CHAPTER III

RESULTS

I. STUDIES ON THE EFFECTS OF:

   i. Sodium Fluoride (NaF) Treatment for 50 Days
   ii. NaF Withdrawal
   iii. NaF + Vitamin C
   iv. NaF + Calcium (Ca+2)
   v. NaF + Vitamin C + Calcium (Ca+2) to Adult Male Rats

SERUM FLUORIDE

The serum fluoride levels in sodium fluoride treated rats (Group II) were significantly elevated \((p < 0.001)\) after 50 days of treatment as compared to control. But in withdrawal group of rats (Group III), the sodium fluoride levels were reduced significantly after 70 days as compared to NaF treatment (Table 1).

In Group IV rats, (administration of NaF alongwith ascorbic acid) the serum fluoride levels decreased as compared to NaF treated groups of rats and the levels recovered to normal upon prolonged (70 days) ascorbic acid (AA) therapy. Similarly, calcium ingestion alongwith NaF (Group V) also showed a trend of recovery in serum fluoride levels. The combined treatment of AA and Ca+2 together with NaF (Group VI), however, resulted in further recovery of serum fluoride levels and their maintenance to normal levels throughout the treatment (Table 1).
BODY WEIGHT

NaF treatment brought about a significant reduction in body weight after 50 days of treatment (p < 0.01) as compared to control but withdrawal of treatment for 70 days (Group III) did not result in regain of body weight. However, simultaneous ingestion of ascorbic acid and calcium individually and in combination with NaF (Group IV to VI) were conducive in the maintenance of body weight to almost control levels (Table 2).

ORGAN WEIGHTS

The weight of testis and cauda epididymis decreased, while adrenal gland weight increased after 50 days of NaF treatment (Table 3). A significant recovery (p < 0.001) occurred after withdrawal of treatment (Group III) as well as by administering ascorbic acid and/or calcium alone and in combination (Group IV to VI respectively) (Table 3).

TESTICULAR PARAMETERS

Cholesterol

The testicular cholesterol levels were insignificantly (p < 0.05) decreased throughout the treatment in Group II to VI as compared to control (Table 4).

3β and 17β Hydroxysteroid Dehydrogenases (HSD)

The activities of 3β and 17β HSD in testis were not affected throughout the treatment (10 to 50 days) by sodium fluoride to rats (Tables 5, 6).
SERUM TESTOSTERONE

The serum testosterone levels in NaF treated rats showed no significant (p < 0.05) alterations as compared to control (Table 4).

SPERM COUNT

The cauda epididymal sperm count declined significantly (p < 0.001) after 50 days of treatment in Group II. The withdrawal of treatment (Group III) showed complete recovery (p < 0.01) as compared to control after 70 days of treatment (Table 7).

The sperm count in Groups IV and V animals (NaF + AA and NaF + Ca+2) respectively recovered after 60 days of treatment as compared to those of Group II (Table 7). However, the sperm count was not significantly affected throughout the treatment by combined administration of AA + Ca+2 together with NaF in Group VI rats (Table 7).

SPERM MOTILITY

NaF treatment caused a gradual inhibition of cauda epididymal sperm motility from day 20, which was significant by 50 days (p < 0.001) of treatment (Table 8). In the withdrawal group of animals (Group III), significant (p < 0.001) recovery was obtained after 70 days (Table 8) as compared to treated group.

The administration of ascorbic acid and/or calcium as in Groups IV and V along with NaF brought about recovery in sperm motility by 70 days of treatment. In Group VI, a complete recovery of sperm motility was obtained after 70 days of treatment (Table 8).
FERTILITY RATE

Sodium fluoride treatment led to a significant inhibition of fertility rate ($p < 0.001$) by 50 days of treatment. The fertility rate was partially recovered ($p < 0.01$) upon withdrawal of treatment for 70 days (Table 9). But, simultaneous ingestion of ascorbic acid and/or calcium together with NaF resulted in complete regain of fertility by 70 days. On the contrary, combined treatment of AA + Ca$^{+2}$ along with NaF the fertility rate was completely under the normal range even after 70 days of treatment (Table 9).

CAUDA EPIDIDYMAL SPERMATOZOA
HYALURONIDASE

The activity of sperm acrosomal hyaluronidase was not affected up to day 30 of treatment. However, a significant decline in enzyme activity ($p < 0.001$) was obtained after 50 days of treatment. The enzyme activity was not recovered up to 50 days after withdrawal of treatment. While significant regain of enzyme activity ($p < 0.001$) occurred after 70 days of withdrawal of treatment (Table 10).

Sodium fluoride treatment along with ascorbic acid and/or calcium resulted in the recovery of hyaluronidase activity only after 30 days of treatment and by day 70 of the treatment, hyaluronidase recovered to normal levels. The combined treatment of AA + Ca$^{+2}$ together with NaF was the most effective treatment for recovery of enzyme activity to normal levels (70 days) (Table 10).
ACROSIN

a) Proacrosin

The activity of proacrosin did not alter up to day 30 of NaF treatment. But, a gradual increase (p < 0.001) occurred after 50 days of treatment (Table 11). The activity recovered to normal in withdrawal as well as other groups (IV to VI) (Table 11).

b) Free Acrosin

The cauda epididymal free acrosin levels decreased by NaF treatment, which was significant (p < 0.01) after 50 days of treatment. The activity was regained to normal status by withdrawal of treatment as well as by administering ascorbic acid and/or calcium alone and in combination (Groups IV to VI) (Table 12). The recovery was significant by 60 days treatment in Group VI.

c) Acrosin-Acrosin Inhibitor Complex

The concentration of acrosin-acrosin inhibitor complex was decreased by 50 days in Group II animals (NaF treated) as compared to control ones. However, withdrawal of treatment resulted in reversal of the activity by 50 days. In Groups IV to VI animals, the reversibility in the activity was significant (p < 0.01) (Table 13).

d) Total Acrosin

The total acrosin activity was not significantly affected by NaF treatment. However, in Groups III to VI animals, the activity was maintained in the normal range almost throughout the treatments (Table 14).
SPERM CALCIUM (Ca\(^{2+}\)) LEVELS

The NaF treatment brought about a significant enhancement (p < 0.001) in calcium levels after 50 days of treatment as compared to control. In withdrawal Group (II) of animals, the calcium levels were not fully recovered after 70 days of treatment (Fig. I).

In Group IV to VI rats, the sperm calcium levels were recovered almost to control state by 70 days (Fig. II).

SPERM SODIUM (Na\(^+\)) LEVELS

The sperm sodium levels were reduced significantly (p < 0.01) after 50 days of treatment. A significant recovery (p < 0.001) occurred after 70 days of treatment under Groups III to VI respectively (Figs. III, IV).

SPERM POTASSIUM (K\(^+\)) LEVELS

The treatment caused a significant decrease (p < 0.001) in sperm potassium levels after 50 days of treatment. But, potassium levels were not significantly recovered after 60 days of withdrawal of treatment in Group III animals. However, K\(^+\) levels were completely recovered in Group IV to VI animals, after 70 days of treatment (Figs. V, VI).

SPERM PROTEINS BY POLYACRYLAMIDE GEL ELECTROPHORESIS (PAGE)

Polyacrylamide gels of cauda epididymal sperm proteins scanned on Beckman Du-40 Spectrophotometer revealed 17 peaks with a maximum molecular weight of 264 K daltons and a low molecular weight of 5.6 K daltons (Fig.
VII). However, after NaF treatment for 50 days, 16 peaks have been detected with molecular weight ranging from 266 - 5.06 K daltons (Fig. VIII). A new protein with a molecular weight of 68.51 K daltons was obtained in NaF treated rat sperm, which was not found in the control cauda epididymal sperm. In Group III (NaF withdrawal) animals, no recovery was obtained, wherein 12 peaks have been detected of molecular weights comparable to control as well as NaF treated groups (Fig. IX).

Administration of ascorbic acid along with NaF resulted in no recovery in protein pattern after 30 days of treatment (Fig. X). But prolonged treatment for 70 days resulted in significant regain in protein mobility pattern with molecular weights ranging from 263 K daltons to 8.1 K daltons (Fig. XI). Similarly, a significant recovery was obtained in protein mobility after 70 days of NaF + Ca$^{+2}$ treated rat groups (Figs. XII, XIII). The combined treatment of NaF + AA + Ca$^{+2}$ resulted in a significant recovery in protein pattern by both 30 and 70 days wherein 16 and 18 peaks respectively were obtained. The molecular weights ranged from 264.94 K daltons to 4.7 K daltons (Figs. XIV, XV).

SCANNING ELECTRON MICROSCOPY (SEM)

The scanning electron microscopy of NaF treated rat sperm revealed deflagellation, head and tail anomalies. However, in Group III to VI animals, the sperm revealed normal morphology with intact head and tail regions.
ADRENAL GLAND EPINEPHRINE

The epinephrine concentration in adrenal gland showed a steady enhancement (p < 0.001) by day 50 of the treatment (Table 15) as compared to control. The levels were recovered upon withdrawal of treatment by day 40. A similar recovery in the concentration of epinephrine was also obtained by treatments under Group IV to VI respectively (Table 15).

NOR-EPINEPHRINE

The levels of nor-epinephrine were also augmented significantly (p < 0.001) throughout treatment and especially after day 30 (Table 16). The nor-epinephrine levels were recovered to normal after 60 days of withdrawal of treatment. However, treatment with AA and/or calcium did not significantly affect the concentration of the nor-epinephrine (Groups IV to VI animals) (Table 16).

SERUM TRIIODOTHYRONINE (T<sub>3</sub>) LEVELS

Sodium fluoride treatment caused a reduction (p < 0.01) in T<sub>3</sub> levels after 50 days of treatment as compared to control. The T<sub>3</sub> levels were maintained within the normal range upon withdrawal of treatment for 70 days and by the treatments in Groups IV to VI. (Table 17).
SERUM THYROXINE (T₄) LEVELS

The serum T₄ levels were reduced by NaF treatment which were not recovered up to day 50 of withdrawal of treatment, but after 70 days a significant (p < 0.001) recovery occurred (Table 18). The T₄ levels were not much affected by ascorbic acid and/or calcium ingestion along with NaF (Group IV, V). Similarly, by combined treatment (Group VI) the levels were completely under the normal range throughout the treatment (Table 18).

LIVER PHOSPHORYLASE

The liver phosphorylase activity declined only after 30 days of treatment and was significant after 50 days (p < 0.001). The enzyme activity did not show much recovery upon withdrawal of treatment, while significant recovery occurred after administration of Vitamin C or calcium (Group IV, V and VI) (Table 19).

MUSCLE PHOSPHORYLASE

The activity of phosphorylase enzyme was significantly inhibited by NaF treatment after 50 days (p < 0.001). In withdrawal group of animals, the enzyme activity revealed no significant recovery even after 70 days. On the contrary, the activity of the enzyme was completely recovered in Groups IV to VI animals throughout the treatment (Table 20).
HISTOLOGY

TESTIS

The control rat testis consists of highly coiled seminiferous tubules with germinal epithelium exhibiting various stages of spermatogenic elements. Between the tubules are interstitial cells or cells of Leydig, which mainly synthesise and secrete androgens (Plate A; Figs. 1, 2).

Sodium fluoride treatment for 50 days affected the histoarchitecture of testis. After treatment, the germinal epithelium was disintegrated with denudation and vacuolation of seminiferous epithelial cells disturbing spermatogenesis with absence of spermatozoa in the lumen (Plate A; Figs. 3, 4). The withdrawal of treatment resulted in recovery from NaF induced effects (Plate A; Figs. 5, 6).

Administration of ascorbic acid alongwith NaF showed a significant recovery after 70 days of treatment in the histoarchitecture of testis (Plate B; Figs. 7, 8). Similarly, calcium ingestion together with NaF also exhibited a complete recovery with a healthy seminiferous germinaal epithelium (Plate B; Figs. 9, 10). Moreover, the combined treatment of ascorbic acid and calcium simultaneously with NaF brought about a complete reversal in the testicular histology with various stages of spermatogenesis (Plate B; Figs. 11, 12).

CAUDA EPIDIDYMIS

The cauda epididymis of normal rat showed several tubules with pseudostratified epithelium having stereocilia. The lumen of the tubules contained sperm bundles (Plate C; Figs. 13, 14).
The treatment led to significant structural alterations in cauda epididymis. The histological picture revealed damage to secretory epithelium, intense pyknotic nuclei, loss of stereocilia and absence of sperm in the lumen (Plate C; Figs. 15, 16). However, withdrawal of treatment resulted in partial recovery in the histoarchitecture of cauda epididymis (Plate C; Figs. 17, 18).

Simultaneous ingestion of ascorbic acid and NaF showed complete recovery in the histology of cauda epididymis with reappearance of sperm bundles in the lumen (Plate D; Figs. 19, 20). The treatment of calcium alongwith NaF also resulted in regain of normalcy in the structure of cauda epididymis (Plate D; Figs. 21, 22). Similarly, a complete recovery occurred in cauda epididymis structure with sperm bundles in the lumen by combined administration of ascorbic acid and calcium alongwith NaF (Plate D; Figs. 23, 24).

ADRENAL GLAND

The normal rat adrenal gland showed two distinct regions of outer cortex and inner medulla with compactly arranged cells (Plate E; Figs. 25, 26). However, after NaF treatment for 50 days, the histological alterations included vacuolation of cells in the medullary region and pyknosis observed in some regions of cortex (Plate E; Figs. 27, 28). After 70 days of withdrawal of treatment normalcy was observed in the histological features of the gland (Plate E; Figs. 29, 30).

Ascorbic acid treatment alongwith NaF resulted in complete recovery in the histoarchitecture of adrenal (Plate F; Figs. 31, 32). Similarly, calcium ingestion alongwith NaF also helped in the recovery from fluoride induced
effects (Plate F; Figs. 33, 34). While combined administration of NaF + AA + Ca$^{+2}$ exhibited a significant recovery in the histology of adrenal gland (Plate F; Figs. 35, 36).

**SPERM MORPHOLOGY - ACIDIC ALCOHOLIC SILVER NITRATE (AgNO$_3$) STAINING**

The cauda epididymal spermatozoa stained with acidic alcoholic silver nitrate revealed a sickle shaped head with prominent acrosomal and post-acrosomal regions as well as middle piece and tail (Plate G; Figs. 37). After 50 days of treatment, acrosomal loss, deflagellation, poor differentiation of acrosomal and post-acrosomal regions, head and tail anomalies were observed (Plate G; Fig. 38). In Group III (NaF withdrawal) animals, the sperm showed no remarkable recovery in its morphology (Plate G; Fig. 39). Administration of AA and/or Ca$^{+2}$ with NaF alone and in combination, after 30 days showed less pronounced effects of NaF on sperm morphology. While, after 70 days of treatment, (Group IV to VI) helped in complete recovery in morphology of spermatozoa (Plate G; Figs. 40 to 42).

