# TECHNICAL MANUAL

# Rat fT3 (Free Triiodothyronine) ELISA Kit

- **SKU CODE:** RTFI01324
- **SIZE:** 48T/96T
- **DETECTION PRINCIPLE:** Competitive (Antigen Coated)
- **RUO:** Research-Use-Only

Revised: 01/2026

# Rat fT3 (Free Triiodothyronine) ELISA Kit

*Please read entire manual carefully before starting experiment. DO NOT mix reagents and use reagents from different kits or batches to prevent assay failure.*

## Table of Contents


**1. Key Features** ..... 3

**2. Storage & Expiry** ..... 3

**3. Product Description** ..... 4

**4. Kit Contents** ..... 5

**5. Precautions** ..... 6

**6. Assay Summary** ..... 7

**7. Sample Preparation** ..... 8

**7.1. Protein Quantification (Optional)** ..... 11

**8. Reagent Preparation** ..... 12

**9. Assay Procedure** ..... 15

**10. Data Analysis** ..... 16

**11. Typical Data** ..... 17

**12. ELISA Troubleshooting** ..... 19

# 1. Key Features

**Detection Method:**

Competitive (Antigen Coated)

**Sample Type:**

Serum, Plasma, Cell Culture Supernatant, Cell or Tissue Lysate, Other Liquid Samples

**Reactivity:**

Rat

**Range:**

0.781-50pg/ml

**Sensitivity:**

0.469pg/ml

# 2. Storage & Expiry

Assay Genie ELISA Kits are shipped on ice packs. Please store this ELISA Kit and/or components as described in section 4. Date of expiration is on the ELISA Box label.

# 3. Product Description

The Assay Genie Rat fT3 (Free Triiodothyronine) ELISA Kit is a highly sensitive assay for the quantitative measurement of a Rat fT3 in the following samples: Serum, Plasma, Cell Culture Supernatant, Cell or Tissue Lysate, Other Liquid Samples.

This kit utilizes a Competitive Enzyme-Linked Immunosorbent Assay (ELISA) principle, where the microtiter wells are pre-coated with Rat fT3. In this format, the Rat fT3 present in the sample competes with a fixed amount of coated Rat fT3 for binding the specific sites of the added biotinylated detection antibody specific to the target molecule.

After washing away unbound materials, HRP-Streptavidin (SABC) is added, which binds to the bound biotinylated detection antibody. TMB substrate is then added, producing a colour reaction. The intensity of the colour is inversely proportional to the amount of Rat fT3 in the sample, meaning that higher concentrations of Rat fT3 result in a weaker signal (lower OD at 450 nm).

The concentration of Rat fT3 in the sample is calculated by comparing the OD values to the standard curve.

**This dual function kit includes validated Bradford Reagent to quantify total protein concentration for accurate sample normalization.**

# 4. Kit Contents

| No | Component Name | Size 48T | Size 96T | Storage |
|---|---|---|---|---|
| **1** | ELISA Microplate (Dismountable) | 8×6 | 8×12 | Place the test strips into a sealed foil bag with the desiccant. Store for 1 month at 2-8°C; Store for 12 months at -20°C. |
| **2** | Lyophilized Standard | 1vial | 2vial | Place the standards into a sealed foil bag with the desiccant. Store for 1 month at 2-8°C; Store for 12 months at -20°C. |
| **3** | Biotin-labeled Antibody (Lyophilized) | 1vial | 1vial | Place the standards into a sealed foil bag with the desiccant. Store for 1 month at 2-8°C; Store for 12 months at -20°C. |
| **4** | HRP-Streptavidin Conjugate (SABC, 100X) | 60ul | 120ul | 2-8°C (Avoid direct light) |
| **5** | TMB Substrate | 5ml | 10ml | 2-8°C (Avoid direct light) |
| **6** | Purified Water | 200ul | 200ul | 2-8°C |
| **7** | Sample Dilution Buffer | 10ml | 20ml | 2-8°C |
| **8** | Antibody Dilution Buffer | 5ml | 10ml | 2-8°C |
| **9** | SABC Dilution Buffer | 5ml | 10ml | 2-8°C |
| **10** | Stop Solution | 5ml | 10ml | 2-8°C |
| **11** | Wash Buffer(25X) | 15ml | 30ml | 2-8°C |
| **12** | Plate Sealer | 3 pieces | 5 pieces | - |
| **13** | Technical Manual | 1 copy | 1 copy | - |
| **14** | Bradford Reagent | 1 vial | 1 vial | 4°C |

## Additional materials required:

1. 37°C incubator.

