ELISA Kit for Measuring Human Elafin/SKALP

CircuLex Human Elafin/SKALP ELISA Kit

Cat# CY-8214

Intended Use

The MBL Research Product **CircuLex Human Elafin/SKALP ELISA Kit** is used for the quantitative measurement of human Elafin/SKALP in serum, plasma, cell culture supernatant, cell lysate, tear, saliva, milk, and urine.

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.
- Do not expose reagents to excessive light.

Introduction

Elafin, also known as peptidase inhibitor 3 (PI3) or skin-derived antileukoprotease (SKALP), was identified as an endogenously produced low-molecular-weight elastase inhibitor derived from psoriatic skins (1), and functions as an antimicrobial peptide against gram-positive and gram-negative bacteria (2). Elafin, which is secreted protein consists of 117 amino acid residue, contains a WAP-type four disulfide core (WFDC) domain, and is thus a member of the WFDC domain family. The functions of elafin other than antibacterial action are anti-fungal, anti-viral and anti-inflammatory effect (3-5) regulation of innate and adaptive immunity (5-7) and so on.

GVHD (Graft-versus-host disease) occurs after a variety of cross-organ transplantation, especially transplanted immune system directly, such as bone marrow transplantation (BMT). Elafin was overexpressed in GVHD skin biopsies and plasma levels of elafin were significantly higher at the onset of skin GVHD (8). GVHD is also associated with kidney injury after hematopoietic cell transplantation (HCT). Urinary elafin levels are with development of acute kidney injury (AKI) and chronic kidney disease (CKD) after HCT (9).

Furthermore, it is reported that elevated levels of elastase were strong associated with recurrence and death in breast cancer patients (10). Increased elafin and/or decreased elastase expression inhibit proliferation and colony formation of tumor cells and in mice decrease tumor size and increase their survival (11). Elafin have a possibility as a prognostic marker in a prospective study.

Principle of the Assay

The MBL Research Product **CircuLex Human Elafin/SKALP ELISA Kit** employs the quantitative sandwich enzyme immunoassay technique. An antibody specific for human Elafin/SKALP is pre-coated onto a microplate. Standards and samples are pipetted into the wells and the immobilized antibody binds any human Elafin/SKALP present. After washing away any unbound substances, a biotinylated monoclonal antibody specific for human Elafin/SKALP is added to the wells. Following a wash to remove any unbound biotinylated antibody, Streptavidin-HRP is added to the wells. After washing away any unbound Streptavidin-HRP, HRP remaining on the well 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 Elafin/SKALP. A standard curve is constructed by plotting absorbance values versus human Elafin/SKALP concentrations of calibrators, and concentrations of unknown samples are determined using this standard curve.

Summary of Procedure

Add 100 µL of diluted sample to the wells
↓ Incubate for 60 minutes at room temp.
Wash the wells
↓
Add 100 µL of Biotinylated Detection Antibody
↓ Incubate for 60 minutes at room temp.
Wash the wells
↓
Add 100 µL of Streptavidin-HRP
↓ Incubate for 20 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 pre-coated with anti-human Elafin/SKALP monoclonal antibody 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 standard reconstitution, and standard and sample dilution. Ready to use.

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

Biotinylated Detection Antibody: One vial containing 12 mL of biotinylated anti-human Elafin/SKALP monoclonal antibody. Ready to use.

100X Streptavidin-HRP: One vial containing 120 µL of 100X HRP (horseradish peroxidase) conjugated streptavidin.

Streptavidin-HRP Dilution Buffer: One bottle containing 12 mL of 1X buffer; use for dilution of 100X Streptavidin-HRP.

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 residue 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 Substrate Solution which contains hydrogen peroxide.
- **CAUTION: 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: Stop Solution is a strong acid. Wear disposable gloves and eye protection when handling the 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.

Cell lysate: Several extraction methods can be used for measurement cellular proteins. The following protocol is provided as an example of suitable methods. All steps of cell lysate preparation should be performed at 4°C.

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

2. Resuspend the cell pellet with the cell lysis buffer (25 mM Tris-HCl, pH 7.5, 250 mM NaCl, 0.1 % NP-40, 1 mM EDTA, 0.2 mM PMSF, 1 µg/mL pepstatin, 0.5 µg/mL leupeptin, 0.2 mM DTT).