II. STUDIES ON HUMAN POPULATION IN ENDEMIC FLUOROSIS AREAS IN MEHSANA DISTRICT OF NORTH GUJARAT (INDIA)

I. WATER ANALYSIS

**WATER FLUORIDE CONTENT IN AHMEDABAD CITY**

The data on fluoride content in Ahmedabad a non-endemic area within the permissible level (1 ppm), was considered as control and compared with the results of Mehsana District, a fluorosis endemic area.

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Twenty four different water samples collected from Ahmedabad city and its vicinity had a mean fluoride level of 0.7 ppm, except in water samples collected from the industrial areas namely Naroda, Leelanagar and Vatva, where the fluoride content varied from 1.1 to 2.5 ppm, which may be due to the industrial pollution (Table 21).

**FLUORIDE LEVELS IN DRINKING WATER OF MEHSANA DISTRICT**

The analysis of water samples collected from 36 villages surveyed in Mehsana district revealed that 33 villages contained fluoride beyond permissible limit, ranging from 1 - 2.9 ppm. In the other three villages, the water fluoride levels were between 0.8 - 0.9 ppm (Table 22).

**SERUM ANALYSIS**

**SERUM FLUORIDE LEVELS**

The human subjects in endemic villages examined for fluorosis contained enhanced fluoride levels in their serum ranging from 0.1 to 0.50 ppm, with mean of 0.18 ± 0.09, while, control population had serum fluoride ranging from 0.03 - 0.05 and mean of 0.04 ± 0.002 respectively (Table 23).

**CHOLESTEROL**

The serum cholesterol levels in fluoride affected human subjects were not altered (Range 153 - 220; Mean = 190.14 ± 5.92) with respect to the individuals from non-endemic area (Range 150 - 195 mg/100 ml; Mean = 183.98 ± 5.26) (Table 24).
TESTOSTERONE

The serum testosterone levels in fluorotic human subjects were unaltered (Range 2.85 - 8.8 ng/ml; Mean 6.38 ± 0.45) as compared to control population of Ahmedabad city (Range 3 - 9; Mean 6.4 ± 0.42) (Table 25).

T<sub>3</sub>, T<sub>4</sub> AND TSH

The serum T<sub>3</sub>, T<sub>4</sub> and TSH were not much affected in the fluoride afflicted cases. However, their ranges were lower as compared to control human population (Table 26).

SERUM GLUTAMATE OXALACETATE TRANSAMINASE (SGOT) AND SERUM GLUTAMATE PYRUVATE TRANSAMINASE (SGPT)

The activities of serum transaminases (SGOT and SGPT) were enhanced significantly (p < 0.001) in fluorotic human cases of endemic villages as compared to control from Ahmedabad city (Table 27).

SIALIC ACID

The concentration of serum sialic acid in the inhabitants of fluoride endemic region decreased significantly (p < 0.001) in comparison to the human cases of fluoride non-endemic areas (Table 28).

EPINEPHRINE

The levels of serum epinephrine were augmented significantly (p < 0.01) in population from endemic area in comparison to those from non-endemic area.
NOR-EPINEPHRINE

The nor-epinephrine concentration was also elevated in fluorotic human cases ($p < 0.001$) as compared to control subjects (Table 29).

CALCIUM LEVELS

The serum calcium levels were significantly reduced ($p < 0.01$) as compared to control population (Table 30).

SODIUM ($\text{Na}^+$) AND POTASSIUM ($\text{K}^+$) LEVELS

The concentration of serum sodium in fluoride endemic population was significantly increased ($p < 0.001$) as compared to control one (Table 31).

Similarly, potassium levels were also significantly elevated ($p < 0.001$) in serum of fluorotic human cases as compared to control subjects (Table 31).

SERUM PROTEINS (PAGE)

Polyacrylamide gel electrophoresis of control human serum proteins revealed 13 peaks with a molecular weight ranging from 203 K daltons to a low molecular weight of 11.27 K daltons (Fig.XVI). However, in fluoride endemic population of Mehsana district 8 - 10 peaks were obtained with a molecular weight of 208 K daltons to 15.25 K daltons (Figs. XVII, XVIII, XIX).
URINE PARAMETERS

FLUORIDE

The urinary fluoride levels analysed from Ahmedabad population was in the range of 0.1 - 1.5 ppm with a mean of 0.67 ppm (Table 32). However, the fluoride concentration in villages of Mehsana District (fluoride endemic area) showed a wide variation with a significant elevation as compared with the control group (Table 33).

EPINEPHRINE

The urine epinephrine output showed no change by high fluoride consumption in fluoride endemic villages, as compared to control population. However, there was wide individual to individual variation observed in fluoride affected population (Table 34).

NOR-EPINEPHRINE

The nor-epinephrine levels were also unaffected similar to those of epinephrine and were comparable to normal (Table 34).

CALCIUM (Ca²⁺)

The analysis of urine samples collected from population of Ahmedabad city showed calcium levels comparable to those individual from endemic villages (Table 35).
SERUM $\text{Na}^+$ AND $\text{K}^+$ LEVELS

The urine sodium levels were significantly increased ($p < 0.001$) in fluorosis afflicted human subjects as compared to Ahmedabad city (Table 36). The potassium levels were also significantly elevated ($p < 0.001$) by fluoride ingestion in human population as compared to control subjects (Table 36).

IN VITRO EFFECT OF FLUORIDE ON HUMAN SPERMATOZOA

In vitro studies of fluoride on human spermatozoa revealed alterations in motility. NaF at a concentration of 20 $\mu$M showed no significant inhibition on sperm motility even after 20 minutes, while 50 $\mu$M fluoride caused a 50% inhibition as compared to control. However, high concentration of fluoride i.e. 250 $\mu$M after 5 minutes and 10 minutes, reduced the motility significantly ($p < 0.001$) (Table 37).
TABLE 1  Showing the Serum Fluoride Levels (ppm) in Control and Treated Rat Groups

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca(^2)</th>
<th>Group VI NaF + AA + Ca(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.58 ± 0.04</td>
<td>0.60 ± 0.04</td>
<td>3.8 ± 0.12</td>
<td>0.66 ± 0.08</td>
<td>0.62 ± 0.04</td>
<td>0.61 ± 0.06</td>
</tr>
<tr>
<td>20</td>
<td>-</td>
<td>-</td>
<td>2.7 ± 0.10</td>
<td>0.78 ± 0.06</td>
<td>0.70 ± 0.04</td>
<td>0.60 ± 0.03</td>
</tr>
<tr>
<td>30</td>
<td>-</td>
<td>1.90 ± 0.10</td>
<td>2.1 ± 0.08</td>
<td>1.14 ± 0.09</td>
<td>1.19 ± 0.1</td>
<td>0.81 ± 0.04</td>
</tr>
<tr>
<td>50</td>
<td>-</td>
<td>3.6 ± 0.11</td>
<td>1.6 ± 0.08</td>
<td>0.98 ± 0.08</td>
<td>0.98 ± 0.05</td>
<td>0.75 ± 0.04</td>
</tr>
<tr>
<td>70</td>
<td>-</td>
<td>-</td>
<td>1.2 ± 0.04</td>
<td>0.71 ± 0.05</td>
<td>0.81 ± 0.05</td>
<td>0.56 ± 0.03</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca^{2+}</th>
<th>Group VI NaF + AA + Ca^{2+}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>294 ± 10.95</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>30</td>
<td>294 ± 9.88</td>
<td>268 ± 8.2</td>
<td>244 ± 9.75</td>
<td>268 ± 11.24</td>
<td>267 ± 8.6</td>
<td>263 ± 7.2</td>
</tr>
<tr>
<td>50</td>
<td>294 ± 9.3</td>
<td>246 ± 8.75</td>
<td>252 ± 5.2</td>
<td>274 ± 6.7</td>
<td>273 ± 8.1</td>
<td>281 ± 5.5</td>
</tr>
<tr>
<td>70</td>
<td>295 ± 9.8</td>
<td>–</td>
<td>272 ± 8.65</td>
<td>288 ± 9.46</td>
<td>287 ± 5.3</td>
<td>290 ± 9.26</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
### TABLE 3  
**Showing the Organ Weights (mg) of Control and Treated Groups of Rats**

<table>
<thead>
<tr>
<th>Tissue</th>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca²</th>
<th>Group VI NaF + AA + Ca²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testis</td>
<td>50</td>
<td>1328 ± 14.2</td>
<td>1302 ± 9.48</td>
<td>1306 ± 10.4</td>
<td>1306 ± 10.8</td>
<td>1312 ± 10</td>
<td>1313 ± 7.85</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>1328 ± 14.2</td>
<td>-</td>
<td>1318 ± 9.88</td>
<td>1320 ± 11.2</td>
<td>1324 ± 9.7</td>
<td>1330 ± 9.05</td>
</tr>
<tr>
<td>Cauda Epididymis</td>
<td>50</td>
<td>218 ± 4.6</td>
<td>194 ± 3.18</td>
<td>208 ± 8.10</td>
<td>204 ± 4.9</td>
<td>210 ± 4.8</td>
<td>212 ± 6.35</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>218 ± 4.6</td>
<td>-</td>
<td>216 ± 7.65</td>
<td>220 ± 6.3</td>
<td>220 ± 3.8</td>
<td>223 ± 4.78</td>
</tr>
<tr>
<td>Adrenal</td>
<td>50</td>
<td>15 ± 0.96</td>
<td>23 ± 0.72</td>
<td>18 ± 0.95</td>
<td>14 ± 0.78</td>
<td>16 ± 0.56</td>
<td>15 ± 0.91</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>15 ± 0.96</td>
<td>-</td>
<td>16 ± 0.75</td>
<td>16 ± 0.81</td>
<td>16 ± 0.89</td>
<td>15 ± 0.75</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
TABLE 4  Testicular Cholesterol Concentration (μg/mg Fresh Tissue Weight) and Testosterone Levels in Control and Treated Groups of Rats

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca²⁺</th>
<th>Group VI NaF + AA + Ca²⁺</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>0.46 ± 0.01</td>
<td>0.40 ± 0.01</td>
<td>0.40 ± 0.01</td>
<td>0.38 ± 0.01</td>
<td>0.41 ± 0.02</td>
<td>0.42 ± 0.01</td>
</tr>
<tr>
<td>70</td>
<td>0.46 ± 0.01</td>
<td>–</td>
<td>0.42 ± 0.01</td>
<td>0.32 ± 0.01</td>
<td>0.44 ± 0.01</td>
<td>0.44 ± 0.01</td>
</tr>
<tr>
<td>Testosterone (ng/ml)</td>
<td>3.62 ± 0.28</td>
<td>2.88 ± 0.32</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
## TABLE 5
Testicular 3\(\beta\) Hydroxy Steroid Dehydrogenase (HSD) Activity in Control and Sodium Fluoride (NaF) Treated Rat Groups

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>DURATION (days)</th>
<th>CONTROL</th>
<th>NaF TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3(\beta) - HSD*</td>
<td>10</td>
<td>5.8 ± 0.92</td>
<td>5.80 ± 0.92</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>-</td>
<td>5.80 ± 0.88</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>-</td>
<td>5.28 ± 1.01</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>-</td>
<td>5.01 ± 0.91</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>-</td>
<td>4.78 ± 0.83</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.

* 5\(\alpha\) diol formed/mg protein/30 minutes.
<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>DURATION (days)</th>
<th>CONTROL</th>
<th>NaF TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 β-HSD*</td>
<td></td>
<td>5.50 ± 0.63</td>
<td>5.50 ± 0.63</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>–</td>
<td>5.50 ± 0.87</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>–</td>
<td>5.40 ± 0.77</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>–</td>
<td>5.22 ± 0.62</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>–</td>
<td>4.97 ± 0.99</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>–</td>
<td>4.65 ± 0.38</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.

* 5 α diol formed/mg protein/30 minutes.
### TABLE 7  Cauda Epididymal Sperm Count (millions/ml) in Control and Treated Groups of Rats

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca$^{2+}$</th>
<th>Group VI NaF + AA + Ca$^{2+}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>58 ± 2.26</td>
<td>58 ± 1.81</td>
<td>32 ± 1.32</td>
<td>56 ± 1.48</td>
<td>57 ± 1.98</td>
<td>57 ± 2.13</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>57 ± 2.18</td>
<td>30 ± 1.41</td>
<td>55 ± 1.32</td>
<td>56 ± 1.34</td>
<td>57 ± 1.98</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>41 ± 1.92</td>
<td>31 ± 0.78</td>
<td>53 ± 1.40</td>
<td>54 ± 1.30</td>
<td>56 ± 1.42</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td>37 ± 1.80</td>
<td>34 ± 1.28</td>
<td>50 ± 2.14</td>
<td>51 ± 1.11</td>
<td>54 ± 1.38</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>34 ± 1.59</td>
<td>37 ± 1.02</td>
<td>51 ± 1.81</td>
<td>51 ± 1.89</td>
<td>55 ± 2.31</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td>41 ± 0.89</td>
<td>54 ± 2.02</td>
<td>54 ± 1.92</td>
<td>58 ± 1.89</td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td>47 ± 1.72</td>
<td>58 ± 2.11</td>
<td>58 ± 2.21</td>
<td>59 ± 2.38</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca^{2+}</th>
<th>Group VI NaF + AA + Ca^{2+}</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>70 ± 2.98</td>
<td>−</td>
<td>−</td>
<td>67 ± 1.89</td>
<td>14 ± 0.88</td>
<td>71 ± 2.21</td>
</tr>
<tr>
<td>20</td>
<td>−</td>
<td>67 ± 1.89</td>
<td>14 ± 0.88</td>
<td>71 ± 2.21</td>
<td>70 ± 2.86</td>
<td>70 ± 2.18</td>
</tr>
<tr>
<td>30</td>
<td>−</td>
<td>58 ± 1.78</td>
<td>21 ± 0.76</td>
<td>66 ± 1.30</td>
<td>64 ± 1.48</td>
<td>70 ± 1.92</td>
</tr>
<tr>
<td>40</td>
<td>−</td>
<td>42 ± 1.30</td>
<td>26 ± 0.76</td>
<td>58 ± 2.13</td>
<td>57 ± 2.36</td>
<td>67 ± 2.12</td>
</tr>
<tr>
<td>50</td>
<td>−</td>
<td>31 ± 1.9</td>
<td>33 ± 0.92</td>
<td>54 ± 1.48</td>
<td>54 ± 1.18</td>
<td>65 ± 1.81</td>
</tr>
<tr>
<td>60</td>
<td>−</td>
<td>14 ± 1.06</td>
<td>39 ± 0.75</td>
<td>55 ± 1.31</td>
<td>56 ± 1.78</td>
<td>63 ± 1.56</td>
</tr>
<tr>
<td>70</td>
<td>−</td>
<td>−</td>
<td>49 ± 1.80</td>
<td>58 ± 0.89</td>
<td>63 ± 1.23</td>
<td>68 ± 2.02</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca(^2)</th>
<th>Group VI NaF + AA + Ca(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>90 ± 3</td>
<td>61 ± 2</td>
<td>48 ± 1</td>
<td>62 ± 1</td>
<td>62 ± 1</td>
<td>68 ± 1</td>
</tr>
<tr>
<td>50</td>
<td>90 ± 3</td>
<td>32 ± 1</td>
<td>60 ± 2</td>
<td>80 ± 2</td>
<td>80 ± 1</td>
<td>82 ± 2</td>
</tr>
<tr>
<td>70</td>
<td>90 ± 3</td>
<td>-</td>
<td>71 ± 2</td>
<td>86 ± 2</td>
<td>85 ± 2</td>
<td>86 ± 2</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
TABLE 10  Cauda Epididymal Sperm Acrosomal Hyaluronidase* Activity in Control and Treated Groups of Rats

