ELISA Kit for Measuring Human S100A6

CircuLex S100A6 ELISA Kit

Cat# CY-8097

Intended Use

The MBL Research Product **CircuLex S100A6 ELISA Kit** is used for the quantitative measurement of human S100A6 in cell lysate, cell culture supernatant, serum and other biological media.

Individual users should determine appropriate conditions when using other types of samples.

This assay kit is for research use only and not for use in diagnostic or therapeutic procedures.

Storage

- Upon receipt store all components at 4°C.
- Don't expose reagents to excessive light.

Introduction

S100A6 also known as calcyclin, a small acidic protein of which molecular weighs is about 10.5 kDa, belongs to the S100 calcium-binding protein family (1). These family members share a common S100 calcium-binding motif and are involved in several regulatory functions that include protein phosphorylation, some enzyme activities, the dynamics of cytoskeletal components, transcription factors, and Ca2+ homeostasis, and also cell proliferation and differentiation (2, 3).

S100A6 is most abundantly expressed in fibroblasts and epithelial cells (4) and has also been found in some neurons, astrocytes, smooth muscle cells, cardiac myocytes, platelets and lymphocytes. S100A6 is also expressed by osteoblasts and up-regulated markedly during osteoblast differentiation; however, its roles in bone physiology are unknown (5). In addition, S100A6 is overexpressed in several tumor cells with high metastatic activity, e.g. melanoma (6). Therefore S100A6 may also be involved in tumorigenesis.

The general function of S100A6 remains unclear, but evidence suggests that it is involved in cell cycle regulation (7, 8) and exocytosis (9, 10), and in the regulation of heat shock proteins and cytoskeletal dynamics. Interestingly overexpression of S100A6 has also been observed in patients suffering from Alzheimer disease or amyotrophic lateral sclerosis (11, 12).

Principle of the Assay

The MBL Research Product **CircuLex S100A6 ELISA Kit** employs the quantitative sandwich enzyme immunoassay technique. An antibody specific for human S100A6 is pre-coated onto a microplate. Standards and samples are pipetted into the wells and the immobilized antibody binds any human S100A6 present. After washing away any unbound substances, an HRP conjugated antibody specific for human S100A6 is added to the wells. Following a wash to remove any unbound antibody HRP conjugate, the remaining conjugate is allowed to react with the substrate H_2O_2-tetramethylbenzidine. The reaction is stopped by addition of acidic solution and absorbance of the resulting yellow product is measured at 450 nm. The absorbance is proportional to the concentration of human S100A6. A standard curve is constructed by plotting absorbance values versus human S100A6 concentrations of calibrators, and concentrations of unknown samples are determined using this standard curve.

Summary of Procedure

Add 100 µL of diluted samples to the wells
↓ Incubate for 60 minutes at room temp.
Wash the wells
↓
Add 100 µL of HRP conjugated anti-human S100A6 antibody
↓ Incubate for 60 minutes at room temp.
Wash the wells
↓
Add 100 µL of Substrate Reagent
↓ Incubate for 10-20 minutes at room temp.
Add 100 µL of Stop Solution
↓
Measure absorbance at 450 nm

Materials Provided

All samples and standards should be assayed in duplicate. The following components are supplied and are sufficient for the one 96-well microplate kit.

Microplate: One microplate supplied ready to use, with 96 wells (12 strips of 8-wells) in a foil, zip-lock bag with a desiccant pack. Wells are coated with anti-human S100A6 monoclonal antibody (YK-3C7) as a capture antibody.

10X Wash Buffer: One bottle containing 100 mL of 10X buffer containing Tween®-20

Dilution Buffer: One bottle containing 50 mL of 1X buffer; use for reconstitution of Human S100A6 Standard and sample dilution. Ready to use.

Human S100A6 Standard: One vial containing X* ng of lyophilized recombinant human S100A6.
***The amount is changed depending on lot. See the real "User's Manual" included in the kit box.**

HRP conjugated Detection Antibody: One bottle containing 12 mL of HRP (horseradish peroxidase) conjugated anti-human S100A6 antibody. Ready to use.

Substrate Reagent: One bottle containing 20 mL of the chromogenic substrate, tetra-methylbenzidine (TMB). Ready to use.

Stop Solution: One bottle containing 20 mL of 1 N H_2SO_4. Ready to use.

Materials Required but not Provided

- **Pipettors:** 2-20 µL, 20-200 µL and 200-1,000 µL precision pipettors with disposable tips.
- **Precision repeating pipettor**
- **Orbital microplate shaker**
- **Microcentrifuge and tubes** for sample preparation.
- **Vortex mixer**
- **(Optional) Microplate washer:** Manual washing is possible but not preferable.
- **Plate reader** capable of measuring absorbance in 96-well plates at dual wavelengths of 450 nm/540 nm. Dual wavelengths of 450/550 or 450/595 nm can also be used. The plate can also be read at a single wavelength of 450 nm, which will give a somewhat higher reading.
- **(Optional) Software package facilitating data generation and analysis**
- **500 or 1,000 mL graduated cylinder**.
- **Reagent reservoirs**
- **Deionized water of the highest quality**
- **Disposable paper towels**

