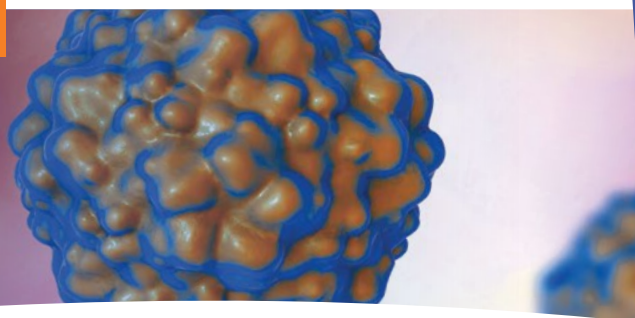


## RISK STRATIFICATION GUIDE

# Torque Teno Virus



**TTViWATCH™**  
Torque Teno Virus qPCR

The **only** commercially available assay in the US validated for monitoring immune response.

## Utilizing TTViWATCH to Monitor for Potential Rejection or Infection

**Torque Teno Virus (TTV)** is a small, non-enveloped virus belonging to the Anelloviridae family. This circular, single-stranded DNA virus is highly prevalent in humans and is found in diverse body fluids, including blood, saliva, and semen.

Despite its widespread presence in 90% of normal, healthy adults, TTV has not been linked to any specific diseases, making its clinical significance unclear. Patients on immunosuppressive therapy are at risk of infection, rejection, and malignancy. A number of studies suggest that TTV may act as a marker of immune status rather than a pathogen, with higher viral loads observed in immunocompromised individuals, such as organ transplant recipients and HIV patients. The prevalence of TTV in solid organ transplant recipients is up to 99% depending on time post-transplant.

TTV viral load monitoring is a promising tool in clinical diagnostics, providing critical information for managing patient's overall state of immunosuppression, particularly in those with compromised immune systems, including solid organ transplant recipients.

TTV viral load monitoring is beneficial for both infection and rejection risk monitoring in solid organ transplant recipients. The analyte, viral DNA, is stable, and the method of analysis (qPCR) has excellent precision and a large dynamic range.

TTV viral load in plasma indicates the intensity of host immunosuppression and is associated with the risk of allograft rejection and infectious disease.

- Higher TTV viral load is associated with a higher risk of infection and lower risk of Rejection
- Lower TTV viral load is associated with a higher risk of rejection and lower risk of Infection

*“The main challenge of immunosuppressive therapy after solid organ transplantation is to create a new immunological balance that prevents organ rejection and does not promote opportunistic infection. Torque teno virus (TTV), a ubiquitous and non-pathogenic single-stranded DNA virus, has been proposed as a marker of functional immunity in immunocompromised patients.”<sup>1</sup>*

