

AAV2 Titration ELISA

Enzyme-linked immunosorbent assay (ELISA) for the quantitative determination of AAV serotype 2 particles in cell culture supernatants and purified virus preparations

Cat. No.: PRATV
Contents: 12 x 8 Determinations
Storage: 2–8 °C
Version: 26

For research use only!

1. Introduction

Adeno-associated viruses (AAV) are non-pathogenic ssDNA viruses, which are subject of intense studies as viral vectors for gene therapy. The virus transduces a variety of dividing and non-dividing cells showing long-term gene expression with low cellular immune response. AAV has been used in several clinical trials (e.g. FIX, CFTR, Parkinson's, Canavan disease) showing no serious vector-related adverse effects.

Methods for the characterization of AAV preparations currently include titration ELISA, qPCR, ddPCR, DNA dot blot, determination of transducing units, infectious center assay, SDS-PAGE or electron microscopy.

Immunotitration by PROGEN's AAV2 Titration ELISA offers a fast, sensitive and reproducible method for titration of intact AAV2 wild-type virions, AAV2 recombinant virions or assembled and intact empty AAV2 capsids.

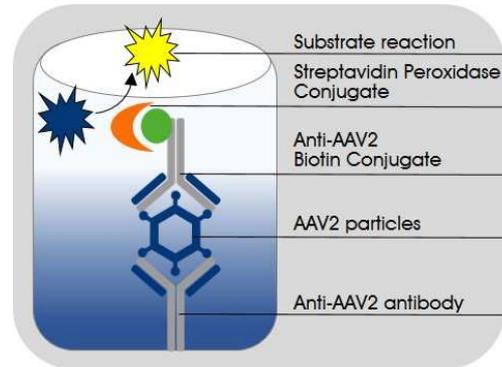
The antibodies used for coating and for detection also cross-react with AAV3. However, the ELISA has not been validated with AAV3 capsids and should not be used without prior standardization.

2. Test Principle

The assay is based on the sandwich ELISA technique. A monoclonal antibody specific for a conformational epitope on assembled AAV2 capsids is coated onto strips of a microtiter plate and is used to capture AAV2 particles from the specimen. Captured AAV particles are detected in two steps (see figure below):

1. A biotin-conjugated monoclonal antibody to AAV2 is bound to the immune complex.
2. A streptavidin peroxidase conjugate reacts with the biotin molecules.

Addition of substrate solution results in a color reaction, which is proportional to the amount of specifically bound viral particles. The absorbance is measured photometrically at 450 nm (optional: reference wavelength at 650 nm).



The provided Kit Control contains an AAV2 particle preparation of empty capsids. Two-fold serial dilutions of the material result in a typical titration curve. The curve allows the quantitative determination of samples of an unknown particle titer.

3. Required Material

- Precision pipettes
- Sterile pipette tips
- Distilled water
- Reaction tubes
- Incubator at 37°C and, if necessary, incubator at room temperature (20-26°C)
- ELISA Reader (450 nm, optional: reference wavelength at 650 nm)

4. Test Kit Content

MTP	Microtiter Plate, 12 x 8-well-strips, coated with mouse monoclonal antibody to AAV2 in resealable aluminum bag with desiccant, 1 plate. Ready- to-use.
KC	Kit Control AAV2 (standard), lyophilized, 3 vials. Reconstitute before use.
ASSB 20x	Assay Buffer 20x, 3 x 20 ml. Dilute before use.
Biotin conc.	Anti-AAV2 Biotin Conjugate 20x, 1 vial, lyophilized. Reconstitute and dilute before use.
Strep-HRP 20x	Streptavidin Peroxidase Conjugate 20x, 750 µl. Dilute before use.
TMB	Substrate, TMB (tetramethylbenzidine), 12 ml. Ready-to-use.
STOP	Stop Solution, 13 ml. Ready-to-use.
Adhesive foil	

5. Preparation of Reagents

Prior to use, allow kit to reach room temperature (RT, 20-26°C).

Preparation and pre-dilution of components:

Dilute required reagent volumes immediately before use!



ASSB 20x (Assay Buffer 20x)

The buffer concentrate may contain salt crystals, which dissolve quickly at 37°C (e.g. in a water-bath). Let buffer cool down to RT before use.