Precautions and Recommendations

- **Although we suggest to conduct experiments as outlined below, the optimal experimental conditions will vary depending on the parameters being investigated, and must be determined by the individual user.**
- Allow all the components to come to room temperature before use.
- All microplate strips that are not immediately required should be returned to the zip-lock pouch, which must be carefully resealed to avoid moisture absorption.
- Do not use kit components beyond the indicated kit expiration date.
- Use only the microtiter wells provided with the kit.
- Rinse all detergent residues from glassware.
- Use deionized water of the highest quality.
- Do not mix reagents from different kits.
- The buffers and reagents in this kit may contain preservatives or other chemicals. Care should be taken to avoid direct contact with these reagents.
- Do not mouth pipette or ingest any of the reagents.
- Do not smoke, eat, or drink when performing the assay or in areas where samples or reagents are handled.
- Dispose of tetra-methylbenzidine (TMB) containing solutions in compliance with local regulations.
- Avoid contact with the acidic Stop Solution and Substrate Solution, which contains hydrogen peroxide.
- Wear gloves and eye protection when handling immunodiagnostic materials and samples of human origin, and these reagents. In case of contact with the Stop Solution and the Substrate Solution, wash skin thoroughly with water and seek medical attention, when necessary.
- **Biological samples may be contaminated with infectious agents. Do not ingest, expose to open wounds or breathe aerosols. Wear protective gloves and dispose of biological samples properly.**
- **CAUTION: Sulfuric Acid is a strong acid. Wear disposable gloves and eye protection when handling Stop Solution.**

Sample Collection and Storage

Serum: Use a serum separator tube and allow samples to clot for 60 ± 30 minutes. Centrifuge the samples at 4°C for 10 minutes at 1,000 x g. Remove serum and assay immediately or store samples on ice for up to 6 hours before assaying. Aliquots of serum may also be stored at below -70°C for extended periods of time. Avoid repeated freeze-thaw cycles.

Note: Heparin and Citrate plasma has not been validated for use in this assay.

Cell culture supernatant: Remove any particulates by centrifugation and assay immediately or aliquot and store samples at below -70°C. Avoid repeated freeze-thaw cycles.

Cell lysate:

1. Harvest and pellet cells by centrifugation using standard methods.

2. Resuspend the cell pellet with an appropriate extraction buffer (for example; 20 mM HEPES-KOH, pH 7.5, 250 mM NaCl, 0.1 % NP-40, 2 mM $CaCl_2$, 1 mM EDTA, 0.2 mM PMSF, 1 µg/mL pepstatin, 0.5 µg/mL leupeptin, 0.5 mM DTT) and lyse the resuspended cells using either a Dounce Homogenizer, sonication, or three cycles of freezing and thawing.

3. Transfer extracts to microcentrifuge tubes and centrifuge at 15,000 rpm for 10 minutes at 4°C.

4. Aliquot cleared lysate to a clean microfuge tube.

5. Assay immediately or store the samples on ice for a few hours before assaying. Aliquots of the samples may also be stored at below -70°C for extended periods of time. Avoid repeated freeze-thaw cycles.

Other biological samples: MBL has not tested.
(*e.g.* Remove any particulates by centrifugation and assay immediately or aliquot and store samples at below -70°C. Avoid repeated freeze-thaw cycles. Individual users should determine appropriate conditions when using other types of samples.)

Detailed Protocol

The MBL Research Product **CircuLex S100A6 ELISA Kit** is provided with removable strips of wells so the assay can be carried out on separate occasions using only the number of strips required for the particular determination. Since experimental conditions may vary, an aliquot of the Human S100A6 Standard within the kit should be included in each assay as a calibrator. Disposable pipette tips and reagent troughs should be used for all liquid transfers to avoid cross-contamination of reagents or samples.

Preparation of Working Solutions

All reagents need to be brought to room temperature prior to the assay. Assay reagents are supplied ready-to-use, with the exception of **10X Wash Buffer** and **S100A6 Standard**.

1. Prepare a working solution of Wash Buffer by adding 100 mL of the **10X Wash Buffer** to 900 mL of deionized (distilled) water. Mix well. Store at 4°C for two weeks or -20°C for long-term storage.

2. Reconstitute **Human S100A6 Standard** with X* **µL** of **Dilution Buffer**. The concentration of S100A6 in vial should be **24 ng/mL**, which is referred to as the **Master Standard** of human S100A6.
   ***The amount is changed depending on lot. See the real "User's Manual" included in the kit box.**

   Prepare Standard Solutions as follows:
   Use the **Master Standard** to produce a dilution series (below). Mix each tube thoroughly before the next transfer. The 2,400 pg/mL standard (Std.1) serves as the highest standard. The **Dilution Buffer** serves as the zero standard (Blank).