2. Plate Reader with 450nm filter.

3. Precision pipettes and disposable pipette tips.

4. Distilled water.

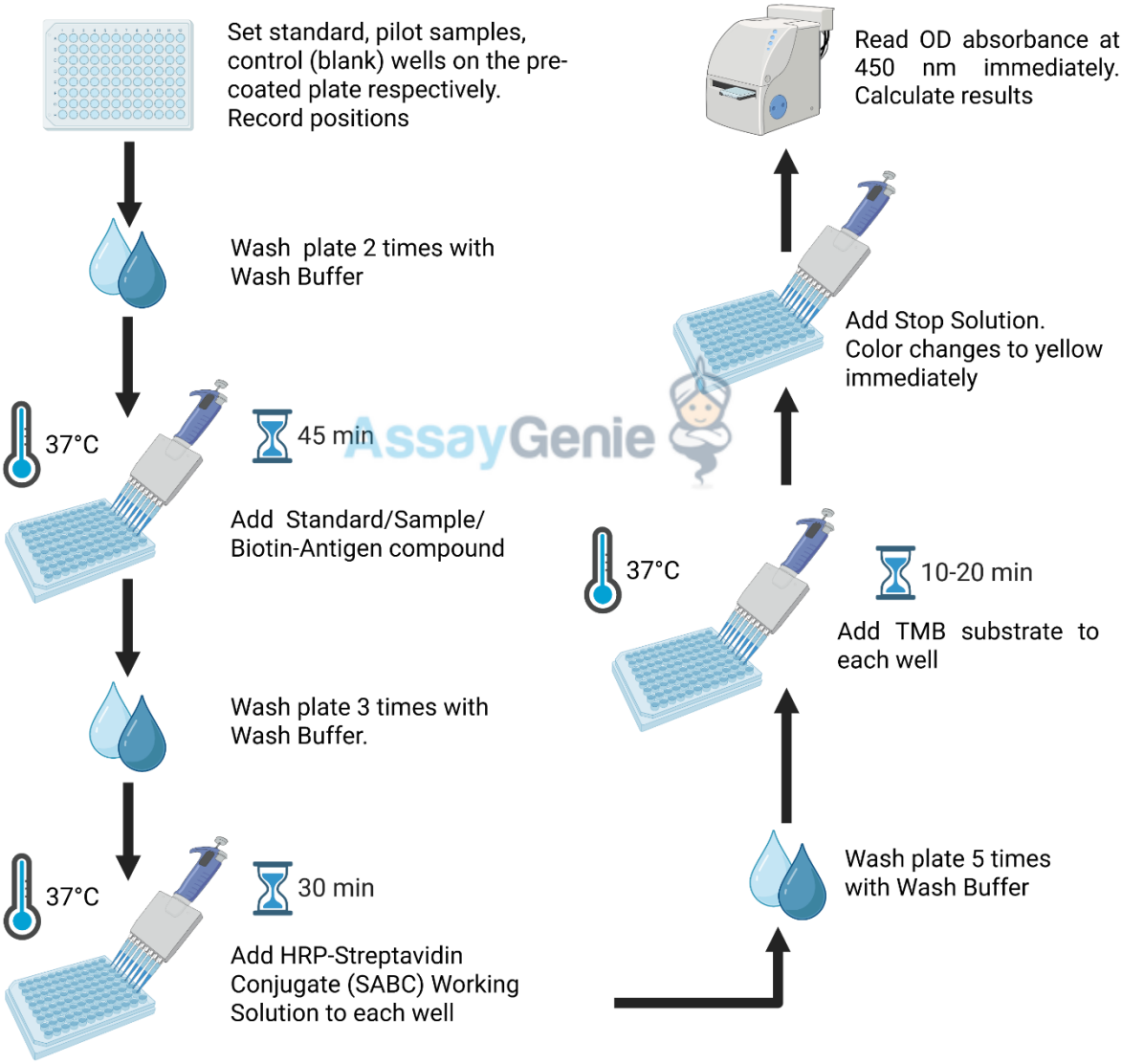
5. Disposable tubes for sample dilution.

