

Summary

Cadmium (Cd) is an environmental and industrial pollutant of growing concern that adversely affects various organs in human and animals. This study was carried out to investigate the protective potentials of bovine milk proteins (casein, whey proteins) on Cd-induced toxicity throughout *in vitro* and *in vivo* studies.

The *in vitro* study was performed by testing different concentration of Cd on fibroblast cell culture after the addition of different concentrations of casein and whey peptides by the use of the Electric Cell substrate Impedance Sensing (ECIS) assay. While the *in vivo* study was conducted on 72 male and female albino Wistar rats strain randomly divided into six groups. (T1 - Cd group; +ve control) received CdCl₂ and control diet, (T2; -ve control) the group received filtered water and control diet, (T3 - Casein+CdCl₂) the group received Cd and a casein based diet, (T4 - Casein) the group received filtered water and a casein based diet, (T5 - Whey Proteins+CdCl₂) the group received Cd and a whey proteins based diet, (T6 - Whey Proteins) the group received filtered water and a whey based diet. The CdCl₂ was offered in drinking water at the concentration of 19.4 mM/L for 10 weeks. All of rats received a basal diet during the first five weeks of the experiment but during the 2nd five weeks they received different feeding treatments as follow: (T1,T2 -basal diet), (T3,T4 – casein based diet), (T5,T6 – whey protein based diet).

The *in vitro* ECIS experiment was conducted to study an intermediate-term exposure (20-25h) of different Cd concentration, in order to observe the fibroblast cell behavior in the presence or lack of casein and whey peptides in the medium. In the microscopic evaluation of time-dependent cytotoxicity, gradual morphological changes were observed and they were represented in early cell shrinkage, and round or oval-shaped appearances of fibroblast cells, which were the most obvious effects observed in the case of fibroblast treated with cadmium. In contrast, these types of morphological changes were not observed in fibroblast cultures treated with casein and whey protein peptides, which showed prophylactic activity against cadmium cytotoxicity. The whey protein peptides revealed better prophylactic activity against cadmium fibroblast cytotoxicity as compared with casein peptides.

In ECIS assay, with higher Cd concentration (6.2 μM), the value of the impedance decreased sharply with the time, which is an indication of cell death. While