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca⁺²</th>
<th>Group VI NaF + AA + Ca⁺²</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>6.63 ± 1.23</td>
<td>6.6 ± 0.98</td>
<td>2.0 ± 0.54</td>
<td>6.8 ± 1.3</td>
<td>6.6 ± 1.02</td>
<td>6.7 ± 1.29</td>
</tr>
<tr>
<td>20</td>
<td>6.63 ± 1.23</td>
<td>6.4 ± 1.09</td>
<td>2.1 ± 0.34</td>
<td>5.9 ± 0.98</td>
<td>5.7 ± 1.09</td>
<td>6.0 ± 1.06</td>
</tr>
<tr>
<td>30</td>
<td>–</td>
<td>5.2 ± 0.89</td>
<td>2.2 ± 0.73</td>
<td>4.5 ± 0.79</td>
<td>4.4 ± 0.91</td>
<td>5.8 ± 1.20</td>
</tr>
<tr>
<td>40</td>
<td>–</td>
<td>2.9 ± 0.98</td>
<td>2.3 ± 0.92</td>
<td>4.8 ± 0.52</td>
<td>4.8 ± 0.73</td>
<td>5.0 ± 1.04</td>
</tr>
<tr>
<td>50</td>
<td>–</td>
<td>1.6 ± 0.28</td>
<td>2.9 ± 0.86</td>
<td>5.3 ± 0.96</td>
<td>4.8 ± 1.10</td>
<td>5.3 ± 1.10</td>
</tr>
<tr>
<td>60</td>
<td>–</td>
<td>–</td>
<td>4.4 ± 0.93</td>
<td>5.8 ± 1.8</td>
<td>5.1 ± 1.09</td>
<td>6.5 ± 1.11</td>
</tr>
<tr>
<td>70</td>
<td>–</td>
<td>–</td>
<td>5.0 ± 0.93</td>
<td>6.3 ± 1.01</td>
<td>6.1 ± 0.97</td>
<td>6.7 ± 1.08</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.

* nm-N-acetyl glucosamine liberated/hour/10⁶ spermatozoa.
**TABLE 11  Cauda Epididymal Sperm Acrosomal Proacrosin (μ Moles BAEE Hydrolysed/Minute/10⁶ Spermatozoa) Activity in Control and Treated Groups of Rats**

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca²</th>
<th>Group VI NaF + AA + Ca²</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>3.07 ± 0.98</td>
<td>3.0 ± 0.83</td>
<td>3.4 ± 0.21</td>
<td>3.2 ± 0.92</td>
<td>3.1 ± 0.88</td>
<td>3.1 ± 0.84</td>
</tr>
<tr>
<td>20</td>
<td>-</td>
<td>3.2 ± 0.42</td>
<td>3.4 ± 0.20</td>
<td>3.1 ± 1.01</td>
<td>3.1 ± 0.96</td>
<td>3.2 ± 0.92</td>
</tr>
<tr>
<td>30</td>
<td>-</td>
<td>3.4 ± 0.80</td>
<td>2.8 ± 0.48</td>
<td>2.4 ± 0.86</td>
<td>2.9 ± 0.95</td>
<td>2.9 ± 0.86</td>
</tr>
<tr>
<td>40</td>
<td>-</td>
<td>3.7 ± 0.60</td>
<td>2.7 ± 0.62</td>
<td>1.9 ± 0.34</td>
<td>2.0 ± 0.49</td>
<td>2.3 ± 0.91</td>
</tr>
<tr>
<td>50</td>
<td>-</td>
<td>3.9 ± 0.40</td>
<td>2.7 ± 0.84</td>
<td>2.4 ± 0.51</td>
<td>2.3 ± 0.86</td>
<td>2.5 ± 0.68</td>
</tr>
<tr>
<td>60</td>
<td>-</td>
<td>-</td>
<td>2.2 ± 0.4</td>
<td>3 ± 0.48</td>
<td>3 ± 0.54</td>
<td>3 ± 0.91</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca(^{+2})</th>
<th>Group VI NaF + AA + Ca(^{+2})</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1.9 ± 0.75</td>
<td>1.8 ± 0.31</td>
<td>0.85 ± 0.14</td>
<td>1.9 ± 0.64</td>
<td>1.8 ± 0.69</td>
<td>1.9 ± 0.44</td>
</tr>
<tr>
<td>20</td>
<td>–</td>
<td>1.8 ± 0.51</td>
<td>0.96 ± 0.12</td>
<td>1.85 ± 0.42</td>
<td>1.5 ± 0.41</td>
<td>1.85 ± 0.51</td>
</tr>
<tr>
<td>30</td>
<td>–</td>
<td>1.4 ± 0.59</td>
<td>1.0 ± 0.33</td>
<td>1.3 ± 0.22</td>
<td>1.3 ± 0.24</td>
<td>1.7 ± 0.43</td>
</tr>
<tr>
<td>40</td>
<td>–</td>
<td>1.0 ± 0.41</td>
<td>1.5 ± 0.41</td>
<td>1.0 ± 0.20</td>
<td>1.1 ± 0.31</td>
<td>1.3 ± 0.35</td>
</tr>
<tr>
<td>50</td>
<td>–</td>
<td>0.89 ± 0.13</td>
<td>1.6 ± 0.76</td>
<td>1.4 ± 0.20</td>
<td>1.5 ± 0.29</td>
<td>1.5 ± 0.28</td>
</tr>
<tr>
<td>60</td>
<td>–</td>
<td>–</td>
<td>1.7 ± 0.34</td>
<td>1.5 ± 0.22</td>
<td>1.7 ± 0.42</td>
<td>1.8 ± 0.62</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
TABLE 13  Cauda Epididymal Sperm Acrosin-Acrosin Inhibitor Complex (μ Moles BAEE Hydrolysed/Minute/10^6 Spermatozoa) Activity in Control and Treated Rat Groups

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca^{2+}</th>
<th>Group VI NaF + AA + Ca^{2+}</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2.6 ± 0.83</td>
<td>2.6 ± 0.91</td>
<td>1.1 ± 0.19</td>
<td>2.7 ± 0.92</td>
<td>2.6 ± 0.91</td>
<td>2.7 ± 0.96</td>
</tr>
<tr>
<td>20</td>
<td>-</td>
<td>2.3 ± 0.96</td>
<td>1.4 ± 0.33</td>
<td>2.2 ± 0.91</td>
<td>2.3 ± 0.99</td>
<td>2.7 ± 0.89</td>
</tr>
<tr>
<td>30</td>
<td>-</td>
<td>2.3 ± 0.84</td>
<td>1.6 ± 0.28</td>
<td>1.8 ± 0.86</td>
<td>1.8 ± 0.35</td>
<td>2.4 ± 0.68</td>
</tr>
<tr>
<td>40</td>
<td>-</td>
<td>1.8 ± 0.72</td>
<td>1.8 ± 0.58</td>
<td>0.96 ± 0.12</td>
<td>1.0 ± 0.29</td>
<td>2.0 ± 0.71</td>
</tr>
<tr>
<td>50</td>
<td>-</td>
<td>1.2 ± 0.28</td>
<td>1.9 ± 0.48</td>
<td>1.8 ± 0.48</td>
<td>2.0 ± 0.48</td>
<td>2.1 ± 0.91</td>
</tr>
<tr>
<td>60</td>
<td>-</td>
<td>-</td>
<td>2.1 ± 0.41</td>
<td>2.3 ± 0.86</td>
<td>2.3 ± 0.61</td>
<td>2.5 ± 0.81</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca²⁺</th>
<th>Group VI NaF + AA + Ca²⁺</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>7.63 ± 0.85</td>
<td>7.5 ± 0.85</td>
<td>5.3 ± 0.18</td>
<td>7.8 ± 0.82</td>
<td>7.6 ± 0.82</td>
<td>2.7 ± 0.96</td>
</tr>
<tr>
<td>20</td>
<td>–</td>
<td>7.3 ± 0.63</td>
<td>5.8 ± 0.24</td>
<td>7.2 ± 0.78</td>
<td>6.9 ± 0.78</td>
<td>7.7 ± 0.77</td>
</tr>
<tr>
<td>30</td>
<td>–</td>
<td>6.7 ± 0.74</td>
<td>5.5 ± 0.36</td>
<td>5.5 ± 0.70</td>
<td>6.0 ± 0.51</td>
<td>7.0 ± 0.65</td>
</tr>
<tr>
<td>40</td>
<td>–</td>
<td>6.6 ± 0.57</td>
<td>6.0 ± 0.53</td>
<td>3.9 ± 0.22</td>
<td>4.1 ± 0.36</td>
<td>5.6 ± 0.65</td>
</tr>
<tr>
<td>50</td>
<td>–</td>
<td>6.0 ± 0.27</td>
<td>6.2 ± 0.69</td>
<td>5.6 ± 0.40</td>
<td>5.8 ± 0.54</td>
<td>6.2 ± 0.62</td>
</tr>
<tr>
<td>60</td>
<td>–</td>
<td>–</td>
<td>5.9 ± 0.38</td>
<td>6.7 ± 0.52</td>
<td>6.9 ± 0.51</td>
<td>7.4 ± 0.78</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
### TABLE 15  Adrenal Gland Epinephrine (µg) Concentration in Control and Treated Groups of Rats

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca²</th>
<th>Group VI NaF + AA + Ca²</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>181 ± 6.3</td>
<td>184 ± 4.3</td>
<td>208 ± 4.8</td>
<td>183 ± 2.0</td>
<td>181 ± 2.4</td>
<td>180 ± 3.4</td>
</tr>
<tr>
<td>20</td>
<td>−</td>
<td>190 ± 3.9</td>
<td>201 ± 4.1</td>
<td>182 ± 3.2</td>
<td>181 ± 3.1</td>
<td>181 ± 2.6</td>
</tr>
<tr>
<td>30</td>
<td>−</td>
<td>192 ± 4.1</td>
<td>188 ± 3.4</td>
<td>188 ± 2.6</td>
<td>186 ± 3.7</td>
<td>185 ± 4.3</td>
</tr>
<tr>
<td>40</td>
<td>−</td>
<td>199 ± 2.1</td>
<td>180 ± 2.3</td>
<td>196 ± 1.8</td>
<td>193 ± 2.9</td>
<td>190 ± 2.8</td>
</tr>
<tr>
<td>50</td>
<td>−</td>
<td>210 ± 2.98</td>
<td>178 ± 3.4</td>
<td>190 ± 2.2</td>
<td>197 ± 3.1</td>
<td>184 ± 2.02</td>
</tr>
<tr>
<td>60</td>
<td>−</td>
<td>−</td>
<td>179 ± 3.0</td>
<td>181 ± 2.1</td>
<td>191 ± 1.8</td>
<td>180 ± 1.08</td>
</tr>
<tr>
<td>70</td>
<td>−</td>
<td>−</td>
<td>179 ± 3.8</td>
<td>180 ± 3.6</td>
<td>184 ± 1.27</td>
<td>180 ± 2.9</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
### TABLE 16 Adrenal Gland Nor-Epinephrine (µg) of Control and Treated Groups of Rats

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca⁺²</th>
<th>Group VI NaF + AA + Ca⁺²</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>48 ± 1.6</td>
<td>60 ± 3.9</td>
<td>101 ± 2.9</td>
<td>44 ± 1.8</td>
<td>47 ± 1.2</td>
<td>47 ± 1.8</td>
</tr>
<tr>
<td>20</td>
<td>-</td>
<td>63 ± 2.1</td>
<td>94 ± 1.93</td>
<td>44 ± 1.11</td>
<td>48 ± 1.8</td>
<td>47 ± 1.6</td>
</tr>
<tr>
<td>30</td>
<td>-</td>
<td>72 ± 2.2</td>
<td>86 ± 2.12</td>
<td>56 ± 1.9</td>
<td>63 ± 1.6</td>
<td>59 ± 1.54</td>
</tr>
<tr>
<td>40</td>
<td>-</td>
<td>104 ± 2.3</td>
<td>74 ± 1.84</td>
<td>58 ± 1.84</td>
<td>66 ± 1.3</td>
<td>60 ± 1.23</td>
</tr>
<tr>
<td>50</td>
<td>-</td>
<td>118 ± 2.34</td>
<td>62 ± 1.6</td>
<td>51 ± 1.03</td>
<td>62 ± 1.44</td>
<td>60 ± 1.31</td>
</tr>
<tr>
<td>60</td>
<td>-</td>
<td>-</td>
<td>53 ± 1.81</td>
<td>47 ± 1.11</td>
<td>57 ± 2.11</td>
<td>53 ± 1.02</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
<th>Duration (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>I</td>
<td>Control</td>
<td>0.37 ± 0.01</td>
</tr>
<tr>
<td>II</td>
<td>NaF</td>
<td>0.16 ± 0.01</td>
</tr>
<tr>
<td>III</td>
<td>NaF Withdrawal</td>
<td>0.28 ± 0.01</td>
</tr>
<tr>
<td>IV</td>
<td>NaF + AA</td>
<td>0.32 ± 0.03</td>
</tr>
<tr>
<td>V</td>
<td>NaF + Ca$^{+2}$</td>
<td>0.30 ± 0.01</td>
</tr>
<tr>
<td>VI</td>
<td>NaF + AA + Ca$^{+2}$</td>
<td>0.39 ± 0.03</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
TABLE 18

