Plate 1

Sections through gills of *Catla catla* exposed to copper ions

**Fig. 1.1** Normal gills x100

(a) Primary gill lamellae

(b) Secondary gill lamellae

**Fig. 1.2** CuSO$_4$ (low concentration) - 7 days x 40

(a) Initial degeneration of interlamellar epithelium of primary gill lamellae

(b) Collapsed secondary gill lamellae

**Fig. 1.3** CuSO$_4$ (low concentration) - 14 days x 400

(a) Haemorrhage at the tip of secondary gill lamellae

(b) Curling of secondary gill lamellae

**Fig. 1.4** CuSO$_4$ (low concentration) - 21 days x 400

(a) Degeneration of interlamellar epithelium

(b) Sloughing and haemorrhage at the tip of secondary gill lamellae

**Fig. 1.5** CuSO$_4$ (high concentration) - 7 days x 400

(a) Destruction of cartilaginous core

(b) Decapped secondary gill lamellae at some places

**Fig. 1.6** CuSO$_4$ (high concentration) - 14 days x 400

(a) Telangiectasis, blood congestion

(b) Partial fusion of secondary gill lamellae

**Fig. 1.7** CuSO$_4$ (high concentration) - 21 days x 400

(a) Epithelial lifting

(b) Hyperplasia

**Fig. 1.8** CuSO$_4$ (high concentration) - 21 days x 400

(a) Disorganisation of secondary gill lamellae with swollen cartilaginous core
Plate 2

Sections through gills of *Catla catla* exposed to nickel ions

Fig. 2.1 NiSO₄ (low concentration) - 7 days x 400
   (a) Telangiectasis and partial fusion of two lamella

Fig. 2.2 NiSO₄ (low concentration) - 14 days x 400
   (a) Disrupted cartilagenous core
       (b) Hyperplasia

Fig. 2.3 NiSO₄ (low concentration) - 21 days x 400
   (a) Degenerated secondary gill lamellae
       (b) Aneurysm
       (c) Epithelial lifting

Fig. 2.4 NiSO₄ (low concentration) - 21 days x 1000
   (a) Telangiectasis and infiltration of blood cells

Fig. 2.5 NiSO₄ (high concentration) - 7 days x 1000
   (a) Lamellar disorganisation
       (b) Haemorrhage in central axis

Fig. 2.6 NiSO₄ (high concentration) - 14 days x 400
   (a) Disrupted cartilaginous core
       (b) Thinning of secondary gill lamellae

Fig. 2.7 NiSO₄ (high concentration) - 14 days x 40
   (a) Swollen primary gill lamellae with haemorrhage
       (b) Erosion of secondary gill lamellae

Fig. 2.8 NiSO₄ (high concentration) - 21 days x 100
   (a) Clumping of cartilaginous core
       (b) Total erosion of secondary gill lamellae
Plate 3

Sections through gills of *Catla catla* exposed to mercury ions

**Fig. 3.1** HgSO$_4$ (low concentration) - 7 days  
(a) Haemorrhage in central axis  
(b) Hyperplasia  

**Fig. 3.2** HgSO$_4$ (low concentration) - 14 days  
(a) Disrupted cartilaginous core  
(b) Degeneration of interlamellar epithelium  
(c) Curling of secondary gill lamellae  

**Fig. 3.3** HgSO$_4$ (low concentration) - 21 days  
(a) Haemorrhage in central axis  
(b) Shortening of secondary gill lamellae  

**Fig. 3.4** HgSO$_4$ (high concentration) - 7 days  
(a) Collapsed secondary gill lamellae  
(b) Haemorrhage and infiltration of mononuclear cells  
(c) Total loss of cartilaginous core  

**Fig. 3.5** HgSO$_4$ (high concentration) - 14 days  
(a) Thinning of secondary gill lamellae  
(b) Interlamellar epithelium disorganisation  
(c) Vacuolated tip of secondary gill lamellae  

