Results
Effect of pylorus ligation on ulcer production in group I rats: On ligating the pylorus for 18 h, circular and linear lesions and petechiae were seen mostly in the rumen area of the stomach. A few lesions were also seen in the glandular portion (Fig. 5a and 6). The mean values with SEM of the volume and pH of the gastric juice and that of ulcer index were $7.40 \pm 0.49$ ml, $2.65 \pm 0.24$ and $0.60 \pm 0.05$ respectively. The microscopic appearance of normal gastric mucosa from the rumen and glandular region of the stomach is shown in Fig. 7 and 9 respectively. The gastric mucosa demonstrating a break in the epithelial layer of the rumen and glandular region of the stomach is shown in Fig.8 and 10 respectively.

Effect of aspirin treatment on ulcer production in group II rats: Administration of aspirin resulted in ulceration of the glandular portion of the stomach. They were seen as erosions and petechiae (Fig. 11 and 12). The mean values with SEM of the volume and pH of the gastric juice and that of ulcer index were $1.88 \pm 0.24$ ml, $3.05 \pm 0.17$ and $0.79 \pm 0.02$ respectively.

Effect of fasting on ulcer production in group III rats: On fasting the rat for 72 h, a few ulcers were seen in the glandular part of the stomach only in 40% of the animals. As the volume of the gastric juice was negligible, only ulcer index was measured which was $0.12 \pm 0.05$.

Effect of Vitamin A (2000 IU) and pylorus ligation in group IVa rats: Administration of vitamin A (2000 IU) prior to pylorus ligation did not produce any
Fig. 5a. Gastric mucosa of the pylorus ligated rat showing ulcers in both rumen and glandular portions of the stomach.

Fig. 5b. Gross appearance of gastric mucosa of the normal rat.

Fig. 6. Gastric mucosa of the pylorus ligated rat showing ulcers mostly in the rumen of the stomach.
Fig. 7. Photomicrograph showing the different layers of normal gastric mucosa from the rumen of the rat stomach (X 250)

Fig. 8. Photomicrograph showing break in the mucosal lining of the gastric wall from the rumen of the stomach (X 250)
Fig. 9. Photomicrograph showing the different layers of normal gastric mucosa from the glandular region of the stomach (X 250)

Fig. 10. Photomicrograph showing break in the mucosal lining of the gastric wall from the glandular region of the stomach (X 250)
Fig.11. Gastric mucosa of aspirin treated rat showing ulcers in the glandular region of the stomach.

Fig.12. Gastric mucosa of aspirin treated rat showing erosions and petechiae in the glandular region of the stomach.
significant change in the mean volume of the gastric juice (Table 1, Fig.13). The mean pH of the gastric juice was not significantly different from that of control group I (Table 1, Fig.14). The mean ulcer index also did not show any significant change with respect to control pylorus ligated group (Table 1, Fig.15).

Effect of vitamin A (4000 IU) and pylorus ligation in group IVb rats: The mean volume of the gastric juice of the group that received 4000 IU of vitamin A was not significantly different from group I (Table 1, Fig.13). The mean pH also did not show any statistically significant result (Table 1, Fig.14). The mean ulcer index did not vary significantly as compared with control (Table 1, Fig.15). Both the doses of vitamin A did not produce any statistically significant change in the volume, pH and that of ulcer index.

Effect of vitamin A (2000 IU) and aspirin in group IVc rats: Administration of vitamin A (2000 IU) did not alter the mean volume of the gastric juice as in the case of pylorus ligated rats (Table 2, Fig.16). The mean pH of the gastric juice was not statistically significant with respect to the control aspirin treated rats (Table 2, Fig.17). The mean ulcer index also did not vary significantly with pretreatment of vitamin A (Table 2, Fig.18).

Effect of vitamin A (4000 IU) and aspirin in group IVd rats: The mean volume of the gastric juice was not statistically significant when compared to control group (Table 2, Fig.16). There was no significant change in the mean pH of the gastric juice (Table 2, Fig.17). But there was a highly significant reduction (p < 0.001) in the mean ulcer index in the group that received 4000 IU of vitamin A for 2
weeks when compared to the control as well as the group that received the lower dose (Table 2, Fig.18).

Effect of vitamin A (4000 IU) and fasting in group IVe rats: Administration of 4000 IU of vitamin A for 2 weeks prior to fasting did not show any significant change in the mean ulcer index (0.03 ± 0.02) as compared with group III.