Serum $T_4$ (ng/ml) Levels in Control and Treated Groups of Rats

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
<th>Duration (Days)</th>
<th>50</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Control</td>
<td></td>
<td>4.2 ± 0.91</td>
<td>–</td>
</tr>
<tr>
<td>II</td>
<td>NaF</td>
<td></td>
<td>2.7 ± 0.78</td>
<td>–</td>
</tr>
<tr>
<td>III</td>
<td>NaF Withdrawal</td>
<td></td>
<td>2.2 ± 0.21</td>
<td>3.9 ± 0.14</td>
</tr>
<tr>
<td>IV</td>
<td>NaF + AA</td>
<td></td>
<td>3.2 ± 0.12</td>
<td>4.3 ± 0.34</td>
</tr>
<tr>
<td>V</td>
<td>NaF + Ca$^{+2}$</td>
<td></td>
<td>2.9 ± 0.18</td>
<td>4.4 ± 0.25</td>
</tr>
<tr>
<td>VI</td>
<td>NaF + AA + Ca$^{+2}$</td>
<td></td>
<td>3.6 ± 0.31</td>
<td>4.4 ± 0.22</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
### TABLE 19 Liver Phosphorylase Activity (mg Phosphorous Released/100 mg of Fresh Tissue Weight/15 Minutes) of Control and Treated Groups of Rats

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca²</th>
<th>Group VI NaF + AA + Ca²</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>21 ± 1.21</td>
<td>20.8 ± 1.05</td>
<td>9.5 ± 0.88</td>
<td>20 ± 0.62</td>
<td>21 ± 0.44</td>
<td>21 ± 1.02</td>
</tr>
<tr>
<td>30</td>
<td>21 ± 1.21</td>
<td>15.4 ± 1.1</td>
<td>11 ± 0.94</td>
<td>18 ± 0.69</td>
<td>20 ± 0.39</td>
<td>20 ± 0.38</td>
</tr>
<tr>
<td>50</td>
<td>21 ± 1.21</td>
<td>9.8 ± 0.72</td>
<td>13 ± 0.72</td>
<td>18 ± 0.72</td>
<td>20 ± 0.78</td>
<td>20 ± 0.42</td>
</tr>
<tr>
<td>70</td>
<td>21 ± 1.21</td>
<td>–</td>
<td>16.7 ± 0.81</td>
<td>18.8 ± 0.93</td>
<td>19.4 ± 0.63</td>
<td>19 ± 1.2</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
TABLE 20 Muscle Phosphorylase Activity (mg Phosphorous released/100 mg Fresh Tissue Weight/15 Minutes) of Control and Treated Groups of Rats

<table>
<thead>
<tr>
<th>Duration (days)</th>
<th>Group I Control</th>
<th>Group II NaF Treated</th>
<th>Group III NaF Withdrawal</th>
<th>Group IV NaF + AA</th>
<th>Group V NaF + Ca^{2+}</th>
<th>Group VI NaF + AA + Ca^{2+}</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>17.7 ± 1.92</td>
<td>17 ± 0.89</td>
<td>9.28 ± 0.63</td>
<td>18 ± 0.91</td>
<td>17.9 ± 0.88</td>
<td>17.5 ± 0.66</td>
</tr>
<tr>
<td>30</td>
<td>17.7 ± 1.92</td>
<td>15 ± 0.68</td>
<td>10.6 ± 0.72</td>
<td>17 ± 0.69</td>
<td>15 ± 0.62</td>
<td>16 ± 0.91</td>
</tr>
<tr>
<td>50</td>
<td>17.7 ± 1.92</td>
<td>11 ± 0.87</td>
<td>12 ± 0.69</td>
<td>17 ± 0.71</td>
<td>15.5 ± 0.91</td>
<td>16 ± 0.72</td>
</tr>
<tr>
<td>70</td>
<td>17.7 ± 1.92</td>
<td>9.2 ± 0.85</td>
<td>14.8 ± 0.81</td>
<td>16.4 ± 0.77</td>
<td>16 ± 0.67</td>
<td>16.7 ± 0.65</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Area</th>
<th>Fluoride (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gujarat University (Bore well)</td>
<td>0.6</td>
</tr>
<tr>
<td>2</td>
<td>Sabarmati River (at Mahatma Gandhi Ashram)</td>
<td>0.6</td>
</tr>
<tr>
<td>3</td>
<td>Gujarat University - Lady's Hostel</td>
<td>0.6</td>
</tr>
<tr>
<td>4</td>
<td>Vadaj (Municipal Water)</td>
<td>0.7</td>
</tr>
<tr>
<td>5</td>
<td>Ashram Road (&quot; )</td>
<td>0.6</td>
</tr>
<tr>
<td>6</td>
<td>Relief Road (&quot; )</td>
<td>0.56</td>
</tr>
<tr>
<td>7</td>
<td>Kalupur Station</td>
<td>0.60</td>
</tr>
<tr>
<td>8</td>
<td>Jamalpur</td>
<td>0.60</td>
</tr>
<tr>
<td>9</td>
<td>Paldi</td>
<td>0.60</td>
</tr>
<tr>
<td>10</td>
<td>Vasana (Well water)</td>
<td>0.70</td>
</tr>
<tr>
<td>11</td>
<td>Naroda (Tap water)</td>
<td>2.50</td>
</tr>
<tr>
<td>12</td>
<td>Raipur (Tap water)</td>
<td>0.70</td>
</tr>
<tr>
<td>13</td>
<td>Leelanagar(Tap water)</td>
<td>1.40</td>
</tr>
<tr>
<td>14</td>
<td>Odhav (Bore well)</td>
<td>1.04</td>
</tr>
<tr>
<td>15</td>
<td>Vatva (Nirma Factory Bore well)</td>
<td>1.40</td>
</tr>
<tr>
<td>16</td>
<td>Vatva (Tap water)</td>
<td>1.40</td>
</tr>
<tr>
<td>17</td>
<td>Maninagar</td>
<td>1.10</td>
</tr>
<tr>
<td>18</td>
<td>Kankaria Lake</td>
<td>0.72</td>
</tr>
<tr>
<td>19</td>
<td>Gujarat College - Ellisbridge</td>
<td>0.63</td>
</tr>
<tr>
<td>20</td>
<td>Sola Road (Tap water)</td>
<td>0.63</td>
</tr>
<tr>
<td>21</td>
<td>Satellite area</td>
<td>0.70</td>
</tr>
<tr>
<td>22</td>
<td>Navrangpura (Bore well)</td>
<td>0.63</td>
</tr>
<tr>
<td>23</td>
<td>Navrangpura (Municipal water)</td>
<td>0.70</td>
</tr>
<tr>
<td>24</td>
<td>Khanpur</td>
<td>0.70</td>
</tr>
<tr>
<td>Village Name</td>
<td>Water Source</td>
<td>Fluoride (ppm)</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Gaja</td>
<td>Bore</td>
<td>1.7</td>
</tr>
<tr>
<td>Mandothri</td>
<td>Bore</td>
<td>1.3</td>
</tr>
<tr>
<td>Veesarvasna</td>
<td>Bore</td>
<td>0.8</td>
</tr>
<tr>
<td>Balishna</td>
<td>Bore</td>
<td>1.3</td>
</tr>
<tr>
<td>Pali</td>
<td>Bore</td>
<td>1.3</td>
</tr>
<tr>
<td>Navpura</td>
<td>Bore</td>
<td>2.7</td>
</tr>
<tr>
<td>Dabhdhi</td>
<td>Bore</td>
<td>1.9</td>
</tr>
<tr>
<td>Matpur</td>
<td>Bore</td>
<td>1.8</td>
</tr>
<tr>
<td>Malekpur</td>
<td>Bore</td>
<td>1.0</td>
</tr>
<tr>
<td>Karsanpur</td>
<td>Bore</td>
<td>1.4</td>
</tr>
<tr>
<td>Khanpur</td>
<td>Bore</td>
<td>2.2</td>
</tr>
<tr>
<td>Chhogala</td>
<td>Bore</td>
<td>1.9</td>
</tr>
<tr>
<td>Phinoz</td>
<td>Bore</td>
<td>1.6</td>
</tr>
<tr>
<td>Ranuz</td>
<td>Bore</td>
<td>2.1</td>
</tr>
<tr>
<td>Bilia</td>
<td>Bore</td>
<td>1.78</td>
</tr>
<tr>
<td>Khali</td>
<td>Bore</td>
<td>1.4</td>
</tr>
<tr>
<td>Dasaj</td>
<td>Bore</td>
<td>2.3</td>
</tr>
<tr>
<td>Lihoda</td>
<td>Bore</td>
<td>1.9</td>
</tr>
<tr>
<td>Mehrwada</td>
<td>Bore</td>
<td>1.9</td>
</tr>
<tr>
<td>Macchava</td>
<td>Bore</td>
<td>1.1</td>
</tr>
<tr>
<td>Nanihirwani</td>
<td>Bore</td>
<td>2.9</td>
</tr>
<tr>
<td>Pansa</td>
<td>Bore</td>
<td>1.75</td>
</tr>
<tr>
<td>Deodara</td>
<td>Bore</td>
<td>2.3</td>
</tr>
<tr>
<td>Lotpur</td>
<td>Bore</td>
<td>1.2</td>
</tr>
<tr>
<td>Borsan</td>
<td>Bore</td>
<td>2.4</td>
</tr>
<tr>
<td>Northa</td>
<td>Bore</td>
<td>1.2</td>
</tr>
</tbody>
</table>

(Contd.)
<table>
<thead>
<tr>
<th>Village Name</th>
<th>Water Source</th>
<th>Fluoride (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambapura</td>
<td>Bore</td>
<td>1.1</td>
</tr>
<tr>
<td>Amud</td>
<td>Bore</td>
<td>1.5</td>
</tr>
<tr>
<td>Rajpur</td>
<td>Well</td>
<td>0.9</td>
</tr>
<tr>
<td>Sankhari</td>
<td>Well</td>
<td>0.9</td>
</tr>
<tr>
<td>Kanthravi</td>
<td>Well</td>
<td>1.1</td>
</tr>
<tr>
<td>Manund</td>
<td>Well</td>
<td>1.0</td>
</tr>
<tr>
<td>Limbdi</td>
<td>Well</td>
<td>1.0</td>
</tr>
<tr>
<td>Lalpur</td>
<td>Well</td>
<td>1.2</td>
</tr>
<tr>
<td>Der</td>
<td>Well</td>
<td>1.2</td>
</tr>
<tr>
<td>Kani</td>
<td>Well</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Range = 0.8 – 2.9 ppm.
TABLE 23
Serum Fluoride Concentration in Control (Ahmedabad City) and Mehsana District (Endemic Area) Population

<table>
<thead>
<tr>
<th>Case Name</th>
<th>F⁻ in Serum (ppm) (Control)</th>
<th>Case Name</th>
<th>F⁻ in Serum (ppm) (Mehsana district)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RK</td>
<td>0.05</td>
<td>AKP</td>
<td>0.10</td>
</tr>
<tr>
<td>MH</td>
<td>0.03</td>
<td>DNP</td>
<td>0.10</td>
</tr>
<tr>
<td>BB</td>
<td>0.04</td>
<td>LNP</td>
<td>0.10</td>
</tr>
<tr>
<td>HN</td>
<td>0.04</td>
<td>RBP</td>
<td>0.17</td>
</tr>
<tr>
<td>AD</td>
<td>0.03</td>
<td>MMT</td>
<td>0.18</td>
</tr>
<tr>
<td>SB</td>
<td>0.05</td>
<td>NMP</td>
<td>0.10</td>
</tr>
<tr>
<td>HB</td>
<td>0.05</td>
<td>VEP</td>
<td>0.14</td>
</tr>
<tr>
<td>PS</td>
<td>0.03</td>
<td>JT</td>
<td>0.10</td>
</tr>
<tr>
<td>PC</td>
<td>0.03</td>
<td>EVP</td>
<td>0.10</td>
</tr>
<tr>
<td>MP</td>
<td>0.05</td>
<td>KJE</td>
<td>0.10</td>
</tr>
<tr>
<td>IC</td>
<td>0.03</td>
<td>TLD</td>
<td>0.10</td>
</tr>
<tr>
<td>GM</td>
<td>0.05</td>
<td>RR</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Mean = 0.04 ± 0.002

Range = 0.03 - 0.05
TABLE 23 (CONTD.)

<table>
<thead>
<tr>
<th>Case Name</th>
<th>F⁻ in Serum (ppm) (Control)</th>
<th>Case Name</th>
<th>F⁻ in Serum (ppm) (Mehsana district)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSB</td>
<td>0.17</td>
<td>CSR</td>
<td>0.17</td>
</tr>
<tr>
<td>CSR</td>
<td>0.17</td>
<td>AA</td>
<td>0.32</td>
</tr>
<tr>
<td>AA</td>
<td>0.32</td>
<td>DKM</td>
<td>0.32</td>
</tr>
<tr>
<td>DKM</td>
<td>0.32</td>
<td>KVP</td>
<td>0.14</td>
</tr>
<tr>
<td>KVP</td>
<td>0.14</td>
<td>MKT</td>
<td>0.14</td>
</tr>
<tr>
<td>MKT</td>
<td>0.14</td>
<td>JGP</td>
<td>0.19</td>
</tr>
<tr>
<td>JGP</td>
<td>0.19</td>
<td>NSG</td>
<td>0.14</td>
</tr>
<tr>
<td>NSG</td>
<td>0.14</td>
<td>IMP</td>
<td>0.13</td>
</tr>
<tr>
<td>IMP</td>
<td>0.13</td>
<td>MV</td>
<td>0.18</td>
</tr>
<tr>
<td>MV</td>
<td>0.18</td>
<td>CMP</td>
<td>0.13</td>
</tr>
<tr>
<td>CMP</td>
<td>0.13</td>
<td>LC</td>
<td>0.17</td>
</tr>
<tr>
<td>LC</td>
<td>0.17</td>
<td>ACP</td>
<td>0.20</td>
</tr>
<tr>
<td>ACP</td>
<td>0.20</td>
<td>GBP</td>
<td>0.17</td>
</tr>
<tr>
<td>GBP</td>
<td>0.17</td>
<td>AGV</td>
<td>0.17</td>
</tr>
<tr>
<td>AGV</td>
<td>0.17</td>
<td>DT</td>
<td>0.19</td>
</tr>
<tr>
<td>DT</td>
<td>0.19</td>
<td>JRT</td>
<td>0.17</td>
</tr>
<tr>
<td>JRT</td>
<td>0.17</td>
<td>MVT</td>
<td>0.16</td>
</tr>
<tr>
<td>MVT</td>
<td>0.16</td>
<td>DST</td>
<td>0.14</td>
</tr>
<tr>
<td>DST</td>
<td>0.14</td>
<td>SM</td>
<td>0.31</td>
</tr>
<tr>
<td>SM</td>
<td>0.31</td>
<td>SBM</td>
<td>0.17</td>
</tr>
<tr>
<td>SBM</td>
<td>0.17</td>
<td>PT</td>
<td>0.17</td>
</tr>
<tr>
<td>PT</td>
<td>0.17</td>
<td>BT</td>
<td>0.20</td>
</tr>
<tr>
<td>BT</td>
<td>0.20</td>
<td>GR</td>
<td>0.50</td>
</tr>
<tr>
<td>GR</td>
<td>0.50</td>
<td>KT</td>
<td>0.19</td>
</tr>
<tr>
<td>KT</td>
<td>0.19</td>
<td>RP</td>
<td>0.17</td>
</tr>
<tr>
<td>RP</td>
<td>0.17</td>
<td>DBV</td>
<td>0.20</td>
</tr>
<tr>
<td>DBV</td>
<td>0.20</td>
<td>SP</td>
<td>0.42</td>
</tr>
<tr>
<td>SP</td>
<td>0.42</td>
<td>JBP</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.  
Mean = 0.18 ± 0.09  
Range = 0.10- 0.50.
TABLE 24
Serum Cholesterol in Control (Ahmedabad City) Human Subjects