**Fig. 3.6** HgSO$_4$ (high concentration) - 14 days  
(a) Disorganisation of secondary gill lamellae  

**Fig. 3.7** HgSO$_4$ (high concentration) - 21 days  
(a) Ragged appearance of gill  

**Fig. 3.8** HgSO$_4$ (high concentration) - 21 days  
(a) Clumping of cartilaginous core  
(b) Erosion of secondary gill lamellae
Plate 4

Sections through Kidney of *Catla catla* exposed to copper ions

**Fig. 4.1** Normal kidney x 40

(a) Glomerulus

(b) Tubules

**Fig. 4.2** Normal kidney x 100

**Fig. 4.3** CuSO$_4$ (low concentration) - 7 days x 400

(a) Shrunken glomerulus

**Fig. 4.4** CuSO$_4$ (low concentration) - 14 days x 400

(a) Degeneration of tubular cells

(b) Tubular lumen dilation

**Fig. 4.5** CuSO$_4$ (low concentration) - 21 days x 400

(a) Degenerated renal tubules

**Fig. 4.6** CuSO$_4$ (high concentration) - 7 days x 400

(a) Vacuolated cytoplasm

(b) Shrunken glomerulus

**Fig. 4.7** CuSO$_4$ (high concentration) - 14 days x 400

(a) Loss of cellular integrity

**Fig. 4.8** CuSO$_4$ (high concentration) - 21 days x 400

(a) Degenerated glomerulus with infiltration of blood cells
**Plate 5**

**Sections through Kidney of *Catla catla* exposed to nickel ions**

**Fig. 5.1** NiSO$_4$ (low concentration) - 7 days x 400

(a) Fatty deposition in glomerulus

(b) Haemorrhage in interstitial space

**Fig. 5.2** NiSO$_4$ (low concentration) - 14 days x 400

(a) Occlusion of tubular lumen

(b) Desquamation of tubular epithelial lining

**Fig. 5.3** NiSO$_4$ (low concentration) - 21 days x400

(a) Severe vacuolation in tubular epithelium

**Fig. 5.4** NiSO$_4$ (low concentration) - 21 days x 400

(a) Shrunken glomerulus

(b) Disorganised interstitial space cells

**Fig. 5.5** NiSO$_4$ (high concentration) -7 days x 400

(a) Renal tubular lumen dilation

**Fig. 5.6** NiSO$_4$ (high concentration) - 14 days x 400

(a) Breakdown of glomerular capillaries

(b) Necrosis of tubular cells

**Fig. 5.7** NiSO$_4$ (high concentration) - 21 days x 400

(a) Hyaline appearance of tubules

**Fig. 5.8** NiSO$_4$ (high concentration) - 21 days x 400

(a) Damaged glomerulus

(b) Occlusion of tubular lumen
Plate 6

Sections through Kidney of *Catla catla* exposed to mercury ions

**Fig. 6.1** HgSO$_4$ (low concentration) - 7 days  
(a) Damaged glomerulus  
 x 400

**Fig. 6.2** HgSO$_4$ (low concentration) - 14 days  
(a) Vacuolisation in tubular epithelium  
 x 1000

**Fig. 6.3** HgSO$_4$ (low concentration) - 21 days  
(a) Loss of tubular architecture  
 x 400

**Fig. 6.4** HgSO$_4$ (high concentration) - 7 days  
(a) Occlusion of tubular lumen  
(b) Shrunken glomerulus  
 x 400

**Fig. 6.5** HgSO$_4$ (high concentration) - 14 days  
(a) Vacuolisation in glomerular  
 x 400

**Fig. 6.6** HgSO$_4$ (high concentration) - 21 days  
(a) Loss of glomerulus architecture  
 x 400

**Fig. 6.7** HgSO$_4$ (high concentration) - 21 days  
(a) Haemorrhage in glomerulus  
 x 400

