HYALURONIDASE ASSAY KIT

Assay kit for
Screening of Hyaluronidase inhibitors, and
Quantification of Hyaluronidase activity in cells and other biological fluids.

Quantity: 96 Tests
Cat.#: Ra003-01-HAK

For Research Use Only.
Not for use in diagnostic or therapeutic procedures.
PLEASE READ BEFORE USING ASSAY KIT

- **Avoid** repeated freezing and thawing of the reagents and Enzyme preparations.
- Vials may contain small quantities of material, hence ensure that they are centrifuged prior to opening.
- Please read the whole manual as many solutions require preparation immediately before use i.e. preparation during the assay itself. The assay protocol indicates at which step certain solutions should be prepared.
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1. INTENDED USE
The hyaluronidase assay kit is an assay for quantitative detection of hyaluronidase in cell culture supernatants, human plasma, biological fluids and tissue samples. The hyaluronidase assay kit is for research use only. Not for use in diagnostic or therapeutic procedures.

I. Background
Hyaluronidase are a group of enzymes that degrade hyaluronic acid (HA). Also known as hyaluronan, it is composed of alternating residues of β-D-(1-3) glucuronic acid and β-D-(1-4)-N-Acetylglosamin. HA is widely distributed in the body and forms one of the most versatile macromolecules of the extracellular matrix. Hyaluronan plays both structural and biological function through its ability to interact with other matrix components. The mammalian hyaluronidase cleaves hyaluronan and potentially similar glycosaminoglycans by hydrolysis of the 1-4 bond between N-acetyl glucosamine and D-glucuronic. Traditionally measurement of the activity of these type of enzymes has been difficult to perform and standardize.

The hyaluronidase assay by Razie is
- Non-radioactive,
- Fast and easy to perform,
- Sensitive and specific to hyaluronidase,
- Uses a universal 96-well plate format ideal for inhibitor studies.

PRINCIPLES OF THE TEST

![Diagram](https://example.com/diagram.png)

The decrease in the OD of well D compared to A is directly proportional to the hyaluronidase activity.
III. Precautions and Limitations

1. For Research Use Only. Not for use in diagnostic or therapeutic procedures.

2. The physical, chemical, and toxicological properties of the chemicals and reagents contained in the Hyaluronidase Assay Kit may not yet have been fully investigated. Therefore, Razie Ltd recommends the followings:

- All chemicals should be considered as potentially hazardous. We therefore recommend that this product is handled only by those persons who have been trained in laboratory techniques and that it is used in accordance with the principles of good laboratory practice. Wear suitable protective clothing such as laboratory overalls, safety glasses and gloves. Care should be taken to avoid contact with skin or eyes. In the case of contact with skin or eyes wash immediately with water. In case of any hypersensitivity reaction see a medical doctor. Reagents are intended for research use only and are not for use in diagnostic or therapeutic procedures.
- Do not mix or substitute reagents with those from other lots or other sources.
- Do not use Positive control enzyme as a reference enzyme in any other tests or procedure
- Do not use kit reagents beyond expiration date on label.
- Do not expose kit reagents to strong light during storage or incubation.
- Do not pipette by mouth.
- Do not eat or smoke in areas where kit reagents or samples are handled.
- Avoid contact of skin or mucous membranes with kit reagents or specimens.
- Rubber or disposable latex gloves should be worn while handling kit reagents or specimens.
- Reagents might contain strong preservatives and may be toxic if ingested.
- Avoid contact of substrate solutions with oxidizing agents and metal.
- Avoid splashing or generation of aerosols.
- In order to avoid microbial contamination or cross-contamination of reagents or specimens which may invalidate the test use disposable pipette tips and/or pipettes.
- Use clean, dedicated reagent trays for dispensing the substrate reagents.
- Exposure to acids will inactivate the signal generating reagents.
- Glass-distilled water or deionized water must be used for reagent preparation.
- Substrate solutions must be at room temperature prior to use.
- Decontaminate and dispose specimens and all potentially contaminated materials as if they could contain infectious agents. The preferred method of decontamination is autoclaving for a minimum of 1 hour at 121.5°C.
- Liquid wastes not containing acid and neutralized waste may be mixed with sodium hypochlorite in volumes such that the final mixture contains 1.0 % sodium hypochlorite. Allow 30 minutes for effective decontamination. Liquid waste containing acid must be neutralized prior to the addition of sodium hypochlorite.

