

CHAPTER IV

RESULTS

General Observation

The injection of 70 mg/kg.BW. into 130-160 g. Wistar rats resulted in polydipsia, polyuria, polyphagia and stable hyperglycemia within 24-48 hours and remained stable for the duration of the experiment. The body weights (Table 1 and Fig.9) were significantly less in STZ-rats than controls at all three monitored time points (8, 16 and 20 weeks). However, the body weights of STZ-G rats were significantly higher than STZ-rats at all monitored time points. The ratios of heart weight per 100 g.BW. were calculated and shown in Table 2 (Fig.10). At 16 and 20 weeks, the ratios of heart weight per 100 g.BW. were significantly increased in diabetic rats compared to their controls. These ratios suggested that STZ-hearts tended to increase their sizes, known as myocardial hypertrophy. The heart weight in garlic fed groups was nearly normal.

Effects of Garlic on Diabetic Plasma Values

At the end of each experimental period, blood glucose was increased in diabetic groups compared with controls whereas decreased in STZ-G and STZ-T rats. The hypoglycemic activity of garlic extract in this study was 74.22%, 96.23% and 93.27% as compared with tolbutamide at 8, 16 and 20 weeks after STZ-injection, respectively.

Interestingly, effect of garlic on blood glucose was also related to insulin level. As shown in table 4 (Fig.11), serum insulin in STZ-rats were significantly reduced as compared to control groups at all three monitored time points. While serum insulin of STZ-G and STZ-T were significantly increased more than those of STZ-rats for all three monitored time points. However, insulin level in STZ-G and STZ-T rats were not differed. The insulin effect of garlic oil in the study were 37.03%, 42.16% and 62.66% as compared with tolbutamide at 8, 16 and 20 weeks after STZ-injection, respectively.

The results shown in table 5, 6 and 7 indicated that the triglycerides and cholesterol level in STZ-rats were significant higher than controls HDL levels were significantly lower as compared to controls at all three monitored time points. However, garlic oil extract seemed to attenuate these changes.

Effects of Garlic on Diabetic Cardiac Functions

The systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) were shown. In table 8 (Fig.16), table 9 (Fig.17) and table 10 (Fig.18). The results indicated that SBP, DBP and MAP values of STZ-rats were significantly increased more than those of the controls for all three monitor time points. These values of STZ-G rats were significantly lower than those of the STZ-rats for all monitored time points.

The heart rated was significantly slower in STZ-rats than in controls, and in STZ-G rats significantly increased over those of STZ-rats for all three monitored time points (Table 11 and Fig.19).

In table 12 (Fig.20) the aortic flow rate (AFR) values of STZ-rats were significantly less than those of the controls. The AFR values of STZ-G rats were significantly increased over those of STZ-rats for all three monitored time points.

The coronary flow rate (CFR) was shown in table 13 (Fig.21). The CFR values of STZ-rats were significantly less than those of controls for all three monitored time points, and the values STZ-G rats were significantly higher than those of STZ-rats for all three monitored time points.

As shown in table 14 (Fig.22), the left ventricular isotonic contraction (LVIC) values of STZ-rats were significantly decreased over those of controls for all three monitored time points. However, the LVIC values of STZ-G rats were significantly increased more than those of STZ-rats at 16 and 20 weeks.

Effects of Garlic on Diabetic Coronary Vascular Structure

Pathological examinations of small coronary arteries (diameter about 50-70 μm) and coronary arterioles (diameter about 10-20 μm) taken by scanning electron microscope were shown in table 15 (Fig.23) and table 16 (Fig.24), respectively. There

was a significant increase of vascular wall thickness whereas a narrowed vessel lumen and swollen cell surface were observed in the heart of STZ-rats for all three monitored time points. Interestingly, garlic extract could minimized these morphological alterations. The vascular wall thickness of STZ-G group were significantly thinner than those of STZ-rats for all three monitored time points.

The capillary's basement membrane thickness was also shown in table 17 (Fig.25). The results indicated that the capillary's basement membrane of STZ-rats were significantly thicker than controls for all three monitored time points. The increasing of pinocytotic vesicles and gap junction of endothelium including loss of pericyte were also observed in STZ-rats. In STZ-G rats for all three monitored time points.

Effects of Diabetic and Garlic on Proteinuria

As shown in table 18 (Fig.26), the proteinuria values of STZ-rats were significantly increased as compared to the controls for all three monitored time points. However, there were not significantly decreased proteinuria levels in STZ-G rat groups as compared to STZ-rats at all there monitored time points.

Table 1. Means \pm SD of body weight (BW ; g.) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.

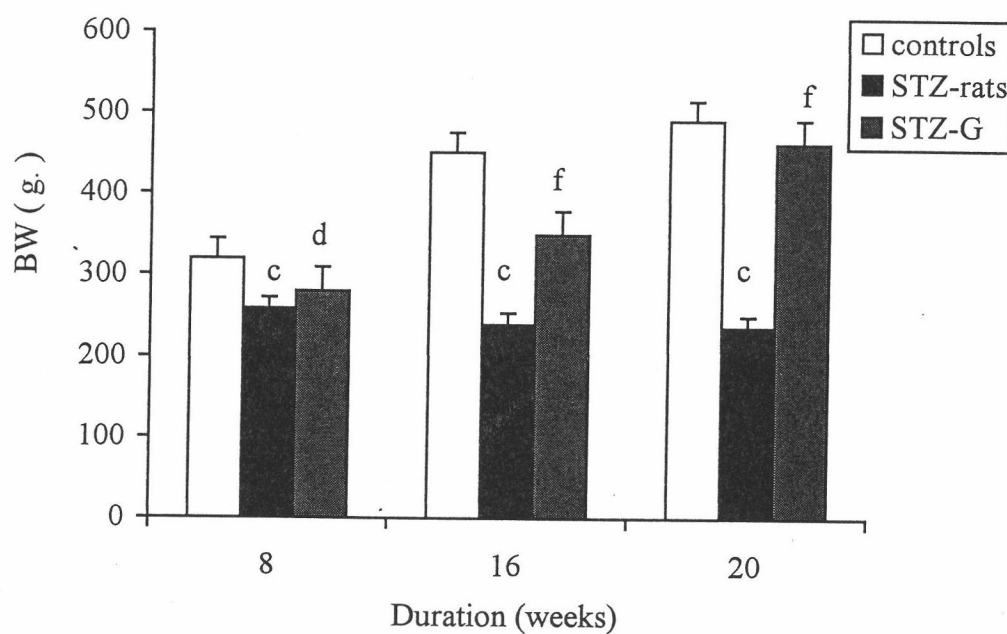
Duration	Body Weight (g.)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	319.30 \pm 16.85	258.94 \pm 9.94 ^c	279.18 \pm 16.45 ^d
16 weeks	450.70 \pm 26.84	239.60 \pm 31.17 ^c	348.60 \pm 33.59 ^f
20 weeks	490.37 \pm 29.28	236.08 \pm 14.85 ^c	461.60 \pm 38.89 ^f

c Statistical difference compared between controls and STZ-rats ($p < 0.005$)

d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)

f Statistical difference compared between STZ-rats and STZ-G ($p < 0.005$)

Fig.9 Means \pm SD of body weight (BW ; g.) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozocin injection.



- c Statistical difference compared between controls and STZ-rats ($p < 0.005$)
d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
f Statistical difference compared between STZ-rats and STZ-G ($p < 0.005$)

Table 2. Means \pm SD of the ratio of heart weight per 100 g.BW. (R ; g/100 g.BW.) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.

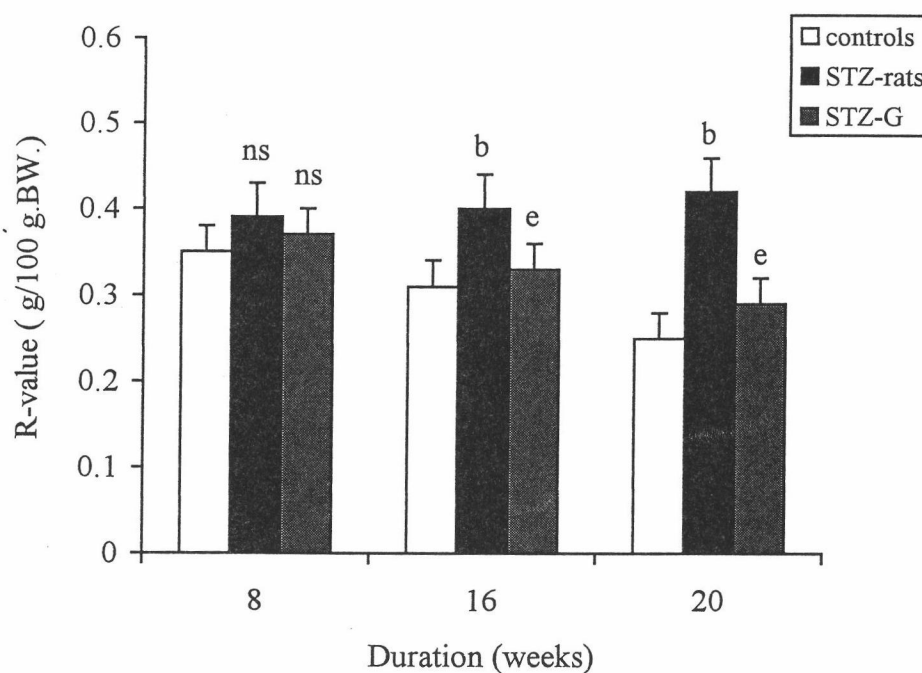
Duration	R-value (g/100 g.BW.)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	0.35 \pm 0.04	0.39 \pm 0.03 ^{ns}	0.37 \pm 0.02 ^{ns}
16 weeks	0.31 \pm 0.04	0.41 \pm 0.07 ^b	0.33 \pm 0.04 ^e
20 weeks	0.25 \pm 0.02	0.42 \pm 0.03 ^b	0.29 \pm 0.04 ^e

ns non significant difference compared between controls or STZ-rats and STZ-G ($p < 0.05$)

b Statistical difference compared between controls and STZ-rats ($p < 0.01$)

e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Fig.10 Means \pm SD of the ratio of heart weight per 100 g.BW.(R ;g/100g.BW.) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.



ns non significant difference compared between controls or STZ-rats and STZ-G ($p < 0.05$)

b Statistical difference compared between controls and STZ-rats ($p < 0.01$)

e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Table 3. Means \pm SD of blood glucose (BG ; mg/dl) of controls, streptozotocin-induced diabetic rats (STZ-rats), STZ-rats treated with garlic extract (STZ-G) and STZ-rats with treated with tolbutamide (STZ-T) following streptozotocin injection.