	Volume of Standard	Dilution Buffer	Concentration
Std.1	100 µL of Master Standard (24 ng/mL)	900 µL	2,400 pg/mL
Std.2	300 µL of Std. 1 (2,400 pg/mL)	300 µL	1,200 pg/mL
Std.3	300 µL of Std. 2 (1,200 pg/mL)	300 µL	600 pg/mL
Std.4	300 µL of Std. 3 (600 pg/mL)	300 µL	300 pg/mL
Std.5	300 µL of Std. 4 (300 pg/mL)	300 µL	150 pg/mL
Std.6	300 µL of Std. 5 (150 pg/mL)	300 µL	75 pg/mL
Std.7	300 µL of Std. 6 (75 pg/mL)	300 µL	37.5 pg/mL
Blank	-	300 µL	0 pg/mL

Note: Do not use a Repeating pipette. Change tips for every dilution. Unused portions of Master Standard should be aliquoted and stored at below -70°C immediately. Avoid multiple freeze and thaw cycles.

Sample Preparation

Dilute samples with **Dilution Buffer**.
- Serum samples may require 50- to 100-fold dilution.
- Tears and saliva samples may require 800- to 1,200-fold dilution.
- Milk samples may require 100- to 500-fold dilution.
- Cell lysates and other biological samples may require 2- to 10-fold dilution.
- Cell culture supernatant samples may require 5- to 50-fold dilution.

Assay Procedure

1. Remove the appropriate number of microtiter wells from the foil pouch and place them into the well holder. Return any unused wells to the foil pouch, refold, seal with tape and store at 4°C.

2. Dilute samples with **Dilution Buffer**. (See "Sample Preparation" above.)

3. Pipette **100 µL** of **Standard Solutions (Std1-Std7, Blank)** and **diluted samples** in duplicates, into the appropriate wells.

4. Incubate the plate **at room temperature (ca.25°C) for 60 minutes**, shaking at ca. 300 rpm on an orbital microplate shaker.

5. Wash 4-times by filling each well with Wash Buffer (350 µL) using a squirt bottle, multi-channel pipette, manifold dispenser or microplate washer.

6. Add **100 µL** of **HRP conjugated Detection Antibody** into each well.

7. Incubate the plate **at room temperature (ca.25°C) for 60 minutes**, shaking at ca. 300 rpm on an orbital microplate shaker.

8. Wash 4-times by filling each well with Wash Buffer (350 µL) using a squirt bottle, multi-channel pipette, manifold dispenser or microplate washer.

9. Add **100 µL** of **Substrate Reagent**. Avoid exposing the microtiter plate to direct sunlight. Covering the plate with e.g. aluminum foil is recommended. Return Substrate Reagent to 4°C immediately after the necessary volume is removed

10. Incubate the plate **at room temperature (ca.25°C) for 10-20 minutes**, shaking at ca. 300 rpm on an orbital microplate shaker. The incubation time may be extended up to 30 minutes if the reaction temperature is below 20°C.

11. Add **100 µL** of **Stop Solution** to each well in the same order as the previously added Substrate Reagent.

12. Measure absorbance in each well using a spectrophotometric microplate reader at dual wavelengths of 450/540 nm. Dual wavelengths of 450/550 or 450/595 nm can also be used. Read the microplate at 450 nm if only a single wavelength can be used. Wells must be read within 30 minutes of adding the Stop Solution.

Note-1: Complete removal of liquid at each step is essential to good performance. After the last wash, remove any remaining Wash Buffer by aspirating or decanting. Invert the plate and blot it against clean paper towels.

Note-2: Reliable standard curves are obtained when either O.D. values do not exceed 0.25 units for the blank (zero concentration), or 3.0 units for the highest standard concentration.

Note-3: If the microplate reader is not capable of reading absorbance greater than the absorbance of the highest standard, perform a second reading at 405 nm. A new standard curve, constructed using the values measured at 405 nm, is used to determine the S100A6 concentration of off-scale samples. The readings at 405 nm should not replace the on-scale readings at 450 nm.

Calculations

Average the duplicate readings for each standard, control, and sample and subtract the average zero standard optical density. Plot the optical density for the standards versus the concentration of the standards and draw the best curve. The data can be linearized by using log/log paper and regression analysis may be applied to the log transformation. To determine human S100A6 concentration of each sample, first find the absorbance value on the y-axis and extend a horizontal line to the standard curve. At the point of intersection, extend a vertical line to the x-axis and read the corresponding human S100A6 concentration. If the samples have been diluted, the concentration read from the standard curve must be multiplied by the dilution factor.

1. The dose-response curve of this assay fits best to a sigmoidal 4-parameter logistic equation. The results of unknown samples can be calculated with any computer program having a 4-parameter logistic function. It is important to make an appropriate mathematical adjustment to accommodate for the dilution factor.

2. Most microtiter plate readers perform automatic calculations of analyte concentration. The calibration curve is constructed by plotting the absorbance (Y) of calibrators versus log of the known concentration (X) of calibrators, using the 4-parameter function. Alternatively, the logit log function can be used to linearize the calibration curve (i.e. logit of absorbance (Y) is plotted versus log of the known concentration (X) of calibrators).

Measurement Range

The measurement range is 37.5 pg/mL to 2.4 ng/mL. Any sample reading higher than the highest standard should be diluted with Dilution Buffer in higher dilution and re-assayed. Dilution factors need to be taken into consideration in calculating the S100A6 concentration.