1. <https://doi.org/10.1016/j.jcv.2021.104871>

## Balancing the Risk for Rejection and Infection

### Torque Teno Virus - Monitoring the Risk for Rejection and Infection Alongside Varying TTV Viral Loads

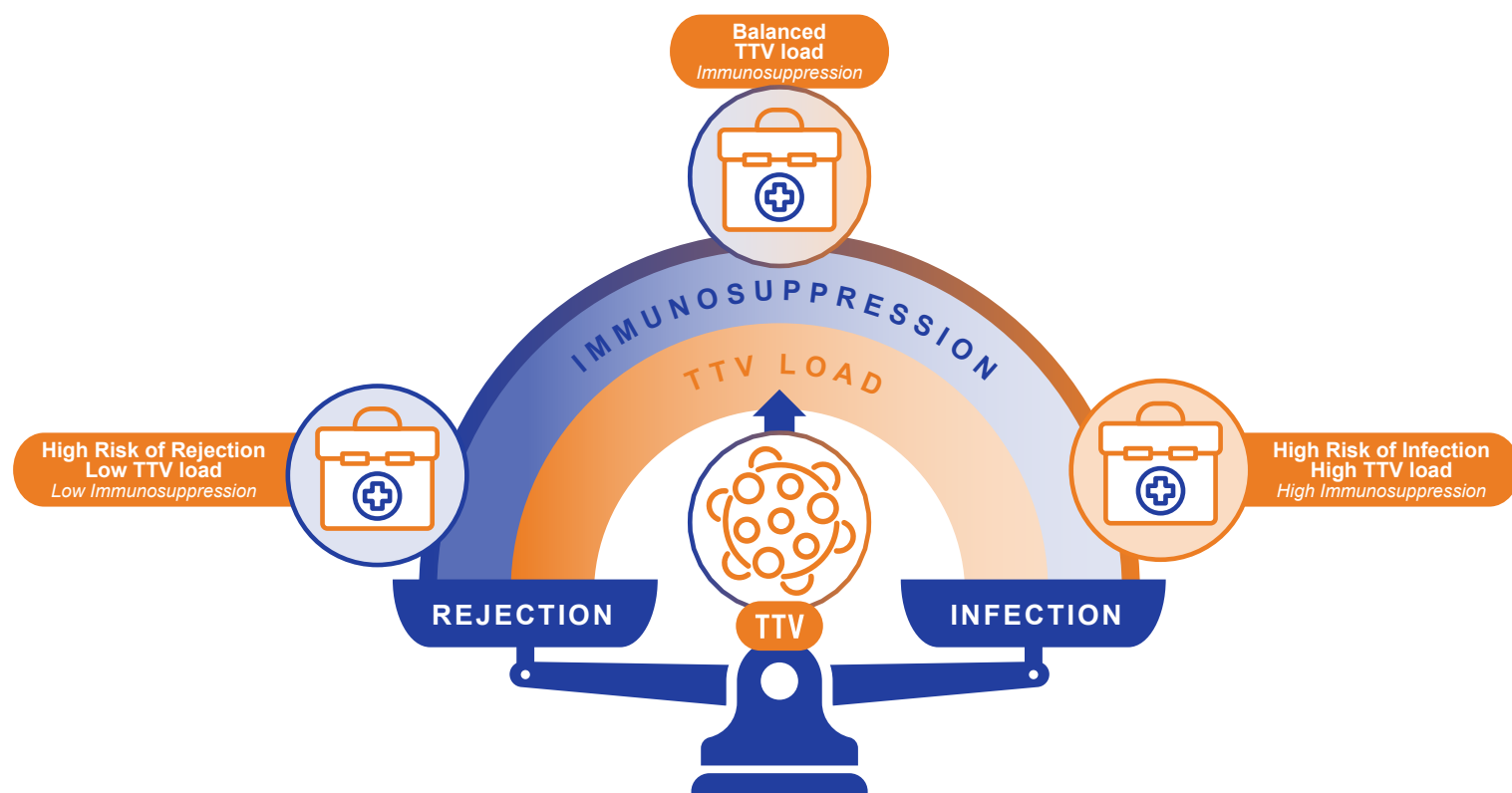


Figure 1: adapted from the original provided by Manon Zuurmond and Joris Rotmans from the Department of Internal Medicine at the University Leiden, The Netherlands. ICU, intensive care unit. Sebastian Kapps, Frederik Hauptenthal, Gregor Bond, Torque Teno Virus-guided monitoring of immunosuppressive therapy, Nephrology Dialysis Transplantation, 2024;., gfae149, <https://doi.org/10.1093/ndt/gfae149>

## Every sample report will include:

Independent studies have identified the optimal range to minimize risk of post-transplant rejection and infection in solid organ recipients as 1.00E+06 to 1.00E+08 copies/mL. Each log10 copies/mL increase in viral load increases the risk of infection by 11%; each log10 copies/mL decrease in viral load increases the risk of rejection by 22%. Literature citations and additional assay details can be found on our website.<sup>2</sup>

If the final result was "Not Detected", this means the patient has not been exposed to TTV or the viral load was below the limit of detection for this assay.

This test was developed and its performance characteristics determined by Eurofins Viracor. It has not been cleared or approved by the U.S. Food and Drug Administration. Results should be used in conjunction with clinical findings, and should not form the sole basis for a diagnosis or treatment decision.