**Fig. 6.8** HgSO$_4$ (high concentration) - 21 days  
(a) Total loss of tubular architecture  
 x 400
Plate 7

Sections through Liver of *Catla catla* exposed to copper ions

**Fig. 7.1** Normal liver x 400

(a) Hepatocytes

(b) Sinusoids

**Fig. 7.2** Normal liver x 1000

(a) Hepatocytes

**Fig. 7.3** CuSO₄ (low concentration) - 7 days x 400

(a) Cytolysis, swelling of hepatocytes

(b) Piknosis

(c) Increased central canal

**Fig. 7.4** CuSO₄ (low concentration) - 14 days x 400

(a) Dilation of sinusoids, fibrosis within sinusoids

(b) Piknotic cells

**Fig. 7.5** CuSO₄ (low concentration) - 21 days x 400

(a) Small necrotic sites

(b) Infiltration of blood cells in central canal

**Fig. 7.6** CuSO₄ (high concentration) - 7 day x 400

(a) Cellular necrosis (of hepatocytes)

(b) Haemorrhage in central lobular vein

**Fig. 7.7** CuSO₄ (high concentration) - 14 days x 400

(a) Parenchymal vacuolisation, focal necrosis

**Fig. 7.8** CuSO₄ (high concentration) - 21 days x 400

(a) Dilation of sinusoids
Plate 8

Sections through Liver of *Catla catla* exposed to nickel ions

**Fig. 8.1** NiSO$_4$ (low concentration) - 7 days  
(a) Degeneration of cell membrane and loss of cytoplasm  
(b) Dilation of sinusoids

**Fig. 8.2** NiSO$_4$ (low concentration) - 14 days  
(a) heterochromatin in nucleus  
(b) Fragmented nucleus

**Fig. 8.3** NiSO$_4$ (low concentration) - 21 days  
(a) Deformated nucleus

**Fig. 8.4** NiSO$_4$ (low concentration) - 21 days  
(a) Haemorrhage in central lobular vein

**Fig. 8.5** NiSO$_4$ (high concentration) - 7 days  
(a) Haemorrhage in central lobular vein  
(b) Cellular clumping

**Fig. 8.6** NiSO$_4$ (high concentration) - 14 days  
(a) Vacuolisation  
(b) Congestion of hepatocytes

**Fig. 8.7** NiSO$_4$ (high concentration) - 21 days  
(a) Small necrotic zones  
(b) Piknosis

**Fig. 8.8** NiSO$_4$ (high concentration) - 21 days  
(a) Rosetty shape is disrupted  
(b) Piknotic cell
Plate 9

Sections through Liver of *Catla catla* exposed to mercury ions

**Fig. 9.1** HgSO$_4$ (low concentration) - 7 days  
(a) Infiltration of blood cells in central lobular vein  
(b) Degeneration of cell membrane  
(c) Dilation of sinusoids

**Fig. 9.2** HgSO$_4$ (low concentration) - 14 days  
(a) Congestion of hepatocytes  
(b) Small necrotic sites

**Fig. 9.3** HgSO$_4$ (low concentration) - 21 days  
(a) Piknotic cell  
(b) Disorganisation of hepatocytes

**Fig. 9.4** HgSO$_4$ (low concentration) - 21 days  
(a) Haemorrhage in central lobular vein  
(b) Steatosis

**Fig. 9.5** HgSO$_4$ (high concentration) - 7 days  
(a) Infiltration of erythrocytes in vacuolated area

**Fig. 9.6** HgSO$_4$ (high concentration) - 14 days  
(a) Haemorrhage within sinusoids

**Fig. 9.7** HgSO$_4$ (high concentration) - 21 days  
(a) Severe steatosis  
(b) Piknotic cell

**Fig. 9.8** HgSO$_4$ (high concentration) - 21 days  
(a) Severe Haemorrhage and cellular clumping in central lobular vein
Plate 10