IV. Reagents Provided

<table>
<thead>
<tr>
<th>Catalog #</th>
<th>Component</th>
<th>Quantity</th>
<th>Storage Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBHAL01-6K</td>
<td>Reaction Buffer</td>
<td>6ml</td>
<td>4°C</td>
</tr>
<tr>
<td>FBHAL02-5K</td>
<td>Base Buffer</td>
<td>10ml</td>
<td>4°C</td>
</tr>
<tr>
<td>FBHAL-03-100</td>
<td>Additive 1</td>
<td>100 μl</td>
<td>4°C</td>
</tr>
<tr>
<td>FBHAL-04 BE-100</td>
<td>Positive Control Enzyme</td>
<td>100 μl</td>
<td>-20°C</td>
</tr>
<tr>
<td>FBHAL-05-PB300</td>
<td>Buffer for Control Enzyme</td>
<td>200 μl</td>
<td>4°C</td>
</tr>
<tr>
<td>FB001-05-20</td>
<td>Strep-HRP</td>
<td>10 μl</td>
<td>-20°C</td>
</tr>
<tr>
<td>FB001-06-10K</td>
<td>HRP Substrate</td>
<td>10ml</td>
<td>4°C</td>
</tr>
<tr>
<td>RA1003--01- HAP</td>
<td>Hyaluronic acid -plate</td>
<td>1</td>
<td>-20°C</td>
</tr>
</tbody>
</table>

V. Materials Required But Not Supplied

- PBS, pH 7.4
- Tween 20
- Glass-distilled or deionized water (preferentially filtered through 0.45μm filter)
- 0.2 N HCl or H$_2$SO$_4$ for stopping the peroxidase reaction.
- Phenylmethyl Sulfonyl Fluoride (PMSF) and other protease inhibitors (optional, to protect tissue/cell extract)
- 10 µl to 1,000 µl adjustable single channel micropipettes with disposable tips
  - 50 µl to 300 µl adjustable multichannel micropipette with disposable tips
  - Multichannel micropipette reservoir
- Centrifuge tubes, beakers, flasks (necessary for preparation of reagents or for dilution of enzyme/buffers).
- Glass Homogenizer (optional, for tissue extract assays)
- Device for delivery of wash solution such as multichannel wash bottle or automatic wash system (optional)
- 37°C incubator
- 96-well plate reader capable of reading at 450 nm (650 nm as optional reference wavelength).
- Inhibitors or cells/tissue.

### VI. Reagent Preparation

- Please note this is how the reagents are prepared. Please refer to the actual protocol for when to prepare the reagents. Bring all reagents to the room temperature.

1. **Reaction buffer**
   
   **Note:**
   The Reaction Buffer should be prepared immediately before use and used within one hour of preparation. A solid precipitate might form in additive 1 due to refrigeration. Bring the solution to the room temperature and vortex the tube vigorously to dissolve the precipitate. Briefly centrifuge the tubes prior to opening.

   Mix 6ml of the Reaction Buffer (Cat# FBHAL 01-6K) with an equal volume (6ml) of filtered distilled water in a clean tube and vortex.
   Add **80µl Additive 1** solution (Cat# FB 001-02-30) to the above diluted base buffer and vortex. Keep at room temperature.