Duration	Blood Glucose (mg/dl)				Hypoglycemic activity of garlic extract as %compared to tolbutamide
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)	STZ-T (n=6)	
8 weeks	107.80 ± 15.7	448.00 $\pm 27.83^c$	293.00 $\pm 3.90^f$	239.17 $\pm 18.39^{f,g}$	74.22 %
16 weeks	100.87 ± 21.35	447.50 $\pm 16.70^c$	226.00 $\pm 24.98^f$	215.75 $\pm 24.08^{f,ns}$	96.23 %
20 weeks	98.50 ± 12.80	446.67 $\pm 13.87^c$	141.00 $\pm 12.73^f$	117.50 $\pm 18.93^{f,ns}$	93.27 %

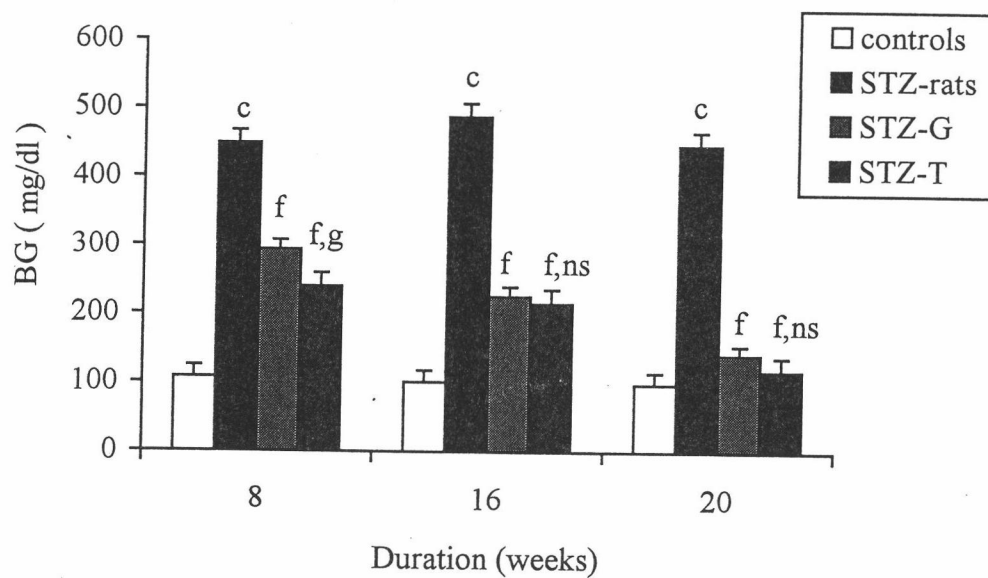
c Statistical difference compared between controls and STZ-rats ($p < 0.005$)

f Statistical difference compared between STZ-rats and STZ-G ($p < 0.005$)

g Statistical difference compared between STZ-G and STZ-T ($p < 0.05$)

ns non significant difference compared between STZ-G and STZ-T ($p < 0.05$)

Fig.11 Means \pm SD of blood glucose (BG ; mg/dl) of controls, streptozotocin-induced diabetic rats (STZ-rats), STZ-rats treated with garlic extract (STZ-G) and STZ-rats with treated with tolbutamide (STZ-T) following streptozotocin injection.



- c Statistical difference compared between controls and STZ-rats ($p < 0.005$)
- f Statistical difference compared between STZ-rats and STZ-G ($p < 0.005$)
- g Statistical difference compared between STZ-G and STZ-T ($p < 0.05$)
- ns non significant difference compared between STZ-G and STZ-T ($p < 0.05$)

Table 4. Means \pm SD of serum insulin ($\mu\text{m/ml}$) of controls, streptozotocin-induced diabetic rats (STZ-rats), STZ-rats treated with garlic extract (STZ-G) and STZ-rats with treated with tolbutamide (STZ-T) following streptozotocin injection.

Duration	Serum Insulin ($\mu\text{m/ml}$)				Insulin effect of garlic effect as % compared to tolbutamide
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)	STZ-T (n=6)	
8 weeks	20.87 ± 4.10	6.33 $\pm 2.01^b$	12.40 $\pm 3.59^d$	22.73 $\pm 9.58^{d, ns}$	37.03 %
16 weeks	28.08 ± 8.80	5.99 $\pm 2.15^b$	12.08 $\pm 4.86^d$	20.42 $\pm 3.47^{e, ns}$	42.16 %
20 weeks	22.37 ± 4.19	6.20 $\pm 2.23^b$	14.20 $\pm 3.90^d$	18.97 $\pm 2.70^{e, ns}$	62.66 %

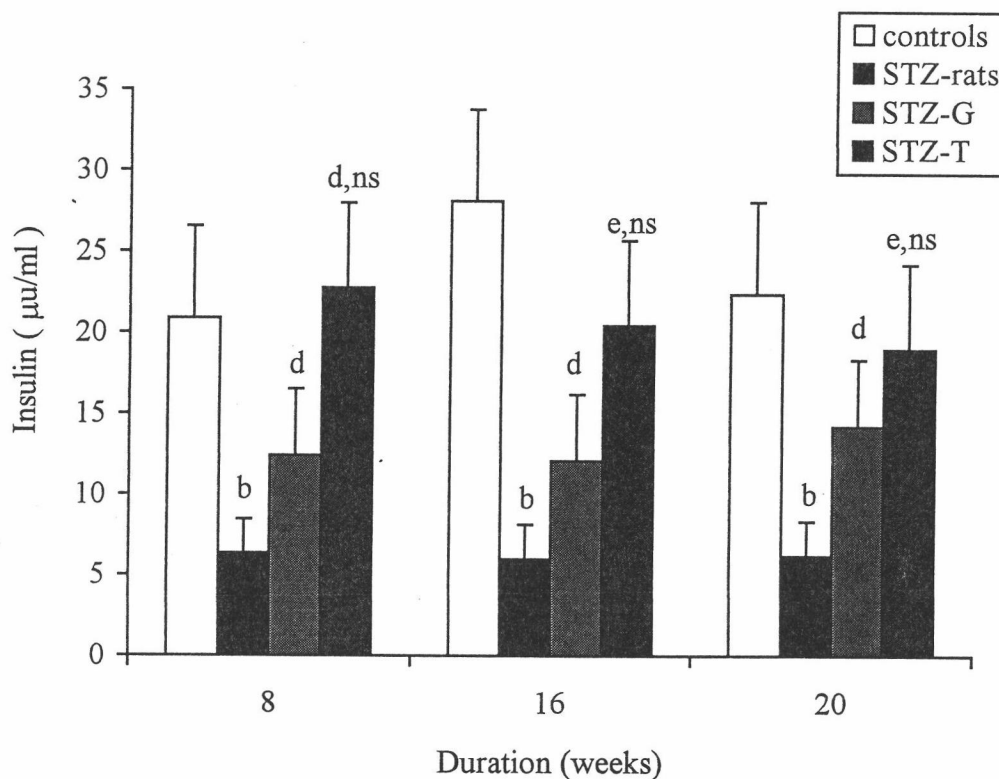
b Statistical difference compared between controls and STZ-rats ($p < 0.01$)

d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)

e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

ns non significant difference compared between STZ-G and STZ-T ($p < 0.05$)

Fig.12 Means \pm SD of serum insulin ($\mu\text{m/ml}$) of controls, streptozotocin-induced diabetic rats (STZ-rats), STZ-rats treated with garlic extract (STZ-G) and STZ-rats with treated with tolbutamide (STZ-T) following streptozotocin injection.



- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)
ns non significant difference compared between STZ-G and STZ-T ($p < 0.05$)

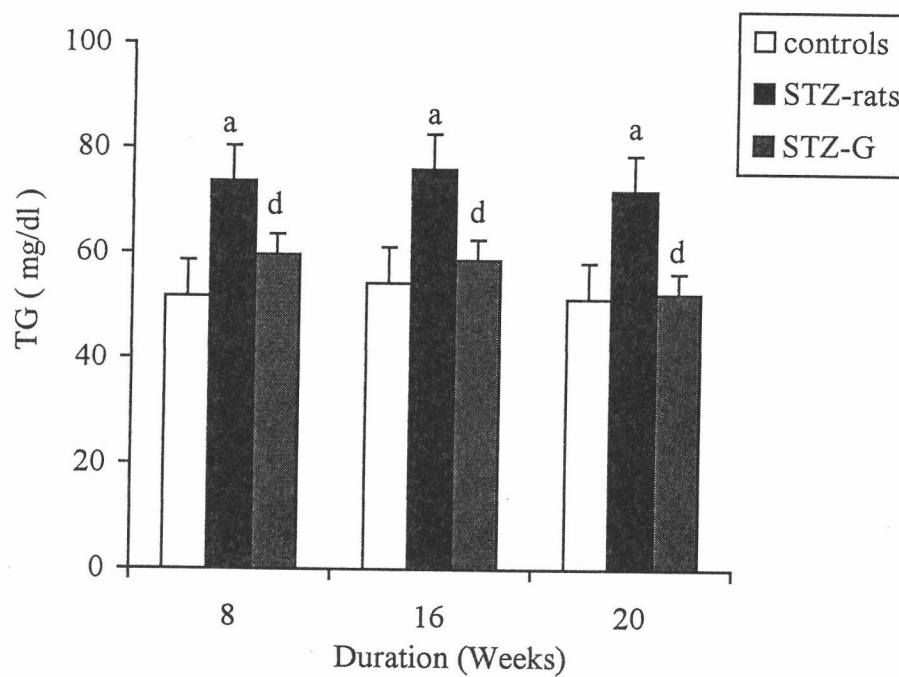
Table 5. Means \pm SD of triglycerides (TG ; mg/dl) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.

Duration	Triglycerides (TG ; mg/dl)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	51.67 \pm 5.69	73.67 \pm 2.08 ^a	59.67 \pm 5.51 ^d
16 weeks	54.25 \pm 5.68	76.00 \pm 9.17 ^a	58.67 \pm 4.51 ^d
20 weeks	51.33 \pm 9.29	72.00 \pm 8.72 ^a	92.33 \pm 1.53 ^d

a Statistical difference compared between controls and STZ-rats ($p < 0.05$)

d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)

Fig. 13 Means \pm SD of triglycerides (TG ; mg/dl) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.



a Statistical difference compared between controls and STZ-rats ($p < 0.05$)

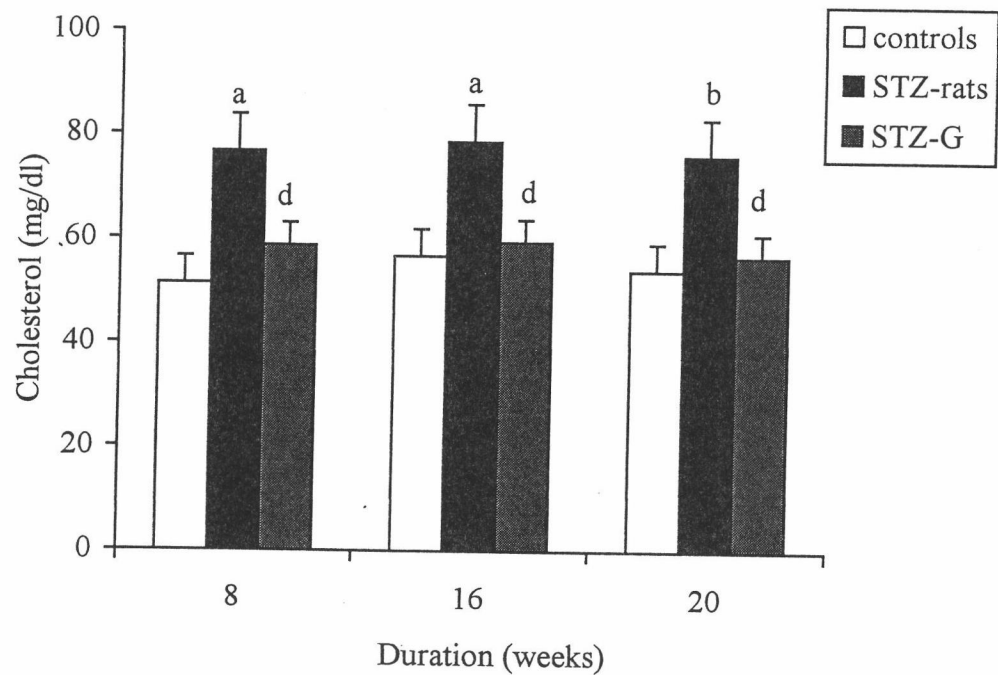
d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)

Table 6. Means \pm SD of cholesterol (mg/dl) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.