Sections through Brain of *Catla catla* exposed to copper ions

**Fig. 10.1** Normal brain  

**Fig. 10.2** CuSO$_4$ (low concentration) - 7 days  
(a) Migration of mononuclear cells towards meninges  

**Fig. 10.3** CuSO$_4$ (low concentration) - 14 days  
(a) Disjoinment in optic tectum

**Fig. 10.4** CuSO$_4$ (low concentration) - 21 days  
(a) Disjoinment in *Stratum fibrosum*  
(b) Clumping of mononuclear layer of stratum  
(c) Fatty deposition in optic tectum

**Fig. 10.5** CuSO$_4$ (high concentration) - 7 days  
(a) Neuronal degeneration and spongiosis

**Fig. 10.6** CuSO$_4$ (high concentration) - 14 days  
(a) Vacuolisation around migrated mononuclear cells, focal necrosis

**Fig. 10.7** CuSO$_4$ (high concentration) - 21  
(a) Vacuolization in optic tectum

**Fig. 10.8** CuSO$_4$ (high concentration) - 21  
(a) Clumping of migrated mononuclear cells  
(b) Pyramidal cells
Plate 11
Sections through Brain of *Catla catla* exposed to nickel ions

**Fig. 11.1** NiSO$_4$(low concentration) - 7 days x 100  
(a) Mild disjoinment of layers of optic tectum

**Fig. 11.2** NiSO$_4$(low concentration) - 14 days x 400  
(a) Clumping of mononuclear cells

**Fig. 11.3** NiSO$_4$(low concentration) - 21 days x 400  
(a) Hyperemia

**Fig. 11.4** NiSO$_4$(high concentration) - 7 days x 400  
(a) Vacuolisation around enlarged neuroglea like cells  
(b) Vacuolisation around Pyramidal cells

**Fig. 11.5** NiSO$_4$(high concentration) - 14 days x 400  
(a) Vacuolisation around clumped migrated mononuclear cells

**Fig. 11.6** NiSO$_4$(high concentration) - 21 days x 400  
(a) Separation of *Stratum opticum* and *Stratum fibrosum* layers

**Fig. 11.7** NiSO$_4$(high concentration) - 21 days x 400  
(a) Spongiosis  
(b) Swelling of Pyramidal cells

**Fig. 11.8** NiSO$_4$(high concentration) - 21 days x 400  
(a) Congestion in mononuclear cell layer
Plate 12

Sections through Brain of *Catla catla* exposed to mercury ions

**Fig. 12.1** HgSO$_4$ (low concentration) - 7 days  
(a) Spongiosis initiated

**Fig. 12.2** HgSO$_4$ (low concentration) - 14 days  
(a) Degeneration of mononuclear cell layer

**Fig. 12.3** HgSO$_4$ (low concentration) - 21 days  
(a) Degeneration of *Stratum fibrosum periventriculare*

**Fig. 12.4** HgSO$_4$ (low concentration) - 21 days  
(a) Vacuolisation around enlarged neuroglea like cells

**Fig. 12.5** HgSO$_4$ (high concentration) - 7 days  
(a) Degeneration of layers and spongiosis

**Fig. 12.6** HgSO$_4$ (high concentration) - 14 days  
(a) Cerebral haemorrhage

**Fig. 12.7** HgSO$_4$ (high concentration) - 21 days  
(a) Enlarged glial cells  
(b) Congestion of mononuclear cells

**Fig. 12.8** HgSO$_4$ (high concentration) - 21 days  
(a) Disruption of general cellular arrangement  
(b) Vacuolised glial cells
Sections through Intestine of *Catla catla* exposed to copper ions