Effect of vitamin C (1500 mg/kg) and pylorus ligation in group Va rats: Administration of vitamin C did not produce significant change in the mean volume of the gastric juice (Table 3, Fig.13). But the mean pH of the gastric juice was significant (p < 0.05) when compared with control group I (Table 3, Fig.14). There was no significant change in the mean ulcer index with respect to control pylorus ligated rats (Table 3, Fig.15).

Effect of vitamin C (3000 mg/kg) and pylorus ligation in group Vb rats: The mean volume of the gastric juice was not altered when compared with control (Table 3, Fig.13). The mean pH of the gastric juice was reduced, p value being <0.05 with respect to control (Table 3, Fig.14). The mean ulcer index was significantly higher (p < 0.05) than control pylorus ligated group (Table 3, Fig.15).

Effect of vitamin C (1500 mg/kg) and aspirin in group Vc rats: Administration of vitamin C, 1500 mg/kg for 2 weeks did not change the mean volume of the gastric juice (Table 4, Fig.16). The mean pH was not statistically significant (Table 4, Fig.17). There was no significant change in the ulcer index (Table 4, Fig.18).
Effect of vitamin C (3000 mg/kg) and aspirin in group Vd rats: In this group, there was a significant reduction ($p < 0.01$) in the mean volume of the gastric juice when compared to the control and the group that received the lower dose (Table 4, Fig.16). The acidity, i.e. the mean pH did not alter with respect to control (Table 4, Fig.17). The higher dose of vitamin C significantly reduced ($p < 0.001$) the ulcer index when compared with control aspirin treated group II and the group that received the lower dose (Table 4, Fig.18).

Effect of vitamin C (3000 mg/kg) and fasting in group Ve rats: There was no change in the mean ulcer index when this group of rats were treated with vitamin C for 2 weeks prior to fasting. The mean ulcer index value being $0.05 \pm 0.03$.

Effect of vitamin E (400 mg/kg) and pylorus ligation in group Vla rats: Vitamin E produced a statistically significant reduction ($p < 0.001$) in the mean volume of the gastric juice (Table 5, Fig.13). The mean pH also increased significantly ($p < 0.001$) as compared with control group (Table 5, Fig.14). The above changes resulted in a highly significant reduction ($p < 0.001$) in the mean ulcer index when compared with control pylorus ligated group (Table 5, Fig.15).

Effect of vitamin E (600 mg/kg) and pylorus ligation in group Vlb rats: Administration of higher dose of vitamin E reduced significantly ($p < 0.001$) the mean volume of the gastric juice (Table 5, Fig.13). The mean pH of the gastric juice increased significantly ($p < 0.001$) with respect to control (Table 5, Fig.14). There was a highly significant reduction ($p < 0.001$) in the mean ulcer index when
compared to control group and the group that received the lower dose (Table 5, Fig.15).

**Effect of vitamin E (400 mg/kg) and aspirin in group Vlc rats:** This dose of vitamin E reduced significantly ($p < 0.01$) the mean volume of the gastric juice (Table 6, Fig.16). But the mean pH of the gastric juice decreased significantly ($p < 0.01$) as compared with control (Table 6, Fig.17). There was a highly significant reduction ($p < 0.001$) in the mean ulcer index than the control group II (Table 6, Fig.18).

**Effect of vitamin E (600 mg/kg) and aspirin in group Vld rats:** When higher dose of vitamin E was administered there was no significant difference in the mean volume of the gastric juice (Table 6, Fig.16). The mean pH also did not change with respect to control but significantly more when compared to the group that received 400 mg/kg of vitamin E (Table 6, Fig.17). The mean ulcer index showed a highly significant ($p < 0.001$) reduction as compared with control and the group that received the lower dose (Table 6, Fig.18).

**Effect of vitamin E (600 mg/kg) and fasting in group Vle rats:** The mean ulcer index did not alter significantly when compared with the control fasting group III. The mean ulcer index being $0.01 \pm 0.01$.

**Effect of vitamins A and E and pylorus ligation in group Vlla rats:** Combination of vitamin A (4000 IU) and vitamin E (600 mg/kg) did not reduce the mean volume of the gastric juice (Table 7, Fig.19). However, there was a
significant fall \( (p < 0.001) \) in the mean pH of the gastric juice with respect to control (Table 7, Fig.20). The mean ulcer index did not vary significantly (Table 7, Fig.21).