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case</th>
<th>Serum Cholesterol (mg/100 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HVP</td>
<td>157.5</td>
</tr>
<tr>
<td>2</td>
<td>HVP</td>
<td>150.0</td>
</tr>
<tr>
<td>3</td>
<td>SS</td>
<td>195.0</td>
</tr>
<tr>
<td>4</td>
<td>MVN</td>
<td>190.0</td>
</tr>
<tr>
<td>5</td>
<td>SJ</td>
<td>187.5</td>
</tr>
<tr>
<td>6</td>
<td>SVS</td>
<td>182.5</td>
</tr>
<tr>
<td>7</td>
<td>RGK</td>
<td>195.0</td>
</tr>
<tr>
<td>8</td>
<td>GNS</td>
<td>189.0</td>
</tr>
<tr>
<td>9</td>
<td>CVR</td>
<td>194.8</td>
</tr>
<tr>
<td>10</td>
<td>SSR</td>
<td>198.0</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.  
Mean = 183.98 ± 5.26  
Range = 150 - 195 mg/100 ml.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case</th>
<th>Serum Cholesterol (mg/100 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PKP</td>
<td>210.0</td>
</tr>
<tr>
<td>2</td>
<td>NVP</td>
<td>220.0</td>
</tr>
<tr>
<td>3</td>
<td>DNP</td>
<td>175.0</td>
</tr>
<tr>
<td>4</td>
<td>BMP</td>
<td>180.0</td>
</tr>
<tr>
<td>5</td>
<td>KBP</td>
<td>162.5</td>
</tr>
<tr>
<td>6</td>
<td>PHP</td>
<td>170.0</td>
</tr>
<tr>
<td>7</td>
<td>LDT</td>
<td>185.0</td>
</tr>
<tr>
<td>8</td>
<td>AKG</td>
<td>195.0</td>
</tr>
<tr>
<td>9</td>
<td>NMP</td>
<td>200.0</td>
</tr>
<tr>
<td>10</td>
<td>JT</td>
<td>215.0</td>
</tr>
<tr>
<td>11</td>
<td>SVP</td>
<td>215.0</td>
</tr>
<tr>
<td>12</td>
<td>RHP</td>
<td>195.0</td>
</tr>
<tr>
<td>13</td>
<td>RR</td>
<td>150.75</td>
</tr>
<tr>
<td>14</td>
<td>MMT</td>
<td>165.0</td>
</tr>
<tr>
<td>15</td>
<td>VIP</td>
<td>175.0</td>
</tr>
<tr>
<td>16</td>
<td>HNP</td>
<td>153.31</td>
</tr>
<tr>
<td>17</td>
<td>KJP</td>
<td>187.5</td>
</tr>
<tr>
<td>18</td>
<td>LIP</td>
<td>200.0</td>
</tr>
<tr>
<td>19</td>
<td>MMP</td>
<td>200.5</td>
</tr>
<tr>
<td>20</td>
<td>RJP</td>
<td>218.0</td>
</tr>
<tr>
<td>21</td>
<td>HPP</td>
<td>155.5</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.  
Mean = 190.14 ± 5.92  
Range = 153 - 220.
<table>
<thead>
<tr>
<th>Case</th>
<th>Testosterone</th>
<th>Case</th>
<th>Testosterone</th>
</tr>
</thead>
<tbody>
<tr>
<td>RK</td>
<td>6.0</td>
<td>MOM</td>
<td>2.85</td>
</tr>
<tr>
<td>MH</td>
<td>7.0</td>
<td>RAB</td>
<td>4.9</td>
</tr>
<tr>
<td>BB</td>
<td>7.9</td>
<td>PHP</td>
<td>8.4</td>
</tr>
<tr>
<td>HN</td>
<td>6.6</td>
<td>MSP</td>
<td>6.1</td>
</tr>
<tr>
<td>AD</td>
<td>9.3</td>
<td>RAP</td>
<td>6.6</td>
</tr>
<tr>
<td>SB</td>
<td>5.3</td>
<td>MIP</td>
<td>4.9</td>
</tr>
<tr>
<td>HB</td>
<td>4.3</td>
<td>VKT</td>
<td>6.5</td>
</tr>
<tr>
<td>PS</td>
<td>5.3</td>
<td>DAT</td>
<td>6.1</td>
</tr>
<tr>
<td>KI</td>
<td>7.0</td>
<td>MBBP</td>
<td>5.2</td>
</tr>
<tr>
<td>SR</td>
<td>5.4</td>
<td>AMT</td>
<td>4.9</td>
</tr>
<tr>
<td>MH</td>
<td>6.4</td>
<td>JKT</td>
<td>6.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PMP</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JMP</td>
<td>8.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ULP</td>
<td>8.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PMP</td>
<td>8.8</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.
Mean Control = 6.4 ± 0.42
Endemic Population = 6.38 ± 0.45
Range = 3 - 9 ng/ml 2.85
Endemic Population = 2.85 - 8.8 ng/ml.
**TABLE 26**  
Serum $T_3$, $T_4$ and TSH Levels in Fluoride Endemic Population

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (Yrs.)</th>
<th>$T_3$ (ng/ml)</th>
<th>$T_4$ (ng/ml)</th>
<th>TSH (mU/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ANS</td>
<td>32</td>
<td>1.50</td>
<td>13.0</td>
<td>0.90</td>
</tr>
<tr>
<td>2</td>
<td>SSP</td>
<td>54</td>
<td>0.62</td>
<td>10.5</td>
<td>2.00</td>
</tr>
<tr>
<td>3</td>
<td>MLT</td>
<td>38</td>
<td>0.52</td>
<td>9.4</td>
<td>1.80</td>
</tr>
<tr>
<td>4</td>
<td>SRR</td>
<td>48</td>
<td>1.40</td>
<td>11.5</td>
<td>0.32</td>
</tr>
<tr>
<td>5</td>
<td>RVP</td>
<td>60</td>
<td>0.88</td>
<td>9.8</td>
<td>0.60</td>
</tr>
<tr>
<td>6</td>
<td>GNP</td>
<td>28</td>
<td>0.34</td>
<td>11.0</td>
<td>0.90</td>
</tr>
<tr>
<td>7</td>
<td>PTP</td>
<td>40</td>
<td>0.80</td>
<td>11.0</td>
<td>1.50</td>
</tr>
<tr>
<td>8</td>
<td>BSR</td>
<td>38</td>
<td>0.50</td>
<td>9.8</td>
<td>0.68</td>
</tr>
<tr>
<td>9</td>
<td>DSP</td>
<td>28</td>
<td>0.74</td>
<td>10.5</td>
<td>1.20</td>
</tr>
<tr>
<td>10</td>
<td>EKP</td>
<td>56</td>
<td>0.50</td>
<td>9.4</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.

Range = $T_3$ 0.34 - 1.5  $T_4$ = 9.4 - 11.5  TSH = 0.32 - 2

Normal Range = 0.70 - 2.0  5.4 - 13.5  0.2 - 5
The Levels of Serum Glutamate Oxaloacetate (SGOT) and Serum Glutamate Pyruvate Transaminase (SGPT) in Control (Ahmedabad City) Human Subjects

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case</th>
<th>SGOT (mU/ml)</th>
<th>SGPT (mU/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HVP</td>
<td>16.00</td>
<td>13.50</td>
</tr>
<tr>
<td>2</td>
<td>KNP</td>
<td>12.50</td>
<td>12.00</td>
</tr>
<tr>
<td>3</td>
<td>SJG</td>
<td>14.00</td>
<td>6.50</td>
</tr>
<tr>
<td>4</td>
<td>RG</td>
<td>20.50</td>
<td>10.00</td>
</tr>
<tr>
<td>5</td>
<td>SRG</td>
<td>14.00</td>
<td>6.50</td>
</tr>
<tr>
<td>6</td>
<td>MVN</td>
<td>14.50</td>
<td>10.00</td>
</tr>
<tr>
<td>7</td>
<td>SVS</td>
<td>18.00</td>
<td>13.50</td>
</tr>
<tr>
<td>8</td>
<td>RGK</td>
<td>14.50</td>
<td>12.00</td>
</tr>
<tr>
<td>9</td>
<td>CHV</td>
<td>18.00</td>
<td>13.50</td>
</tr>
<tr>
<td>10</td>
<td>GSN</td>
<td>14.00</td>
<td>12.00</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.  
Mean = 15.5 ± 0.80  10.95 ± 0.84  
Range = 12.5 - 20.5  6.5 - 13.5
TABLE 27

The Levels of Serum Glutamate Oxaloacetate (SGOT) and Serum Glutamate Pyruvate Transaminase (SGPT) in Mehsana (Fluoride Endemic Area) Population

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case</th>
<th>Village</th>
<th>SGOT (mU/ml)</th>
<th>SGPT (mU/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PKP</td>
<td>Rajpur</td>
<td>18.0</td>
<td>17.0</td>
</tr>
<tr>
<td>2</td>
<td>EVP</td>
<td>&quot;</td>
<td>18.0</td>
<td>16.0</td>
</tr>
<tr>
<td>3</td>
<td>NVP</td>
<td>&quot;</td>
<td>16.0</td>
<td>35.0</td>
</tr>
<tr>
<td>4</td>
<td>RBP</td>
<td>Gaja</td>
<td>76.0</td>
<td>27.0</td>
</tr>
<tr>
<td>5</td>
<td>AKP</td>
<td>&quot;</td>
<td>38.0</td>
<td>23.0</td>
</tr>
<tr>
<td>6</td>
<td>DNP</td>
<td>&quot;</td>
<td>20.5</td>
<td>45.0</td>
</tr>
<tr>
<td>7</td>
<td>BMP</td>
<td>&quot;</td>
<td>16.0</td>
<td>23.0</td>
</tr>
<tr>
<td>8</td>
<td>RPP</td>
<td>Sankhari</td>
<td>14.0</td>
<td>31.0</td>
</tr>
<tr>
<td>9</td>
<td>AJS</td>
<td>&quot;</td>
<td>34.0</td>
<td>35.0</td>
</tr>
<tr>
<td>10</td>
<td>KBP</td>
<td>Mandothri</td>
<td>54.0</td>
<td>81.0</td>
</tr>
<tr>
<td>11</td>
<td>GEP</td>
<td>&quot;</td>
<td>79.0</td>
<td>31.0</td>
</tr>
<tr>
<td>12</td>
<td>CMP</td>
<td>&quot;</td>
<td>50.0</td>
<td>21.0</td>
</tr>
<tr>
<td>13</td>
<td>PHP</td>
<td>Veesal Vashna</td>
<td>36.0</td>
<td>24.0</td>
</tr>
<tr>
<td>14</td>
<td>LDT</td>
<td>&quot;</td>
<td>61.5</td>
<td>40.5</td>
</tr>
<tr>
<td>15</td>
<td>MFS</td>
<td>Balishna</td>
<td>86.0</td>
<td>69.5</td>
</tr>
<tr>
<td>16</td>
<td>AKG</td>
<td>&quot;</td>
<td>61.5</td>
<td>36.0</td>
</tr>
<tr>
<td>17</td>
<td>JT</td>
<td>&quot;</td>
<td>48.0</td>
<td>36.0</td>
</tr>
<tr>
<td>18</td>
<td>SVP</td>
<td>&quot;</td>
<td>61.5</td>
<td>30.0</td>
</tr>
<tr>
<td>19</td>
<td>PHP</td>
<td>Pali</td>
<td>72.0</td>
<td>75.0</td>
</tr>
<tr>
<td>20</td>
<td>RR</td>
<td>&quot;</td>
<td>86.0</td>
<td>87.0</td>
</tr>
<tr>
<td>21</td>
<td>MMT</td>
<td>&quot;</td>
<td>86.0</td>
<td>71.0</td>
</tr>
</tbody>
</table>
**TABLE 27 (CONTD.)**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case</th>
<th>Village</th>
<th>SGOT (mU/ml)</th>
<th>SGPT (mU/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>VIP</td>
<td>Navapura</td>
<td>60.0</td>
<td>87.0</td>
</tr>
<tr>
<td>23</td>
<td>HNP</td>
<td></td>
<td>86.0</td>
<td>87.0</td>
</tr>
<tr>
<td>24</td>
<td>AMP</td>
<td></td>
<td>86.0</td>
<td>75.0</td>
</tr>
<tr>
<td>25</td>
<td>ARP</td>
<td>Khandarvi</td>
<td>72.0</td>
<td>93.0</td>
</tr>
<tr>
<td>26</td>
<td>KKN</td>
<td></td>
<td>74.0</td>
<td>86.0</td>
</tr>
<tr>
<td>27</td>
<td>RPV</td>
<td>Malund</td>
<td>86.0</td>
<td>120.0</td>
</tr>
<tr>
<td>28</td>
<td>KSM</td>
<td></td>
<td>72.0</td>
<td>81.0</td>
</tr>
<tr>
<td>29</td>
<td>AST</td>
<td>Limbdi</td>
<td>86.0</td>
<td>112.5</td>
</tr>
<tr>
<td>30</td>
<td>MRT</td>
<td></td>
<td>84.0</td>
<td>96.0</td>
</tr>
</tbody>
</table>