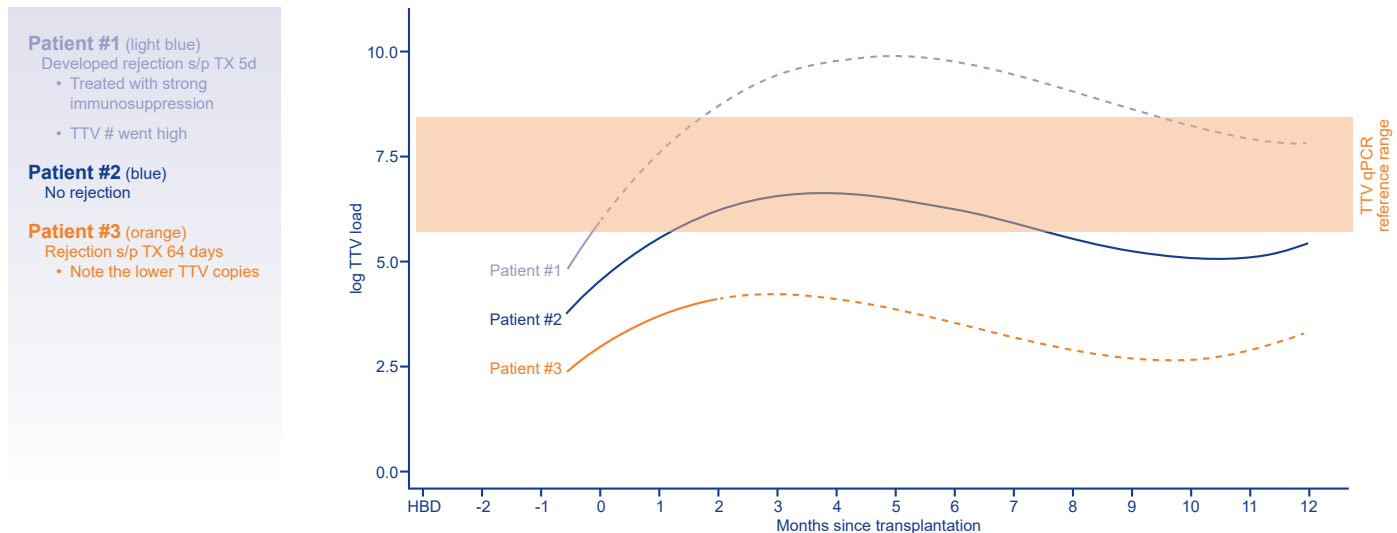
## Sample Report of Patient Monitored with TTV Testing

| RESULTS                                                                                                                                            |                     |      |                             |      |                     |                                   |           |                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|-----------------------------|------|---------------------|-----------------------------------|-----------|---------------------|
| TTV - Torque Teno Virus qPCR (plasma)                                                                                                              |                     |      | Client Accession ID:        |      |                     |                                   |           |                     |
| Eurofins Viracor Accession ID: 2424300239                                                                                                          |                     |      | Collected: 08/20/2024 06:30 |      |                     | Final - Approved 08/30/2024 07:00 |           |                     |
| Performed at: Eurofins Viracor, LLC 18000 W. 99th Street, Suite 10, Lenexa, KS 66219. Lab Director: Brock Neil PhD, BCLD (ABB), CLIA # 26D-0983643 |                     |      |                             |      |                     |                                   |           |                     |
|                                                                                                                                                    | 08/20/2024<br>06:30 |      | 07/18/2024<br>08:55         |      | 06/16/2024<br>07:30 |                                   |           |                     |
| TEST                                                                                                                                               | RESULT              | FLAG | RESULT                      | FLAG | RESULT              | FLAG                              | UNIT      | REF RANGE           |
| TTV qPCR                                                                                                                                           | 2.25E+08            | H    | 1.50E+08                    | H    | 1.10E+06            |                                   | copies/mL | 1.00E+06 - 1.00E+08 |

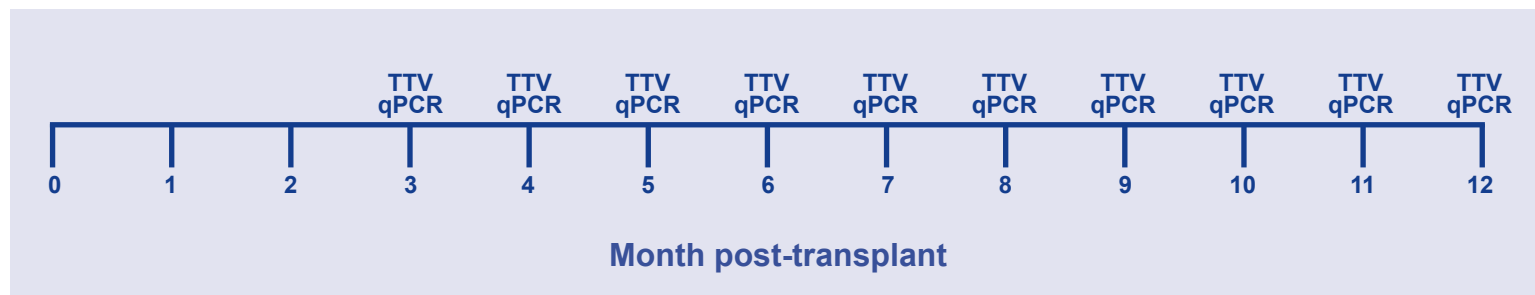
Interpretation: Patient starts within reference range then trends towards increased risk of infection