3. Lyse the resuspended cells using either a Dounce homogenizer, sonication or three cycles of freezing and thawing.

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

5. Aliquot cleared lysate to a clean microfuge tube.

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

Note-1: The above procedures are intended only as a guideline. The optimal experimental conditions will vary depending on the parameters being investigated, and must be determined by the individual user.
Note-2: Individual users should determine appropriate conditions when using other types of samples which doesn't be indicated in this manual.

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 Human Elafin/SKALP 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 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**, **100X Streptavidin-HRP**, and **Human Elafin/SKALP Standard**.

1. Prepare a working solution of **Wash Buffer** by adding **100 mL** of **10X Wash Buffer** to **900 mL** of deionized (distilled) water (**ddH_2O**). Mix well. Store at 4°C for two weeks or -20°C for long-term storage.

2. Prepare **1X Streptavidin-HRP** by 100-fold diluting **100X Streptavidin-HRP** with **Streptavidin-HRP Dilution Buffer** at the time of use and discard any unused portion after use.

3. Reconstitute **Human Elafin/SKALP Standard** with X* **mL** of **Dilution Buffer** by gently mixing. After reconstitution, immediately dispense it in small aliquots (e.g. 100 µL) to plastic micro-centrifuge tubes and store below -70°C to avoid non-specific adsorption to glass surface and multiple freeze-thaw cycles. The concentration of human Elafin/SKALP in vial should be **9.6 ng/mL**, which is referred to as the **Master Standard** of human Elafin/SKALP.

***The amount is changed depending on lot. See the real "User's Manual" included in the kit box.**

Prepare Standard Solutions as follows:

Use **Master Standard** to produce a dilution series (below). Mix each tube thoroughly before the next transfer. **Std.1 (960 pg/mL)** serves as the highest standard. **Dilution Buffer** serves as the zero standard (Blank).

	Volume of Standard	Dilution Buffer	Concentration
Std.1	60 µL of Master Standard (9.6 ng/mL)	540 µL	960 pg/mL
Std.2	300 µL of Std. 1 (960 pg/mL)	300 µL	480 pg/mL
Std.3	300 µL of Std. 2 (480 pg/mL)	300 µL	240 pg/mL
Std.4	300 µL of Std. 3 (240 pg/mL)	300 µL	120 pg/mL
Std.5	300 µL of Std. 4 (120 pg/mL)	300 µL	60 pg/mL
Std.6	300 µL of Std. 5 (60 pg/mL)	300 µL	30 pg/mL
Std.7	300 µL of Std. 6 (30 pg/mL)	300 µL	15 pg/mL
Blank	-	300 µL	0 pg/mL

Note: Do not use a repeating pipette. Change tips for every dilution. Wet tip with Dilution Buffer before dispensing.

Sample Preparation

Dilute samples with **Dilution Buffer**.
- Serum samples may require a 50-fold dilution.
- Other biological samples require appropriate dilutions.

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 **Biotinylated 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 **1X Streptavidin-HRP** into each well.

10. Incubate the plate **at room temperature (ca.25°C) for 20 minutes**, shaking at ca. 300 rpm on an orbital microplate shaker.

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

12. 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

13. 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 than 20°C.

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

15. 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 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 optical density of the average zero standard. Plot the optical density versus the concentration of standards and draw the best curve. Most microtiter plate readers perform automatic calculations of analyte concentration. The standard curve fits best to a sigmoidal four-parameter logistic equation. The results of unknown samples can be calculated with any computer program having a four-parameter logistic function.

A standard curve is also to be constructed by plotting the absorbance (Y) versus log of the known concentration (X) of standards, using a cubic function. Alternatively, the logit log function can be used to linearize the standard curve (i.e. logit of optical density (Y) is plotted versus log of the known concentration (X) of standards). To determine the concentration of each sample, first find the optical density 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 concentration.

If the samples have been diluted, the concentration read from the standard curve must be multiplied by the dilution factor.

Measurement Range

The measurement range is 15 pg/mL to 960 pg/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 human Elafin/SKALP concentration.