**Fig. 13.1** Normal intestine  x 100

**Fig. 13.2** CuSO₄ (low concentration) - 7 days  x 400

  (a) Plateau like villi

  (b) Discontinuation of mucosa layer

**Fig. 13.3** CuSO₄ (low concentration) - 14 days  x 400

  (a) Disjoinment of layers

  (b) Infiltration of mononuclear cells

**Fig. 13.4** CuSO₄ (low concentration) - 21 days  x 400

  (a) Hyperplasia in lamina propria

**Fig. 13.5** CuSO₄ (high concentration) - 7 days  x 400

  (a) Vacuolisation in mucosa

**Fig. 13.6** CuSO₄ (high concentration) - 14 days  x 400

  (a) Cracked appearance of mucosa

**Fig. 13.7** CuSO₄ (high concentration) - 21 days  x 1000

  (a) Vacuolisation in villi

  (b) Steatosis

**Fig. 13.8** CuSO₄ (high concentration) - 21 days  x 1000

  (a) Vacuolisation in muscularis and disjoinment of layers
Plate 14

Sections through Intestine of *Catla catla* exposed to nickel ions

**Fig. 14.1** NiSO$_4$ (low concentration)- 7 days  x 400
  (a) Loosening of muscularis

**Fig. 14.2** NiSO$_4$ (low concentration)- 14 days  x 100
  (a) Flattened) tip of villi
  (b) Degeneration of submucosa,

**Fig. 14.3** NiSO$_4$ (low concentration)- 21 days  x 400
  (a) Plateau like villi

**Fig. 14.4** NiSO$_4$ (low concentration)- 21 days  x 1000
  (a) Damaged villi

**Fig. 14.5** NiSO$_4$ (high concentration)- 7 days  x 100
  (a) Broad tip of villi

**Fig. 14.6** NiSO$_4$ (high concentration)- 14 days  x 100
  (a) Bilobed villi
  (b) Discontinuous serosa

**Fig. 14.7** NiSO$_4$ (high concentration)- 21 days  x 100
  (a) Sloughing off of layers

**Fig. 14.8** NiSO$_4$ (high concentration)- 21 days  x 1000
  (a) Severe vacuolisation and haemorrhage in villi
Plate 15

Sections through Intestine of *Catla catla* exposed to mercury ions

**Fig. 15.1** HgSO$_4$ (low concentration) - 7 days  
(a) Haemorrhage in the lamina propria and aggregations of inflammatory cells  
x 400

**Fig. 15.2** HgSO$_4$ (low concentration) - 14 days  
(a) Flattened tip of villi  
(b) Vacuolisation around lamina propria  
x 400

**Fig. 15.3** HgSO$_4$ (low concentration) - 21 days  
(a) Aggregations of inflammatory cells with edema  
x 1000

**Fig. 15.4** HgSO$_4$ (high concentration) - 7 days  
(a) Severe edema of villi  
x 400

**Fig. 15.5** HgSO$_4$ (high concentration) - 14 days  
(a) Partial fusion of villi  
(b) Degeneration of lamina propria  
x 100

**Fig. 15.6** HgSO$_4$ (high concentration) - 21 days  
(a) Desquamation and necrosis of villous epithelium  
x 100

**Fig. 15.7** HgSO$_4$ (high concentration) - 21 days  
(a) Hyaline appearance in submucosa  
(b) Discontinuous serosa  
x 100

**Fig. 15.8** HgSO$_4$ (high concentration) - 21 days  
(a) Epithelial lifting in serosa  
(b) Deshaped villi  
x 100
Plate 16

Blood smears of *Catla catla* exposed to copper ions

**Fig.16.1** Normal blood smear  x 400
(a) Mature RBCs

**Fig.16.2** CuSO_4* (low concentration) - 7 days  x 400
(a) Micronuclei
(b) Blebbed nucleus in bloated erythrocyte

**Fig.16.3** CuSO_4* (low concentration) - 14 days  x 400
(a) Homomorphic nucleoli
(b) Vacuolated nucleus
(c) Swollen RBCs

**Fig.16.4** CuSO_4* (high concentration) - 7 days  x 400
(a) Vacuolated nucleus with micronuclei
(b) Diffused chromatin material
(c) Bilobed nucleus

**Fig.16.5** CuSO_4* (high concentration) - 14 days  x 400
(a) Tetrahedral RBC
(b) Vacuolated RBC
(c) Beaked RBC

**Fig.16.6** CuSO_4* (high concentration) - 21 days  x 400
(a) Fragmented nucleus with loss of cellularity
(b) Degenerated chromatin material in swollen cell
Plate 17