Troubleshooting

1. All samples and standards should be assayed in duplicate, using the protocol described in the **Detailed Protocol**. Incubation times or temperatures significantly different from those specified may give erroneous results.

2. Poor duplicates, accompanied by elevated values for wells containing no sample, indicate insufficient washing. If all instructions in the **Detailed Protocol** were followed accurately, such results indicate a need for washer maintenance.

3. Overall low signal may indicate that desiccation of the plate has occurred between the final wash and addition of Substrate Reagent. Do not allow the plate to dry out. Add Substrate Reagent immediately after wash.

Reagent Stability

All of the reagents included in the MBL Research Product **CircuLex S100A6 ELISA Kit** have been tested for stability. Reagents should not be used beyond the stated expiration date. Upon receipt, kit reagents should be stored at 4°C, except the reconstituted Human S100A6 Standard must be stored at below -70°C. Coated assay plates should be stored in the original foil bag sealed by the zip lock and containing a desiccant pack.

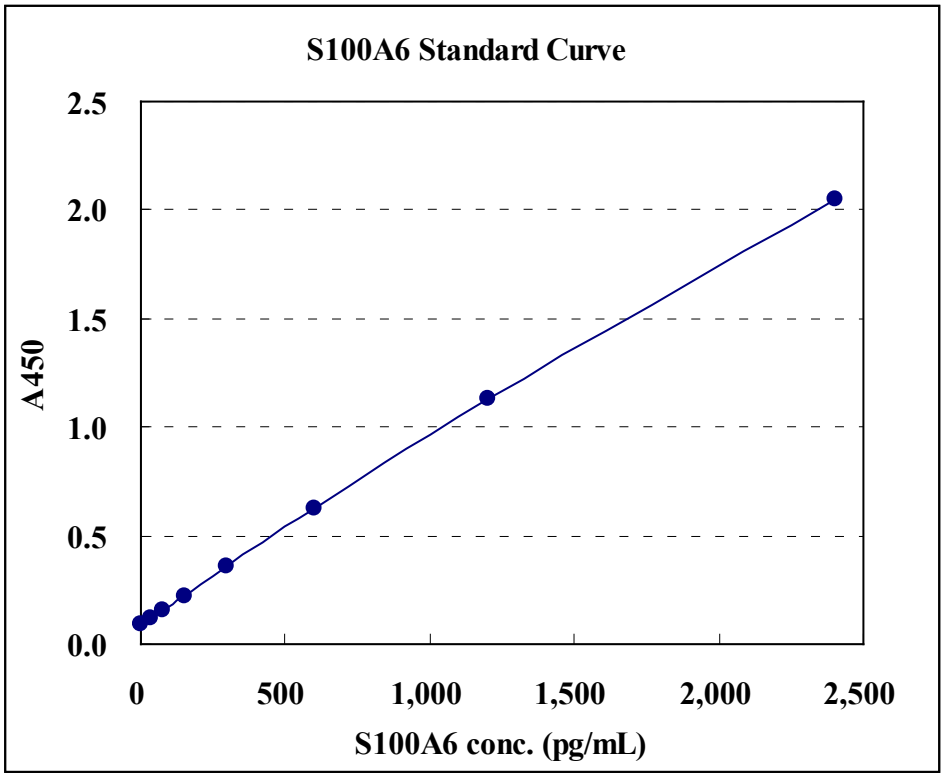
Assay Characteristics

1. Sensitivity

The limit of detection (defined as such a concentration of human S100A6 giving absorbance higher than mean absorbance of blank* plus three standard deviations of the absorbance of blank: A blank + 3SD blank) is better than 11.1 pg/mL of sample.

* Dilution Buffer was pipetted into blank wells.

Typical Standard Curve



2. Precision

Intra-assay Precision (Precision within an assay)

Four samples* of known concentration were tested sixteen times on one plate to assess intra-assay precision.

• Intra-assay (Within-Run, n=16) CV=3.7-5.6 %

*Sample: Human serum

S100A6 conc. (ng/ml)

	Sample 1	Sample 2	Sample 3	Sample 4
1	121.9	67.2	33.3	132.2
2	122.4	65.2	33.0	125.7
3	118.5	63.5	33.8	121.4
4	113.9	62.0	31.9	120.3
5	126.9	65.7	31.6	138.5
6	122.1	65.8	33.3	129.0
7	122.9	70.1	36.1	136.1
8	128.8	74.7	37.4	140.9
9	121.2	67.2	34.5	133.8
10	119.2	63.6	33.7	130.7
11	114.7	60.1	32.2	123.2
12	119.3	63.5	30.9	122.2
13	125.5	64.7	32.0	139.4
14	120.1	64.9	33.0	128.7
15	127.1	69.5	36.5	129.7
16	128.2	71.5	35.0	134.9
MAX.	**128.8**	**74.7**	**37.4**	**140.9**
MIN.	**113.9**	**60.1**	**30.9**	**120.3**
MEAN	**122.0**	**66.2**	**33.6**	**130.4**
S.D.	**4.5**	**3.7**	**1.9**	**6.6**
C.V.	**3.7%**	**5.6%**	**5.5%**	**5.1%**

Inter-assay Precision (Precision between assays)

Four samples* of known concentration were tested in five separate assays to assess inter-assay precision.

