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This study evaluated the potential effect of ionising radiation on population growth using simple population models and parameter values derived from chronic exposure experiments in two invertebrate species with contrasting life-history strategies. In the earthworm Eisenia fetida, models predicted increasing delay in population growth with increasing gamma dose rate (up to 0.6 generation times at 11 mGy h^{-1}). Population extinction was predicted at 43 mGy h^{-1}. In the microcrustacean Daphnia magna, models predicted increasing delay in population growth with increasing alpha dose rate (up to 0.8 generation times at 15.0 mGy h^{-1}), only after two successive generations were exposed. The study examined population effects of changes in different individual endpoints (including survival, number of offspring produced and time to first reproduction). Models showed that the two species did not respond equally to equivalent levels of change, the fast growing daphnids being more susceptible to reduction in fecundity or delay in reproduction than the slow growing earthworms. This suggested that susceptibility of a population to ionising radiation cannot be considered independent of the species' life history.

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