Blood smears of *Catla catla* exposed to nickel ions

**Fig.17.1** NiSO$_4$ (low concentration) - 7 days x 400
(a) Quadrilateral RBC

**Fig.17.2** NiSO$_4$ (low concentration) - 14 days x 400
(a) Cytoplasmic vacuolation
(b) Micronuclei

**Fig.17.3** NiSO$_4$ (low concentration) - 21 days x 400
(a) Beaked RBC
(b) Triangular RBC

**Fig.17.4** NiSO$_4$ (high concentration) - 7 days x 400
(a) Micronuclei
(b) Blebbing of nucleus

**Fig.17.5** NiSO$_4$ (high concentration) - 14 days x 400
(a) Notched nucleus
(b) Fragmented apoptic cell

**Fig.17.6** NiSO$_4$ (high concentration) - 21 days x 400
(a) Cytoplasmic vacuolization in swollen cell
Plate 18

Blood smears of *Catla catla* exposed to mercury ions

**Fig. 18.1** HgSO$_4$ (low concentration) - 7 days  
(a) Beaked RBC  
(b) Loss of cellular membrane  

**Fig. 18.2** HgSO$_4$ (low concentration) - 14 days  
(a) Diffused chromatin material  
(b) Kidney shaped nucleus  

**Fig. 18.3** HgSO$_4$ (low concentration) - 21 days  
(a) Micronuclei  
(b) Cytoplasmic vacuolization in deshaped cell  

**Fig. 18.4** HgSO$_4$ (high concentration) - 7 days  
(a) Loss of cellular membrane  
(b) Micronuclei  

**Fig. 18.5** HgSO$_4$ (high concentration) - 14 days  
(a) Triangular RBC  
(b) Micronuclei  

**Fig. 18.6** HgSO$_4$ (high concentration) - 21 days  
(a) Fusiform nucleus  
(b) Blebbing of nucleus
Sections showing recovery in gills of reacclimatized *Catla catla*

**Fig. 19.1** Normal gills  
(c) Primary gill lamellae  
(d) Secondary gill lamellae

**Fig. 19.2** CuSO$_4$ (high concentration) - 21 days  
(c) Epithelial lifting  
(d) Hyperplasia

**Fig. 19.3** Recovery: CuSO$_4$  
(a) Epithelial lifting disappeared  
(b) Secondary gill lamellae redeveloped  
(c) Inter lamellar epithelium restored

**Fig. 19.4** NiSO$_4$ (high concentration) - 21 days  
(c) Clumping of cartilaginous core  
(d) Total erosion of secondary gill lamellae

**Fig. 19.5** Recovery: NiSO$_4$  
(a) Secondary gill lamellae reappeared

**Fig. 19.6** HgSO$_4$ (high concentration) - 21 days  
(a) Ragged appearance of gill

**Fig. 19.7** Recovery: HgSO$_4$  
(a) Appearance of gill is improved
Plate 20

Sections showing recovery in kidney of reacclimatized *Catla catla*

**Fig. 20.1** Normal kidney x 40

- (c) Glomerulus

- (d) Tubules

**Fig. 20.2** CuSO$_4$ (high concentration) - 21 days x 400

- (b) Degenerated glomerulus with infiltrated blood cells

**Fig. 20.3** Recovery: CuSO$_4$ x 400

- (a) Reduced haemolysis

- (b) Reappearance of renal tubules and interstitial tissues

**Fig. 20.4** NiSO$_4$ (high concentration) - 21 days x 400

- (c) Damaged glomerulus with infiltrated blood

- (d) Occlusion of tubular lumen

**Fig. 20.5** Recovery: NiSO$_4$ x 400

- (a) Glomerulus repaired to some extent

- (b) Shape of tubular epithelium restored

**Fig. 20.6** HgSO$_4$ (high concentration) - 21 days x 400

- (b) Total loss of tubular architecture

**Fig. 20.7** Recovery: HgSO$_4$ x 400

- (a) Restoration of tubular architecture
Sections showing recovery in liver of reacclimatized *Catla catla*

