabetic rats (D).

Ns: non significant difference P > 0.05; *P < 0.05; **P < 0.01; ***P < 0.001

Variation of the open Field Test parameters

The three lots of rats (T), (VT) and (D) are subjected to the open field test on the 2nd and 4th days of the experiment. This test consists in measuring the locomotor activity of the rats.

Distance traveled

Figure 3A shows that the distance traveled by the diabetic rats was significant (P< 0.001) than that traversed by the control.

Diabetic rats showed a highly significant ($p <0.01$) increase in distance traveled (A) on day 4 compared to distance traveled on day 2.

No difference between the control lot and vehicle control lot.

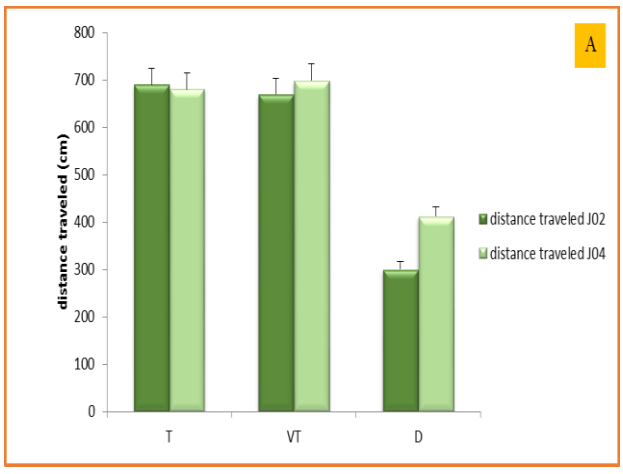

Figure 3 A: Behavior of control, VT rats and diabetic rats in Open Field. The distance traveled (A) 2nd and 4th day.

Ns : non significant difference P > 0.05 ; *P < 0.05 ; **P < 0.01 ; ***P < 0.001

Number of recovery

The results obtained in Figure 3B, on day 02, show a decrease highly significant in the number of recovery between the diabetic rats compared to the control and vehicle control ($p < 0.01$).

There is also a decrease in the 2 lots (diabetic and vehicle control) on day 04 compared to day 02.

The control lot on day 4 shows a significant decrease ($p < 0.05$) of the number of recovery (B) compared with the 2nd day.

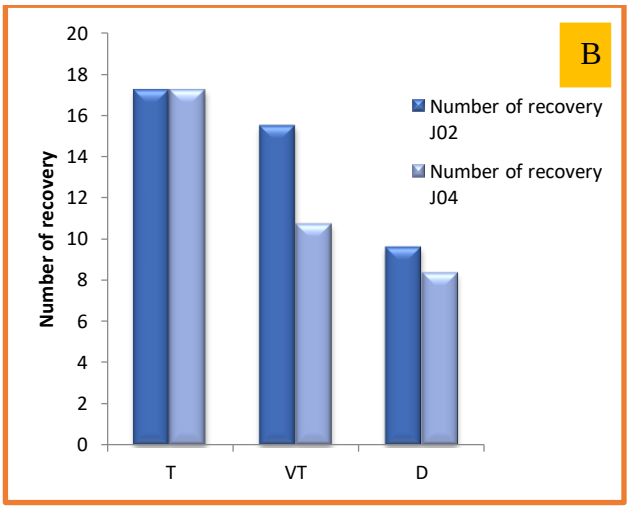

Figure 3 B: Behavior of control, vehicle control and diabetic rats in the Open field. Number of recovery (B), during the two sessions (2nd and 4th day).

DISCUSSION

Our results show a decrease in weight in rats made diabetic by intraperitoneal injection of STZ (60 mg / kg of body weight) compared to control and control rats. The statistical analysis showed a significant difference.

Our results are consistent with those in the literature, which report that STZ-induced diabetes is characterized by severe loss of body weight [7].

In the present study, diabetes was confirmed by the recorded increase of glucose in blood and this was due to the injected streptozotocin which has certainly reducing the mass of β cells of Langerhans islets [10,11,12,13] These complications associated with diabetes status seem to negatively affect the browser behavior and anxious state of diabetic rats at of whose comparison with the control group reported persistent and acute locomotor hypoactivity represented by a decrease in the distance [14].

The OF parameters measured in the current investigation were the locomotor activity, The analysis of these results traduced by the level of anxiety, locomotor function and mental flexibility, showed an increase in number of recovery and distance traveled .

In the present study, all of these behavioral complications noticed at the 2nd day after the injection of the STZ reveal that our animals are stressed before the installation of the diabetes at the 4th day. These results do indeed increase the effect of the injection, which caused a state of anxiety in the animals of lot D compared to controls.

Statistical analysis showed a very highly significant difference between the lot that was injected STZ at day 2.

The results of open field test at day 4 are associated with installation of diabetes, which appears to have a negative impact on the exploratory behavior and anxiety of diabetic rats.

Our results show not only the installation of hyperglycemia but also a deficit of emotional reaction and anxiety [2, 3].

Our results confirm the stress effects of rats after injection of streptozotocin on day 2, before the installation of diabetes on day 4.

CONCLUSION

The injection of Streptozotocin causes the anxiety disorders at day 2 (24 hours after injection) and a significant weight regressions.

These anxiety disorders appear on the 2nd day, before the installation of diabetes.

This stress of the 2 nd day is caused by the injection and not by diabetes.

These neurobehavioral deficits are associated with a high level of glucose in the blood at day 4.

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