Values are mean ± S.E. Mean = 57.93 ± 4.73 56.38 ± 5.75
Range = 14 - 86 16 - 120
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Village</th>
<th>SGOT (mU/ml) (Range)</th>
<th>SGPT (mU/ml) (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rajpur</td>
<td>16 - 18</td>
<td>16 - 35</td>
</tr>
<tr>
<td>2</td>
<td>Gaja</td>
<td>16 - 76</td>
<td>23 - 45</td>
</tr>
<tr>
<td>3</td>
<td>Sankhari</td>
<td>14 - 34</td>
<td>31 - 35</td>
</tr>
<tr>
<td>4</td>
<td>Mandothri</td>
<td>50 - 79</td>
<td>21 - 81</td>
</tr>
<tr>
<td>5</td>
<td>Veesalvashna</td>
<td>36 - 61.5</td>
<td>24 - 40.5</td>
</tr>
<tr>
<td>6</td>
<td>Balishna</td>
<td>48 - 86</td>
<td>30 - 69.5</td>
</tr>
<tr>
<td>7</td>
<td>Pali</td>
<td>72 - 86</td>
<td>71 - 87</td>
</tr>
<tr>
<td>8</td>
<td>Navapura</td>
<td>60 - 86</td>
<td>75 - 87</td>
</tr>
<tr>
<td>9</td>
<td>Khandarvi</td>
<td>72 - 74</td>
<td>86 - 93</td>
</tr>
<tr>
<td>10</td>
<td>Malund</td>
<td>72 - 86</td>
<td>81 - 120</td>
</tr>
<tr>
<td>11</td>
<td>Limbbdi</td>
<td>84 - 86</td>
<td>96 - 112.5</td>
</tr>
</tbody>
</table>

Mean Range = 49.09 ± 7.69 - 50.36 ± 9.34 - 62.95 ± 8.93 - 73.22 ± 9.22
### TABLE 28

Serum Sialic Acid Concentration in Control (Ahmedabad City) Human Subjects

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case</th>
<th>Sialic Acid (μg/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HVP</td>
<td>222.08</td>
</tr>
<tr>
<td>2</td>
<td>VPL</td>
<td>199.92</td>
</tr>
<tr>
<td>3</td>
<td>MHT</td>
<td>193.37</td>
</tr>
<tr>
<td>4</td>
<td>MNB</td>
<td>230.71</td>
</tr>
<tr>
<td>5</td>
<td>KPR</td>
<td>187.27</td>
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<tr>
<td>6</td>
<td>NKP</td>
<td>185.04</td>
</tr>
<tr>
<td>7</td>
<td>RGK</td>
<td>236.66</td>
</tr>
<tr>
<td>8</td>
<td>IMS</td>
<td>184.48</td>
</tr>
<tr>
<td>9</td>
<td>RRT</td>
<td>190.84</td>
</tr>
<tr>
<td>10</td>
<td>GSN</td>
<td>199.47</td>
</tr>
<tr>
<td>11</td>
<td>RGS</td>
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<tr>
<td>12</td>
<td>MKT</td>
<td>194.86</td>
</tr>
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</table>

Values are mean ± S.E.  
Mean = 200.4 ± 0.88  
Range = 180 - 236
### TABLE 28 (CONTD.)

Serum Sialic Acid Concentration in Mehsana (Fluoride Endemic Area)

<table>
<thead>
<tr>
<th>S.No</th>
<th>Case</th>
<th>Village</th>
<th>Sialic Acid (µg/ml)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PKP</td>
<td>Rajpur</td>
<td>165.11</td>
<td>138 - 172</td>
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<tr>
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<td>EVP</td>
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<td>138.33</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>LNP</td>
<td>&quot;</td>
<td>156.18</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>VKG</td>
<td>&quot;</td>
<td>165.11</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>NVP</td>
<td>&quot;</td>
<td>172.55</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>RBP</td>
<td>Gaja</td>
<td>121.97</td>
<td>122 - 197</td>
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<tr>
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<td>AKP</td>
<td>&quot;</td>
<td>165.11</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>DNP</td>
<td>&quot;</td>
<td>197.01</td>
<td></td>
</tr>
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<td>9</td>
<td>BMP</td>
<td>&quot;</td>
<td>191.88</td>
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<tr>
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<td>MEP</td>
<td>Sankhari</td>
<td>168.08</td>
<td>129 - 203</td>
</tr>
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<td>DUS</td>
<td>&quot;</td>
<td>203.78</td>
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<td>RBP</td>
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<td>AJS</td>
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<td>129.41</td>
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<td>14</td>
<td>KBP</td>
<td>Mondothri</td>
<td>160.65</td>
<td>144 - 160</td>
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<tr>
<td>15</td>
<td>GEP</td>
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<td>156.18</td>
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<td>&quot;</td>
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<tr>
<td>17</td>
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<td>Veesal vashna</td>
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<td>147 - 188</td>
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<td>&quot;</td>
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<tr>
<td>19</td>
<td>AKG</td>
<td>Balishna</td>
<td>174.03</td>
<td>139 - 193</td>
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<tr>
<td>20</td>
<td>MKT</td>
<td>&quot;</td>
<td>188.91</td>
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<tr>
<td>21</td>
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<td>&quot;</td>
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<td>&quot;</td>
<td>139.82</td>
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</tr>
<tr>
<td>23</td>
<td>RR</td>
<td>Pali</td>
<td>191.00</td>
<td>133 - 191</td>
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<td>182.00</td>
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<tr>
<td>26</td>
<td>VIP</td>
<td>Navapura</td>
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</tr>
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<td>Case</td>
<td>Village</td>
<td>Sialic Acid (µg/ml)</td>
<td>Range</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
<td>---------------</td>
<td>---------------------</td>
<td>--------</td>
</tr>
<tr>
<td>29</td>
<td>ARP</td>
<td>Khandarvi</td>
<td>175.52</td>
<td>138 - 175</td>
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<tr>
<td>30</td>
<td>URH</td>
<td>&quot;</td>
<td>138.33</td>
<td></td>
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<tr>
<td>31</td>
<td>KSM</td>
<td>Malund</td>
<td>192.78</td>
<td>163 - 192</td>
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<tr>
<td>32</td>
<td>AST</td>
<td>&quot;</td>
<td>163.62</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>KJP</td>
<td>Kharshanpur</td>
<td>179.98</td>
<td>177 - 192</td>
</tr>
<tr>
<td>34</td>
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<td>&quot;</td>
<td>177.01</td>
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<td>35</td>
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<td>&quot;</td>
<td>191.88</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>HPP</td>
<td>Khanpur</td>
<td>196.35</td>
<td>129 - 222</td>
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<tr>
<td>37</td>
<td>RJP</td>
<td>&quot;</td>
<td>222.00</td>
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<td>ABP</td>
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<td>129.41</td>
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<tr>
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<td>PPP</td>
<td>&quot;</td>
<td>215.68</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>JSP</td>
<td>&quot;</td>
<td>171.06</td>
<td></td>
</tr>
</tbody>
</table>

Values are mean ± S.E. Mean = 168.27 ± 4.14 Range = 114 - 222
TABLE 29

Serum Epinephrine and Nor-Epinephrine Concentrations in Normal Human Subjects

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (Yrs)</th>
<th>Nor-Epinephrine (ng/ml)</th>
<th>Epinephrine (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MM</td>
<td>24</td>
<td>126.0</td>
<td>260.0</td>
</tr>
<tr>
<td>2</td>
<td>RGK</td>
<td>24</td>
<td>88.6</td>
<td>255.0</td>
</tr>
<tr>
<td>3</td>
<td>KP</td>
<td>26</td>
<td>98.0</td>
<td>254.0</td>
</tr>
<tr>
<td>4</td>
<td>HVP</td>
<td>26</td>
<td>86.0</td>
<td>168.0</td>
</tr>
<tr>
<td>5</td>
<td>SN</td>
<td>26</td>
<td>61.7</td>
<td>190.0</td>
</tr>
<tr>
<td>6</td>
<td>SGT</td>
<td>28</td>
<td>129.0</td>
<td>258.0</td>
</tr>
<tr>
<td>7</td>
<td>KIR</td>
<td>24</td>
<td>78.0</td>
<td>231.0</td>
</tr>
<tr>
<td>8</td>
<td>MVN</td>
<td>25</td>
<td>102.0</td>
<td>208.0</td>
</tr>
<tr>
<td>9</td>
<td>SNL</td>
<td>24</td>
<td>90.7</td>
<td>187.4</td>
</tr>
<tr>
<td>10</td>
<td>KSR</td>
<td>26</td>
<td>102.4</td>
<td>218.0</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.  
Mean = 96.24 ± 2.10  
222.94 ± 10.68  
Range  
Nor-Epinephrine = 78 - 129  
Epinephrine = 168 - 260
TABLE 29 (CONTD.)

Serum Epinephrine and Nor-Epinephrine Concentrations in Fluoride Endemic Population of Mehsana District

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (Yrs)</th>
<th>Nor-Epinephrine (ng/ml)</th>
<th>Epinephrine (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PES</td>
<td>60</td>
<td>112.20</td>
<td>269.0</td>
</tr>
<tr>
<td>2</td>
<td>LMV</td>
<td>23</td>
<td>98.54</td>
<td>221.8</td>
</tr>
<tr>
<td>3</td>
<td>ACP</td>
<td>60</td>
<td>87.10</td>
<td>180.0</td>
</tr>
<tr>
<td>4</td>
<td>CDP</td>
<td>22</td>
<td>95.30</td>
<td>244.5</td>
</tr>
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<td>RKA</td>
<td>45</td>
<td>97.59</td>
<td>302.8</td>
</tr>
<tr>
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<td>PVP</td>
<td>50</td>
<td>95.30</td>
<td>270.8</td>
</tr>
<tr>
<td>7</td>
<td>EKP</td>
<td>57</td>
<td>75.00</td>
<td>264.0</td>
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<tr>
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<td>HRP</td>
<td>52</td>
<td>84.29</td>
<td>294.0</td>
</tr>
<tr>
<td>9</td>
<td>KBB</td>
<td>40</td>
<td>96.26</td>
<td>294.8</td>
</tr>
<tr>
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<td>RKM</td>
<td>40</td>
<td>90.54</td>
<td>347.9</td>
</tr>
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<td>MPP</td>
<td>50</td>
<td>94.62</td>
<td>196.02</td>
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<td>HKC</td>
<td>50</td>
<td>92.40</td>
<td>392.5</td>
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<td>ASN</td>
<td>32</td>
<td>84.70</td>
<td>168.2</td>
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<td>25</td>
<td>81.32</td>
<td>257.71</td>
</tr>
<tr>
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<td>SGS</td>
<td>10</td>
<td>90.80</td>
<td>346.0</td>
</tr>
<tr>
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<td>TGS</td>
<td>10</td>
<td>84.23</td>
<td>254.0</td>
</tr>
<tr>
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<td>MKT</td>
<td>10</td>
<td>96.33</td>
<td>207.2</td>
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<td>NSG</td>
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<td>149.60</td>
<td>268.8</td>
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<tr>
<td>19</td>
<td>BPT</td>
<td>12</td>
<td>140.50</td>
<td>386.2</td>
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<td>151.5</td>
<td>324.3</td>
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### TABLE 29 (CONTD.)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (Yrs)</th>
<th>Nor-Epinephrine (ng/ml)</th>
<th>Epinephrine (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>10</td>
<td>68.80</td>
<td>175.96</td>
</tr>
<tr>
<td>22</td>
<td>JGP</td>
<td>55</td>
<td>86.10</td>
<td>166.0</td>
</tr>
<tr>
<td>23</td>
<td>EBT</td>
<td>35</td>
<td>134.20</td>
<td>247.68</td>
</tr>
<tr>
<td>24</td>
<td>SSR</td>
<td>24</td>
<td>157.40</td>
<td>256.6</td>
</tr>
<tr>
<td>25</td>
<td>BVP</td>
<td>52</td>
<td>81.00</td>
<td>298.0</td>
</tr>
<tr>
<td>26</td>
<td>KDP</td>
<td>50</td>
<td>130.14</td>
<td>291.0</td>
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<td>RVP</td>
<td>46</td>
<td>86.47</td>
<td>234.5</td>
</tr>
<tr>
<td>28</td>
<td>KKC</td>
<td>55</td>
<td>130.14</td>
<td>345.0</td>
</tr>
<tr>
<td>29</td>
<td>RNP</td>
<td>52</td>
<td>103.14</td>
<td>168.00</td>
</tr>
<tr>
<td>30</td>
<td>KLP</td>
<td>48</td>
<td>128.00</td>
<td>261.80</td>
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</table>

Values are mean ± S.E.  
Mean = 103.43 ± 4.50  
264.35 ± 11.86  

Range  
Nor-Epinephrine = 75 - 157.4  
Epinephrine = 166 - 392.5
### TABLE 30

Serum Calcium Levels in Control (Ahmedabad City) Human Subjects

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (Yrs.)</th>
<th>Sex</th>
<th>Ca(^{+2}) (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HVP</td>
<td>26</td>
<td>M</td>
<td>0.92</td>
</tr>
<tr>
<td>2</td>
<td>MM</td>
<td>24</td>
<td>M</td>
<td>0.86</td>
</tr>
<tr>
<td>3</td>
<td>MVN</td>
<td>25</td>
<td>M</td>
<td>0.87</td>
</tr>
<tr>
<td>4</td>
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<td>0.98</td>
</tr>
<tr>
<td>5</td>
<td>NS</td>
<td>35</td>
<td>M</td>
<td>1.12</td>
</tr>
<tr>
<td>6</td>
<td>MP</td>
<td>26</td>
<td>M</td>
<td>0.99</td>
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<td>7</td>
<td>HMP</td>
<td>29</td>
<td>M</td>
<td>1.14</td>
</tr>
<tr>
<td>8</td>
<td>KNP</td>
<td>25</td>
<td>M</td>
<td>1.09</td>
</tr>
<tr>
<td>9</td>
<td>GSP</td>
<td>36</td>
<td>M</td>
<td>1.15</td>
</tr>
<tr>
<td>10</td>
<td>KAS</td>
<td>26</td>
<td>M</td>
<td>1.12</td>
</tr>
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Values are mean ± S.E.  
Mean = 1.024 ± 0.13  
Range = 0.86 - 1.15
TABLE 30 (CONTD.)