6. Absorbent paper.

## 5. Precautions

1. This kit is for research purposes only and not for diagnostics or therapeutic uses.
2. Store all components as listed in this manual. Do not use the ELISA Kit after its expiration date.
3. Allow all reagents and samples to reach room temperature before use.
4. Ensure unopened and unused plates are kept dry to avoid contamination.
5. Before using the kit, centrifuge tubes to spin down standard and/or antibody.
6. Prepare all reagents, samples and standards as directed in this manual.
7. Duplicate wells are recommended for both standard and sample testing.
8. Do not let the microplate wells dry during assay.
9. Maintain consistent incubation times and temperatures as variations can affect results.
10. Do not reuse tips and tubes to avoid cross contamination.
11. Avoid using the reagents from different batches together.

# 6. Assay Summary



# 7. Sample Preparation

The procedures outlined in this document are provided as general recommendations for sample preparation in ELISA assays. Due to the variability of biological samples and specific assay requirements, users are advised to optimize protocols based on their own experimental conditions.

***Note**: For information regarding validation data in specific samples, please contact our Technical Support Team at techsupport@assaygenie.com.*

## General Considerations

To prevent denaturation or degradation of target proteins, it is recommended to process samples promptly and store them under appropriate conditions.

- **Storage Conditions**:
  - **Short-term**: 2-8 °C for up to 5 days.
  - **Medium-term**: -20 °C for up to 6 months.
  - **Long-term**: -80 °C or cryopreservation in liquid nitrogen.
- **Thawing Protocol**: Frozen samples should be thawed rapidly in a 15-25 °C water bath to minimize ice crystal-induced damage. Thawed samples can be analysed immediately or stored temporarily at 2-8 °C.
- **Freeze-Thaw Cycles**: Repeated freeze-thaw cycles should be strictly avoided due to their detrimental effect on protein stability.

### A. Blood-Derived Samples

- **Serum:** Allow whole blood to coagulate at room temperature (2 h) or 2-8 °C overnight. Centrifuge at 1000 × g for 20 min and collect the supernatant. Store or use immediately.
- **Plasma:** Collect in anticoagulant tubes (EDTA, citrate, or heparin), mix gently, and centrifuge within 30 min at 1000 × g, 2-8 °C for 15 min. Store or assay as needed.

**B. Tissue Homogenates**

Tissue samples should be homogenized prior to use. Avoid buffers containing NP-40, Triton X-100, or DTT, as these strongly inhibit the assay. We recommend using 50 mM Tris + 0.9% NaCl + 0.1% SDS, pH 7.3.

The recommended protocol is as follows:

- **Sample Collection and Washing**
    - Place the target tissue on ice.
    - Rinse the tissue with pre-cooled PBS buffer (0.01 M, pH 7.4) to remove residual blood.
    - Weigh the tissue for further processing.
- **Homogenization**
    - Homogenize the tissue on ice using an appropriate lysis buffer.
    - The lysate volume should correspond to the tissue weight; typically, 9 mL PBS is used per 1 g of tissue. It is recommended to add protease inhibitors to the PBS (e.g., 1 mM PMSF). ***Note:*** *PBS buffer or mild RIPA lysis buffer can be used for homogenization. When using RIPA, adjust pH to 7.3.*
- **Cell Disruption**
    - Further disrupt the tissue using ultrasonic homogenization or freeze–thaw cycles.
        - Ultrasonic homogenization: Keep samples on an ice bath during sonication to avoid overheating.
        - Freeze–thaw cycles*:* Repeat twice for effective lysis.
- **Centrifugation and Storage**
    - Centrifuge the homogenate at 5000 × g for 5 minutes.
    - Collect the supernatant for immediate analysis, or aliquot and store at –20°C or –80°C for future assays.
- **Protein Concentration Measurement**
    - Determine total protein concentration using the Bradford Reagent included in this kit.

- For ELISA assays, the total protein concentration should generally be 1–3 mg/mL.
- Tissues with high endogenous peroxidase levels (e.g., liver, kidney, pancreas) may react with TMB substrate, causing false positives. If this occurs, treat samples with 1% $H_2O_2$ for 15 minutes before repeating the assay.

