

ZYMUTEST Protein Z

RK031A

(Complete ELISA kit for Protein Z)

In vitro research use only

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INTENDED USE:

The ZYMUTEST Protein Z kit is a one step immuno-assay for measuring human Protein Z (PZ) in plasma, or in any fluid where PZ can be present.

ASSAY PRINCIPLE:

First, the immunoconjugate, which is a polyclonal antibody specific for PZ coupled to horse radish peroxidase (HRP), is introduced into the microwells coated with a polyclonal antibody specific for PZ. Then, the diluted tested sample is immediately introduced, and the immunological reaction starts. When present, PZ binds onto the polyclonal antibody coated solid phase through one epitope, and fixes the polyclonal antibody coupled to HRP through free epitopes. Following a washing step, the peroxidase substrate, 3,3',5,5' – Tetramethylbenzidine (TMB), in presence of hydrogen peroxide (H₂O₂), is introduced and a blue colour develops. When the reaction is stopped with Sulfuric Acid, a yellow colour is obtained. The amount of colour developed is directly proportional to the concentration of human PZ in the tested sample.

TEST SAMPLE:

- Trisodium Citrate or Na₂ EDTA anticoagulated human plasma.
- Any biological fluid where PZ must be measured.

REAGENTS:

1. **COAT:** Micro ELISA plate, containing 12 strips of 8 wells, coated with a rabbit polyclonal antibody specific for human PZ, then stabilised; the plate is packed in an aluminium pouch hermetically sealed in presence of a desiccant.
2. **SD:** 2 vials containing 50ml of **Sample Diluent**, ready to use.
3. **Cal:** 3 vials of **Protein Z Calibrator**, lyophilised. When restored with 2 ml of Sample Diluent, a plasma containing a concentration "C" (expressed in **ng/ml**) of human PZ is obtained.
4. **CI:** 1 vial containing **0.5 ml** of lyophilised **Plasma PZ Control I High** (human plasma).
5. **CI:** 1 vial containing **0.5 ml** of lyophilised **Plasma PZ Control II Low** (human plasma).

Nota: The PZ concentrations and acceptancy ranges for calibrator and controls can vary from lot to lot, and are indicated on the flyer provided in the kit.

6. **IC:** 3 vials of **Anti-(h)-PZ-HRP immunoconjugate**, a polyclonal antibody coupled to HRP, lyophilised.
7. **CD:** 1 vial of 25 ml of **Conjugate Diluent**, ready to use.
8. **WS:** 1 vial of 50 ml of 20 fold concentrated **Wash Solution**.
9. **TMB:** 1 vial of 25 ml peroxidase substrate: **3,3',5,5' – Tetramethylbenzidine** containing hydrogen peroxide. Ready to use.
10. **SA:** 1 vial of 6 ml of **0.45M Sulfuric acid** (Stop solution). Ready to use.

Nota: Use only components from a same kit lot. Do not mix components from different lots, when running the assay.

REAGENTS AND EQUIPMENT REQUIRED BUT NOT PROVIDED:

- **8-channel** or repeating **pipette** allowing dispensing 50-300 µl.
- **1-channel pipettes** at variable volumes from 0 to 20 µl, 20 to 200 µl and 200 to 1000 µl.
- **Micro ELISA plate** washing equipment and shaker.
- Micro ELISA plate **reader** with a wavelength set up at 450 nm.
- Distilled water.

REAGENTS PREPARATION, STORAGE AND STABILITY:

In their original packaging box, before use, when stored at 2-8°C, the unopened reagents are stable until the expiration date printed on the box.

1. **Micro ELISA plate:** open the plastic pouch and take off the required amounts of 8 well strips for the test series. When out of the pouch, the strips must be used within 30 minutes. Unused strips can be stored at **2-8°C** for **4 weeks** in their original aluminium pouch, in presence of the desiccant, hermetically closed and protected from any moisture, and stored in the provided microplate storage bag (minigrip).
2. **Sample Diluent:** It is ready to use. When open, it can be used for **4 weeks**, stored at **2-8 °C**, and provided that any bacterial contamination is avoided during use. This reagent contains 0.05% Kathon CG.
3. **Protein Z Calibrator:** restore each vial with **2 ml** of Sample Diluent in order to obtain a plasma containing a PZ concentration "C". This solution is stable for at least **8 hours** at room temperature or **72 hours** at **2-8°C**.
4. **Plasma PZ Control I** (human plasma, high): restore with **0.5 ml** distilled water.
5. **Plasma PZ Control II** (human plasma, low): restore with **0.5 ml** distilled water.

