CHAPTER 6

CONCLUSION

Studies on cadmium toxicity and its impact on metabolic activities in Japanese quail were conducted for a period of three years. The ingredients and feeds of animals particularly Japanese quails were analysed for heavy metals. A market survey on six commercially important farm animal’s tissues/organisms was conducted for heavy metals. The acute cadmium toxicity study as well as long term sublethal dose impact on Japanese quails were studies. The bioaccumulation and bioconcentration of cadmium in different tissues/organisms of Japanese quails and the associated metabolic changes particularly proteins, lipids, blood components, enzymes of clinical importance, histopathological changes and chromosomes changes were also investigated. The data collected were statistically analysed and discussed. Based on the data collected during the present study, the following major conclusion have been drawn.

1. The feed of Japanese quail contained 0.78 μg/g of cadmium, 1.05 μg/g of copper and 48.76 μg/g of zinc. The former was greater than the permissible level while the latter two were below the permissible level.

2. Among the ingredients of feeds investigated, the fish meal contained maximum cadmium of 3.40 μg/g.

3. The survey of tissues/organs of Japanese quails, chicken, sheep, bull, buffalo and pig collected from the market revealed that the
accumulation of cadmium was greater in kidneys and liver but relatively lower in muscles.

4. The cadmium accumulation in kidneys of chicken, sheep, bull, buffalo and pig was 2 to 5 times greater than the cadmium content in liver. The cadmium accumulation in the liver of Japanese quails was twice than that in the kidneys.

5. The cadmium content of Japanese quail was 1.5 μg/g in blood, 1.0 μg/g in brain and 0.44 μg/g in muscles, which were considered to be greater than the permissible level.

6. Among the brains of animals investigated, buffalo contained relatively higher cadmium of 1.2 μg/g.

7. The copper and zinc contents in tissues/organs were uniformly low in Japanese quails and but within the permissible level.

8. The oral LD₅₀ of cadmium for three week old Japanese quail was to be 40 mg/kg of body weight.

9. The sublethal daily oral dose studies of 4 mg/kg body weight for 5 weeks from 3rd to 8th week of age further confirmed that the accumulation of cadmium was high in liver (158.10 μg/g) and kidneys (132.02 μg/g) but low in muscles (3.28 μg/g).

10. When the dose of cadmium and exposure time increased in Japanese quail, the percentage accumulation of cadmium decreased slightly in liver but rapidly in kidneys. However, the percentage accumulation of cadmium increased steadily in feathers and excreta at higher application of cadmium indicating the
possibility of elimination of the toxicant through feathers and excreta.

11. The accumulation of copper in different tissues exhibited a marked trend while its rate of uptake was higher in earlier stages of cadmium treatment than the latter stages where the copper excretion was blocked due to excess cadmium.

12. Cadmium induced greater accumulation of zinc in kidneys, liver, heart and feathers but depleted the zinc content in lungs, bone and excreta.

13. Cadmium interfered with normal metabolic activities in Japanese quail and reduced the body weight by 24.1 per cent, haemoglobin content by 50.6 per cent, RBC count by 28.5 per cent and PCV by 51.3 per cent over the control bird at eight weeks of age.

14. The cadmium accumulation in eight week old cadmium treated birds enhanced total serum protein by 17.5 per cent, total liver lipid by 102.2 per cent and kidney lipid by 43.3 per cent over the control bird but the kidney protein and liver protein were reduced by 62.0 and 54.6 per cent, respectively.

15. The enzyme analysis indicated that the accumulation of cadmium reduced 72.8 per cent of AST and 40.8 per cent of ALT in liver, 39.7 per cent of AST and 37.1 per cent of ALT in kidneys but enhanced the serum AST by 361.5 per cent and serum ALT by 1245.2 per cent in eight week old cadmium treated birds over the control. However, the percentage increase of GGT in liver, kidneys and serum was 153.7, 94.7 and 170.6, respectively at the end of five weeks of treatment.
16. Cadmium in Japanese quail produced necrosis, degenerative changes and excessive deposition of fat in liver, kidneys, testes and bone. It also caused atrophy of the gonads, emphysema of lungs and arrested erythropoiesis of bone marrow.

17. Cadmium was mutagenic and reduced the percentage of mitotic index in cadmium treated birds (21.3%) compared to the control (30.3%) and caused pulverization of chromosomes.

18. The bioaccumulation of cadmium investigated in different tissues/organs of various animals strongly suggested that preferential consumption of liver, kidneys and brain of farm animals would lead to heavy metal toxicity in consumers. Since the feeds and ingredients of animals are the major sources of heavy metals, the periodical monitoring and control of feeds and ingredients of animals will not only improve the quality of feeds of animals but also improve the health status and productivity of animals.