***Note:*** *Liver, kidney, and pancreas samples often contain high levels of endogenous peroxidase, which may react with the chromogenic substrate at elevated sample concentrations, potentially resulting in false positive signals.*

*If analysis of these tissues is required, a gradient dilution assay is recommended. A proportional decrease in signal with increasing dilution typically indicates minimal interference and supports the accuracy of the results.*

*To further minimise potential interference, samples can be pre-treated with 1% hydrogen peroxide ($H_2O_2$) for 15 minutes prior to testing. To prepare the treatment solution, add 1 µl of pure $H_2O_2$ to 100 µl of sample (1% v/v).*

**C. Cell Culture Supernatant**

Centrifuge the sample at 2500 rpm for 5 minutes at 2–8°C. Carefully collect the clarified cell culture supernatant for immediate analysis, or aliquot and store it at –80°C for future assays.

**D. Cell Lysates**

- **Suspension Cell Lysate:** Centrifuge the cell suspension at 2500 rpm for 5 minutes at 2–8°C and collect the cell pellet. Wash the pellet with pre-cooled PBS (0.01 M, pH 7.4) and mix gently. Repeat centrifugation and discard the supernatant. Add 0.5–1 mL of cell lysis buffer containing an appropriate protease inhibitor (e.g., PMSF, final concentration: 1 mM). Lyse the cells on ice for 30–60 minutes or disrupt them using ultrasonic homogenization.

- **Adherent Cell Lysate:** Remove the supernatant and wash the cells three times with pre-cooled PBS. Add 0.5–1 mL of cell lysis buffer supplemented with an appropriate protease inhibitor (e.g., PMSF at a final concentration of 1 mmol/L). Scrape the adherent cells using a cell scraper and transfer the cell suspension to a centrifuge tube. Lyse the cells on ice for 30–60 minutes, or disrupt the cells by ultrasonic treatment.

Follow next steps for protein extraction and supernatant collection:

- **Protein Release and DNA Disruption**
  - During lysis, pipette gently or intermittently shake the tube to enhance protein extraction.
  - Mucilaginous material formed during lysis is DNA, which can be broken down by ultrasonic disruption (3–5 mm probe, 150–300 W, 3–5 seconds per cycle, with 30-second intervals for 1–2 minutes total).
- **Supernatant collection**
  - After lysis or ultrasonic treatment, centrifuge the lysate at 10,000 rpm for 10 minutes at 2–8°C. Collect the supernatant for immediate use or aliquot and store at –80°C for future assays.

***Notes:*** *Refer to the "Tissue Sample Notes" for additional buffer and inhibitor recommendations.*

**E. Other Sample Types**

For more information about how to process other sample types, (e.g., body fluids, breast milk & more), please contact our Tech Support Team at techsupport@assaygenie.com.

## 7.1. Protein Quantification (Optional)

To quantify total protein levels, use the Bradford Reagent included in this kit. Visit https://www.assaygenie.com/bradford-protein-assay-protocol/ to view the full protocol.

# 8. Reagent Preparation

## Manual Washing

Discard the solution in the plate without touching the side of the wells. Clap the plate on absorbent filter paper or other absorbent material. Fill each well completely with 350 µl wash buffer and soak for 1 to 2 mins, then aspirate contents from the plate, and clap the plate on absorbent filter paper or other absorbent material. Repeat this procedure for the designated number of washes.

## Automated Washing

Aspirate all wells, then wash plate with 350 µl wash buffer. After the final wash, invert plate, and clap the plate on absorbent filter paper or other absorbent material. It is recommended that the washer is set for a soaking time of 1 minute.

***Note:*** *Set the height of the needles; be sure the fluid can be taken up completely.*

## Sample Dilution Guidelines

Determine the concentration of the target protein in the test sample and then select the optimal dilution factor to ensure the target protein concentration falls within the optimal detection range of the kit. Dilute the samples with the dilution buffer provided with the kit. Several dilution tests may be required to achieve the optimal results. The test samples must be well mixed with the dilution buffer. Standard and sample dilution should be performed before starting the experiment.