Duration	Cholesterol (mg/dl)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	51.33 \pm 5.86	76.67 \pm 7.64 ^a	58.67 \pm 6.35 ^d
16 weeks	56.67 \pm 3.76	78.67 \pm 8.96 ^a	59.33 \pm 6.03 ^d
20 weeks	54.00 \pm 6.08	76.00 \pm 4.58 ^b	56.67 \pm 6.66 ^d

- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)

Fig. 14 Means \pm SD of cholesterol (mg/dl) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.



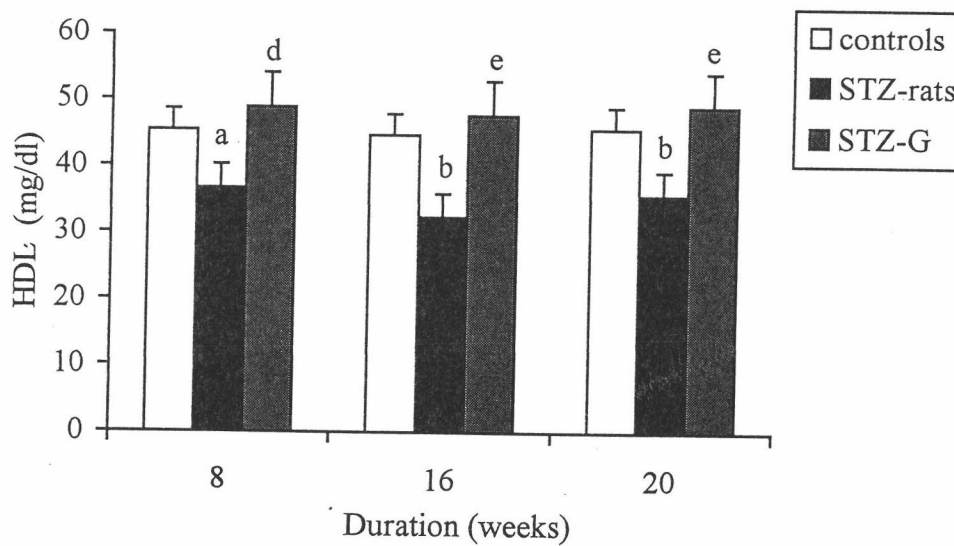
- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
- d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)

Table 7. Means \pm SD of high density lipoprotein (HDL ; mg/dl) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.

Duration	HDL (mg/dl)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	45.33 \pm 3.06	36.67 \pm 2.89 ^a	48.83 \pm 4.86 ^d
16 weeks	44.67 \pm 2.89	32.33 \pm 3.22 ^b	47.67 \pm 4.51 ^e
20 weeks	45.67 \pm 3.51	35.67 \pm 4.62 ^b	49.00 \pm 6.08 ^e

- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
 b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
 d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
 e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Fig. 15 Means \pm SD of high density lipoprotein (HDL ; mg/dl) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.



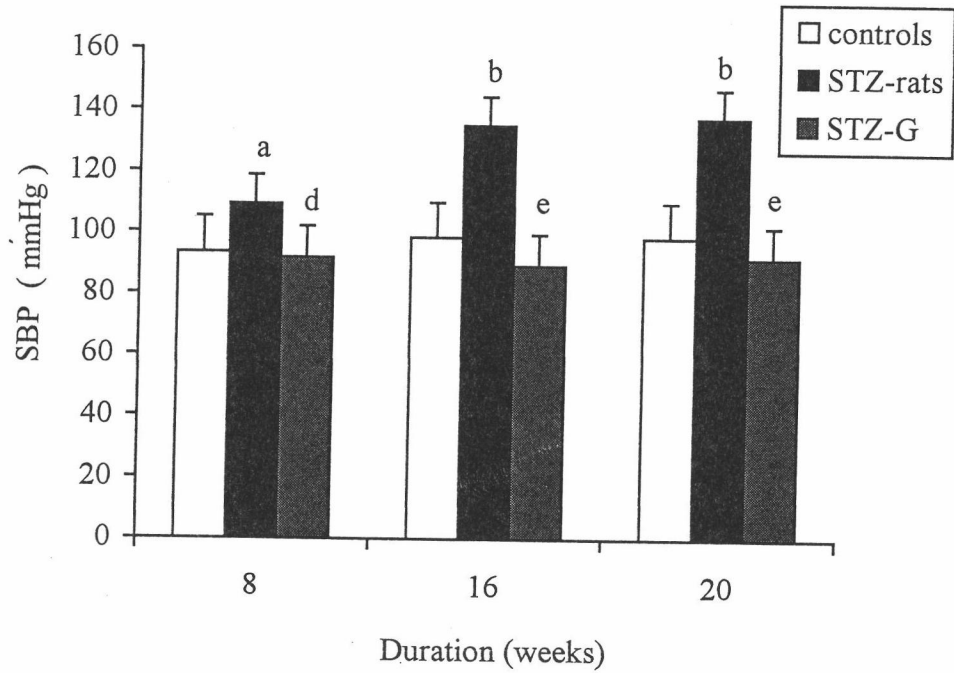
- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
- d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
- e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Table 8. Means \pm SD of systolic blood pressure (SBP ; mmHg) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.

Duration	Systolic Blood Pressure (mmHg)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	93.33 \pm 12.52	109.17 \pm 5.85 ^a	91.67 \pm 10.80 ^e
16 weeks	98.33 \pm 10.33	135.00 \pm 10.00 ^b	89.17 \pm 9.70 ^e
20 weeks	98.33 \pm 12.11	137.50 \pm 12.55 ^b	91.67 \pm 10.33 ^e

- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
 b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
 e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Fig.16 Means \pm SD of systolic blood pressure (SBP ; mmHg) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection



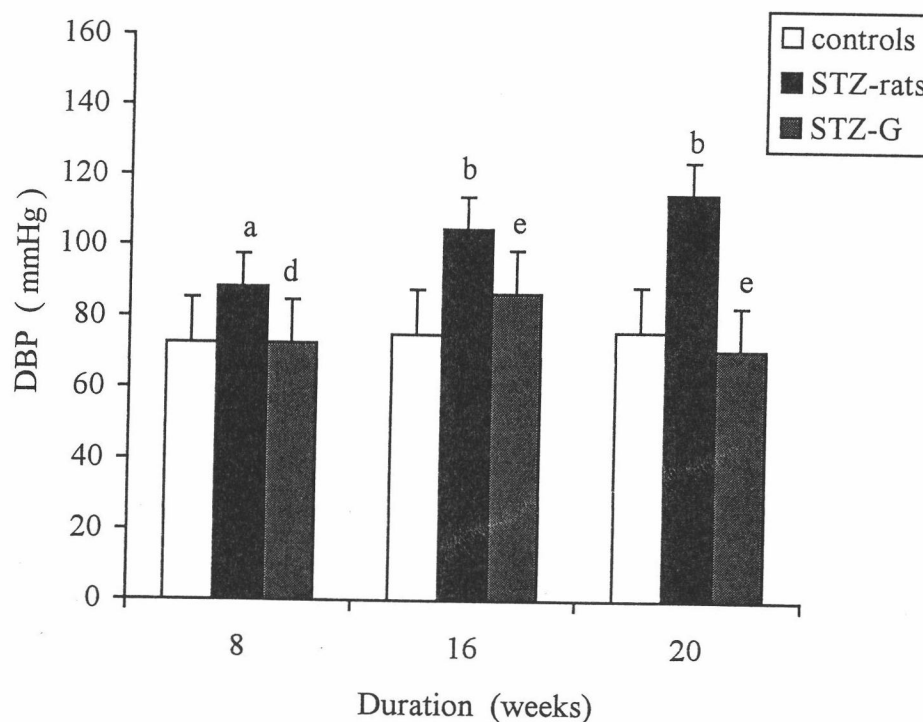
- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
- d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
- e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Table 9. Means \pm SD of diastolic blood pressure (DBP ; mmHg) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.

Duration	Diastolic Blood Pressure (mmHg)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	72.50 \pm 15.73	88.33 \pm 5.16 ^a	72.50 \pm 12.15 ^d
16 weeks	75.00 \pm 13.04	104.83 \pm 8.38 ^b	66.67 \pm 8.76 ^e
20 weeks	75.83 \pm 13.57	115.00 \pm 14.14 ^b	70.83 \pm 8.01 ^e

- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
 b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
 d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
 e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Fig. 17 Means \pm SD of diastolic blood pressure (DBP ; mmHg) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection



- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
- d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
- e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Table 10. Means \pm SD of mean arterial pressure (MAP ; mmHg) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.