2. **Base Buffer (FBHAL02-5K)**
   Base Buffer is ready for use, bring to room temperature just before using. Used to
   - Dilute the test samples, any inhibitors to be tested
   - Prepare cell / tissue extracts.

3. **Positive control Enzyme**
Just before setting up the plate, add 120 µl of the enzyme (FBHAL 04-BE-100) to 80 µl enzyme buffer (FBHAL-05-PB300), mix thoroughly. This final solution should be used within 30 minutes. This solution should be used directly on the plate without addition of any other buffer or additives.

4. Strep-HRP
Immediately before use, dilute 10 µl of the supplied Strep-HRP (Cat# FB001-05-20) in 12 ml PBS. Use the diluted Strep-HRP within 30 min. A total volume of 100 µl/well of diluted Strep-HRP is required in the assay.

5. HRP substrate
The supplied Peroxidase substrate solution (Cat# FB001-06-10K) is ready for use. Bring to room temperature prior to use.

6. Controls
   i. Negative control (must be included in each test): A negative control without hyaluronidase, test sample or cell extract should be included. This will provide the baseline reading (i.e. no enzyme present, hence strongest colour is produced in these wells.)
Add a further 50 µl of the reaction buffer to four wells (i.e. 100 µl of the reaction buffer is present in each well)

   ii. Positive control (optional): The diluted Positive Control Enzyme (see 3 above). Allocate at least two wells for this purpose. Add 100 µl of the final enzyme solution to each well. There is no need to add any other buffer or additives to these two wells.

VII. HYALURONIDASE Activity in other biological samples

A. Preparation of Cell culture samples

   i- Adherent cells:
   Before analysis, it is important to be able to transfer your cell culture to a Serum-Free Media (SFM) as follows:
   1- Grow your cell culture to confluence.
   2- Discard the culture media containing serum.
   3- Wash the cell culture 4X by adding 1X PBS to the culture vessel, gently shaking the culture vessel and discarding the PBS.
   4- Add SFM to the culture vessel and culture overnight in the incubator. The culture time in SFM will depend on the nature of the cells and should be determined independently.
   5- Collect the SFM from the culture vessel. Use aliquots of this SFM for the enzyme assay. Follow steps in enzyme assay as described (section VIII)

   ii- Non-adherent cells:
   1. Centrifuge 2 x 10^6 to 1 x 10^7 non-adherent cells grown in a suitable SFM to form a pellet at 1500g for 3 min (3000 RPM in an ordinary bench top centrifuge).
   2. Centrifuge the supernatant (at 1500g for 2min) to pellet any cellular contaminant.
   3. Treat this final supernatant as your test sample and carry out the hyaluronidase assay as described in section VIII.
B. Tissue Extract
The following procedure must be carried out in a safety hood / cabinet. Appropriate eye protection and surgical mask should be used.

1. Wash the tissue thoroughly using cold PBS. The tissue must be clean and as far as possible free from contaminants such as blood or blood clots.

2. Cut a small piece of the tissue and place it inside a clean glass mortar. Add a volume of 1x Base Buffer (at least 1ml of buffer per every mg tissue)

3. Grind and homogenize the tissue.

4. Transfer the homogenate into a test tube or microfuge tube and centrifuge at around 2000g for 2min.

5. Use 50µl of the clear supernatant and carry out the enzyme assay as described (section VIII). It might be necessary to repeat centrifugation to obtain a supernatant free from tissue debris. Avoid repeated cycles of freeze / thaw of this supernatant.

C. Biological Fluids
There is no particular preparation for biological fluids, as long as it is clear and free from any contaminants such as particulate material. This can be achieved as described for tissue extracts by a simple centrifugation step. Biological fluids should be kept ice cold and used immediately or frozen (preferably at -80°C) until use. Avoid repeated cycles of freeze/thaw as this will lead to inactivation of the enzyme.

For blood, it is advisable to use only plasma and not serum or whole blood to avoid contamination by activated platelets products.