• Inter-assay (Run-to-Run, n=5) CV=7.5-10.5 %

*Sample: Human serum

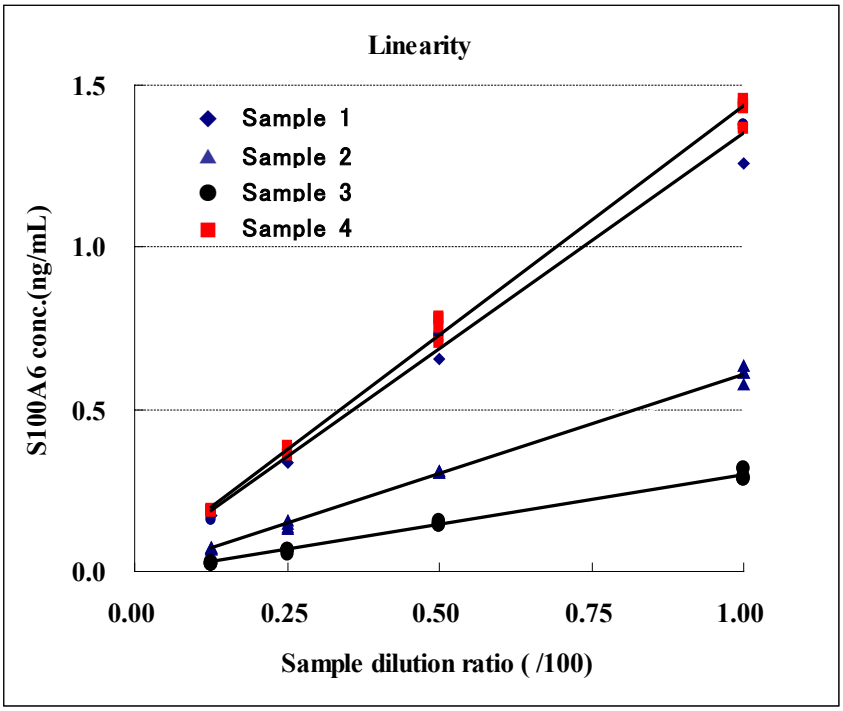
S100A6 conc. (ng/ml)

	Sample 1	Sample 2	Sample 3	Sample 4
1	131.4	65.1	30.4	159.9
2	120.5	72.1	33.5	133.4
3	110.8	61.2	26.5	120.0
4	131.5	71.6	32.7	142.5
5	132.2	76.4	31.2	136.6
MAX.	**132.2**	**76.4**	**33.5**	**159.9**
MIN.	**110.8**	**61.2**	**26.5**	**120.0**
MEAN	**125.3**	**69.3**	**30.8**	**138.5**
S.D.	**9.4**	**6.0**	**2.7**	**14.5**
C.V.	**7.5%**	**8.7%**	**8.9%**	**10.5%**

3. Linearity

Four samples* were diluted with Dilution Buffer and assayed after dilution. The neat sample was set to 1. Please note that all samples including the neat sample were 100-fold diluted as stated in the Assay Procedure. The results are summarized in the figure below.