***Note:*** *Dilution may be required to avoid matrix effect. However, if the target concentration in the sample is very low, the pre-processed sample may be added directly to the assay without dilution.*

## Reagent Preparation

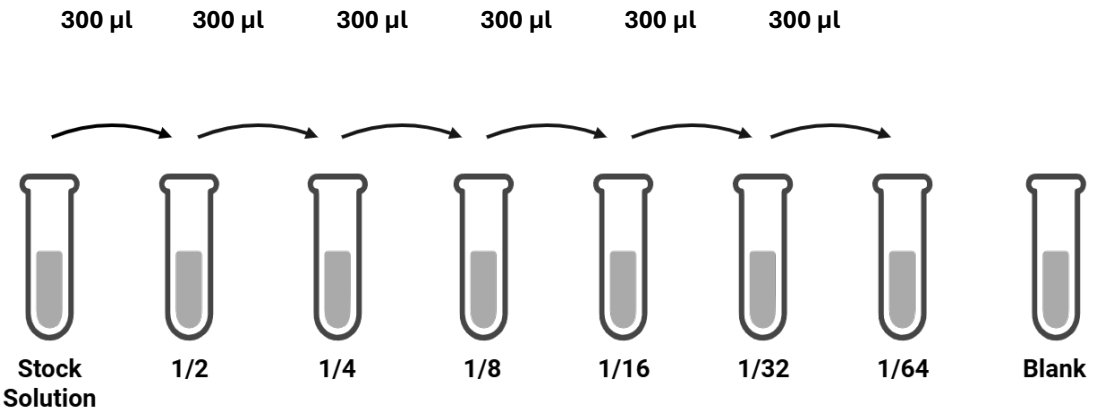
Bring all reagents and samples to room temperature 20 minutes before use (18 - 25°C). For repeated assays, please use only strips and standards required and store remaining reagents at the appropriate temperatures.

**A. Wash Buffer:**

Dilute 30 ml (15 ml for 48T) of Concentrated Wash Buffer into 750 ml (375 ml for 48T) of Wash Buffer with deionized or distilled water (recommended resistivity of ultrapure water is 18MΩ). Store unused solution at 4°C. If crystals have formed in the concentrate, warm at 40°C in water bath (Heating temperature should not exceed 50°C) and mix gently until crystals have completely dissolved. The solution should be cooled to room temperature before use.

**B. Standard Dilution:**

1. Centrifuge the standard tube for 1 min at 10,000 x g.
2. Add 1 ml of Sample dilution buffer into one Standard tube (labelled as Stock Solution), keep the tube at room temperature for 10 min. Invert the tube several times to mix (or use a low-speed vortex mixer for 3 – 5 seconds).
3. Finally, centrifuge for 1 min at 1,000 x g to collect liquid at the bottom of the tube and remove bubbles. ***Note:*** *If the concentration of the standard vial differs from the highest value in the standard curve range (see page 3), dilute it with sample buffer to match the highest range value and prepare the stock solution*.
4. Label 7 Eppendorf tubes with 1/2, 1/4, 1/8, 1/16, 1/32, 1/64 and blank respectively. Aliquot 300µl of the Sample dilution buffer into each tube. Add 300 µl of the above (Stock Solution) standard solution into 1st tube and mix thoroughly. Transfer 300 µl from 1st tube to 2nd tube and mix thoroughly. Transfer 300 µl from 2nd tube to 3rd tube and mix thoroughly, and so on. Sample dilution buffer is used as blank control.




***Note:*** *The standard solutions are best used within 2 hours. The standard solution series should be kept at 4°C for up to 12 hours. Or store at -20 °C for up to 48 hours. Avoid repeated freeze-thaw cycles.*

**C. Preparation of biotin-labelled Antibody working solution:**

The antibody working solution should be prepared within 30 minutes of starting the assay and it cannot be stored for a long period of time.

1. Calculate required total volume of the working solution: 50 µl /well x quantity of wells. (It's better to prepare additional 100 µl-200 µl.)

2. Centrifuge for 1min at 2000xg and bring down the concentrated biotin-labelled antibody to the bottom of tube. Add 70 µl purified water into tube and mix them thoroughly, after the biotin-labelled antibody is dissolved, please store it at 2-8°C.

3. Dilute the biotinylated detection antibody with antibody dilution buffer at 1/100 and mix them thoroughly. (e.g. Add 10 µl concentrated biotin-labelled antibody into 990 µl antibody dilution buffer.)

**D. Preparation of HRP-Streptavidin Conjugate (SABC) Working Solution**

Prepare within 30 minutes of starting the experiment.

1. Calculate the total volume of the working solution: 100 µl / well × quantity of wells. (Allow 100-200 µl more than the total volume)

2. Centrifuge for 1 min at 1000xg in low speed and bring down the concentrated SABC to the bottom of the tube.

3. Dilute the SABC with SABC dilution buffer at 1:100 and mix thoroughly. (i.e. Add 1µl of SABC into 99µl of SABC dilution buffer.)

