Recently, there has been interest in the application of radiation emitting materials for the control of restenosis after cardiovascular balloon angioplasty. One approach would be to use radioactive stents to prevent restenosis. This paper proposes using electron linear accelerators as an alternate production device. The purpose of this talk is to determine the range of energies and power levels necessary for production of clinically useful amounts of activity in the stents using linear accelerators.

An intense beam of electrons can be used to produce radioisotopes from stable target material. The physics process is the emission of neutrons or protons from the nucleus via the giant dipole resonance. The principle of our approach is to maximize the flux of electromagnetic energy into the resonance window of this reaction for a given material. Nuclear physics cross section data and Monte Carlo modeling is used to provide input for calculating activation yields and prediction of dose. A 2 kW linear accelerator operating at 25 MeV can be used to activate nitinol . The decay properties of this material is summarized. As an example, approximately 70 microCuries of 57Ni can be produced in a nitinol stent in less than 15 minutes. This produces a 10 Gy total dose at a distance of 1 mm from the deployed stent. This dose is delivered primarily in a few days after stent implantation. The results indicate that linear accelerators can be used for in-house activation of stents for novel cardiovascular radiation therapy.