Troubleshooting

1. All samples and standards should be assayed in duplicate, using the protocol described in **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 **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 Human Elafin/SKALP ELISA Kit** have been tested for stability. Reagents should not be used beyond the stated expiration date.

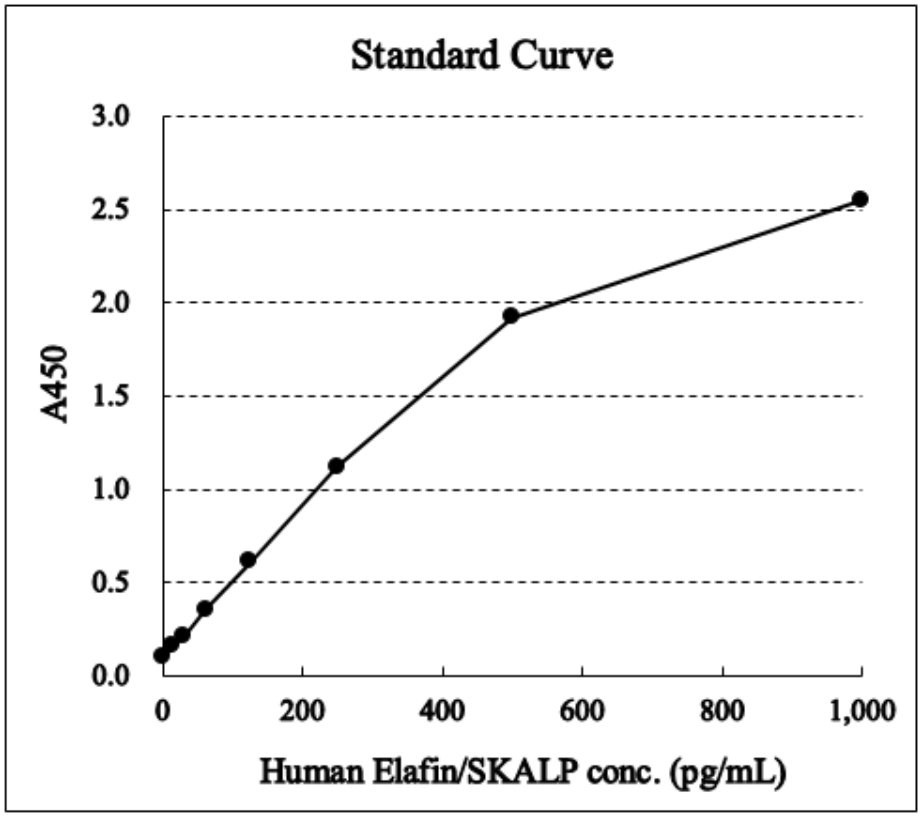
Assay Characteristics

1. Sensitivity

The limit of detection (defined as such a concentration of human Elafin/SKALP giving absorbance higher than mean absorbance of blank* plus three standard deviations of the absorbance of blank: A blank + 3SD blank) is better than 6.2 pg/mL of sample.

* Dilution Buffer was pipetted into blank wells.

Typical standard curve



2. Precision

Intra-assay Precision (Precision within an assay)

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

• Intra-assay (Within-Run, n=16) CV=2.4-4.5 %

* Sample 1&2: Cell culture supernatant
Sample 3&4: Cell lysate
Sample 5&6: Serum

Human Elafin/SKALP conc. (pg/mL)

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
1	245.2	135.7	521.2	98.6	72.5	80.4
2	235.0	135.2	534.2	97.0	76.9	78.1
3	226.2	139.7	565.3	100.4	76.4	78.5
4	235.1	135.5	578.1	104.0	75.1	83.6
5	249.7	136.1	609.3	101.0	76.2	82.7
6	246.5	134.0	588.9	103.0	76.3	82.6
7	228.8	132.6	584.8	101.6	77.9	81.9
8	249.0	143.5	582.6	106.7	73.8	85.0
9	233.0	133.2	539.7	97.3	74.7	78.3
10	238.0	132.1	561.7	100.6	73.9	80.0
11	244.0	137.9	584.8	102.2	79.0	77.3
12	232.9	134.9	592.5	99.5	74.0	82.3
13	240.4	131.8	609.8	103.7	74.5	79.6
14	245.3	132.5	588.3	107.1	74.0	82.0
15	244.4	140.2	591.6	104.5	78.2	85.7
16	250.0	135.0	591.7	104.2	81.6	81.0
MAX.	**250.0**	**143.5**	**609.8**	**107.1**	**81.6**	**85.7**
MIN.	**226.2**	**131.8**	**521.2**	**97.0**	**72.5**	**77.3**
MEAN	**240.2**	**135.6**	**576.5**	**102.0**	**75.9**	**81.2**
S.D.	**7.6**	**3.3**	**25.7**	**3.0**	**2.4**	**2.5**
C.V.	**3.2%**	**2.4%**	**4.5%**	**3.0%**	**3.1%**	**3.1%**