*Sample: Human serum



Example of Test Results

Fig.1 S100A6 concentrations in human sera of several volunteers

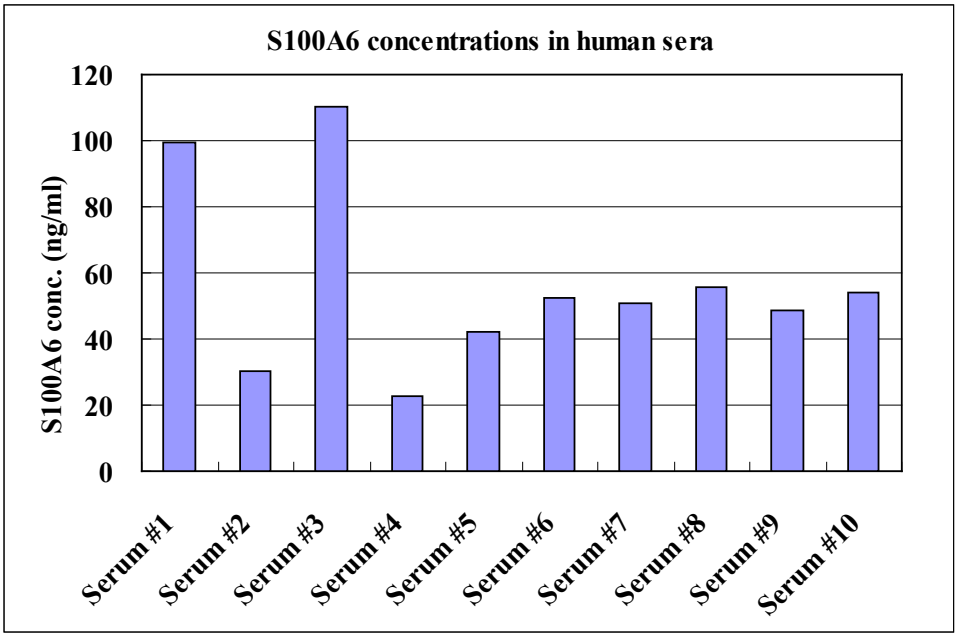


Fig.2 S100A6 concentrations in human urine of several volunteers

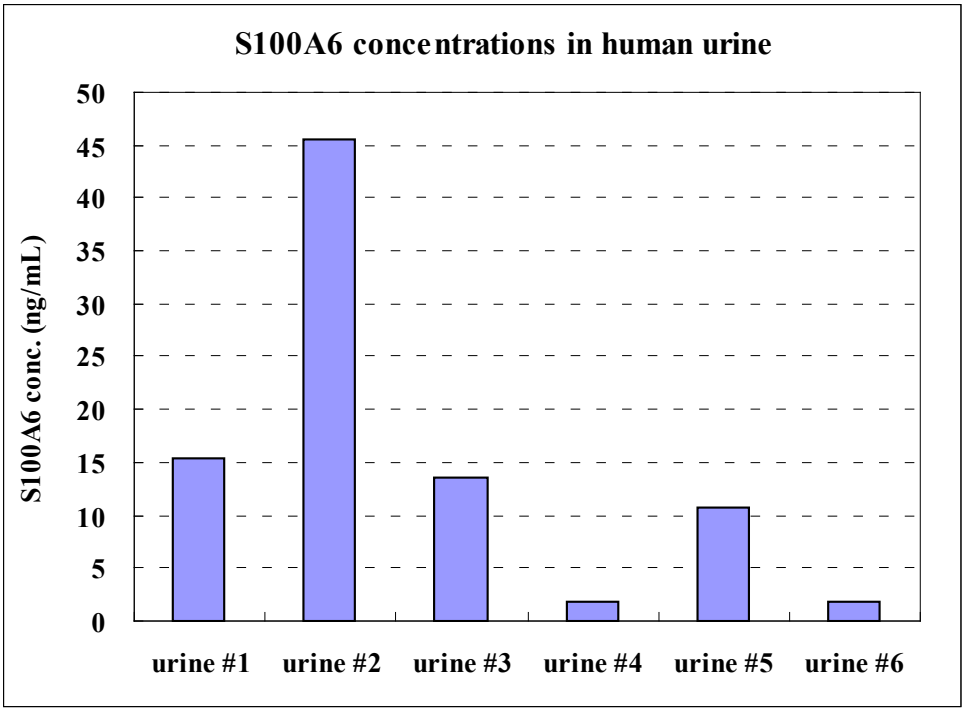


Fig.3 S100A6 concentrations in human tears and saliva of several volunteers