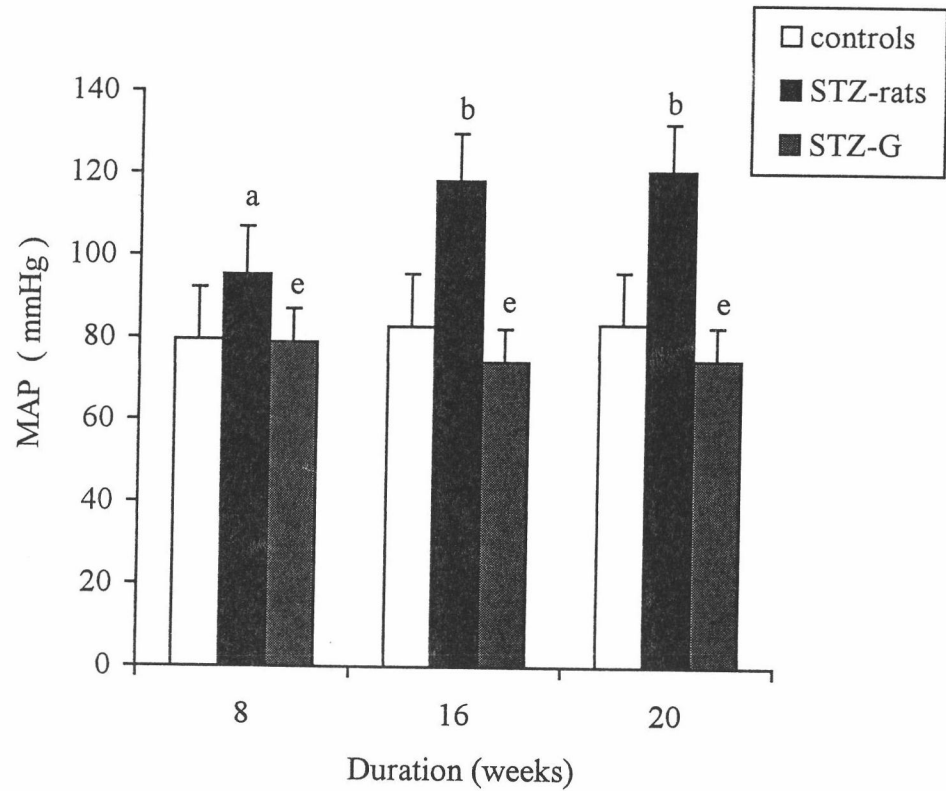
Duration	Mean Arterial Pressure (mmHg)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	79.44 \pm 14.56	95.28 \pm 5.10 ^a	78.89 \pm 11.39 ^e
16 weeks	82.78 \pm 11.39	118.33 \pm 14.53 ^b	74.17 \pm 8.35 ^e
20 weeks	83.33 \pm 12.34	120.83 \pm 14.97 ^b	74.67 \pm 4.63 ^e

a Statistical difference compared between controls and STZ-rats (p<0.05)

b Statistical difference compared between controls and STZ-rats (p<0.01)

e Statistical difference compared between STZ-rats and STZ-G (p<0.01)

Fig.18 Means \pm SD of mean arterial pressure (MAP ; mmHg) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rats treated with garlic extract (STZ-G) following streptozotocin injection.



- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
- e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Table 11. Means \pm SD of heart rate (HR ; beats/min) of controls, streptozotocin-induced diabetic rats (STZ-rats) and treated with garlic extract (STZ-G) following streptozotocin injection.

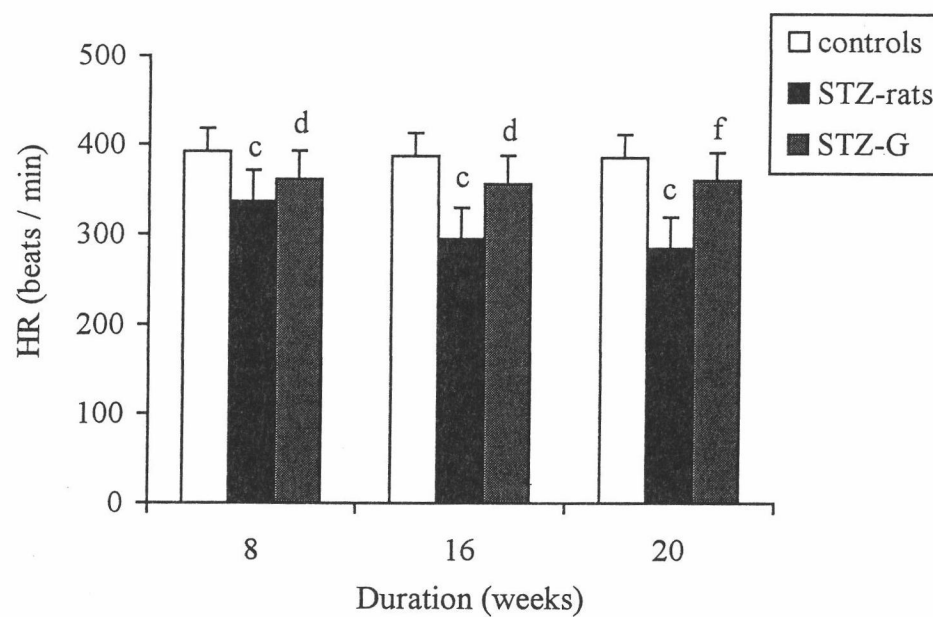
Duration	Heart Rate (beats/min)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	392.00 \pm 22.00	336.00 \pm 28.00 ^c	361.00 \pm 31.00 ^d
16 weeks	378.00 \pm 34.00	395.00 \pm 48.00 ^c	356.00 \pm 35.00 ^d
20 weeks	385.00 \pm 20.00	285.00 \pm 28.00 ^c	360.00 \pm 21.00 ^f

c Statistical difference compared between controls and STZ-rats ($p < 0.005$)

d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)

f Statistical difference compared between STZ-rats and STZ-G ($p < 0.005$)

Fig. 19 Means \pm SD of heart rate (HR ; beats/min) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.



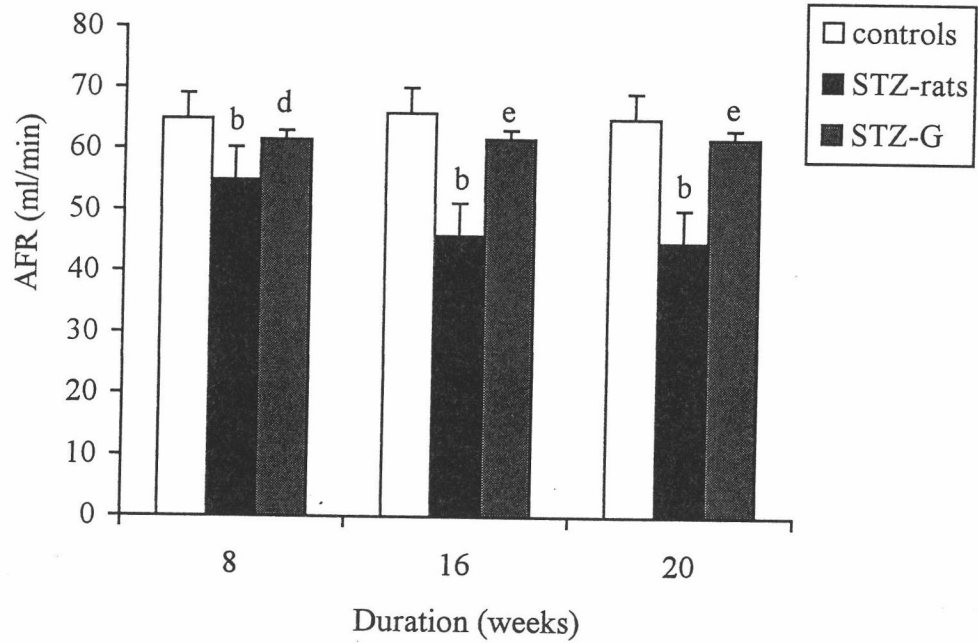
- c Statistical difference compared between controls and STZ-rats ($p < 0.005$)
d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
f Statistical difference compared between STZ-rats and STZ-G ($p < 0.005$)

Table 12. Means \pm SD of aortic flow rate (AFR ; ml/min) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.

Duration	Aortic Flow Rate (ml/min)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	64.83 \pm 2.56	54.83 \pm 5.46 ^b	61.50 \pm 1.76 ^d
16 weeks	65.83 \pm 6.18	45.83 \pm 3.87 ^b	61.67 \pm 1.37 ^e
20 weeks	65.00 \pm 3.90	44.83 \pm 6.68 ^b	61.83 \pm 1.17 ^e

- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Fig.20 Means \pm SD of aortic flow rate (AFR ; ml/min) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.



- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
- d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
- e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

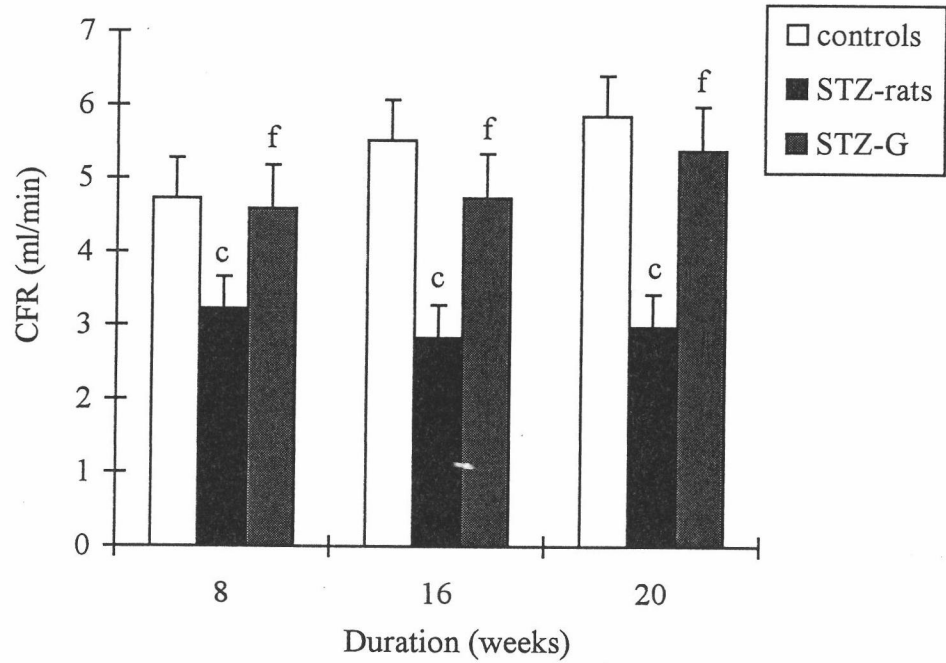
Table 13. Means \pm SD of coronary flow rate (CFR ; ml/min) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.

Duration	Coronary Flow Rate (ml/min)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	4.72 \pm 0.53	3.22 \pm 0.43 ^c	4.58 \pm 0.89 ^f
16 weeks	5.52 \pm 0.72	2.83 \pm 0.63 ^c	4.73 \pm 0.53 ^f
20 weeks	5.85 \pm 0.40	2.98 \pm 0.25 ^c	5.38 \pm 0.40 ^f

c Statistical difference compared between controls and STZ-rats ($p < 0.005$)

f Statistical difference compared between STZ-rats and STZ-G ($p < 0.005$)

Fig.21 Means \pm SD of coronary flow rate (CFR ; ml/min) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.



- c Statistical difference compared between controls and STZ-rats ($p < 0.005$)
f Statistical difference compared between STZ-rats and STZ-G ($p < 0.005$)

Table 14. Means \pm SD of left ventricular isotonic contraction (LVIC ; g./heart weight) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.