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=5.7-9.5 %

* Sample 1&2: Cell culture supernatant
Sample 3&4: Cell lysate

Human Elafin/SKALP conc. (pg/mL)

	Sample 1	Sample 2	Sample 3	Sample 4
1	240.2	135.6	576.5	102.0
2	212.7	124.4	717.0	110.8
3	224.3	133.8	691.6	96.5
4	219.5	146.5	656.1	95.5
5	207.5	128.5	589.8	86.8
MAX.	240.2	146.5	717.0	110.8
MIN.	207.5	124.4	576.5	86.8
MEAN	220.8	133.7	646.2	98.3
S.D.	12.6	8.4	61.6	8.8
C.V.	5.7%	6.3%	9.5%	9.0%

3. Spiking Recover

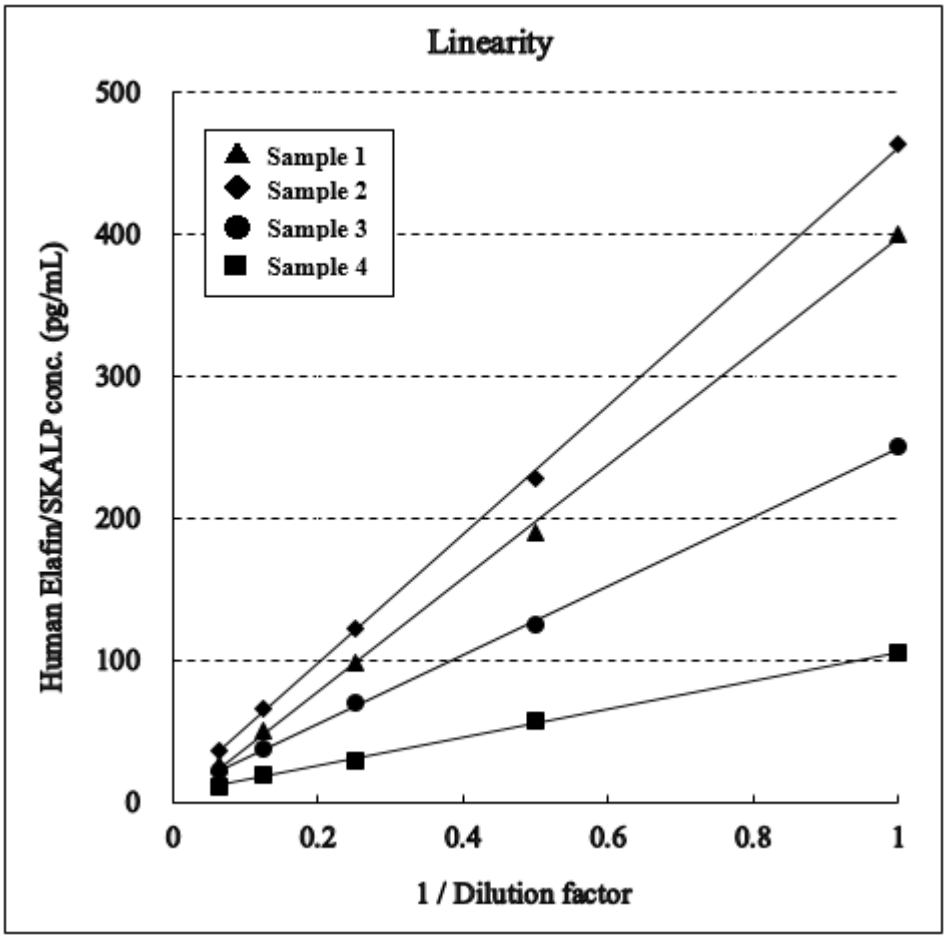
Serum samples were spiked with different amounts of human Elafin/SKALP and assayed.
The recovery of human Elafin/SKALP spiked to levels throughout the range of the assay was evaluated.

