# A feasibility study of the production of $^{131}I$ to be used in radioimmunoassay in Sri Lanka

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$^{131}I$ is a major radioisotope in nuclear medicine, extensively employed both to diagnose and treat differential thyroid cancers and to manage hyperthyroidism. For therapeutic purposes $^{131}I$ is required in higher doses, typically exceeding 10 mCi, depending on the stage of the cancer. Beyond its primary roles, $^{131}I$ is also utilized as a radiolabelled tracer in Radioimmunoassay (RIA) for quantitative detection of hormones, proteins and other antigenic substances. Typical $^{131}I$ activity used per RIA test ranges from 0.5 to 2 µCi. Since thyroid cancer diagnosis and therapy are critically important, Sri Lanka imports $^{131}I$ from neighbouring countries at a high cost because it does not have a domestic radioisotope production facility. Consequently, the accessibility of $^{131}I$ for RIA research in Sri Lanka remains limited, due to its high demand and high importation costs. This study examines the feasibility of producing $^{131}I$ in Sri Lanka using the neutron activation facility available at the University of Colombo. Considering the current neutron flux of the available source, the focus was placed on generating activity levels appropriate for RIA applications, rather than aiming for the much higher doses required for diagnostic and therapeutic uses. Five grams of 99.9% enriched $^{130}Te$ was irradiated with a flux of approximately 2.25 x $10^5$ neutrons/$cm^2$/s. During irradiation, $^{130}Te$ undergoes a nuclear reaction $^{130}Te(n,\gamma)^{131}Te$ and the resulting $^{131}Te$ (half-life~25 minutes) decays to $^{131}I$ (half-life~8 days). The production was monitored using a gamma spectroscopy with a sodium iodide scintillation detector. After 40 irradiation cycles, an activity of 6.1±0.3 nCi was measured, demonstrating the feasibility of local $^{131}I$ production. Utilizing a neutron source with significantly higher flux (approximately 2 x $10^8$ neutrons/$cm^2$/s) and irradiating for more cycles would allow achieving the required RIA dose more readily. The $^{131}I$ separation process is ongoing and will be reported in future. Preliminary trials using irradiated $KIO_3$ and the wet distillation protocol achieved a separation efficiency of 68%.

**Keywords:** *Neutron activation, Radioimmunoassay, $^{131}I$ Production and separation*