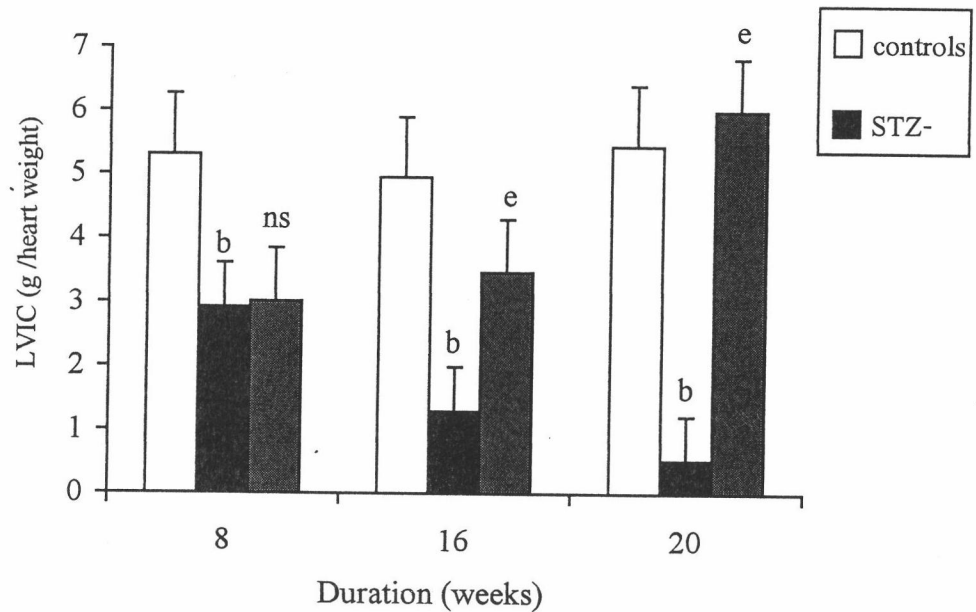
Duration	left ventricular isotonic contraction (LVIC ; g./heart weight)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	5.31 \pm 1.28	2.91 \pm 1.33 ^b	3.01 \pm 1.83 ^{ns}
16 weeks	4.95 \pm 0.49	1.29 \pm 0.75 ^b	3.47 \pm 0.79 ^e
20 weeks	5.45 \pm 1.09	0.52 \pm 0.12 ^b	6.00 \pm 1.05 ^e

b Statistical difference compared between controls and STZ-rats ($p < 0.01$)

e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

ns non significant difference compared between STZ-rats and STZ-G ($p < 0.05$)

Fig.22. Means \pm SD of left ventricular isotonic contraction (LVIC ; g./heart weight) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.



- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)
ns non significant difference compared between STZ-rats and STZ-G ($p < 0.05$)

Table 15. Means \pm SD of thickness of arterial wall (μm) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.

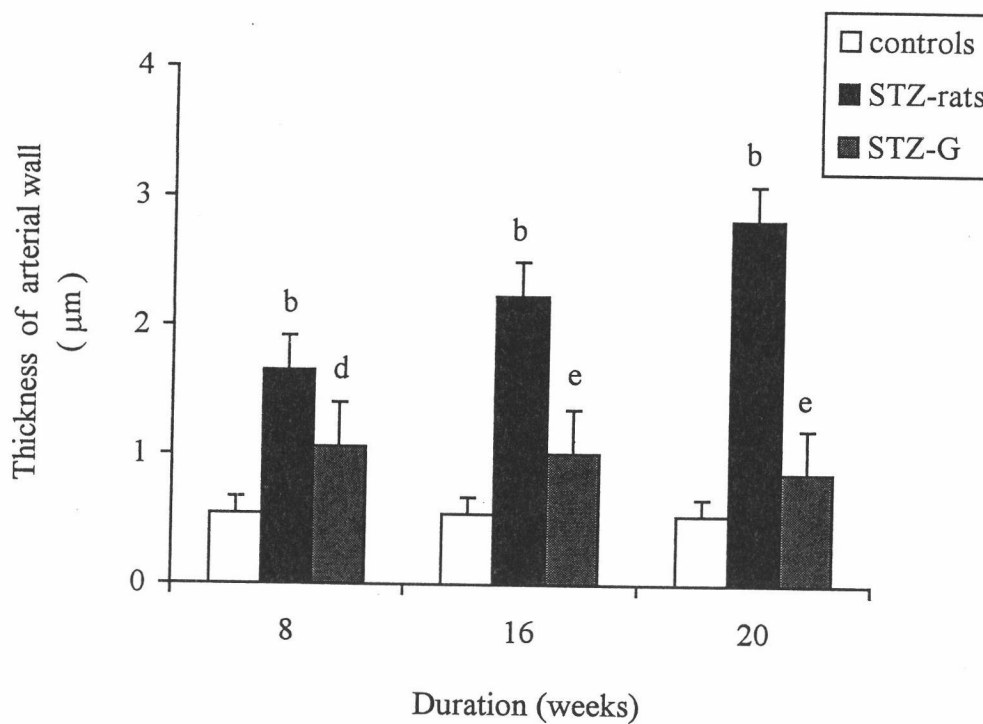
Duration	Thickness of Arterial wall (μm)		
	controls (n=3)	STZ-rats (n=3)	STZ-G (n=3)
8 weeks	0.54 \pm 0.11	1.65 \pm 0.03 ^b	1.06 \pm 0.24 ^d
16 weeks	0.54 \pm 0.11	2.23 \pm 0.22 ^b	1.01 \pm 0.56 ^e
20 weeks	0.53 \pm 0.17	2.82 \pm 0.58 ^b	0.86 \pm 0.22 ^e

b Statistical difference compared between controls and STZ-rats ($p < 0.01$)

d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)

e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Fig.23 Means \pm SD of thickness of arterial wall (μm) of controls, streptozotocin induced diabetes(STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.



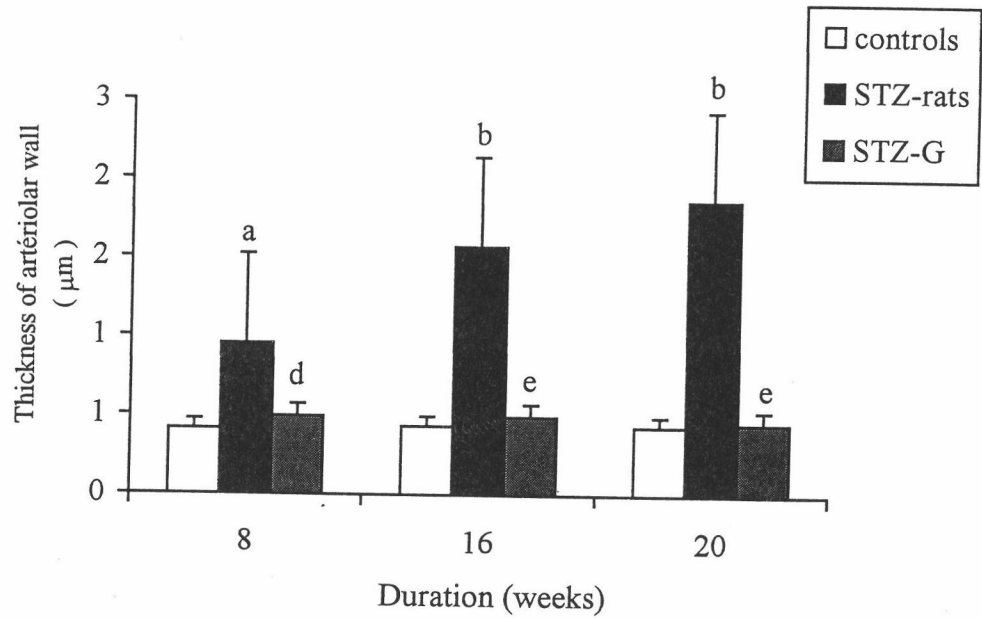
- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
- d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
- e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Table 16. Means \pm SD of thickness of arteriolar wall (μm) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.

Duration	Thickness of Arteriolar wall (μm)		
	controls (n=3)	STZ-rats (n=3)	STZ-G (n=3)
8 weeks	0.41 \pm 0.07	0.95 \pm 0.19 ^a	0.49 \pm 0.06 ^d
16 weeks	0.43 \pm 0.07	1.57 \pm 0.29 ^b	0.49 \pm 0.11 ^e
20 weeks	0.43 \pm 0.05	1.86 \pm 0.60 ^b	0.45 \pm 0.07 ^e

- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
 b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
 d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
 e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Fig.24 Means \pm SD of thickness of arteriolar wall (μm) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.



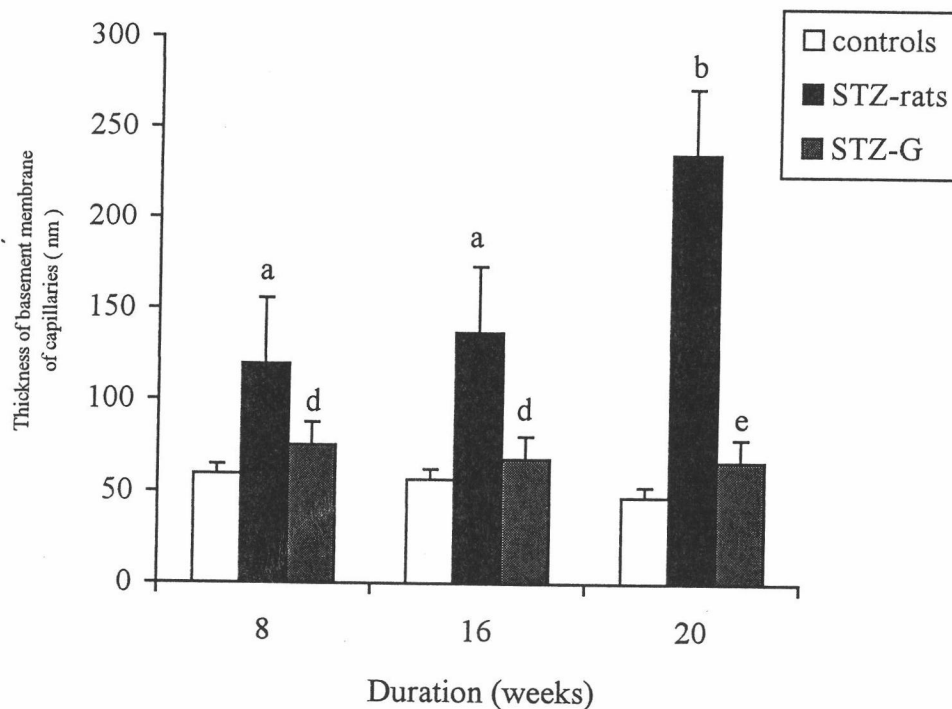
- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
- d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
- e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Table 17. Means \pm SD of thickness of basement membrane of capillaries (nm) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.

Duration	Thickness of Basement membrane of capillaries (nm)		
	controls (n=3)	STZ-rats (n=3)	STZ-G (n=3)
8 weeks	59.39 \pm 5.10	119.30 \pm 27.86 ^a	75.46 \pm 20.89 ^d
16 weeks	56.71 \pm 4.46	137.02 \pm 38.99 ^a	68.05 \pm 5.68 ^e
20 weeks	47.22 \pm 6.84	235.33 \pm 42.33 ^b	66.51 \pm 9.99 ^e

- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
 b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
 d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
 e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

Fig.25 Means \pm SD of thickness of basement membrane of capillaries (nm) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.



