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# KLD-003
# RadChemDosi™
## Ideal dosimetry solution for γ radiation

## Assay Description

RadChemDosi™ is a chemical based assay that can measure the dose rate of ionizing radiation. γ–radiation is quite commonly used in radiobiological research to understand the mechanism of radiation induced cell death. It is also used to screen drugs that could be used as a radiation protector and sensitizer of normal and cancer cells respectively. Radiation mainly works by producing free radicals that reacts with biomolecules (DNA, protein and lipid) in mammalian and other types of cells. The amount of free radicals produced by radiation is dependent on the dose. Although the dose rate is generally extrapolated from the half-life of radiation source (isotope) used and the distance from the source, it is not a precise measurement of the dose rate and likely to skew the radiation dose given to multiple samples at a time. The error is likely to be most significant for screening of drugs that requires 6 and 24 wells plate. Additionally, the dimension and the structural differences (horizontal vs. vertical radiation chambers) of the radiation chambers also make it difficult to extrapolate the exact dose given to a sample. Further, the radiation isotope used in the radiation chambers decays over time and the sample position used by researchers may not be uniform. These variations warrant a well prepared stable chemical dosimetry solution that is easy and convenient to measure the dose rate at various positions in a chamber used for the irradiation of the samples.

## RadChemDosi™

RadChemDosi™ is an easier and more effective way to measure dose rate for ionizing radiation. It is a chemical-based assay that uses the ability of ionizing radiation to induce changes in certain chemicals. Our dosimetry is a high quality assay solution prepared under rigorous conditions to maintain the stability for at least five months. The radiation dosimetry probe used is based on previous studies conducted by various laboratories. Our test demonstrated that RadChemDosi™ is sensitive to measure the dose rate as low as 2.5Gy/min at various positions in a Cesium irradiator chamber. In addition to calibrating the dose rate at each position in a radiation chamber periodically, it can also be used to measure the dose rate in each well of a 6 and 24 wells plate. Thus, RadChemdosi™ offers many advantages to exactly measure the dose rate at each position in a radiation chamber without the difficulty in extrapolating the dose rate from half-life of the source, position distance from the source, etc.

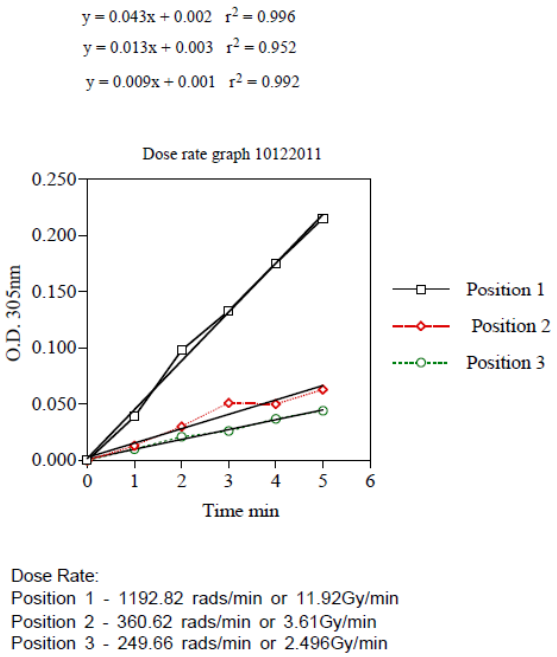


Figure 1: Dose rate measured at three different positions in a Cesium irradiator with a vertical source.

## Use for blood irradiators –

Gamma irradiators are also used for irradiation of blood and blood cells. The irradiation of the blood and blood components is essential for the prevention of transfusion associated graft vs host disease (TA-GVHD). For this purpose, an accurate dose is necessary to properly inactivate T lymphocytes, which is believed to play a significant role in TA-GVHD, without affecting the function of other blood cells. Although the machines used for blood irradiation have been much improved, verification of the dose rate of these machines will facilitate better outcome of irradiated blood and blood cells. Similar to the potential use of RadChemDosi in gamma irradiators used in research lab, it may also be useful for blood irradiators. RadChemDosi™ may be useful for periodic calibration of the blood irradiators. Additionally, it may also be used to determine the dose given to blood by simultaneously irradiating RadChemDosi™ in small disposable tubes attached to the blood sample by taping the tubes outside the bag.

***CAUTION/Warning:***
***RadChemDosi™ can only be used for verification of the specified dose rate. Any variations found in the dose rate measured by RadchemDosi™ as compared to the manufacturer's specifications for blood irradiators should be reported to the manufacturers of blood irradiators for their review. The users of the blood irradiators should not make any changes in the radiation exposure time for blood until approved by the manufacturer of the blood irradiators and by others involved in routine checkup carried out for blood irradiation and irradiators. Rockland is not liable for misuse of RadChemDosi™.***

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## Safety Precautions

Eye, skin and respiratory irritants are contained in this kit. Do not ingest or inhale. Utilize standard laboratory safety procedures when handling these reagents. **FOR LIFE SCIENCE RESEARCH USE ONLY**.

Chemicals contained in this kit: Ferrous ammonium sulphate, sodium chloride and sulfuric acid.

## Kit Reagents

**KLD-A003: Reagent 1** (100 tests, 100 ml white bottle) – Store at 2 - 8$^{o}$ C.

Approximate uses: 100 tests if 1ml is used for irradiation.

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## RadChemDosi™ Assay

### For Research Use:

1. Use 7ml glass tubes, 6 or 24 wells plate
2. Add 1ml of the RadChemDosi™ solution to glass tubes or each well of the plate.
3. Irradiate for 0, 1, 2, 3, 4, 5 minutes.
4. Transfer the RadChemDosi™ solution to a 1ml quartz cuvette and measure the absorptions of the irradiated and un-irradiated solution at 305nm in a spectrophotometer.
5. Plot Absorption vs. minutes to determine the slope of the dose response curve.
6. Multiply the slope (OD) with 2.774 X $10^2$ to determine the dose rate (Gy/min).

### For periodic verification of the dose rate in blood irradiators:

1. Use 2ml microfuge tubes for periodic verification without the blood samples.
2. Add 1ml of the RadChemDosi™ solution to each microfuge tubes.

### For simultaneous verification of the dose given to blood:

1. Use 2ml microfuge tubes for simultaneous verification with the blood samples.
2. Add 1ml of the RadChemDosi solution to microfuge tubes.
3. Attach the microfuge tubes on the blood bag using a tape.
4. Irradiate these for the specified time for the blood suggested by the manufacturer.
5. Transfer the RadChemDosi solution to a 1ml quartz cuvette and measure the absorptions of the irradiated and un-irradiated solution at 305nm in a spectrophotometer.
6. Multiply the absorption (OD) with 2.774 X $10^2$ to determine the dose (Gy).
7. Report any variation to the manufacturer of the blood irradiators to identify the problem.

3. Irradiate for 0, 1, 2, 3, 4, 5 minutes for periodic calibration.
4. Transfer the RadChemDosi ™ solution to a 1ml quartz cuvette and measure the absorptions of the irradiated and un-irradiated solution at 305nm in a spectrophotometer.
5. Plot Absorption vs. minutes to determine the slope of the dose response curve.
6. Calculate the absorption per minute.
7. Multiply the slope (OD per minute) with $2.774 \times 10^2$ to determine the dose rate (Gy/min).
8. Report any variation to the manufacturer of the blood irradiators.