## 9. Assay Procedure

1. **Reagent Preparation:** Equilibrate the TMB substrate at room temperature for at least 30 minutes before use. When diluting samples and reagents, ensure they are mixed thoroughly and evenly. It is recommended to prepare a standard curve for each assay.
2. **Plate Setup:** Designate standard wells, test sample wells, and control (blank) wells on the pre-coated plate, and record their positions. It is recommended to measure each standard and sample in duplicate. Wash plate twice before adding standards, samples, and controls.
3. **Standard Loading:** Aliquot 50 µl of standard solutions into the standard wells.
4. **Control (Blank) Loading**: Add 50 µl of Sample dilution buffer into the control (blank) well.
5. **Samples Loading**: Add 50 µl of properly diluted sample into test sample wells.
6. **Biotin-labelled Antibody Working Solution Loading:** Immediately add 50 µl -labelled Antibody Working Solution into each well, gently tap the plate for 1min to ensure thorough mixing then incubate for 45 minutes at 37°C.
7. **Washing:** Aspirate each well and wash with 350 µL of Wash Buffer three times according to the instructions. Allow the wash buffer to remain in the wells for 1–2 minutes during each wash. After the final wash, remove any residual wash buffer by aspiration or decanting.
8. **HRP-Streptavidin Conjugate (SABC):** Add 100 µL of SABC working solution to each well. Cover the plate and incubate at 37°C for 30 minutes.
9. **Washing:** Remove the cover and wash plate five times with 350 µL Wash Buffer. Let the Wash Buffer remain in the wells for 1–2 minutes during each wash.

10. **TMB Substrate:** Add 90 µL of TMB substrate solution to each well. Cover the plate and incubate at 37°C in the dark for 10–20 minutes. (***Note****: This incubation time is for reference only and should be optimised by the end-user*.) Terminate the reaction when an apparent gradient appears in the standard wells.
11. **Stop Solution:** Add 50 µL of Stop Solution to each well and mix thoroughly. The colour will change to yellow immediately.
12. **OD Measurement:** Read the optical density (OD) at 450 nm in a microplate reader immediately after adding the Stop Solution.

# 10. Data Analysis

This assay uses a competitive inhibition enzyme immunoassay format; therefore, the assay signal intensity is inversely proportional to the concentration of Rat fT3 in the sample.

Average the duplicate absorbance readings for each standard, control, and sample. Generate a standard curve by plotting Rat fT3 concentration on the y-axis against absorbance on the x-axis. Determine the best-fit line through the standard points using regression analysis.

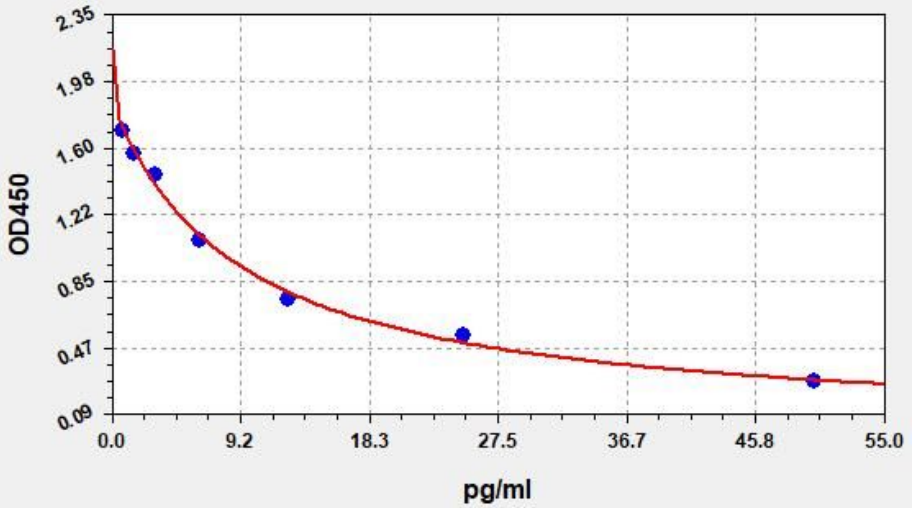
For diluted samples, multiply the concentration obtained from the standard curve by the corresponding dilution factor to calculate the final concentration. Curve fitting and data analysis may be performed using appropriate software (e.g., CurveExpert).