- a Statistical difference compared between controls and STZ-rats ($p < 0.05$)
- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
- d Statistical difference compared between STZ-rats and STZ-G ($p < 0.05$)
- e Statistical difference compared between STZ-rats and STZ-G ($p < 0.01$)

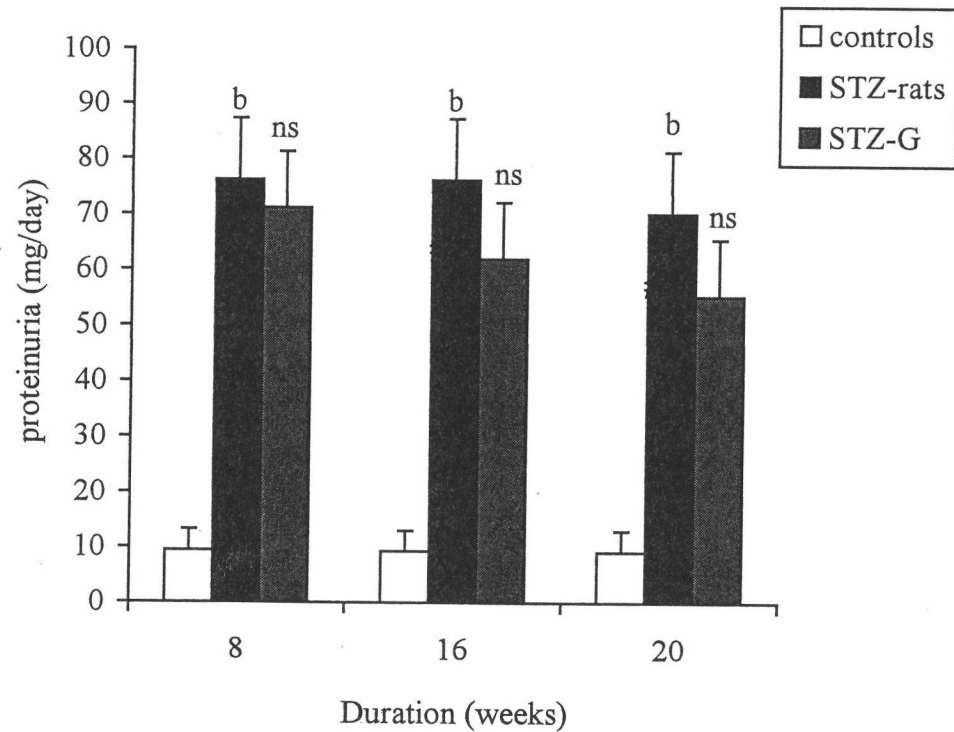
Table 18. Means \pm SD of proteinuria (mg/day) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.

Duration	Proteinuria (mg/day)		
	controls (n=6)	STZ-rats (n=6)	STZ-G (n=6)
8 weeks	9.43 \pm 3.97	74.18 \pm 17.02 ^b	71.15 \pm 11.45 ^{ns}
16 weeks	9.28 \pm 3.81	76.17 \pm 3.86 ^b	62.00 \pm 8.89 ^{ns}
20 weeks	9.18 \pm 3.55	70.23 \pm 12.78 ^b	55.33 \pm 10.26 ^{ns}

b Statistical difference compared between controls and STZ-rats ($p < 0.01$)

ns non significant difference compared between STZ-rats and STZ-G ($p < 0.05$)

Fig.26 Means \pm SD of proteinuria (mg/day) of controls, streptozotocin-induced diabetic rats (STZ-rats) and STZ-rat treated with garlic extract (STZ-G) following streptozotocin injection.



- b Statistical difference compared between controls and STZ-rats ($p < 0.01$)
ns non significant difference compared between STZ-rats and STZ-G ($p < 0.05$)

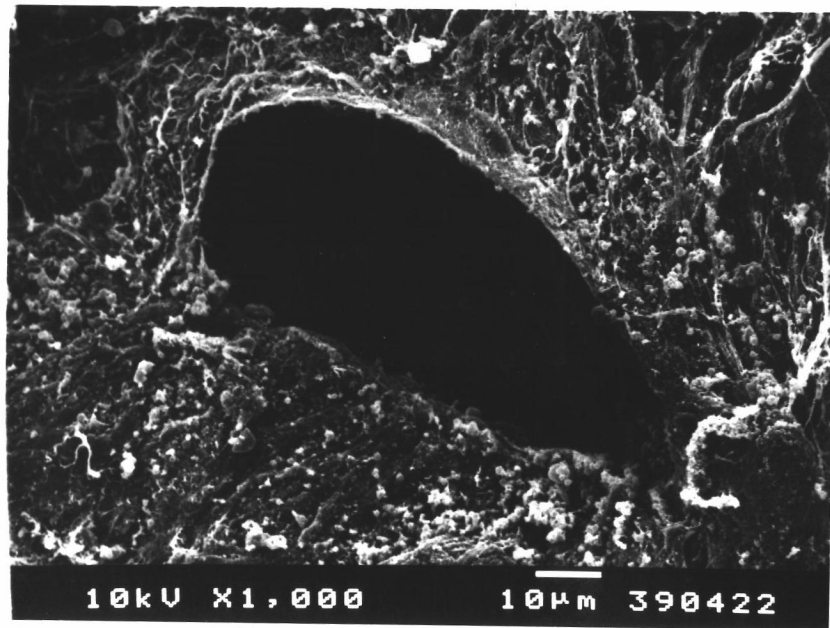


Fig.27 Scanning electron micrograph of intramural coronary artery taken from left ventricle of controls at 20 weeks following streptozotocin injection.

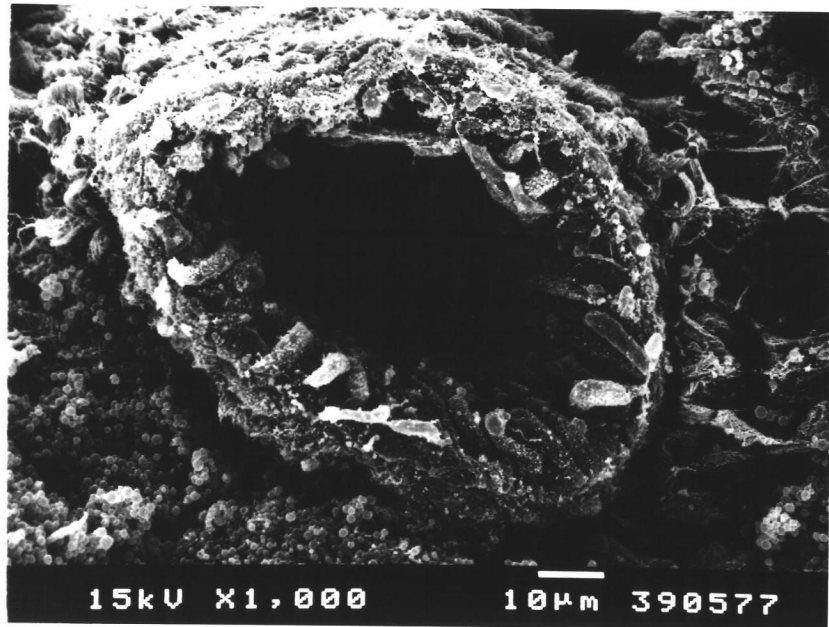


Fig.28 Scanning electron micrograph of intramural coronary artery taken from left ventricle of STZ-rats at 20 weeks following streptozotocin injection.

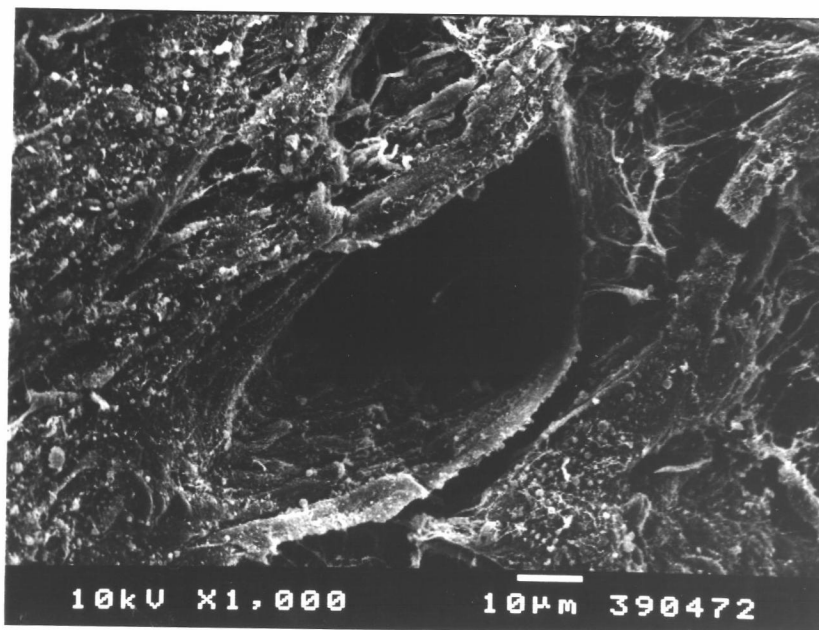


Fig.29 Scanning electron micrograph of intramural coronary artery taken from left ventricle of STZ-G at 20 weeks following streptozotocin injection.

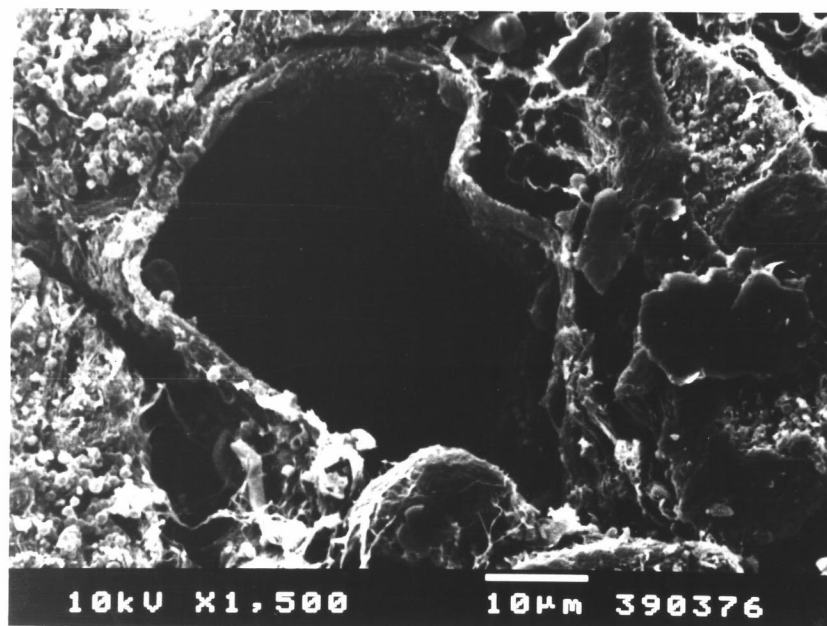


Fig.30 Scanning electron micrograph of intramural coronary arteriole taken from left ventricle of controls at 20 weeks following streptozotocin injection.