Nota: when restored, Protein Z controls are stable for **24 hours** at room temperature, **72 hours** at **2-8°C** or **2 months** frozen at **-20°C** or below.

Warning: Plasma controls I and II (4&5) and calibrator (3) are prepared with normal human plasma. This latter was tested with registered methods and found negative for HIV antibodies, HBs Ag and HVC antibodies. However, no assay may warrant the total absence of infectious agents. Any product of human origin must then be handled with all the required cautions, as being potentially infectious.

6. **Anti-(h)-PZ-HRP immunoconjugate:** each vial must be restored with **2 ml** of **Conjugate Diluent**. Let the pellet to be completely dissolved before use, and shake the vial gently in order to homogenize the content. The restored conjugate is stable for at least **24 hours** at room temperature or for at least **4 weeks** at **2-8°C**.
7. **Conjugate Diluent:** It is ready to use. When open, it can be used for **4 weeks**, stored at **2-8 °C**, and provided that any bacterial contamination is avoided during use. This reagent contains 0.05% Kathon CG.
8. **Wash Solution:** Incubate the vial for 15-30 minutes in a water bath at **37°C** until complete dissolution of solids, when present. Shake the vial and dilute the amount required 1:20 in distilled water (the 50 ml contained in the vial allow preparing 1 liter of Wash Solution). The Wash Solution must be stored at **2-8°C** in its original vial and used within **4 weeks** following opening. The diluted Wash Solution must be used within **7 days**, when protected from any contamination and stored at **2-8°C**. This reagent contains 0.05% Kathon CG.
9. **TMB substrate:** It is ready to use. When open, it can be used for **4 weeks**, stored at **2-8°C**, and provided that any bacterial contamination is avoided during use.
10. **Stop solution:** It is ready to use.

Cautions: Sulfuric acid, although diluted to 0.45M is caustic. As for any similar chemical, handle Sulfuric acid with great care. Avoid any skin and eye contact. Wear protection glasses and gloves when handling.

Nota: Bring the kit at room temperature, at least 30 min. before use. Store the unused reagents at **2-8°C**. The stability studies at 30°C show that the reagents can be shipped at room temperature without damage.

PROCEDURE:

Specimen collection:

Blood (9 vol.) must be collected on 0.109M citrate anticoagulant (1 vol.); plasma supernatant is decanted following a 20 min. centrifugation at 2,500 g; citrated plasma should be tested within **8 hours** or stored frozen at **-20°C** or colder for up to 6 months, and thawed for 15 min. at 37°C just before use. Thawed specimen must be tested within **4 hours**.

EDTA collected human plasma may also be used. Conditions of storage are the same than those for citrated plasma.

Tested plasma or sample or controls:

The sample must be tested diluted **fifty fold (1:50)** in the Sample Diluent. For expected PZ concentrations > 5µg/ml, plasma or samples can be tested at a higher dilution, **1:100**, or **1:200**, or more.

Plasma Controls I and II must be tested diluted **fifty fold (1:50)**, with Sample Diluent.

Calibration:

Using the **Plasma PZ Calibrator**, with a PZ concentration "C" (in the range 80-120% according to the lot used) provided in the kit, prepare the following standard solutions.

PZ concentration (ng/ml)	C	C/2	C/4	C/10	C/20	0
Vol. of PZ calibrator	1 ml	0.5 ml	0.25 ml	0.1 ml	0.05 ml	0 ml
Vol. of Sample Diluent	0 ml	0.5 ml	0.75 ml	0.9 ml	0.95 ml	1 ml

Mix gently for a complete homogenisation.

The standard dilutions are stable for at least **8 hours** at room temperature.

Assay procedure:

Remove the required number of strips from the aluminium pouch, for the series of measures to be performed. Then put the strips in the frame provided. In the different wells of the micro ELISA plate introduce the reagents and perform the various assay steps as indicated on the following table:

Reagent	Volume	Procedure
Conjugate anti (h)-PZ-HRP. (Restored with 2 ml of conjugate Diluent)	50 µl	Introduce the Anti-(h)-PZ- HRP immunoconjugate in the micro ELISA plate wells
PZ calibrator or tested sample or sample diluent (blank)	200 µl	Introduce immediately the standard solutions or the tested samples in the corresponding micro ELISA plate well
Mix gently on a plate shaker or manually and incubate for 1 hour at room temperature (18-25°C)		
Wash Solution (20 fold diluted in distilled water)	300 µl	Proceed to 5 successive washings using the washing instrument. (a)
TMB/H ₂ O ₂ Substrate	200 µl	Immediately after the washing, introduce the substrate into the wells. Nota : The substrate distribution, row by row, must be accurate and at exact time intervals (b, c).
Incubate for exactly 5 minutes at room temperature (18-25 °C) (c)		
0.45 M Sulfuric Acid (5)	50 µl	Following exactly the same time intervals than for the addition of substrate, stop the colour development by introducing the 0.45M sulfuric acid (b).
Wait for 10 minutes in order to allow the colour to stabilize and measure absorbance at 450 nm (A450) . Subtract the blank value (d).		