**Fig. 21.1** Normal liver x 400
   (c) Hepatocytes
   (d) Sinusoids

**Fig. 21.2** CuSO$_4$ (high concentration) - 21 days x 400
   (b) Dilation of sinusoids

**Fig. 21.3** Recovery: CuSO$_4$ x400
   (a) Reduced dilation of sinusoids

**Fig. 21.4** NiSO$_4$ (high concentration)-21 days x 400
   (c) Rosetty shape is disrupted
   (d) Pyknotic cell

**Fig. 21.5** Recovery: NiSO$_4$ x400
   (a) Hepatocytes gain shape

**Fig. 21.6** HgSO$_4$ (high concentration) - 21 days x 400
   (c) Severe steatosis
   (d) Pyknotic cell

**Fig. 21.7** Recovery: HgSO$_4$ x400
   (a) Steatosis reduced
Plate 22

Sections showing recovery in brain of reacclimatized *Catla catla*

**Fig. 22.1** Normal brain  

**Fig. 22.2** CuSO$_4$ (high concentration) - 21 days  

(c) Clumping of migrated mononuclear cells  

(d) Pyramidal cells

**Fig. 22.3** Recovery: CuSO$_4$  

(a) Clumping of mononuclear cells not seen  

(b) Reduced infiltration of mononuclear cells

**Fig. 22.4** NiSO$_4$ (high concentration) - 21 days  

(c) Spongiosis  

(d) Swelling of pyramidal cells

**Fig. 22.5** Recovery: NiSO$_4$  

(a) Spongiosis not seen

**Fig. 22.6** HgSO$_4$ (high concentration) - 21 days  

(c) Disruption of general cellular arrangement  

(d) Vacuolated glial cells

**Fig. 22.7** Recovery: HgSO$_4$  

(a) Vacuolated glial cells disappeared
Plate 23

Sections showing recovery in intestine of reacclimatized *Catla catla*

**Fig. 23.1** Normal intestine x 100

**Fig. 23.2** CuSO$_4$ (high concentration) - 21 days x 400
   (c) Mucosal layer damaged

**Fig. 23.3** Recovery: CuSO$_4$ x 400
   (a) Mucosal layer developed

**Fig. 23.4** NiSO$_4$ (high concentration) - 21 days x 100
   (b) Damaged villi

**Fig. 23.5** Recovery: NiSO$_4$ x 100
   (a) All four layers restored to some extent

**Fig. 23.6** HgSO$_4$ (high concentration) - 21 days x 100
   (c) Epithelial lifting in serosa
   (d) Broken tip of villi

**Fig. 23.7** Recovery: HgSO$_4$ x 100
   (a) Villi recovered mildly
Plate 24

Blood smears showing recovery in reacclimatized *Catla catla*

**Fig.24.1** Normal blood smear  x 400
   (b) Mature RBCs

**Fig.24.2** CuSO$_4$ (high concentration) - 21 days  x 400
   (c) Fragmented nucleus with loss of cellularity
   (d) Degenerated chromatin material in swollen cell

**Fig.24.3** Recovery : CuSO$_4$  x 400
   (a) Moderately recovered RBCs

**Fig.24.4** NiSO$_4$ (high concentration) - 21 days  x 400
   (c) Beaked RBC
   (d) Triangular RBC

**Fig.24.5** Recovery: NiSO$_4$  x 400
   (a) Cell shapes recover
   (b) Homomorphic nucleoli
   (c) Vacuolated nucleus

**Fig.24.6** HgSO$_4$ (high concentration) - 21 days  x 400
   (c) Fusiform nucleus
   (d) Blebbing of nucleus

**Fig.24.7** Recovery : HgSO$_4$  x 400
   (a) Vacuolated nucleus
   (b) Micronuclei
   (c) Degenerated chromatin material in swollen cell