In the present atomic age, uses of radiation and radioisotopes have increased many folds in the fields of radio diagnosis, radiotherapy, industries, agriculture, nuclear research etc. All high-energy radiation, whether particulate or electromagnetic are capable of inducing excitation or ionization of atoms or molecules of both living and non-living matter. However, the diagnostic and therapeutic use of radiations is of prime importance and hence their effects specially haematopoietic and other systems has attracted the interest to minimize them by using some agents.

In the recent years, immense interest has been developed in the field of chemoprotection against radiation and heavy metals induced changes. Therefore, our study aims to investigate the protective effect of Liv.52 against combined exposure of radiation and cadmium chloride on blood of Swiss albino mice.
PLAN OF WORK

In the present investigation, healthy adult Swiss albino mice (6-8 weeks old) were used. In order to investigate the protective effect of Liv.52 the animals were divided into following groups:

Group – I  (Sham-irradiated animals) The animals of this group were sham-irradiated and served as control (normal) group.

Group - II  (Cadmium chloride treated animals)

All the animals of this group were orally fed with CdCl$_2$ solution at the dose rate of 20 ppm ad libitum in drinking water continuously till the end of experiment.

Group - III  (Irradiated animals)

The animals of this group were exposed to sub lethal doses of gamma radiation from Cobalt-60 source. This group was further divided into two sub-groups on the basis of radiation dose received:

Sub-group III a : 3.0 Gy
Sub-group III b : 6.0 Gy

Group - IV  (Animals treated with radiation and cadmium chloride)

All the animals of this group were orally fed with cadmium chloride solution (20 ppm) and also exposed to different doses of gamma radiation. This group was
further divided into two sub-groups on the basis of radiation dose received:

Sub-group IV a : 3.0 Gy + CdCl₂
Sub-group IV b : 6.0 Gy + CdCl₂

Group - V (Cadmium chloride and Drug treated animals)

The animals of this group were orally fed with cadmium chloride (20 ppm) and also received Liv.52 orally for seven days at a dose of 0.01 ml/animal/day prior to cadmium chloride treatment and continued up to the last autopsy interval.

Group - VI (Radiation and drug treated animals)

The animals of this group were exposed to 6.0 Gy of gamma radiation from Cobalt-60 source. The Liv.52 was given seven days prior to irradiation and continued up to last autopsy interval. This group was further divided into two sub-groups on the basis of radiation dose received:

Sub-group VI a : 3.0 Gy + Liv.52
Sub-group VI b : 6.0 Gy + Liv.52

Group - VII (Radiation, Cadmium chloride and drug treated animals)

The animals of this group were orally fed with CdCl₂ solution at the dose rate of 20 ppm and received Liv.52 orally (0.01ml/ animal/day) for seven days prior to irradiation and cadmium chloride till the last autopsy day
of experiment. This group was further divided into two sub-groups on the basis of radiation dose received:

Sub-group VII a : 3.0 Gy + CdCl₂ + Liv.52
Sub-group VII b : 6.0 Gy + CdCl₂ + Liv.52

A minimum of five animals from groups II to VII were sacrificed by cervical dislocation and autopsied at each post treatment intervals of 1, 2, 4, 7, 14 and 28 days. The weight of animals was recorded before the autopsy. Five sham-irradiated mice (normal) were also sacrificed.

**Parameters**

The following parameters were taken into consideration:

(i) Red blood corpuscles (RBC)
(ii) White Blood corpuscles (WBC)
(iii) Haemoglobin (Hb)
(iv) Packed cell volume (PCV)
(v) Mean cell volume (MCV)
(vi) Mean corpuscular Haemoglobin (MCH)
(vii) Mean corpuscular Haemoglobin concentration (MCHC)
(viii) Differential leucocyte count (DLC)
BIOCHEMICAL STUDIES

(a) Serum Glutamic Oxaloacetic Transaminase (SGOT)
(b) Serum Glutamic Pyruvic Transaminase (SGPT)

RESULTS

All these parameters exhibited modulations in the form of increase or decrease following treatment of cadmium chloride and radiation exposure independently as well as in combination with or without Liv.52.

The values of RBC, WBC, Hb and PCV were found to decrease in all the groups as compared to normal group, but the decrease in these values were lesser in Liv.52 treated groups (V to VII) as compared to non-drug treated groups (II to IV). The values of MCV were also found to decrease but the difference from normal value was significant at previous intervals and it was significant on later intervals.

The values of MCH increased in all the groups as compared with normal group after 1, 2, 4, 7, 14 and 28 days of post-treatment intervals.

The increase in the value of MCH was lesser in Liv.52 treated groups (V to VII) as compared to non drug treated groups (II to IV). Besides this values of MCHC increased in all the groups at various intervals but the values were lower in the Liv.52 treated
groups (V to VII) as compared to non-drug treated groups (II to IV). The difference from the normal was non-significant in all the groups.

The value of lymphocytes declined up to day-14 in non drug treated groups and day-7 in the Liv.52 treated groups. Similarly the values of monocytes and granulocytes percentage increased up to day-14 in the non drug treated animals and day-7 in the drug treated animals thereafter, a decrease in the value was noted up to day-28 without reaching to the normal.

The values of SGOT and SGPT elevated up to day-14 in the non drug treated groups and day-7 in the Liv.52 treated groups, thereafter a fall in the value was seen up to day-28.

From the present findings followings could be deduced –

1. The blood of Swiss albino mice suffered with radiation and cadmium induced changes at histological and biochemical levels.

2. Alterations in the histological structures followed the biochemical changes.

3. The combined treatment of radiation and cadmium chloride showed synergistic changes.

4. The blood of Liv.52 treated animals showed less severe radiolesions and early and fast recovery in comparison to non-drug treated animals. Thus, it seems that Liv.52 has protected the blood at both the dose levels with and without cadmium chloride treatment.
5. The Liv.52 might have protected the animals from radiation by more than one mechanism due to multiplicity of its properties.

Thus, Liv.52 is a good radioprotector and can be given to cancer patients during radiotherapy to minimize the side effects of exposure.