• Sample Average % Recovery Range: human serum (n=3), 82.3-112.1 %

4. Linearity

To assess the linearity of the assay, three samples* were serially diluted with Dilution Buffer to produce samples with values within the dynamic range of the assay.

* Sample 1: Cell culture supernatant
Sample 2&3: Cell lysate
Sample 4: Serum



Example of Test Results

Fig.1 Human Elafin/SKALP concentration in healthy volunteers' sera (n=16)

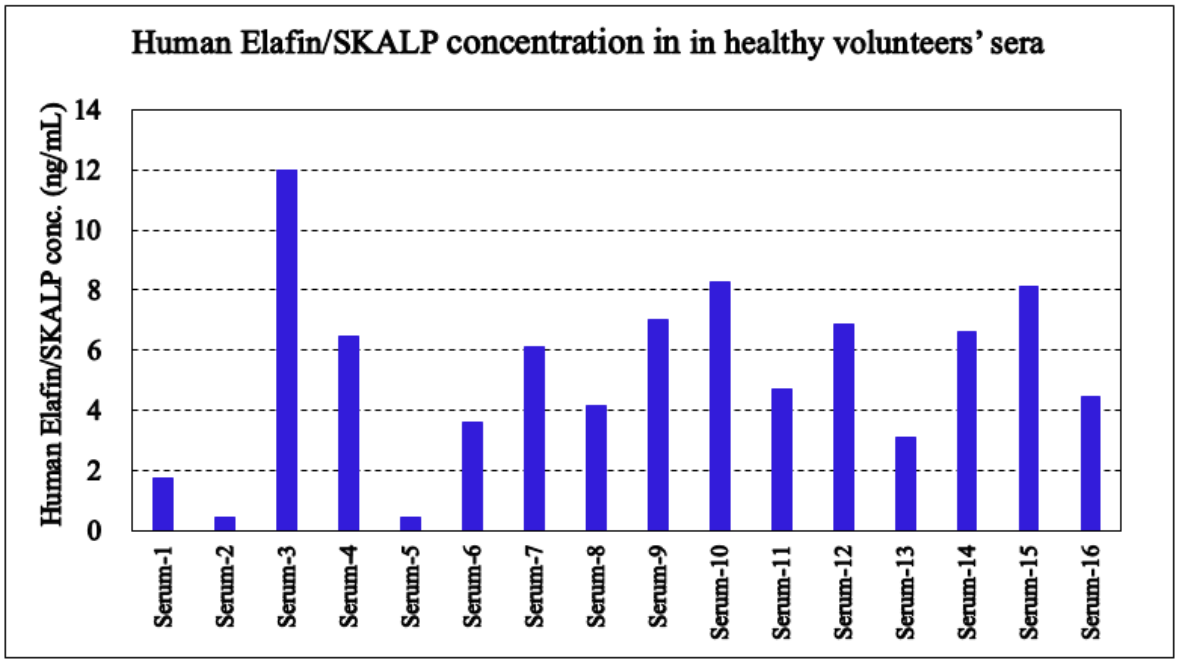


Fig.2 Human Elafin/SKALP concentration in cell culture supernatants

