






# KRIBIOLISA™ LENALIDOMIDE (REVLIMID) ELISA

**REF** : KOD1010

Ver 1.0

**RUO**

Enzyme Immunoassay for the quantitative determination of Lenalidomide (REVLIMID) in serum, plasma and cell culture supernatant

<b>RUO</b>	<b>For Research Use</b>	<b>REF</b>	<b>Catalog Number</b>
	<b>Store At</b>	<b>LOT</b>	<b>Batch Code</b>
	<b>Manufactured By</b>		<b>Biological Risk</b>
	<b>Expiry Date</b>		<b>Consult Operating Instructions</b>

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**REF** KOD1010

 96 tests



**KRISHGEN BioSystems**

Unit Nos#318/319, Shah & Nahar,  
Off Dr E Moses Road, Worli, Mumbai 400018.  
Tel: 91 (22) 49198700 | Email: sales@krishgen.com  
<http://www.krishgen.com>

**Introduction:**

Lenalidomide, sold under the trade name Revlimid among others, is a medication used to treat multiple myeloma (MM) and myelodysplastic syndromes (MDS). There are multiple mechanisms of action, and they can be simplified by organizing them as mechanisms of action in vitro and in vivo. In vitro, lenalidomide has three main activities: direct anti-tumor effect, inhibition of angiogenesis, and immunomodulation. In vivo, lenalidomide induces tumor cell apoptosis directly and indirectly by inhibition of bone marrow stromal cell support, by anti-angiogenic and anti-osteoclastogenic effects, and by immunomodulatory activity. Lenalidomide has a broad range of activities that can be exploited to treat many hematologic and solid cancers. On a molecular level, lenalidomide has been shown to interact with the ubiquitin E3 ligase cereblon and target this enzyme to degrade the Ikaros transcription factors IKZF1 and IKZF3.

**Intended Use:**

The KRIBIOLISA™ Lenalidomide (REVLIMID) ELISA is used as an analytical tool for quantitative determination of Lenalidomide (REVLIMID) in serum, plasma and cell culture supernatant.

**Principle:**

The method employs the quantitative competitive enzyme immunoassay technique. The microtiter wells are coated with Lenalidomide antigen. Lenalidomide present in the sample competes with antigen coated on the microtiter plate for the antibody. After incubation and washing, Biotin Lenalidomide: HRP Conjugate is added and incubated. Post incubation TMB substrate is added which develops blue color during incubation period and the reaction is stopped after the addition of stop solution with development of yellow color. The intensity of the color generated is inversely proportional to the amount of lenalidomide present in the sample.

**Materials Provided:**

1. Lenalidomide (REVLIMID) Binding Protein Coated Microtiter Plate (12x8 wells) - 1 no
2. Lenalidomide (REVLIMID) Standard, (0.5 ml/vial) - 0, 12.5, 25, 50, 100, 500 ng/ml
3. Biotin-Lenalidomide (REVLIMID):HRP Conjugate - 12 ml
4. Streptavidin:HRP Conjugate - 12 ml
5. Sample Diluent - 50 ml
6. Wash Buffer (20X) - 25 ml
7. TMB Substrate - 12 ml
8. Stop Solution - 12 ml
9. Instruction Manual

**Materials to be provided by the End-User:**

1. Microtiter Plate Reader able to measure absorbance at 450 nm.
2. Adjustable pipettes and multichannel pipettor to measure volumes ranging from 25 ul to 1000 ul
3. Deionized (DI) water
4. Wash bottle or automated microplate washer
5. Graph paper or software for data analysis
6. Timer
7. Absorbent Paper

**Handling/Storage:**

1. All reagents should be stored at 2°C to 8°C for stability.
2. All the reagents and wash solutions should be used within 12 months from manufacturing date.
3. Before using, bring all components to room temperature (18-25°C). Upon assay completion ensure all components of the kit are returned to appropriate storage conditions.
4. The Substrate is light-sensitive and should be protected from direct sunlight or UV sources.

**Health Hazard Warnings:**

1. Reagents that contain preservatives may be harmful if ingested, inhaled or absorbed through the skin.
2. For Research Use Only.

**Sample Preparation and Storage:**

Blood is taken by venipuncture. Serum is separated after clotting by centrifugation. Plasma can be used, too. Lipaemic, hemolytic or contaminated samples should not be run. Repeated freezing and thawing should be avoided. If samples are to be used for several assays, initially aliquot samples and keep at -20°C.

For Cell Culture Supernatant – If necessary, centrifuge to remove debris prior to analysis. Samples can be stored at -20°C or -80°C. Avoid repeated freeze-thaw cycles.

**Preparation Before Use:**

Allow samples to reach room temperature prior to assay. Take care to agitate patient samples gently in order to ensure homogeneity.

Test Sample preparation - Samples have to be diluted 1:100 (1 ul sample + 99 ul sample diluent) prior to assay. The samples may be kept at 2 - 8°C for up to three days. Long-term storage requires -20°C.

**Reagent Preparation (all reagents should be diluted immediately prior to use):**

1. Label any aliquots made with the kit Lot No and Expiration date and store it at appropriate conditions mentioned.
2. Bring all reagents to Room temperature before use.
3. To make Wash Buffer (1X); dilute 25 ml of 20X Wash Buffer in 475 ml of DI water.