Serum Calcium Levels in Fluoride Endemic Human Population

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (Yrs.)</th>
<th>Sex</th>
<th>Ca$^{+2}$ (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MVT</td>
<td>40</td>
<td>F</td>
<td>0.18</td>
</tr>
<tr>
<td>2</td>
<td>RSB</td>
<td>45</td>
<td>F</td>
<td>0.34</td>
</tr>
<tr>
<td>3</td>
<td>NMP</td>
<td>55</td>
<td>M</td>
<td>0.80</td>
</tr>
<tr>
<td>4</td>
<td>SMR</td>
<td>25</td>
<td>F</td>
<td>0.29</td>
</tr>
<tr>
<td>5</td>
<td>NCR</td>
<td>55</td>
<td>M</td>
<td>1.26</td>
</tr>
<tr>
<td>6</td>
<td>ANS</td>
<td>32</td>
<td>M</td>
<td>0.80</td>
</tr>
<tr>
<td>7</td>
<td>CSR</td>
<td>42</td>
<td>M</td>
<td>0.28</td>
</tr>
<tr>
<td>8</td>
<td>CAT</td>
<td>25</td>
<td>M</td>
<td>1.20</td>
</tr>
<tr>
<td>9</td>
<td>GSP</td>
<td>39</td>
<td>M</td>
<td>1.00</td>
</tr>
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<td>NMP</td>
<td>55</td>
<td>M</td>
<td>1.48</td>
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<td>11</td>
<td>SSP</td>
<td>54</td>
<td>M</td>
<td>0.77</td>
</tr>
<tr>
<td>12</td>
<td>SRR</td>
<td>22</td>
<td>F</td>
<td>0.80</td>
</tr>
<tr>
<td>13</td>
<td>GPP</td>
<td>28</td>
<td>M</td>
<td>0.70</td>
</tr>
<tr>
<td>14</td>
<td>PSP</td>
<td>37</td>
<td>M</td>
<td>0.80</td>
</tr>
<tr>
<td>15</td>
<td>MKT</td>
<td>32</td>
<td>M</td>
<td>0.17</td>
</tr>
<tr>
<td>16</td>
<td>PTP</td>
<td>38</td>
<td>M</td>
<td>0.21</td>
</tr>
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<td>17</td>
<td>MLT</td>
<td>38</td>
<td>M</td>
<td>0.49</td>
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<td>18</td>
<td>NNP</td>
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<td>M</td>
<td>0.56</td>
</tr>
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<td>EUG</td>
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<td>M</td>
<td>0.63</td>
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<td>20</td>
<td>ECS</td>
<td>10</td>
<td>M</td>
<td>0.58</td>
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Values are mean ± S.E. Mean = 0.617 ± 0.06
Range = 0.17 - 1.26
### TABLE 31

Serum Na⁺ and K⁺ Levels in Control (Ahmedabad City) Human Population

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (Yrs.)</th>
<th>Sex</th>
<th>Na⁺ (ppm)</th>
<th>K⁺ (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MM</td>
<td>24</td>
<td>Male</td>
<td>3000</td>
<td>250</td>
</tr>
<tr>
<td>2</td>
<td>MVN</td>
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<td>3500</td>
<td>220</td>
</tr>
<tr>
<td>3</td>
<td>KP</td>
<td>27</td>
<td>&quot;</td>
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<td>180</td>
</tr>
<tr>
<td>4</td>
<td>GKR</td>
<td>24</td>
<td>&quot;</td>
<td>2900</td>
<td>175</td>
</tr>
<tr>
<td>5</td>
<td>NS</td>
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<td>&quot;</td>
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<td>200</td>
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<td>&quot;</td>
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<td>HMP</td>
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<td>&quot;</td>
<td>2895</td>
<td>165</td>
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<td>8</td>
<td>KNP</td>
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<td>&quot;</td>
<td>3090</td>
<td>180</td>
</tr>
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<td>9</td>
<td>GSP</td>
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<td>&quot;</td>
<td>2900</td>
<td>220</td>
</tr>
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<td>10</td>
<td>KAS</td>
<td>26</td>
<td>&quot;</td>
<td>2900</td>
<td>220</td>
</tr>
</tbody>
</table>

Values are mean ± S.E.

Mean = Na⁺ = 3083.5 ± 41.91 K⁺ = 195 ± 13.20

Range - Na⁺ = 2895 - 3500 K⁺ = 160 - 250
TABLE 31 (CONTD.)

Serum Na\(^+\) and K\(^+\) Levels in Fluoride Endemic Population of Mehsana District, Gujarat

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (Yrs.)</th>
<th>Sex</th>
<th>Village Name</th>
<th>Na(^+) (ppm)</th>
<th>K(^+) (oom)</th>
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</thead>
<tbody>
<tr>
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<td>M</td>
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<td>530</td>
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<tr>
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<td>PNS</td>
<td>39</td>
<td>M</td>
<td>&quot;</td>
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<td>620</td>
</tr>
<tr>
<td>3</td>
<td>KPP</td>
<td>22</td>
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<td>&quot;</td>
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<td>580</td>
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<td>22</td>
<td>F</td>
<td>Lalpur</td>
<td>3900</td>
<td>720</td>
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<td>M</td>
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<td>M</td>
<td>Khali</td>
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<td>&quot;</td>
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<td>Ligoda</td>
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<td>460</td>
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<td>F</td>
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Values are mean S.E.

Mean = Na⁺ = 4404.37 ± 718  K⁺ = 534 ± 103.9
Na⁺ Range = 1300 - 7000
K⁺ Range = 200 - 1001
TABLE 32

Fluoride Levels in Urine of Control (Ahmedabad City)  
Human Subjects

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Values are mean ± S.E.  
Mean = 0.67 ± 0.1  
Range = 0.1 - 1.50 ppm.
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Values are mean ± S.E.  
Mean = 3.66 ± 0.71  
Range = 1-7.6 ppm
TABLE 34

Urine Epinephrine and Nor-Epinephrine Concentrations in Control Human Subjects

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<td>2.</td>
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<td>KP</td>
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<td>34</td>
<td>14</td>
</tr>
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<td>4.</td>
<td>HVP</td>
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<td>30</td>
<td>24</td>
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<td>5.</td>
<td>SN</td>
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<tr>
<td>6.</td>
<td>SGT</td>
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<td>12</td>
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<td>7.</td>
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<td>20</td>
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<td>8.</td>
<td>MVN</td>
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<td>9.</td>
<td>SNL</td>
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<td>16</td>
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<tr>
<td>10.</td>
<td>KSR</td>
<td>26</td>
<td>38</td>
<td>24</td>
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</tbody>
</table>

Values are mean ± S.E. Mean = 30.1 ± 2.16 19.63 ± 2.40

Range
Epinephrine = 16 - 40
Nor-epinephrine = 14 - 31
### TABLE 34 CONTD.

Urine Epinephrine and Nor-Epinephrine Concentrations in Fluoride Endemic Human Subjects

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (yrs.)</th>
<th>Epinephrine (ng/ml)</th>
<th>Nor-epinephrine (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PES</td>
<td>60</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>LMV</td>
<td>23</td>
<td>32</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>RKA</td>
<td>45</td>
<td>28</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
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<td>22</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>RKM</td>
<td>40</td>
<td>34</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>ASN</td>
<td>32</td>
<td>29</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>LDT</td>
<td>25</td>
<td>30</td>
<td>21</td>
</tr>
<tr>
<td>8</td>
<td>NSG</td>
<td>42</td>
<td>31</td>
<td>14</td>
</tr>
<tr>
<td>9</td>
<td>DBP</td>
<td>28</td>
<td>28</td>
<td>21</td>
</tr>
<tr>
<td>10</td>
<td>EBT</td>
<td>35</td>
<td>36</td>
<td>24</td>
</tr>
<tr>
<td>11</td>
<td>SSR</td>
<td>24</td>
<td>22</td>
<td>11</td>
</tr>
<tr>
<td>12</td>
<td>BVP</td>
<td>52</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
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<td>KDP</td>
<td>50</td>
<td>26</td>
<td>7</td>
</tr>
<tr>
<td>14</td>
<td>RVP</td>
<td>46</td>
<td>31</td>
<td>--</td>
</tr>
<tr>
<td>15</td>
<td>KKC</td>
<td>55</td>
<td>36</td>
<td>21</td>
</tr>
<tr>
<td>16</td>
<td>RNP</td>
<td>52</td>
<td>38</td>
<td>--</td>
</tr>
<tr>
<td>17</td>
<td>KLP</td>
<td>48</td>
<td>29</td>
<td>14</td>
</tr>
<tr>
<td>18</td>
<td>PSP</td>
<td>37</td>
<td>32</td>
<td>17</td>
</tr>
<tr>
<td>19</td>
<td>CDP</td>
<td>22</td>
<td>34</td>
<td>14</td>
</tr>
<tr>
<td>20</td>
<td>TGS</td>
<td>10</td>
<td>36</td>
<td>8</td>
</tr>
</tbody>
</table>

Values are mean ± S.E

Mean = 29.5 ± 1.47  
14.42 ± 1.29

Range

Epinephrine = 18 - 38
Nor-epinephrine = 6 - 24
## TABLE 35

Urinary Calcium (Ca$^{+2}$) Levels in Control Human Subjects

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (yrs.)</th>
<th>Sex</th>
<th>Ca$^{+2}$ (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MM</td>
<td>24</td>
<td>Male</td>
<td>1.20</td>
</tr>
<tr>
<td>2.</td>
<td>SGJ</td>
<td>26</td>
<td>&quot;</td>
<td>1.05</td>
</tr>
<tr>
<td>3.</td>
<td>KVR</td>
<td>26</td>
<td>&quot;</td>
<td>1.20</td>
</tr>
<tr>
<td>4.</td>
<td>GKR</td>
<td>24</td>
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<td>1.30</td>
</tr>
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<td>HVP</td>
<td>26</td>
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<td>0.80</td>
</tr>
<tr>
<td>6.</td>
<td>KRT</td>
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<td>0.80</td>
</tr>
<tr>
<td>7.</td>
<td>KP</td>
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<td>0.90</td>
</tr>
<tr>
<td>8.</td>
<td>MVN</td>
<td>25</td>
<td>&quot;</td>
<td>0.90</td>
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<tr>
<td>9.</td>
<td>SN</td>
<td>25</td>
<td>&quot;</td>
<td>1.00</td>
</tr>
<tr>
<td>10.</td>
<td>SNL</td>
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<td>0.86</td>
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</table>

Values are mean ± S.E.  
Mean = 1.001 ± 0.05  
Range = 0.8 - 1.3


<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (yrs.)</th>
<th>Sex</th>
<th>Ca$^{+2}$ (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>KCT</td>
<td>50</td>
<td>Male</td>
<td>1.1</td>
</tr>
<tr>
<td>2</td>
<td>SGN</td>
<td>10</td>
<td>&quot;</td>
<td>1.1</td>
</tr>
<tr>
<td>3</td>
<td>CMP</td>
<td>42</td>
<td>&quot;</td>
<td>0.8</td>
</tr>
<tr>
<td>4</td>
<td>TNP</td>
<td>58</td>
<td>&quot;</td>
<td>0.9</td>
</tr>
<tr>
<td>5</td>
<td>KCT</td>
<td>11</td>
<td>&quot;</td>
<td>1.2</td>
</tr>
<tr>
<td>6</td>
<td>GJC</td>
<td>34</td>
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<td>0.5</td>
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<td>1.4</td>
</tr>
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<td>CSR</td>
<td>42</td>
<td>&quot;</td>
<td>1.1</td>
</tr>
<tr>
<td>10</td>
<td>RKM</td>
<td>40</td>
<td>Female</td>
<td>1.2</td>
</tr>
<tr>
<td>11</td>
<td>RBC</td>
<td>65</td>
<td>Male</td>
<td>0.6</td>
</tr>
<tr>
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<td>CGT</td>
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<td>&quot;</td>
<td>1.4</td>
</tr>
<tr>
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<td>&quot;</td>
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<tr>
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<td>50</td>
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<td>1.0</td>
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<td>1.40</td>
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<td>VGR</td>
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<td>1.74</td>
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### TABLE 35 (CONTD.)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (yrs.)</th>
<th>Sex</th>
<th>Ca$^{+2}$ (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
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<td>32</td>
<td>Male</td>
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</tr>
<tr>
<td>21</td>
<td>BSP</td>
<td>46</td>
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<td>1.26</td>
</tr>
<tr>
<td>22</td>
<td>MLT</td>
<td>38</td>
<td>&quot;</td>
<td>1.00</td>
</tr>
<tr>
<td>23</td>
<td>SMP</td>
<td>20</td>
<td>&quot;</td>
<td>1.50</td>
</tr>
<tr>
<td>24</td>
<td>RAM</td>
<td>29</td>
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<td>1.20</td>
</tr>
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<td>SAT</td>
<td>39</td>
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<td>1.25</td>
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Values are mean ± S.E. Mean = 1.14 ± 0.06
Range = 0.5 - 1.74
### TABLE 36

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Na⁺ (ppm)</th>
<th>K⁺ (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>SN</td>
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<td>Male</td>
<td>3678</td>
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<td>MS</td>
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<td></td>
<td>1650</td>
<td>1200</td>
</tr>
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<td>4.</td>
<td>HVP</td>
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<td>3800</td>
<td>1100</td>
</tr>
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<td>PP</td>
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<td></td>
<td>2000</td>
<td>3000</td>
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<td>RV</td>
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<td>3800</td>
<td>1100</td>
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<tr>
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<td>RG</td>
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<td>2800</td>
</tr>
<tr>
<td>8.</td>
<td>AM</td>
<td>28</td>
<td></td>
<td>2700</td>
<td>1200</td>
</tr>
<tr>
<td>9.</td>
<td>BK</td>
<td>27</td>
<td></td>
<td>1300</td>
<td>2000</td>
</tr>
<tr>
<td>10.</td>
<td>SS</td>
<td>28</td>
<td></td>
<td>2300</td>
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</table>

**Na⁺ and K⁺ Levels in Urine in Control (Ahmedabad City) Human Subjects**

Mean = 2850.8 ± 314.25 1670 ± 265.0

Range = 1300 - 4000 600 - 3000

Values are mean ± S.E.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Village Name</th>
<th>K⁺ (ppm)</th>
<th>Urine Na⁺ (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>VDC</td>
<td>35</td>
<td>Male</td>
<td>Rajpur</td>
<td>1400</td>
<td>2400</td>
</tr>
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<td></td>
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</tr>
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<td></td>
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<td>1880</td>
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<td>MKP</td>
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<td></td>
<td></td>
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</tr>
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<td></td>
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<td>650</td>
</tr>
<tr>
<td>13.</td>
<td>MAP</td>
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<td>RRR</td>
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<td>7800</td>
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<tr>
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<td></td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
<td>16.</td>
<td>NGR</td>
<td>41</td>
<td></td>
<td></td>
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<td>3000</td>
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</table>