**Effect of vitamins A and E and aspirin in group VIIIb rats:** When vitamin A (4000 IU) and vitamin E (600 mg/kg) were administered together there was no significant change in the mean volume of the gastric juice (Table 8, Fig.22). The mean pH of the gastric juice also did not alter significantly (Table 8, Fig.23). But the decrease in the mean ulcer index was highly significant \( (p < 0.001) \) as compared with control group II (Table 8, Fig.24).

**Effect of vitamins A and C and pylorus ligation in group VIIIa rats:** Combination of vitamins A (4000 IU) and vitamin C (3000 mg/kg) produced a significant increase \( (p < 0.01) \) in the volume of the gastric juice (Table 7, Fig.19). The mean pH decreased significantly \( (p < 0.001) \) as compared with control (Table 7, Fig.20). The mean ulcer index was not affected with respect to control group I (Table 7, Fig.21).

**Effect of vitamins A and C and aspirin in group VIIIb rats:** On administration of vitamin A (4000 IU) and vitamin C (3000 mg/kg) together, the mean volume of the gastric juice was significantly lower \( (p < 0.001) \) than the control (Table 8, Fig.22). There was no change in the mean pH of the gastric juice (Table 8, Fig.23). But there was a highly significant reduction \( (p < 0.001) \) in the mean ulcer index as compared with control (Table 8, Fig.24).
Effect of vitamins C and E and pylorus ligation in group IXa rats:
Combination of vitamin C (3000 mg/kg) and vitamin E (600 mg/kg) showed a
significant increase (p < 0.001) in the mean volume of the gastric juice (Table 7,
Fig.19). There was a significant decrease (P < 0.001) in the mean pH of the gastric
juice (Table 7, Fig.20). The mean ulcer index did not change significantly as
compared to control (Table 7, Fig.21).

Effect of vitamins C and E and aspirin in group IXb rats: When vitamin C
(3000 mg/kg) and vitamin E (600 mg/kg) were administered together, there was a
significant reduction (p < 0.001) in the mean volume of the gastric juice (Table 8,
Fig.22). The mean pH did not change significantly (Table 8, Fig.23). The reduction
in the mean ulcer index was highly significant (p < 0.001) when compared with
control (Table 8, Fig.24).

Effect of vitamins A, C and E and pylorus ligation in group Xa rats:
Combination of vitamin A (4000 IU), vitamin C (3000 mg/kg) and vitamin E (600
mg/kg) showed a highly significant increase (p < 0.001) in the mean volume of the
gastric juice (Table 7, Fig.19). There was also significant decrease (p < 0.001) in the
mean pH of the gastric juice (Table 7, Fig.20). But the mean ulcer index was
significantly higher (p < 0.001) than the control (Table 7, Fig.21).

Effect of vitamins A, C and E and aspirin in group Xb rats: When vitamin
A (4000 IU), vitamin C (3000 mg/kg) and vitamin E (600 mg/kg) were administered
together there was a significant reduction (p < 0.001) in the mean volume of the
gastric juice (Table 8, Fig.22). There was no change in the mean pH of the gastric juice (Table 8, Fig.23). However, the reduction in the mean ulcer index was highly significant ($p < 0.001$) with respect to control (Table 8, Fig.24).

**Urease test for H. pylori for group Xla, Xlb and Xlc rats**: Urease test for H. pylori was performed in all the rats following pylorus ligation, aspirin treatment and fasting. Except in two cases (fasting) all the other specimens showed negative results, i.e. the urea solution did not change from yellow to pink. The two positive results were obtained only after 24 h and hence they were considered as false positive. The other specimens did not produce any change in colour even after 24 h.

**Effect of aspirin (500 mg/kg) for one week for group Xlla rats**: Ulcer index ranged between 0.4 and 0.6 in this group of animals, mean ulcer index was $0.52 \pm 0.02$.

**Effect of aspirin (500 mg/kg) and vitamin E (600 mg/kg) for one week for group Xllb rats**: In this group, the ulcer index ranged between 0.2 and 0.4 in 6 rats. In the remaining 4 rats there was no ulceration. Mean ulcer index was $0.19 \pm 0.05$. The results were compared using Student's 't' test. The reduction in ulcer index was highly significant ($p < 0.001$).