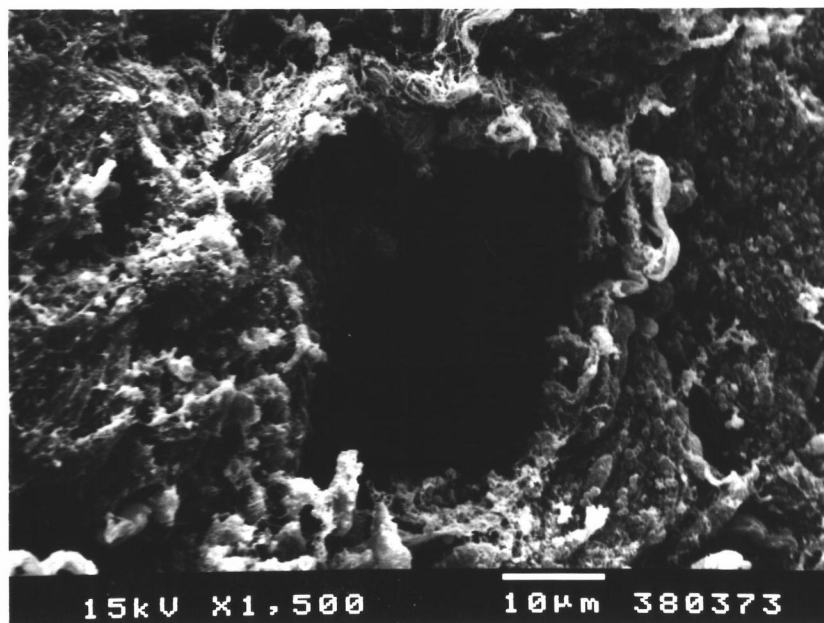


Fig.31 Scanning electron micrograph of intramural coronary arteriole taken from left ventricle of STZ-rats at 20 weeks following streptozotocin injection.

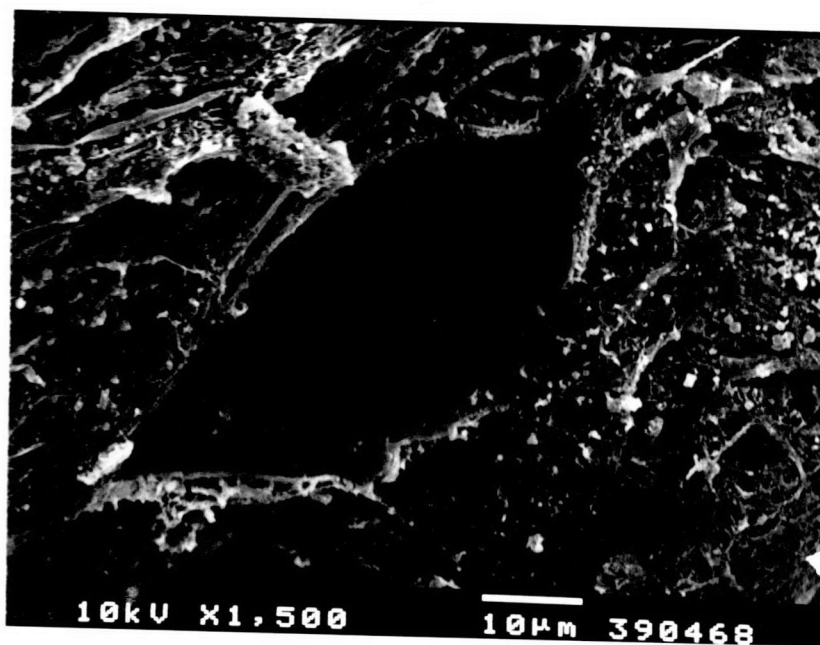


Fig.32 Scanning electron micrograph of intramural coronary arteriole taken from left ventricle of STZ-G at 20 weeks following streptozotocin injection.

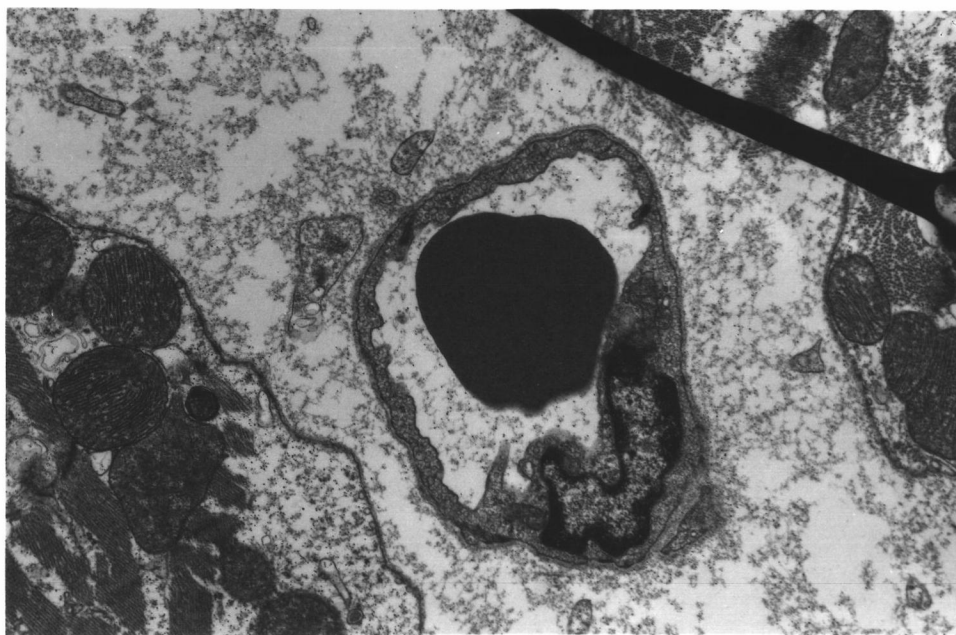


Fig.33 Transmission electron micrograph of intramural coronary capillary (at magnification 6000x) taken from left ventricle of controls at 20 weeks following streptozotocin injection.

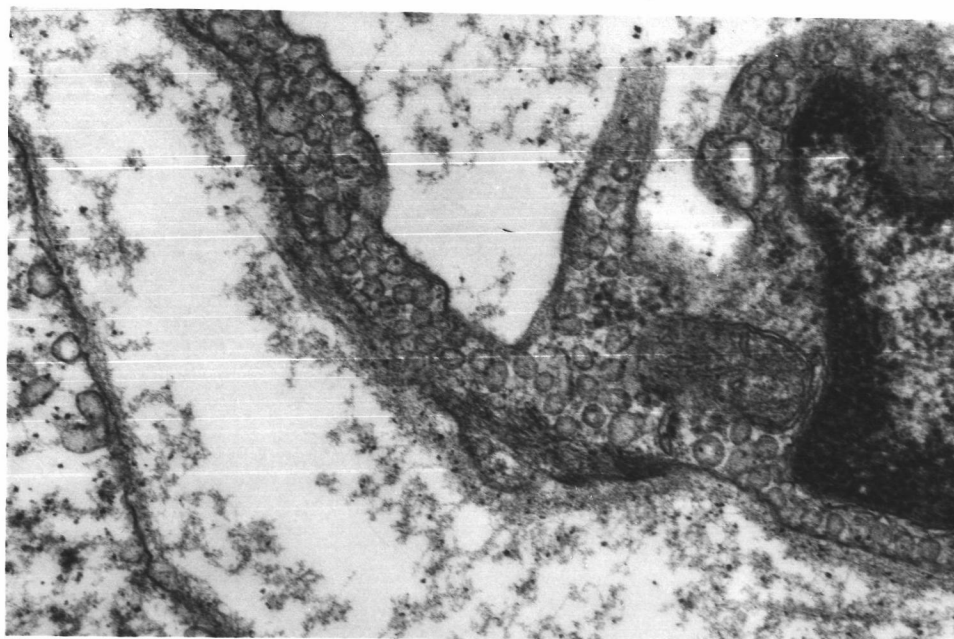
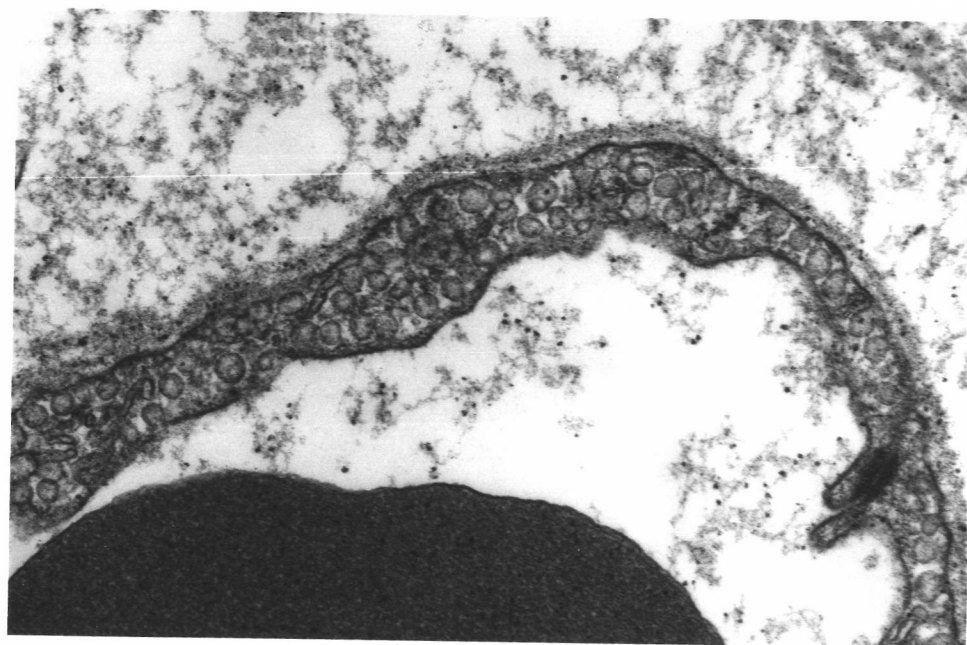


Fig.34 Transmission electron micrograph of intramural coronary capillary (at magnification 25000x) taken from left ventricle of controls at 20 weeks following streptozotocin injection.

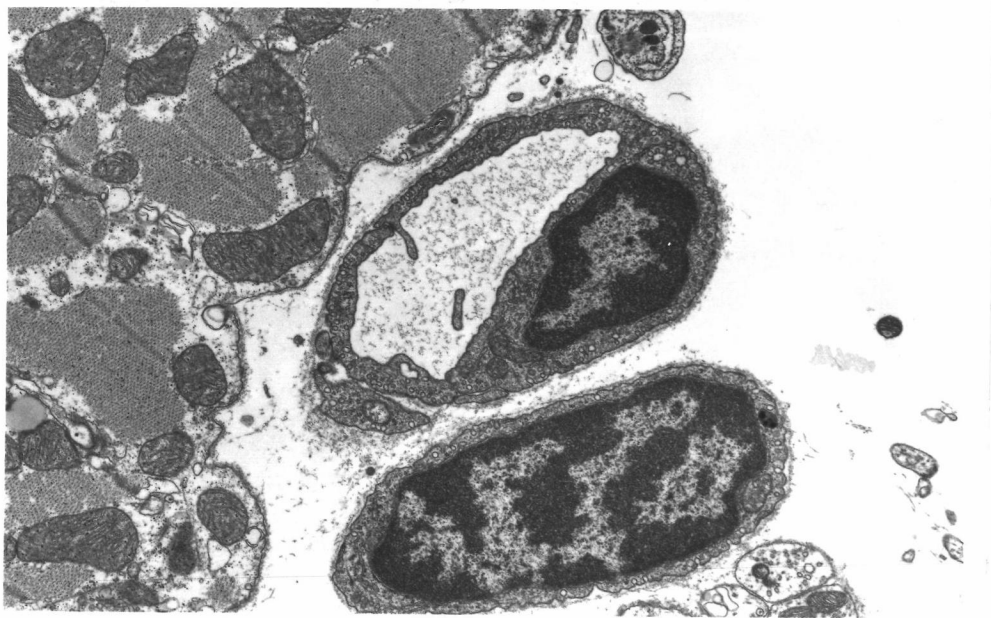


Fig.35 Transmission electron micrograph of intramural coronary capillary (at magnification 6000x) taken from left ventricle of STZ-rats at 20 weeks following streptozotocin injection.