VIII. HYALURONIDASE Assay Protocol

Bring the reaction buffer and HRP substrate to the room temperature.

A. Enzyme reaction
1. Rehydrate the microwell plate by adding 100µl of PBS to each well of the plate. Incubate at room temperature for a minimum of 30 min or overnight at 4°C. Cover the microwell plate with the lid or a Plate Cover.
2. Remove the PBS from the microwells. Take care not to scratch the surface of the microwells. Ensure that all the liquid is removed by tapping plate onto paper towels to remove excess PBS. Use the microwell strips immediately or place upside down on a wet absorbent paper for no longer than 15 minutes. Do not allow wells to dry.
3. Add 50µl of the reaction buffer to all wells. (positive control wells will not receive this and are left empty)
4. Add 50 µl of the reaction buffer to four wells as the negative control.
5. Add 50µl of your test samples to duplicate wells.
6. Add 100µl of the positive control (See 6-ii above) to two wells.
7. Incubate the microwell plate (ideally at 37°C) for one hour on a plate shaker.
8. Wash the microwell strips four times with approximately 200 µl 1X PBS/ Tween20 (0.1% V/V) per well and then twice with approximately 200 µl 1X PBS with thorough aspiration of microwell contents between washes. Take care not to scratch the surface of the microwells. After each wash, empty wells and tap microwell plate on paper towels to remove excess liquid. Use the microwell strips immediately after washing or place upside down on a wet absorbent paper for not longer than 15 minutes. Do not allow wells to dry.

**B. Detection**

Blank the plate reader according to the manufacturer's instructions against the air.

1. Add 100 µl of diluted Strep-HRP at room temperature (prepared in section VI.4) per well. Incubate at 37º C for 50 minutes on a plate shaker.
2. Wash the microwell plate five times with approximately 200 µl 1X PBS / well with thorough aspiration of microwell contents between washes. Take care not to scratch the surface of the microwells. After each wash, empty wells and tap microwell plate on paper towels to remove excess liquid. Use the microwell strips immediately after washing or place upside down on a wet absorbent paper for not longer than 15 minutes. Do not allow wells to dry.
3. Add 100 µl of room temperature peroxidase substrate (see step VI.5) per well. Gently shake the plate to get a uniform colour. Read absorbance of each microwell on a spectrophotometer using 650 nm as the reference wavelength, at intervals of 2 to 3 minutes.
4. The substrate reaction should be stopped as soon as an OD of 0.6 – 0.65 is reached for the blank wells. Stop the enzyme reaction by quickly pipetting 100 µl of 0.12M HCl into each well, including the blank wells (take care not to cause formation of bubbles at the surface of liquid). It is important that the Stop Solution is spread quickly and uniformly throughout the microwells to completely inactivate the enzyme.
5. Determine the absorbance of all wells, at 450nm, within 5 min post stopping. Make sure there are no bubbles on the surface of liquids in the wells. The colour post stopping is relatively stable for one hour.

**IX. HYALURONIDASE Inhibitor Screening Assay Protocol**

It is important to make sure that the inhibitor preparation is as pure and homogeneous as possible, so that the any effect seen, is representative of the inhibitor and not other compounds. The inhibitor preparation should be checked in the absence of any enzyme in this assay, to ensure that it is has no effect on the mechanism of the assay. The wells should generate full colour with or without the inhibitor. Similarly, for your targeted enzyme, it is recommended to run a pilot study to determine the enzyme’s activity behavior, (e.g. check dilution response), using Razie’s assay prior to the inhibition studies.

Potential inhibitors can be assayed using two different procedures

**A. Concurrent inhibition**

The inhibitor can be added to the enzyme at the time of preparing the reaction mixture.