Nota:

Distribute calibrators, controls and tested specimen as rapidly as possible, in order to obtain an homogeneous immunological kinetics for PZ binding. A too long delay (>15 min) between the distribution of the first and the last wells may induce an influence of immunological kinetics and produce wrong results.

- Never let the plates empty between the addition of the reagents or following the washing step. The next reagent must be added within 3 minutes, in order to prevent the plate from drying, which could damage the immobilised components. If necessary, keep the plate filled with Wash Solution and empty it just before the introduction of the next reagent. The washing instrument must be adjusted in order to wash the plates gently, and to avoid a too drastic emptying, which could lower plate reactivity.
- For addition of the TMB substrate, the time interval between each row must be accurate and exactly determined. It must be the same when stopping the reaction.
- Avoid letting the plate in the bright sunlight during incubations and more particularly during colour development. A micro-ELISA plate shaker can be used.
- For bichromatic readings, a reference wavelength at 690 nm or at 620 nm can be used.

TWO STEP METHOD:

- The assay can also be performed with a two step method. The calibration curve is from **0 to C ng/ml** (as for the one step method), the PZ calibrator being reconstituted with **2 ml** of Sample Diluent (**SD**).
- The immunoconjugate (**IC**) must be reconstituted with **7.5 ml** of Conjugate Diluent (**CD**).
- Tested plasma must be assayed at a fifty fold (**1:50**) dilution or at higher dilutions in Sample Diluent (**SD**), if required.
- In each microwell, **200µL** of the calibration solution (prepared as for the one step method) or **200µL** of the diluted tested plasma are introduced. Following a **1 hour** incubation at room temperature (18-25°C) and a washing step, **200µl/well** of

immunoconjugate (**IC**) are introduced. Following a new **1 hour** incubation at room temperature and a washing step, the colour development with TMB (**200µl/well**) is allowed to develop for **5 min**, and is then stopped with **50 µl** of 0.45M sulfuric acid (**SA**). A450 is then measured. Washing and operating cautions, as well as results interpretation, are the same as recommended for the one step method.

EXPRESSION OF RESULTS:

- On a linear graph paper plot the **PZ concentrations (ng/ml)** on abscissa and the corresponding absorbances (**A450**) on ordinates.
- Users must construct their own calibration curve, obtained using their standard dilutions. From the curve obtained, deduce the PZ concentration for the tested sample. For obtaining the PZ concentration in this sample, the value read on the calibration curve must be multiplied by the dilution factor (i.e. **50,100, 200.....**) (See model on the flyer).
- For controls I and II, the concentrations measured must be multiplied by **50**.
- Alternatively, an ELISA software (i.e. Dynex, Biolise, etc...) can be used for the calculation of concentrations.

EXPECTED RANGE:

The mean PZ concentration in normal population is of about 2.8µg/ml when measured with the Zymutest PZ assay, and can largely vary between individuals (from about 1 to 4µg/ml).

BIOCHEMISTRY:

PZ is a vitamin K dependent glycoprotein, with a molecular weight of 62,000 daltons. The PZ-PZ dependent inhibitor (ZPI) complex is a factor Xa inhibitor, in the presence of calcium and phospholipids.

PATHOLOGICAL VARIATIONS:

Clinical associations of Protein Z are still discussed and there is no obvious consensus until now. Among the reported studies, we can indicate:

- The PZ-ZPI complex is supposed to be involved in an increased thrombotic risk, for patients with antiphospholipid (aPL) syndrome.
- Protein Z deficiencies have been described in patients with ischemic stroke, and may induce in women an enhanced risk of early foetal loss, which could be related to enhanced immune complex formation with PZ, favoring an hypercoagulability state in placenta.
- The total PZ antigen level is extremely low in patients on stable warfarin therapy. Low PZ plasma levels are also associated with acute coronary syndromes (ACS).

APPLICATIONS:

- Assay of PZ in plasma samples.

ASSAY CHARACTERISTICS:

- Detection threshold $\leq 0.25 \mu\text{g/ml}$.
- Intra-assay: 3-8%.
- Inter-assay: 5-10%.
- No significant heparin interference up to 2 IU/ml.

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