***Note:*** *If the samples measured were diluted, multiply the dilution factor to the concentrations from interpolation to obtain the concentration before dilution*.

# 11. Typical Data

### Standard Curve

Results of a typical standard run of an ELISA kit are shown below. This standard curve was generated at our lab for demonstration purpose only. Each user should obtain their own standard curve as per experiment.




### Specificity

This assay has high sensitivity and excellent specificity for detection of Rat fT3. No significant cross-reactivity or interference between Rat fT3 and other targets was observed.

***Note:*** *Limited by current skills and knowledge, it is difficult for us to complete the cross-reactivity detection between Rat fT3 and other analytes, therefore, cross reaction may still exist.*

### Recovery

Matrices listed below were spiked with a certain level of Rat fT3 and the recovery rates were calculated by comparing the measured value to the expected amount of Rat fT3 in the samples.

| Matrix | Recovery Range (%) | Average (%) |
|---|---|---|
| **Serum(n=5)** | 85-103 | 95 |
| **EDTA Plasma(n=5)** | 87-105 | 98 |
| **Heparin Plasma(n=5)** | 94-103 | 95 |

### Linearity

The linearity of the kit was assayed by testing the samples spiked with appropriate concentration of Rat fT3 and their serial dilutions.

| Sample | 1:2 | 1:4 | 1:8 |
|---|---|---|---|
| **Serum(n=5)** | 83-98% | 80-98% | 80-97% |
| **EDTA Plasma(n=5)** | 85-105% | 92-105% | 86-98% |
| **Heparin Plasma(n=5)** | 89-101% | 86-103% | 86-103% |

### Precision

- Intra-Assay: CV<8%
- Inter-Assay: CV<10%

### Stability

The stability of the Rat fT3 is determined by the loss rate of activity. The loss rate of this kit is less than 10% within the expiration date under appropriate storage conditions.

| Sample | 37°C for 1 month | 4°C for 12 months |
|---|---|---|
| **Average (%)** | 80 | 95-100 |

To minimize extra influence on the performance, operation procedures and lab conditions, especially room temperature, air humidity, incubator temperature should be strictly controlled. It is also strongly suggested that the whole assay is performed by the same operator from the beginning to the end.

# 12. ELISA Troubleshooting

| Problem | Possible Causes | Solutions |
|---|---|---|
| **Standard curve without signal** | Incorrect reagent order; Mixed components from different kits; Missing reagents. | Ensure correct reagent order and use components from the same kit. Verify all reagents are added. |
| **Overflow OD** | Mixed components from different kits; Over-concentrated working solution. | Use correct components and prepare solutions at recommended concentrations. |
| **Poor standard curve** | Incorrect curve fitting model. | Try alternative curve fitting models. |
| **Samples without signal** | Sample concentration too low; Incompatible buffer; Incorrect preparation; Sample degradation or excessive freeze-thaw. | Reduce dilution or concentrate sample. Check buffer compatibility and follow proper preparation and storage. |
| **High CV%** | Precipitate formation; Unclean plate; Foaming; Uneven washing; Incomplete reagent mixing; Pipetting inconsistency. | Dilute samples if needed, avoid foaming, ensure uniform washing, mix reagents thoroughly, and use calibrated pipettes. |
| **Low standard signal** | Improperly reconstituted standards; Degraded standards; Incorrect pipetting; Expired kit; Improper storage; Over-dried wells. | Reconstitute standards properly, use fresh kits, follow storage recommendations, and prevent wells from drying. |
| **Slow colour development** | TMB not equilibrated; Incorrect microplate reader wavelength; Over-washing. | Pre-warm TMB (30 min at 37°C), confirm correct wavelength (450 nm), and follow recommended washing times. |
| **High background** | Insufficient washing; Contaminated wash buffer; Excess detection reagents; Delayed reading; TMB exposed to light. | Wash adequately, prepare fresh wash buffer, use correct reagent amounts, read results promptly, and incubate TMB in the dark. |

## Notes:

## Notes:

## Notes:

## Notes:

**Assay Genie 100% money-back guarantee!**

If you are not satisfied with the quality of our products and our technical team cannot resolve your problem, we will give you 100% of your money back.

**Manufacturers Statement: This final kit system is assembled and quality-released by Assay Genie Limited.**