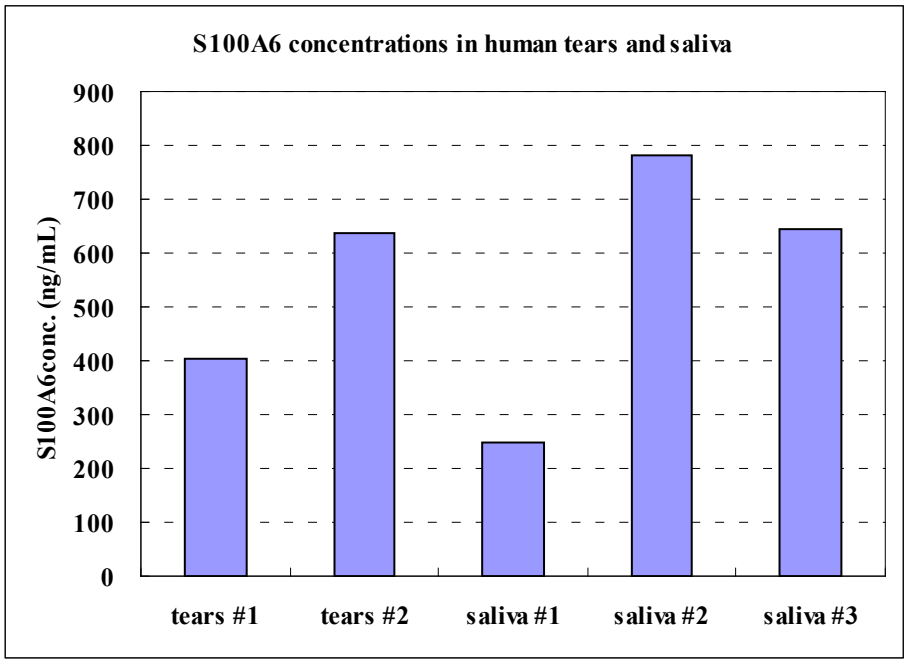


Fig.4 S100A6 concentrations in human milk of several volunteers

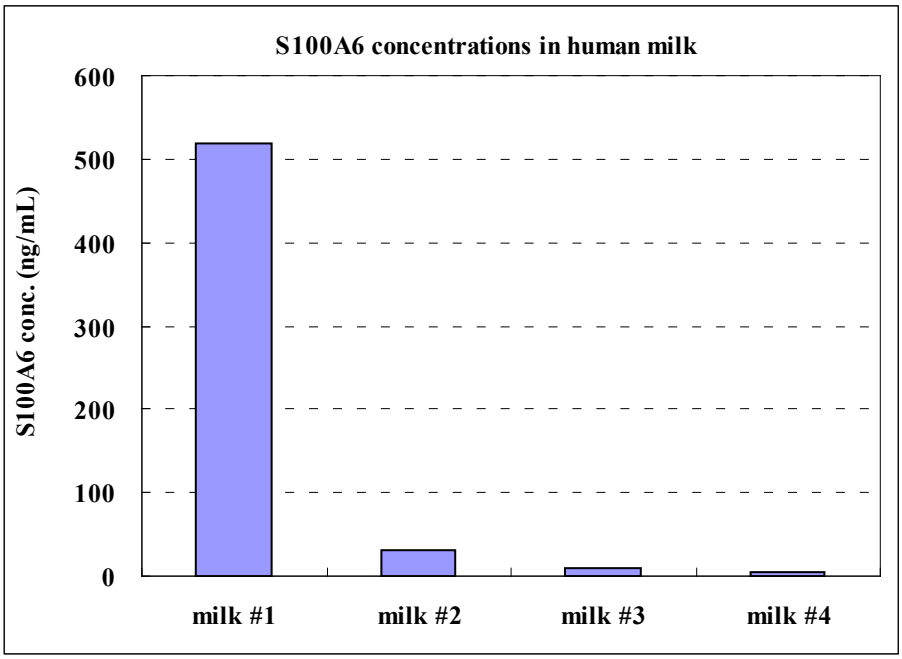


Fig.5 S100A6 concentrations in culture supernatants of cell lines

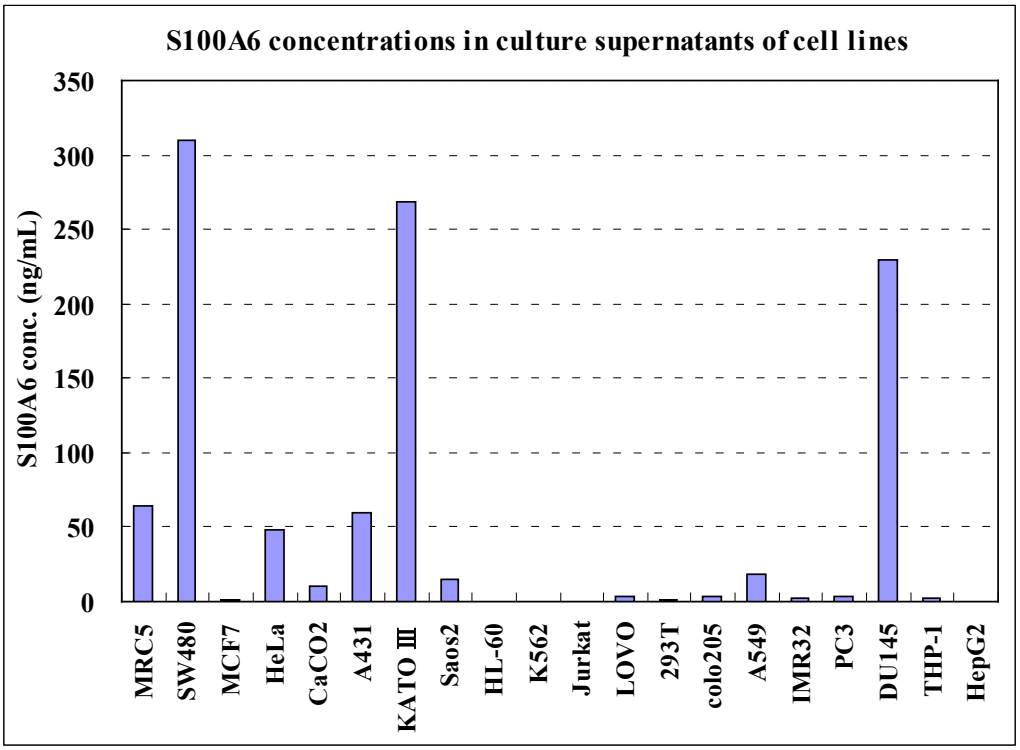
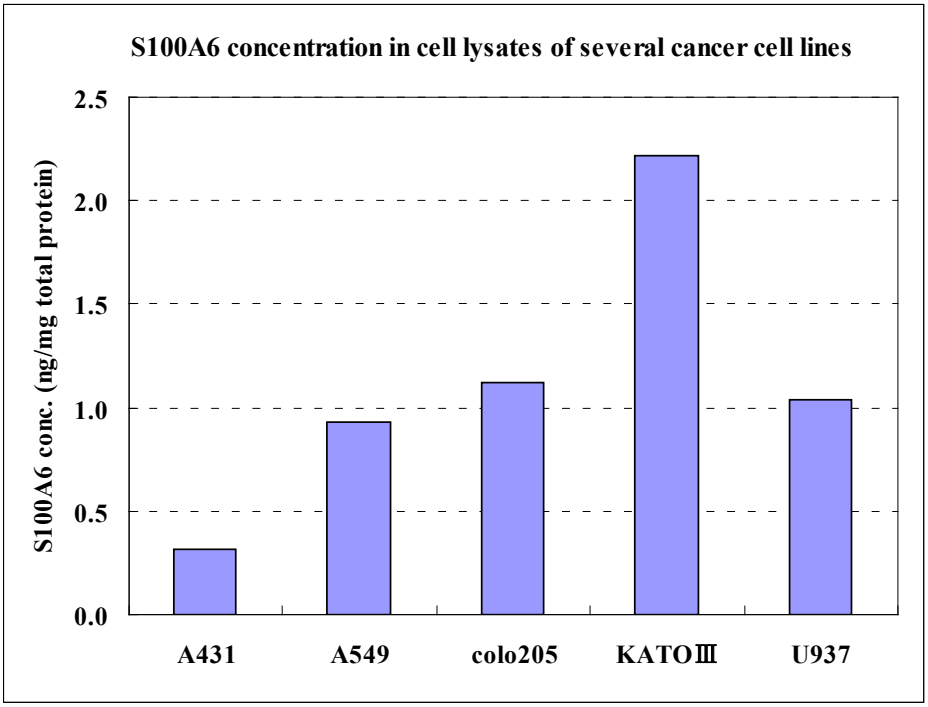