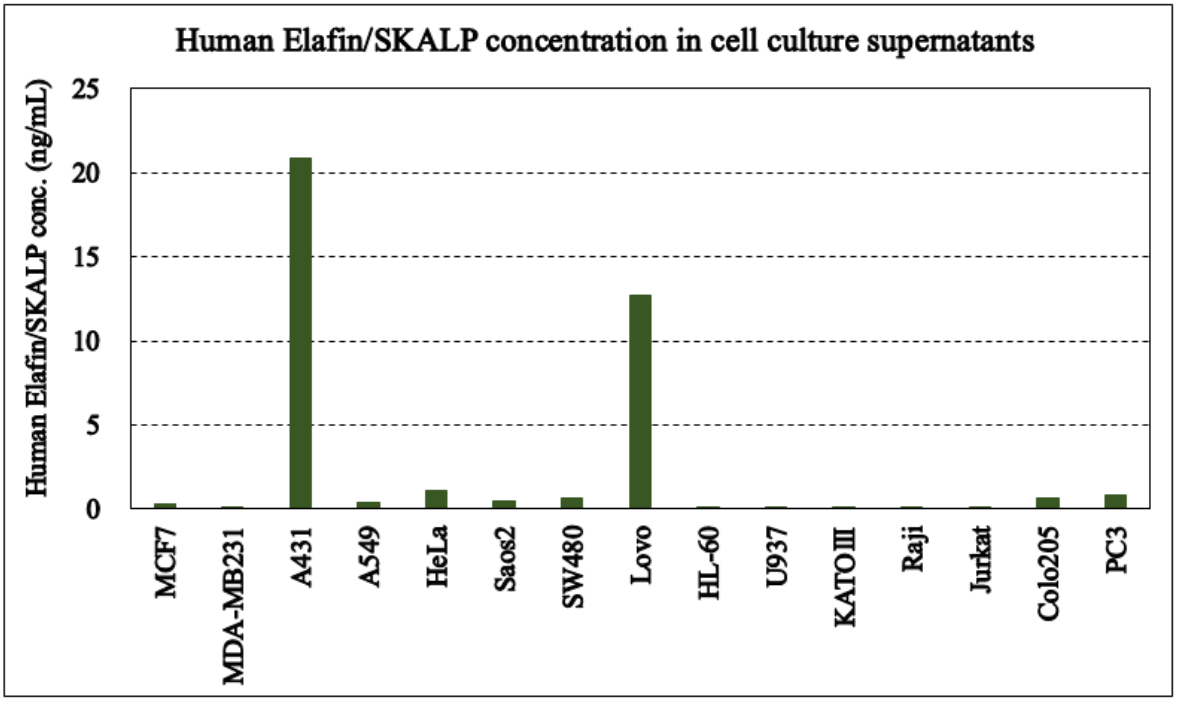


Fig.3 Human Elafin/SKALP concentration in tear samples

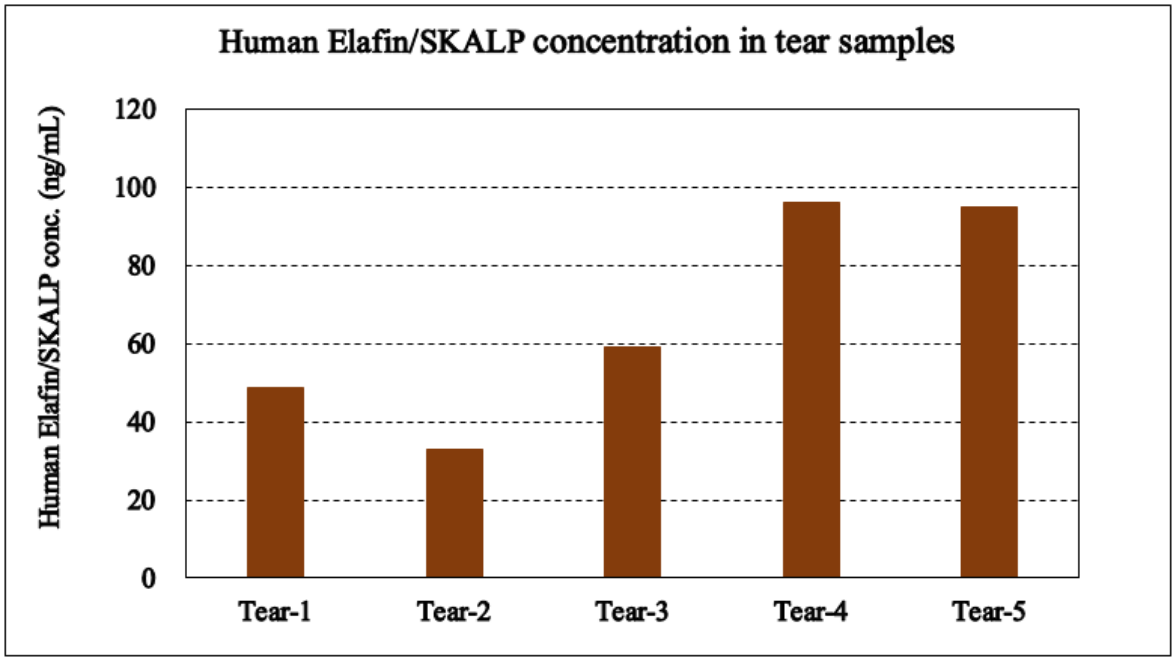


Fig.4 Human Elafin/SKALP concentration in saliva samples

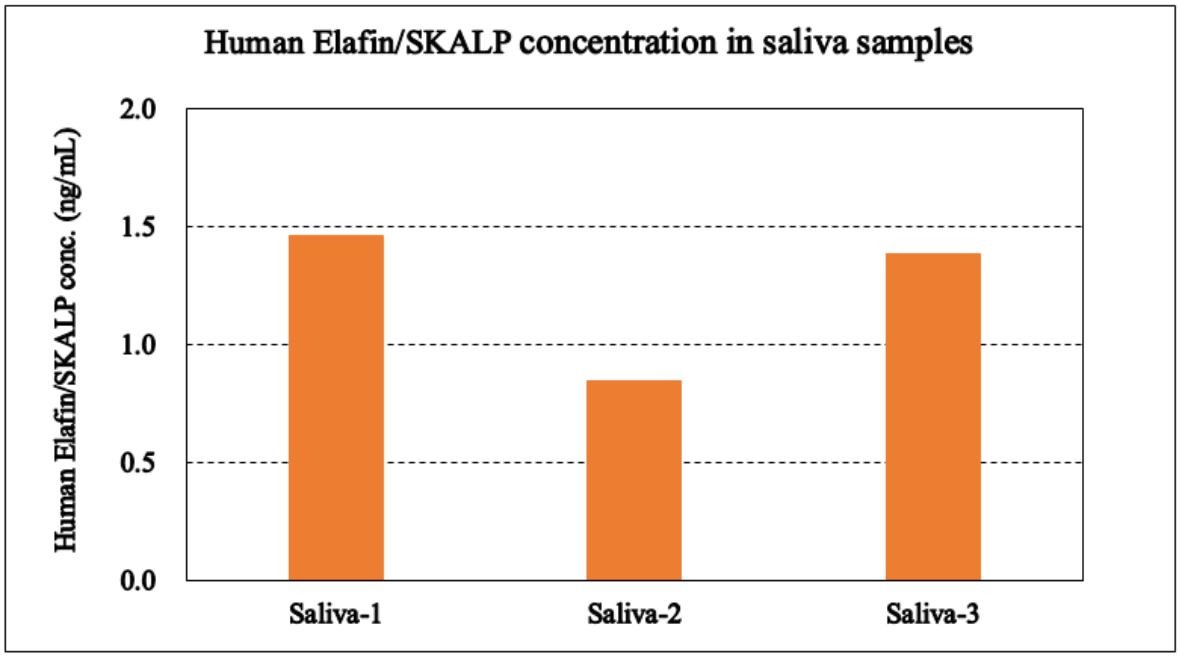