Survey Conducted at Mehsana District from 12th - 18th February, 1990.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Village Name</th>
<th>Na⁺ (ppm)</th>
<th>K⁺ (ppm)</th>
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</thead>
<tbody>
<tr>
<td>17.</td>
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<td>Male</td>
<td>Veesal Vashna</td>
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<td>&quot;</td>
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<td>&quot;</td>
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<td>&quot;</td>
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<td>5380</td>
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<td>3280</td>
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<tr>
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<td>&quot;</td>
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<td>1450</td>
</tr>
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<td>25.</td>
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<td>&quot;</td>
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<td>4900</td>
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<tr>
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<td>&quot;</td>
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<td>3090</td>
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<tr>
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<tr>
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<td>&quot;</td>
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</tr>
<tr>
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<td>KTP</td>
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<td>&quot;</td>
<td>&quot;</td>
<td>5050</td>
<td>750</td>
</tr>
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</table>
### TABLE 36 (CONTD.)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Village Name</th>
<th>Urine</th>
<th>Na⁺ (ppm)</th>
<th>K⁺ (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.</td>
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<td>39.</td>
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<td>23</td>
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<td>40.</td>
<td>VSR</td>
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<td>5820</td>
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<tr>
<td>41.</td>
<td>PJV</td>
<td>29</td>
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<td>&quot;</td>
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<td>42.</td>
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<td>44.</td>
<td>GVV</td>
<td>38</td>
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<td>&quot;</td>
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<td>2110</td>
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<tr>
<td>45.</td>
<td>VPH</td>
<td>8</td>
<td>&quot;</td>
<td>Mathpur</td>
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<td>6100</td>
<td>1050</td>
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TABLE 36 (CONTD.)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Case Name</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Village Name</th>
<th>Urine Na⁺ (ppm)</th>
<th>K⁺ (ppm)</th>
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<tr>
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<td>&quot;</td>
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<td>2500</td>
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<td>&quot;</td>
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<td>1750</td>
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<td>KKT</td>
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<td>Limbdi</td>
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<td>1900</td>
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<td>&quot;</td>
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<td>1780</td>
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<tr>
<td>56.</td>
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<td>Kharshanpur</td>
<td>4550</td>
<td>5800</td>
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<tr>
<td>57.</td>
<td>JBP</td>
<td>13</td>
<td>&quot;</td>
<td>&quot;</td>
<td>5820</td>
<td>2350</td>
</tr>
<tr>
<td>58.</td>
<td>DPP</td>
<td>10</td>
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<td>&quot;</td>
<td>5470</td>
<td>2370</td>
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<td>59.</td>
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<td>Khanpur</td>
<td>5490</td>
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<td>60.</td>
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<tr>
<td>63.</td>
<td>JSP</td>
<td>50</td>
<td>&quot;</td>
<td>&quot;</td>
<td>2900</td>
<td>1250</td>
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</tbody>
</table>

Value are mean ± S.E.  
Mean = 3567.6 ± 272.54  2541.9 ± 227.7
### TABLE 36 (CONTD.)

Mean Ranges of Na⁺ and K⁺ Levels in Urine of Mehsana District Population

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Village Name</th>
<th>Na⁺ (ppm) (Range)</th>
<th>K⁺ (ppm) (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Rajpur</td>
<td>1400 - 2800</td>
<td>2400 - 4200</td>
</tr>
<tr>
<td>2.</td>
<td>Gaja</td>
<td>1400 - 3000</td>
<td>1490 - 7800</td>
</tr>
<tr>
<td>3.</td>
<td>Sankhari</td>
<td>1700 - 6680</td>
<td>650 - 5270</td>
</tr>
<tr>
<td>4.</td>
<td>Mandothri</td>
<td>1500 - 3000</td>
<td>790 - 7800</td>
</tr>
<tr>
<td>5.</td>
<td>Veesal Vashna</td>
<td>650 - 2900</td>
<td>500 - 5380</td>
</tr>
<tr>
<td>6.</td>
<td>Balishna</td>
<td>1400 - 2200</td>
<td>1450 - 5500</td>
</tr>
<tr>
<td>7.</td>
<td>Pali</td>
<td>2000 - 6100</td>
<td>750 - 1750</td>
</tr>
<tr>
<td>8.</td>
<td>Navapura</td>
<td>1450 - 7600</td>
<td>250 - 3000</td>
</tr>
<tr>
<td>9.</td>
<td>Khandarvi</td>
<td>1150 - 2700</td>
<td>950 - 1250</td>
</tr>
<tr>
<td>10.</td>
<td>Malund</td>
<td>6100 - 8680</td>
<td>1750 - 3700</td>
</tr>
<tr>
<td>12.</td>
<td>Mathpur</td>
<td>1750 - 6100</td>
<td>650 - 1050</td>
</tr>
<tr>
<td>13.</td>
<td>Maalekhpur</td>
<td>1800 - 4900</td>
<td>1400 - 5300</td>
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<td>14.</td>
<td>Limbdi</td>
<td>6800 - 7300</td>
<td>1780 - 2050</td>
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<tr>
<td>15.</td>
<td>Khanpur</td>
<td>4550 - 5820</td>
<td>2370 - 5800</td>
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</tbody>
</table>

| Values are mean ± S.E. | Mean = 2396.9 ± 452 - 5292.5 ± 551 | 1172 ± 168 - 415.63 ± 538.6 |

*Note: Values are mean ± S.E.*
### TABLE 37

**NaF in vitro Human Spermatozoa**

<p>| | | |</p>
<table>
<thead>
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<tr>
<td>1.</td>
<td>Control</td>
<td>62.75 %</td>
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<tr>
<td>2.</td>
<td>NaF 20 μM after 20 minutes</td>
<td>54 %</td>
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<tr>
<td>3.</td>
<td>NaF 50 μM after 20 minutes</td>
<td>37.96 %</td>
</tr>
<tr>
<td>4.</td>
<td>NaF 250 μM after 5 minutes</td>
<td>32.4 %</td>
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<tr>
<td>5.</td>
<td>NaF 250 μM after 10 minutes</td>
<td>10.37 %</td>
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</table>
First Bar - Control
Second Bar - NaF Treatment
Third Bar - NaF Withdrawal

Fig. 1
First Bar - Control
Second Bar - NaF Treatment
Third Bar - NaF Withdrawal

Fig. III
Fig. IV

First Bar - Control
Second Bar - NaF+AA
Third Bar - NaF+Ca+2
Fourth Bar - NaF+AA+Ca+2
Fig. VI

First Bar - Control
Second Bar - NaF+AA
Third Bar - NaF+Ca+2
Fourth Bar - NaF+AA+Ca+2
WAVELENGTH (NM) = 560.00
READING/MM = 10.000
CALIBRATION (MM) = 85.000
WAVELENGTH (NM) = 560.00
READING/MM = 10.000
CALIBRATION (MM) = 85.000
Fig. IX

WAVELENGTH (NM) = 560.00
READING/MM = 10.000
CALIBRATION (MM) = 85.000
BECKMAN
DU-40 SPECTROPHOTOMETER

GEL SCAN

WAVELENGTH (NM) = 560.00
READING/MM = 10,000
CALIBRATION (MM) = 85,000
WAVELENGTH (NM) = 560.00
READING/MM = 10.000
CALIBRATION (MM) = 85.000
BECKMAN
DU-40 SPECTROPHOTOMETER

GEL SCAN

WAVELENGTH (NM) = 560.00
BECKMAN
DU-40 SPECTROPHOTOMETER

GEL SCAN

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WAVELENGTH (NM) = 560.00
READING/MM = 10.000
CALIBRATION (MM) = 85.00
**BECKMAN**

**DU-40 SPECTROPHOTOMETER**

**GEL SCAN**

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<th>CALIBRATION (MM)</th>
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Fig. XIV
BECKMAN

DU-40 SPECTROPHOTOMETER

GEL SCAN

WAVELENGTH (NM) = 560.00
READING/MM = 10.000
CALIBRATION (MM) = 85.000
BECKMAN
DU-40 SPECTROPHOTOMETER
GEL SCAN

---

Figure XVII
BECKMAN
DU-40 SPECTROPHOTOMETER

GEL SCAN

Fig. XVIII
PLATE A

Figs. 1 - 6

Transverse sections (T. S.) of testis of control, sodium fluoride (NaF) treated (10 mg/kg body weight) for 50 days and NaF withdrawal (70 days) groups of rats (Rattus norvegicus) (Haematoxylin - Eosin (H - E) stain, 5 μ sections).

Fig. 1. T. S. of Control rat testis showing seminiferous tubules with various stages of spermatogenesis and Leydig cells in between the tubules. X 800

Fig. 2. Magnified view of Fig. 1 X 1388

Fig. 3. Sodium fluoride (NaF) treated rat testis (T.S.) showing disorganization of seminiferous epithelium with denudation of spermatogenic cells. X 850

Fig. 4. Magnified view of Fig. 3 X 1350

Fig. 5. T. S.of Rat testis after 70 days withdrawal of NaF treatment. Note recovery in the organization of germinal cells. X 700

Fig. 6. Magnified view of Fig. 5 X 1600
Transverse sections (T. S.) of testis of NaF + ascorbic acid (AA), NaF + Calcium (Ca^{+2}) and NaF + AA + Ca^{+2} treated rat for 70 days (Haematoxylin Eosin stain, 5 μ sections).

Fig. 7. Rat testis (T.S.) treated with NaF + ascorbic acid (AA) for 70 days. Note recovery in the seminiferous tubular histology. X 500

Fig. 8. Magnified view of Fig. 7. Note recovery in the spermatogenic elements. X 950

Fig. 9. T. S. of testis of NaF + Calcium (Ca^{+2}) administered rat showing significant recovery in the histology. X 466.

Fig. 10. Magnified view of Fig. 9. X 1000.

Fig. 11. T. S. of rat testis treated with NaF + AA + Ca^{+2} for 70 days. Note complete normalcy in the histoarchitecture as compared to individual treatments. X. 800.

Fig. 12. Magnified view of Fig. 11. X. 1300
Transverse sections (T.S.) of cauda epididymis of control, NaF 50 days treated (10 mg/kg body weight) and NaF withdrawal (70 days) groups of rat (Rattus norvegicus) (Haematoxylin Eosin stain, 5 μ sections).

Fig. 13. T. S. of normal rat cauda epididymis tubules showing pseudostratified epithelium containing sperm bundles in the lumen. X 300.

Fig. 14. Magnified view of Fig. 13. X 1750

Fig. 15. NaF treated cauda epididymis showing loss of stereocilia and absence of sperm in the lumen. X 975.

Fig. 16. Magnified view of Fig. 15. X 1375.

Fig. 17. Cauda epididymis of withdrawal group of rat after 70 days exhibiting recovery in histology. X 400.

Fig. 18. Magnified view of Fig. 17. X 550.
Transverse section (T. S.) of Cauda epididymis of NaF + AA, NaF + Ca+2 and NaF + AA + Ca+2 treated rat cauda epididymis for 70 days (Haematoxylin - Eosin stain, 5 µ sections).

Fig. 19. Cauda epididymis of rat treated with NaF + AA for 70 days. Note the recovery in the histology with sperm bundles in the lumen of the tubules. X 444.

Fig. 20. Magnified view of Fig. 19. X 1142.

Fig. 21. NaF + Ca+2 treated (70 days) rat cauda epididymis showing recovery in its histology. X 666.

Fig. 22. Magnified view of Fig. 21. X 1666.

Fig. 23. NaF + AA + Ca+2 treated rat cauda epididymis with normal histological features exhibiting significant recovery by combined treatment. X 650.

Fig. 24. Magnified view of Fig. 23. X 1250.
Transverse sections (T. S.) of adrenal gland of control, NaF treated (10 mg/kg body weight) for 50 days and NaF withdrawal (70 days) groups of rats (Rattus norvegicus) (H - E stain, 5 μ sections)

Fig. 25. T. S. of Normal rat adrenal cortex with compactly arranged cells. X 760.

Fig. 26. Normal rat adrenal medulla with chromaffin cells in the centre. X 500.

Fig. 27. NaF 50 days treated rat adrenal cortex showing pyknosis in some regions. X 444.

Fig. 28. Adrenal medulla showing vacuolation of cells after 50 days of NaF treatment. X 333.

Fig. 29. Adrenal cortex after 70 days of withdrawal showing recovery. X 833.

Fig. 30. Adrenal medulla showing recovery in the histology upon withdrawal of treatment for 70 days. X 400.
Transverse sections (T. S.) of rat adrenal of NaF + AA, NaF + Ca$^{+2}$ and NaF + AA + Ca$^{+2}$ 70 days treated groups (H - E stain, 5 µ sections).

Fig. 31. NaF + AA treated (70 days) adrenal cortex showing complete recovery. X 800.

Fig. 32. NaF + AA treated adrenal medullary portion showing complete recovery. X 444.

Fig. 33. NaF + Ca$^{+2}$ treated (70 days) adrenal cortex revealing normal histological features. X. 600.

Fig. 34. Adrenal medulla showing recovery after 70 days treatment (NaF + Ca$^{+2}$). X 466.

Fig. 35. NaF + AA + Ca$^{+2}$ treated rat adrenal cortex. Note normalcy in the histology. X 571.

Fig. 36. NaF + AA + Ca$^{+2}$ treated rat adrenal medulla showing significant recovery. X 444.
PLATE G

Figs. 37 - 42

Photomicrographs of alcoholic acidic silver nitrate stained cauda epididymal spermatozoa of control, NaF 50 days treatment, NaF withdrawal, NaF + AA, NaF + Ca$^{+2}$ and NaF + AA + Ca+2 (70 days) administered groups of rats.

Fig. 37. Normal rat cauda epididymal sperm with intact acrosomal, post-acrosomal and mid-piece regions. X 1500.

Fig. 38. NaF treated (50 days) rat sperm for 50 days. Note loss of acrosome as well as deflagellation. X. 875.

Fig. 39. NaF withdrawal (70 days) rat sperm showing partial recovery in the morphology. X 1500.

Fig. 40. NaF + AA treated rat sperm (70 days) revealing normal morphology. X 1900.

Fig. 41. NaF + Ca+2 treated sperm (70 days) showing recovery in morphology. X 1590.

Fig. 42. NaF + AA + Ca+2 treated (70 days) spermatozoa showing intact acrosomal and post-acrosomal regions. X 1350.
Polyacrylamide gel electrophoresis (PAGE) of cauda epididymal sperm protein pattern (9.5 % gels) in control, NaF treatment (50 days) NaF withdrawal, NaF + AA, NaF + Ca$^{2+}$ and NaF + AA + Ca$^{2+}$ treated for 30 and 70 days stained with coomassie blue.

1. Electrophoretic mobility of normal rat cauda epididymal sperm proteins.

2. NaF treated (50 days) rat sperm showing alterations in protein mobility.

3. NaF withdrawal for 50 days revealing same mobility as observed in NaF treated rat sperm (Fig. 2).

4. NaF + AA 30 days treated rat sperm showing no recovery in protein pattern.

5. NaF + Ca$^{2+}$ 30 days treatment revealing no improvement in protein mobility.


7. NaF + AA 70 days treated rat sperm showing significant regain in mobility pattern.

8. NaF + Ca$^{2+}$ 70 days treated rat sperm. Observe normal pattern in protein mobility.

9. NaF + AA + Ca$^{2+}$ (70 days) treated rat sperm exhibiting significant recovery in protein pattern.