1. Dilute **1:20** with distilled water.
2. The diluted component is named **ASSB 1x**.
(About 30 ml ASSB 1x per strip is needed.)

KC (Kit Control)

1. Reconstitute with **500 µl ASSB 1x**.
2. Incubate for 5 min at RT and then mix by rolling for another 5 min. Avoid vortexing.
3. Find the amount of capsids/ml on the label or the lot-specific Quality Control Certificate.

Biotin conc. (Anti-AAV2 Biotin Conjugate 20x)

1. Reconstitute with **750 µl ASSB 1x**.
2. Incubate for 5 min at RT and then mix by rolling for another 5 min. Avoid vortexing.
3. Immediately before use, dilute **1:20** with **ASSB 1x**.
4. The diluted component is named **Biotin 1x**.

Strep-HRP 20x (Streptavidin Peroxidase Conjugate 20x)

1. Immediately before use, dilute **1:20** with **ASSB 1x**
2. The diluted component is named **Strep-HRP 1x**.
3. Store in the dark until use.

6. Storage & Stability

Store the test kit and components at 2-8°C. The unopened reagents are stable at 2-8°C until the indicated expiry date.

Stability after opening:

- 2 weeks at 2-8°C: ASSB 20x, Strep-HRP 20x, TMB, STOP
- 2 weeks after reconstitution at 2-8°C: KC, Biotin conc.
- 2 weeks in the resealable aluminum bag with desiccant at 2-8°C: MTP

7. Kit Control and Specimen Dilution

We recommend to dilute the reconstituted Kit Control (**KC**) in **ASSB 1x** in steps of 1:2:

Undiluted \Rightarrow 1:2 \Rightarrow 1:4 \Rightarrow 1:8 \Rightarrow 1:16 \Rightarrow 1:32 \Rightarrow 1:64

An example for dilutions is provided in Table 1 on the lot-specific Example Curve document. Please find the lot-specific titer of the Kit Control on the vial or on the Quality Control Certificate. Both the Example Curve document and the Quality Control Certificate are provided with the Kit.

Pre-dilute your **specimen** containing AAV2 particles in **ASSB 1x** in serial dilution steps to reach a concentration

within the recommended quantification range of the ELISA (please see section 9). It might be necessary to perform a pre-experiment to determine the approximate titer of the unknown specimen before analyzing more fine-tuned dilutions.

Example for a plate layout:

	1	2	3	4
A	KC0	KC0	Specimen dilution 1	Specimen dilution 1
B	KC1	KC1	Specimen dilution 2	Specimen dilution 2
C	KC2	KC2	etc.	etc.
D	KC3	KC3		
E	KC4	KC4		
F	KC5	KC5		
G	KC6	KC6		
H	KC7	KC7		

Prepare dilutions:

KC0: ASSB 1x

KC1: reconstituted Kit Control

KC2: 250 µl **KC1** + 250 µl ASSB 1x

KC3: 250 µl **KC2** + 250 µl ASSB 1x

etc.

8. Test Procedure

1. Pipette 100 µl of ASSB 1x (KC0), serial dilutions of KC and specimen (both in ASSB 1x) in duplicates into the corresponding wells of the microtiter strips. Seal strips with adhesive foil and incubate for 1 h at 37°C.
2. Discard content of microtiter strips. For washing, fill each well with 200 µl of ASSB 1x, incubate approximately 5 sec, discard and tap inverted plate onto absorbent paper. Carry out three washing steps in total.
3. Prepare Biotin 1x. Pipette 100 µl of Biotin 1x into each well. Seal strips with adhesive foil and incubate for 1 h at 37°C.
4. Repeat washing step as described in 2.
5. Prepare Strep-HRP 1x. Pipette 100 µl of Strep-HRP 1x into each well. Seal strips with adhesive foil and incubate for 1 h at 37°C.
6. Repeat washing step as described in 2.
7. Pipette 100 µl of ready-to-use TMB into each well. Seal strips with adhesive foil and incubate for 15 min at RT.
8. Stop color reaction by adding 100 µl of STOP into each well.
9. Make sure no air bubbles are in the wells. Within 30 min, measure color intensity with a photometer at a wavelength of 450 nm (optional: reference wavelength at 650 nm).