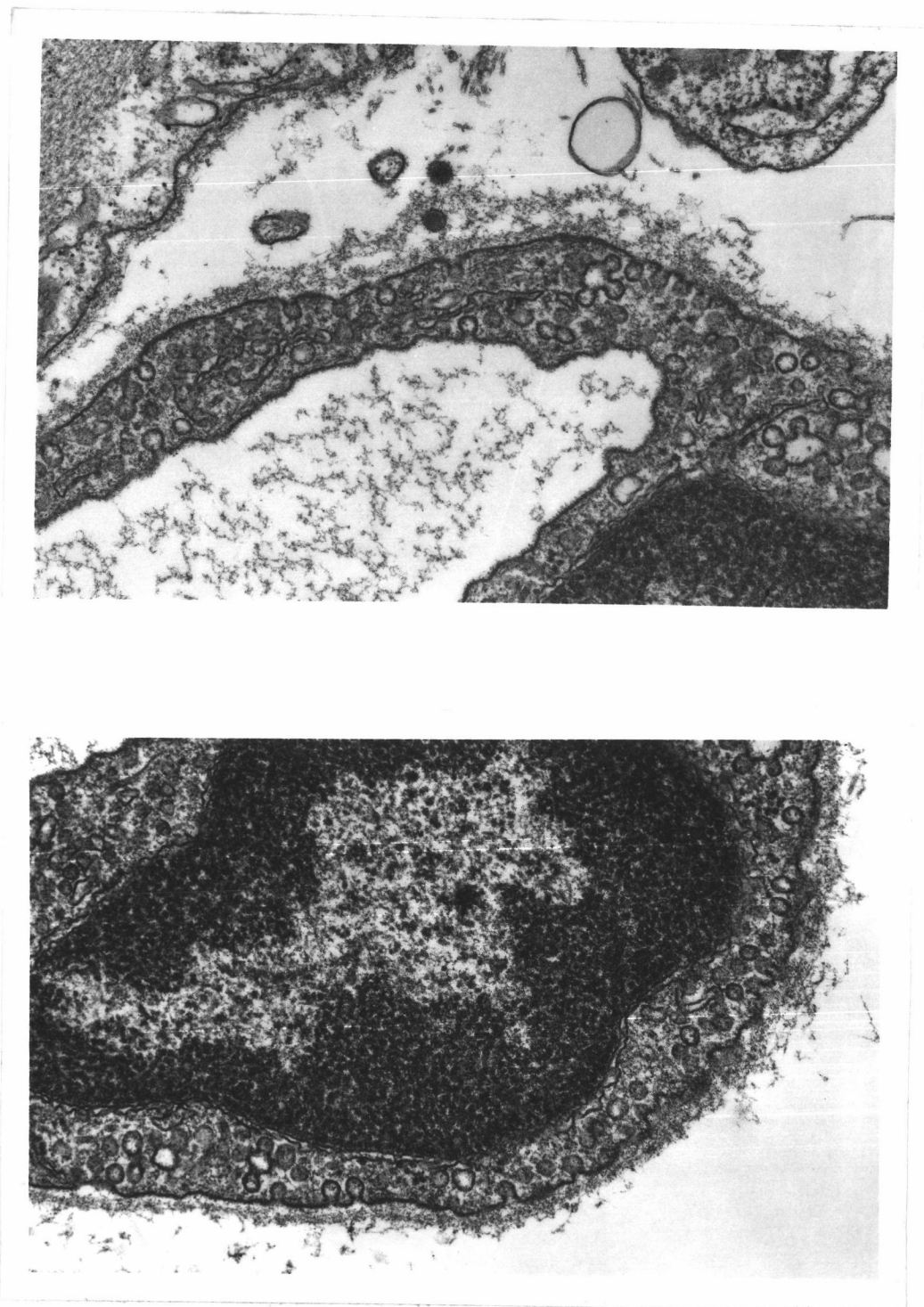


Fig.36 Transmission electron micrograph of intramural coronary capillary (at magnification 25000x) taken from left ventricle of STZ-rats at 20 weeks following streptozotocin injection.

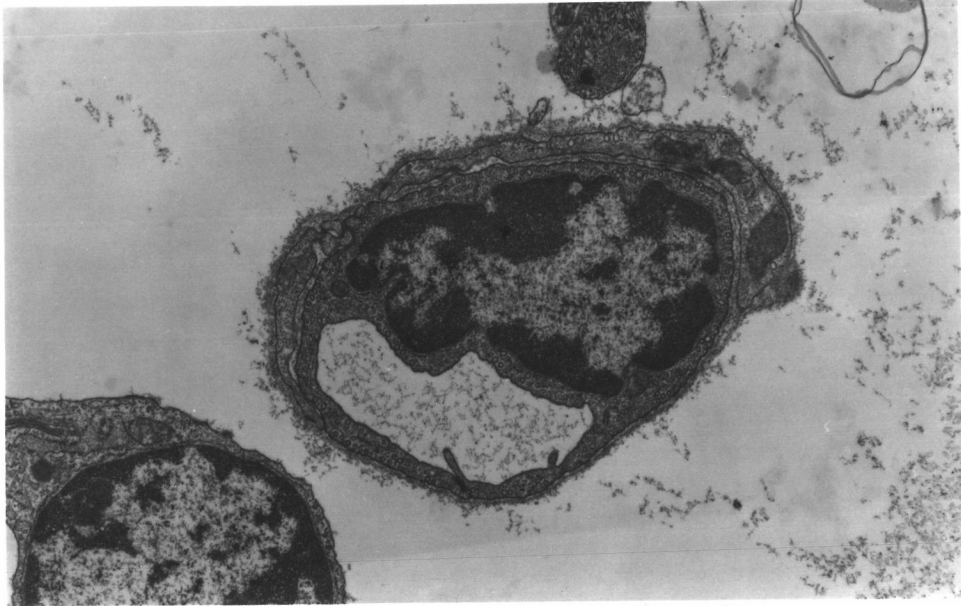


Fig.37 Transmission electron micrograph of intramural coronary capillary (at magnification 6000x) taken from left ventricle of STZ-G at 20 weeks following streptozotocin injection.

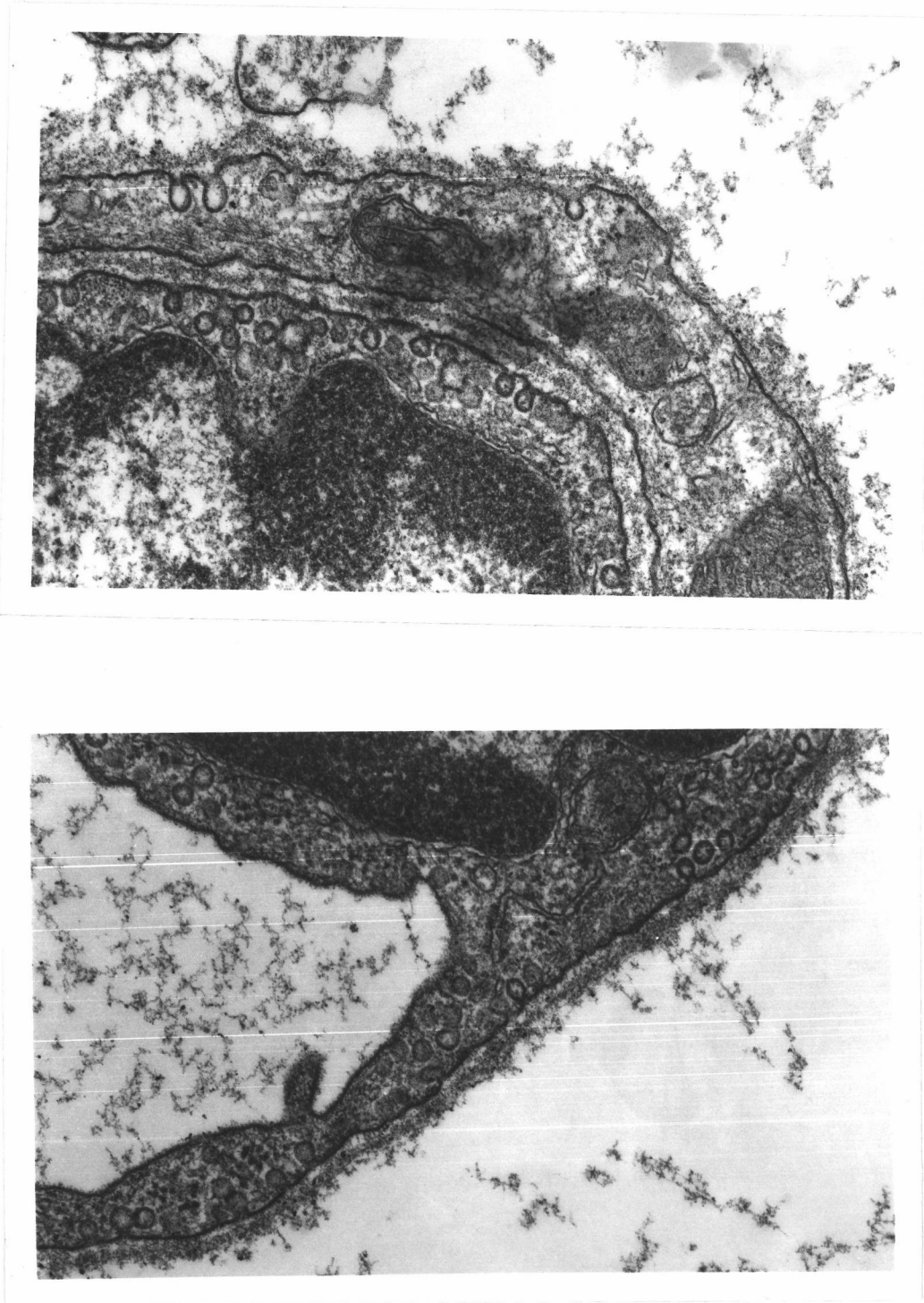


Fig.38 Transmission electron micrograph of intramural coronary capillary (at magnification 25000x) taken from left ventricle of STZ-G at 20 weeks following streptozotocin injection.