| RESULTS                                                                                                                                            |                     |      |                             |      |                     |                                   |           |                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|-----------------------------|------|---------------------|-----------------------------------|-----------|---------------------|
| TTV - Torque Teno Virus qPCR (plasma)                                                                                                              |                     |      | Client Accession ID:        |      |                     |                                   |           |                     |
| Eurofins Viracor Accession ID: 2419300493                                                                                                          |                     |      | Collected: 06/18/2024 08:38 |      |                     | Final - Approved 07/11/2024 08:43 |           |                     |
| Performed at: Eurofins Viracor, LLC 18000 W. 99th Street, Suite 10, Lenexa, KS 66219. Lab Director: Brock Neil PhD, BCLD (ABB), CLIA # 26D-0983643 |                     |      |                             |      |                     |                                   |           |                     |
|                                                                                                                                                    | 06/18/2024<br>08:38 |      | 05/17/2024<br>08:36         |      | 04/15/2024<br>08:33 |                                   |           |                     |
| TEST                                                                                                                                               | RESULT              | FLAG | RESULT                      | FLAG | RESULT              | FLAG                              | UNIT      | REF RANGE           |
| TTV qPCR                                                                                                                                           | 1.35E+03            | L    | 2.52E+06                    |      | 1.56E+08            | H                                 | copies/mL | 1.00E+06 - 1.00E+08 |
| <div>Interpretation: Patient starts within reference range then trends towards increased risk of rejection</div>                                   |                     |      |                             |      |                     |                                   |           |                     |

## Observed and Modelled TTV Loads after Kidney Transplantation



## TTV Recommended Protocol



### Summary of testing timepoints:

- TTV qPCR q1 – 2 months beginning at month 3 post-transplant
- Year 2 – 3 post-transplant, decrease testing frequency to q3 – 4 months

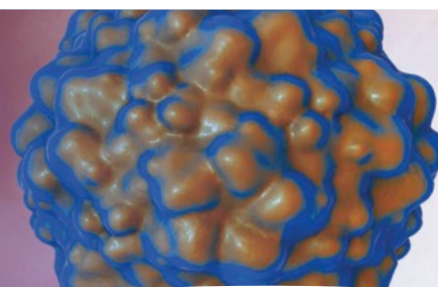
### Summary of result interpretation:

- TTV qPCR  $<10^6$  copies/mL – evidence of under immunosuppression (IS); in combination with other results, consider **increasing** IS dose and/or agents
- TTV qPCR  $>10^8$  copies/mL – evidence of over IS; in combination with other results, consider **decreasing** IS dose and/or agents

This assay is meant as a guide to establish effective immunosuppression and to reduce the risk of infection and rejection. Stable TTV levels will likely vary from patient to patient based on their immune composition. The reference range is meant as a guide based on previously published studies.

## Get Fast Accurate Results

Find out more at [eurofins-viracor.com](https://eurofins-viracor.com)  
or contact us at [info@eurofins-viracor.com](mailto:info@eurofins-viracor.com)  
or call **800-305-5198**



## About Viracor

With over 35 years of diagnostic expertise in infectious disease, immunology and allergy testing for immunocompromised and critical patients, Eurofins Viracor is passionate about delivering accurate, timely and actionable results, never losing sight of the connection between the testing it performs and the patients it serves.

Eurofins Viracor is a subsidiary of Eurofins Scientific (EUFI.PA), a global leader in bio-analytical testing, and one of the world leaders in genomic services. For more information, please visit [eurofins.com](https://eurofins.com) and [eurofins-viracor.com](https://eurofins-viracor.com)



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