Fig.6 S100A6 concentrations in cell lysates of several cancer cell lines



References

1. Heizmann, C.W., and Cox, J.A.; New perspectives on S100 proteins: a multi-functional Ca2+-, Zn2+- and Cu2+- binding protein family. *BioMetals* 11, 383-397, 1998

2. Donato, R.; Functional roles of S100 proteins, calcium-binding proteins of the EF-hand type. *Biochim. Biophys. Acta* 1450, 191-231, 1999

3. Donato, R.; S100: a multigenic family of calcium-modulated proteins of the EF-hand type with intracellular and extracellular functional roles. Int. J. Biochem. *Cell Biol.* 33, 637-668, 2001

4. Stulík J, Österreicher J, Koupilová K, Knížek J, Bureš J, Jandík P, Langr F, Dědič K, Schäfer BW, Heizmann CW.; Differential expression of the Ca2+ binding S100A6 protein in normal, preneoplastic and neoplastic colon mucosa. *Eur. J. Cancer* 36, 1050-1059, 2000

5. Seth A, Lee BK, Qi S, Vary CP.; Coordinate expression of novel genes during osteoblast differentiation. *J. Bone Miner. Res*. 15, 1683-1696, 2000

6. Weterman MA, Stoopen GM, van Muijen GN, Kuznicki J, Ruiter DJ, Bloemers HP.; Expression of calcyclin in human melanoma cell lines correlates with metastatic behavior in nude mice. *Cancer Res*. 52, 1291-1296, 1992

7. Calabretta B, Battini R, Kaczmarek L, de Riel JK, Baserga R. Molecular cloning of the cDNA for a growth factor-inducible gene with strong homology to S-100, a calcium-binding protein. *J. Biol. Chem*. 261, 12628-12632, 1986

8. Calabretta B, Venturelli D, Kaczmarek L, Narni F, Talpaz M, Anderson B, Beran M, Baserga R.; Altered expression of G1-specific genes in human malignant myeloid cells. *Proc Natl Acad Sci U S A*. 83, 1495-1498, 1986

9. Okazaki K, Niki I, Iino S, Kobayashi S, Hidaka H; A role of calcyclin, a Ca2+-binding protein, on Ca2+-dependent insulin release in the pancreatic β cell. *J. Biol. Chem*. 269, 6149-6152, 1994

10. Thordarson, G., Southard, J.N., Talamantes, F.; Purification and characterization of mouse decidual calcyclin: A novel stimulator of mouse placental lactogen-II secretion *Endocrinology* 129, 1257-1265, 1991

11. Boom A, Pochet R, Authelet M, Pradier L, Borghgraef P, Van Leuven F, Heizmann CW, Brion J-P. ; Astrocytic calcium/zinc binding protein S100A6 over expression in Alzheimer's disease and in PS1/APP transgenic mice models. *Biochim. Biophys. Acta* 1742, 161-168, 2004

12. Hoyaux D., Boom A., Van den Bosch L., Belot N., Martin J.J., Heizmann C.W., Kiss R., Pochet R.; S100A6 overexpression within astrocytes associated with impaired axons from both ALS mouse model and human patients. *J. Neuropathol. Exp. Neurol*. 61, 736-744, 2002

For more information, please visit our web site**.**
https://ruo.mbl.co.jp/

MANUFACTURED BY

MBL A JSR Life Sciences Company
MEDICAL & BIOLOGICAL LABORATORIES CO., LTD.
URL: https://ruo.mbl.co.jp
E-mail: support@mbl.co.jp