Fig.5 Human Elafin/SKALP concentration in milk samples

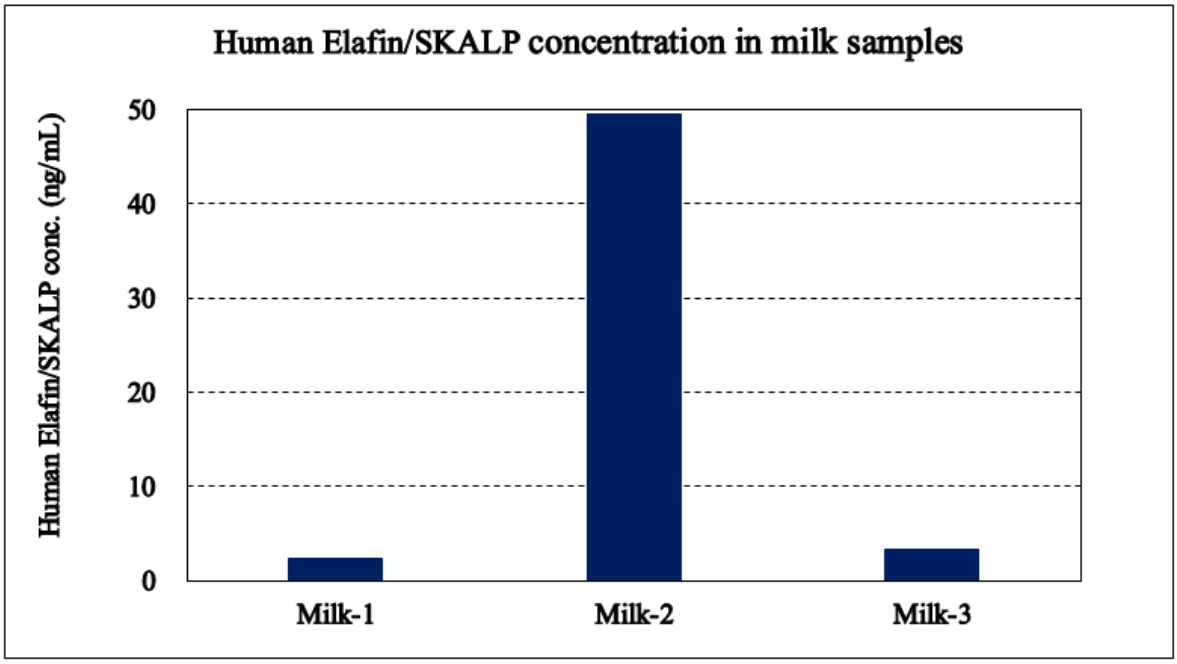
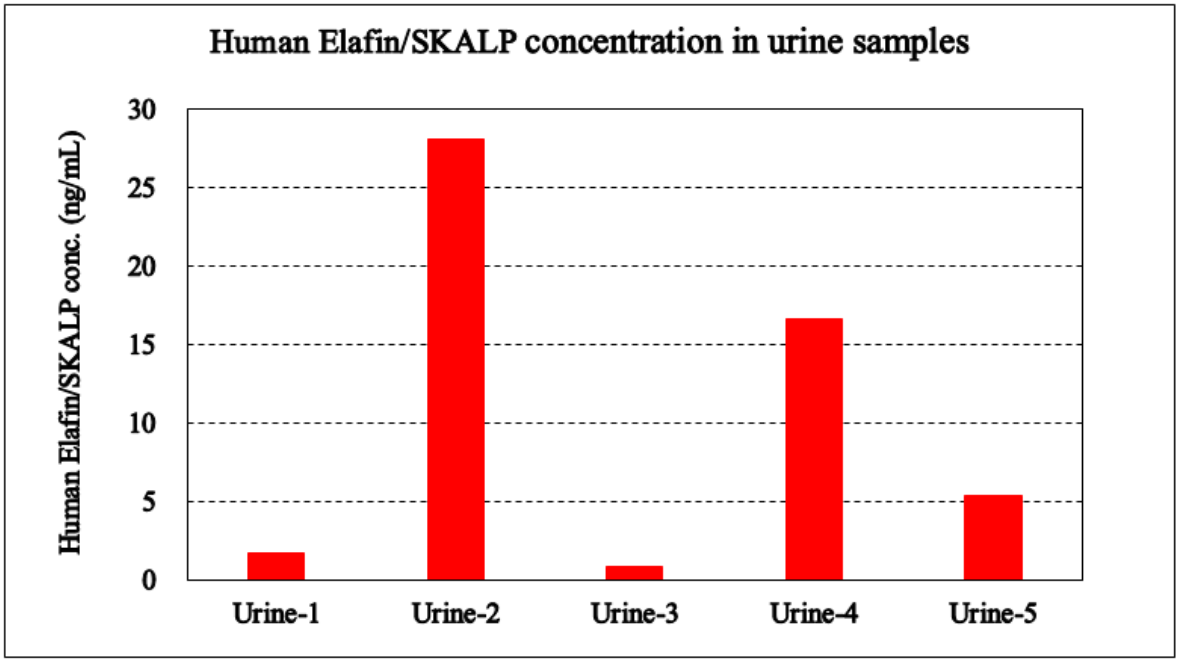


Fig.6 Human Elafin/SKALP concentration in urine samples



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