Body of Abstract: Tooth enamel dosimetry has been extensively used for retrospective dose reconstruction of exposure to ionizing radiation of Mayak nuclear workers. The first dose reconstructions have been carried out for workers who were exposed to external photons, because the response function of tooth enamel to photons has been well characterized.

A considerable number of Mayak workers was also exposed to mixed neutron and gamma field. The largest number of workers exposed to neutrons was at the reactor plant, but the dose due to neutrons was of the order of only a few percents of the total dose. In some areas of the radiochemical and plutonium production plants a limited number of workers was exposed to higher neutron dose. Notwithstanding the number of neutron exposed workers and the level of dose were not high, this cohort represents the only population exposed to neutrons from which some additional information about the risk coefficients could be obtained.

In tooth enamel, neutron and gamma doses cannot be discriminated, because EPR signal induced by neutrons is the same as that induced by photons. This impossibility to distinguish gamma and neutron doses requires the contemporary use of another independent dosimetric method, when both the contributions need be measured. Moreover, even when the neutron to photon relative flux is so small that it could be neglected, the uncertainty of individual g-dose assessment is affected by the knowledge of tooth enamel sensitivity to neutrons. Accuracy in the individual total dose depends on the degree of knowledge of the radiation energy spectrum and of the relative sensitivity of tooth enamel to the two kinds of radiation.

Recently the response function of tooth enamel has been evaluated for several energies: in monoenergetic neutron beams of 2.8 and 14 MeV and in reactor neutron fields (i.e. between 0.1 keV and 1 MeV). Response to neutrons relative to that to 60Co has been found to increase with energy, from a few percent at thermal neutrons up to about 50% at higher energies (around 14 MeV).

Work is in progress to evaluate the relative contribution to the total dose to enamel due to neutrons in some Mayak working sites. The results, obtained using the tooth enamel response function to neutrons and the measured neutron energy spectra, will be presented. These data will improve accuracy in tooth enamel dose reconstruction of people belonging to the Mayak workers cohort.