9. Calculation of Results

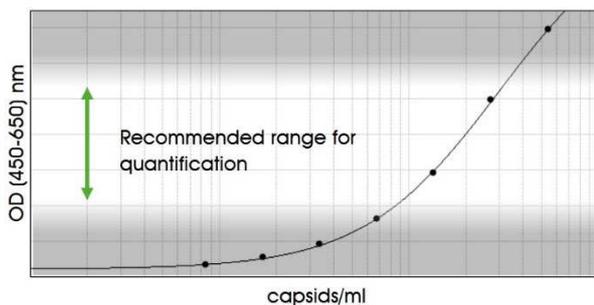
If applicable, subtract values measured at 650 nm reference wavelength from values at 450 nm. The test is also valid if you use OD values at 450 nm only.

Calculate the average absorbance values for each duplicate set of Kit Control dilutions and specimen dilutions.

Create a standard curve by plotting the mean absorbance value of each Kit Control dilution (y-axis, linear scale) against the corresponding concentration (x-axis, logarithmic scale recommended).

Use a best fit curve for calculating the results. We suggest using a suitable computer program for the calculation. A 4-parameter logistic fit (4PL) is recommended. Calculate the particle titer of your specimens.

The kit is quantitative over the whole range of Kit Control dilutions. For highest accuracy, the OD values of unknown samples should ideally be in the recommended range for quantification:



Multiply the value obtained by the dilution factor to determine the amount of capsids/ml in the sample.

Please note:

The Kit Control curve needs to be determined for each experiment individually. For further orientation, please find the lot-specific Example Curve provided with the kit.

10. Test Validity

The absorbance value of the undiluted Kit Control should be > 1.2.

The absorbance value of the Blank should be < 0.3.

11. Test Characteristics

The Kit Control has been calibrated on the ATCC AAV2 RSM (VR-1616), [Lock et al., 2010].

12. General Information

For professional use.

Release notes

The instruction manual is only valid in combination with the lot-specific documents (→ *Example Curve* and *Quality Control Certificate*), which are enclosed in each kit.

Please make sure to use the instruction manual with the version number that corresponds to the number on the lot-specific documents.

Precautions

All liquid components except TMB and STOP contain a preservative. Do not swallow. Avoid any contact with skin or mucous epithelia!

STOP (sulphuric acid) and TMB may cause skin or eye irritation. In the event of eye contact, rinse out immediately with plenty of water and consult a physician!

Safety data sheet is available on request!

Disposal

Product: Chemicals and biological materials must be disposed of in compliance with the respective national regulations.

Packaging: Packaging must be disposed of in compliance with the respective national regulations. Handle contaminated packaging in the same way as the product itself. If not officially specified otherwise, non-contaminated packaging may be treated like household waste or may be recycled.

Transport damages

If a kit is considerably damaged, please contact the manufacturer or local distributor. Do not use damaged components for test procedure. Such components or kits should be stored at 2-8°C until the complaint is handled.

13. References

Lock M, McGorray S, et al. Characterization of a recombinant Adeno-Associated Virus Type 2 reference standard material; Hum Gene Therapy 21:1273-1285 (2010).

Grimm D, Kern A, Pawlita F, Ferrari F, Samulski R and Kleinschmidt J. Titration of AAV-2 particles via a novel capsid ELISA: packaging of genomes can limit production of recombinant AAV-2. Gene Therapy 6:132-1330 (1999).

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PREPARATIONS

Assay Buffer, ASSB 1x	Dilute ASSB 20x 1:20 with distilled water
Kit Control, KC	Reconstitute KC in 500 μ l ASSB 1x prepare serial dilutions with ASSB 1x
Sample Dilutions	Prepare serial dilutions with ASSB 1x
Biotin 1x	Immediately before use, reconstitute Biotin conc. in 750 μ l ASSB 1x For use, dilute 1:20 with ASSB 1x
Strep-HRP 1x	Immediately before use, dilute Strep-HRP 20x 1:20 with ASSB 1x



SHORT PROTOCOL