1- Prepare dilutions of the inhibitor in the hyaluronidase buffer (Cat# FBHAL02-5K) you might be able to use another buffer provided that it does not have extreme pH or detectable levels of heavy Ions.
2- Prepare a dilution of the enzyme from your source in the hyaluronidase buffer (prepared in step VI.2)
3- Follow procedure as VIII. A.1-5 above.
4- Add appropriate volumes of enzyme preparation and inhibitor together to one well. Make sure the final volume in the well is 100µl. (The base 50µl reaction buffer, step VIII. A.3, can be adjusted to achieve this volume).
5- Follow the procedure as for hyaluronidase assay (Steps VIII. A.6, 7).
6- Detection: Follow VIII B1-5

B. Pre reaction inhibition
In this procedure the inhibitor is added prior to the reaction.
1- Mix aliquots of the enzyme and the inhibitor as required (For example a ratio of 1:1 v/v i.e. 100µl of inhibitor to 100µl enzyme or 2:1, 3:1 and so on), mix.
2- Incubate at 4ºC for the desired period of time. This time may vary between a few minutes to overnight. Please note that the longer the incubation period the more chance there is of natural enzyme degeneration.
3- Use 50µl of the above enzyme/inhibitor mixture as your test sample and follow the normal assay procedure as in VIII.A 1-7
4- Detection: Follow VIII B1-5

X. Data Interpretation.
Calculate the activity of your sample (in ng HA removed per minute) using the following formulae
First calculate R,
R= (OD / Max OD) X 500
MaxOD= maximum reading possible from your plate reader from the negative control wells (section VI, 6i and VIII),A4).
OD= reading obtained from your test well

Then substitute R in the following formulae to obtain the activity

Activity* = (500- R) / 60 (ng HA removed per minute)

Specific activity is then calculated by dividing the activity by protein concentration present in your sample to give: nanograms of HS removed per minute per mg protein of active enzyme.

* This figure is based on the amount of HA loaded onto the plate and assumes that all have been immobilized by the active sites in the well.

XI. Reference List
XII. Troubleshooting

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<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>No colour reaction is seen.</td>
<td>Strep-HRP has not been added. Not enough incubation time</td>
<td>Make sure step VIII, B.1 is carried out. Prolong the incubation of strep-HRP.</td>
</tr>
<tr>
<td></td>
<td>Cold HRP substrate has been used</td>
<td>Make sure HRP substrate is at room temperature</td>
</tr>
<tr>
<td>No detectable signal is generated.</td>
<td>Insufficient amount of the hyaluronidase enzyme is present</td>
<td>Increase the concentration of protein in your sample enzyme</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase incubation time to 1.5 hours. Increase the volume and/or concentration of cell extract added to each well.</td>
</tr>
<tr>
<td>Colour generated is above the working range of the plate reader.</td>
<td>Long incubation of HRP substrate prior to stopping the reaction</td>
<td>Stop the reaction much earlier (Step VIII, B 4,5) Increase the dilution of Strep-HRP (Step VI, 4) (ie 6µl in 12ml)</td>
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XIII. Related Products Available From Razie Biotech Ltd

<table>
<thead>
<tr>
<th>Catalog #</th>
<th>Description</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Ra1003-01-HAP</td>
<td>HA coated plate</td>
<td>1 plate</td>
</tr>
<tr>
<td>FBHAL 02-5K</td>
<td>Buffer for dilution</td>
<td>1 Vial</td>
</tr>
</tbody>
</table>

XIV. Appendix

Reagent composition:

1. **1X PBS (pH 7.4) (not supplied)**: 7.5 mM Na₂HPO₄, 2.5 mM NaH₂PO₄, 145 mM NaCl.
2. **2X Base Buffer**: Proprietary buffer solution containing active ions.
3. **Strep-HRP**: Streptavidin Peroxidase tagged proprietary solution.
4. **HYALURONIDASE Buffer**: Proprietary buffer solution.
5. **HRP Substrate**: 3,3’,5,5’-Tetramethylbenzidine (TMB).
XV. ORDERING INFORMATION

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