**Procedural Notes:**

1. In order to achieve good assay reproducibility and sensitivity, proper washing of the plates to remove excess un-reacted reagents is essential.
2. High Dose Hook Effect may be observed in samples with very high concentrations of Lenalidomide (REVLIMID). High Dose Hook Effect is due to excess of antibody for very high concentrations of Lenalidomide (REVLIMID) present in the sample. High Dose Hook effect is most likely encountered from samples early in the purification process. If Hook Effect is possible, the samples to be assayed should be diluted with a compatible diluent. Thus if the Lenalidomide (REVLIMID) concentration of the undiluted sample is less than the diluted sample, this may be indicative of the Hook Effect.
3. Avoid assay of Samples containing sodium azide ( $\text{NaN}_3$ ), as it could destroy the HRP activity resulting in under-estimation of the amount of Lenalidomide (REVLIMID).
4. It is recommended that all Standards and Samples be assayed in duplicates.
5. Maintain a repetitive timing sequence from well to well for all the steps to ensure that the incubation timings are same for each well.
6. If the Substrate has a distinct blue color prior to use it may have been contaminated and use of such substrate can lead to compromisation of the sensitivity of the assay.
7. The plates should be read within 30 minutes after adding the Stop Solution.
8. Make a work list in order to identify the location of Standards and Samples.

**Assay Procedure:**

1. It is strongly recommended that all Standards and Samples be run in duplicates or triplicates. A standard curve is required for each assay. All steps must be performed at 37°C
2. Pipette **100 ul** of **Standards** or **Samples** into the respective wells.

3. Pipette without delay in the same order **100 ul** of **Biotinylated Lenalidomide** into each well.
4. Cover the plate and incubate for 60 minutes at 37°C
5. Aspirate and wash plate 4 times with **Wash Buffer (1X)** and blot residual buffer by firmly tapping plate upside down on absorbent paper. Wipe of any liquid from the bottom outside of the microtiter wells as any residue can interfere in the reading step.
6. Pipette 100 ul of Streptavidin:HRP Conjugate to each well.
7. Cover the plate and incubate for 60 minutes at 37°C
8. Aspirate and wash plate 4 times with **Wash Buffer (1X)** and blot residual buffer by firmly tapping plate upside down on absorbent paper. Wipe of any liquid from the bottom outside of the microtiter wells as any residue can interfere in the reading step.
9. Add **100 ul** of **TMB Substrate** in each well.
10. Incubate the plate at 37°C for 15-30 minutes in dark. DO NOT SHAKE or else it may result in higher backgrounds and worse precision. Positive wells should turn bluish in color.
11. Pipette out **100 ul** of **Stop Solution**. Wells should turn from blue to yellow in color.
12. Read the absorbance at 450 nm with a microplate reader.

#### Calculation of Results:

Determine the Mean Absorbance for each set of duplicate or triplicate Standards and Samples. Using Semi-Log graph paper, plot the average value (absorbance 450nm) of each standard on the Y-axis versus the corresponding concentration of the standards on the X-axis. Draw the best fit curve through the standard points. To determine the unknown Lenalidomide concentrations, find the unknown's Mean Absorbance value on the Y-axis and draw a horizontal line to the standard curve. At the point of intersection, draw a vertical line to the X-axis and read the Lenalidomide Concentration. If samples were diluted, multiply by the appropriate dilution factor. Software which is able to generate a cubic spline curve-fit is best recommended for automated results.

#### Note:

It is recommended to repeat the assay at a different dilution factor in the following cases:

- If the sample absorbance value is below the first standard.
- If the absorbance value is equivalent or higher than the 500 ng/ml standard.

#### Quality Control:

It is recommended that for each laboratory assay appropriate quality control samples in each run to be used to ensure that all reagents and procedures are correct.

#### Performance Characteristics of the Kit:

This kit has been validated as per EMA/FDA guidelines in line with ICH Code for Harmonization of Biological Assays.

#### Sensitivity:

**Limit Of Detection:** It is defined as the lowest detectable concentration corresponding to a signal of Mean of '0' standard plus 2\* SD.

10 replicates of '0' standards were evaluated and the LOD was found to be 12.5ng/ml

#### Linearity:

Standards provided in the kit will be used for measuring the linearity range of Lenalidomide (REVLIMID) present in matrix.

**Precision:**

Precision is defined as the percent coefficient of variation (%CV) i.e. standard deviation divided by the mean and multiplied by 100. Assay precision was determined by both intra (n=5 assays) and inter assay (n=5 assays) reproducibility on two pools with low (12.5ng/ml), medium (50ng/ml) and high (500ng/ml) concentrations. While actual precision may vary from laboratory to laboratory and technician to technician, it is recommended that all operators achieve precision below these design goals before reporting results.

Pool	Intra Assay %CV	Inter Assay %CV
Low	<10%	<10%
Medium	<5%	<5%
High	<5%	<5%

**Safety Precautions:**

- **This kit is For Research Use only.** Follow the working instructions carefully.
- The expiration dates stated on the kit are to be observed. The same relates to the stability stated for reagents
- Do not use or mix reagents from different lots.
- Do not use reagents from other manufacturers.
- Avoid time shift during pipetting of reagents.
- All reagents should be kept in the original shipping container.
- Some of the reagents contain small amount of sodium azide (< 0.1 % w/w) as preservative. They must not be swallowed or allowed to come into contact with skin or mucosa.
- Source materials maybe derived from human body fluids or organs used in the preparation of this kit were tested and found negative for HBsAg and HIV as well as for HCV antibodies. However, no known test guarantees the absence of such viral agents. Therefore, handle all components and all patient samples as if potentially hazardous.
- Since the kit contains potentially hazardous materials, the following precautions should be observed
  - Do not smoke, eat or drink while handling kit material
  - Always use protective gloves
  - Never pipette material by mouth
  - Wipe up spills promptly, washing the affected surface thoroughly with a decontaminant.
- In any case GLP should be applied with all general and individual regulations to the use of this kit.



**LIMITED WARRANTY**

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