ATP+AMP assay

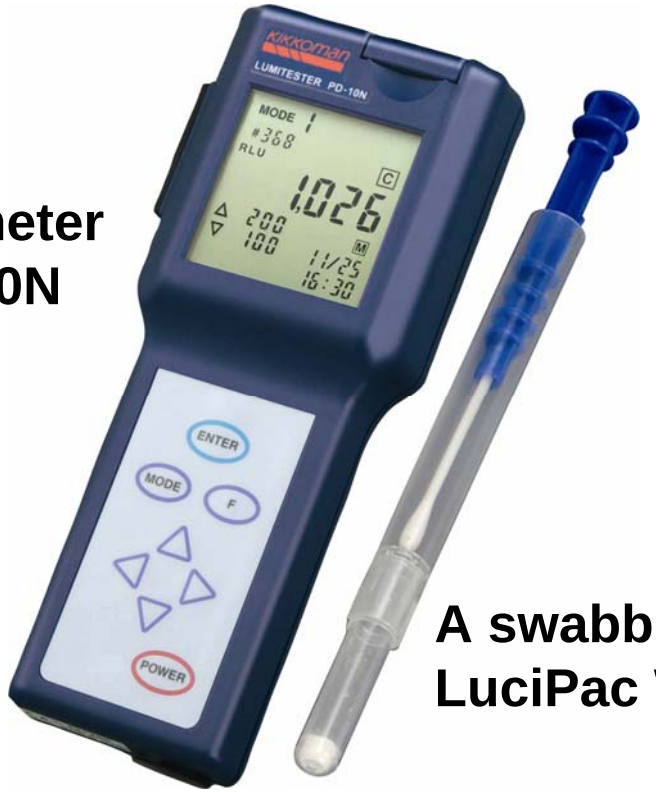
A most reliable indicator of surface cleanliness and cleaning efficacy

Easy, Rapid, Expressing numerically

ATP+AMP assay

which can detect invisible soil or dirt

A portable luminometer
Lumitester PD－10N



A swabbing and dipping device
LuciPac W

Cleaning is the most important at hospitals from different points of view

Hand hygiene

Environmental hygiene

Reusable medical instrument and devices

Everyone knows that cleaning is the most important

→ So everyone dose cleaning

But after cleaning, how do you know whether the cleaning has been really done???

They looks clean…..
But from the beginning, some of them were already clean visually…..

“Visually clean” means really clean???

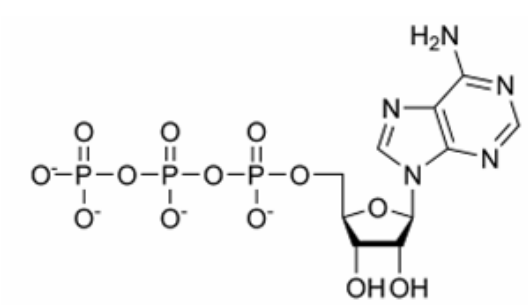
Yes, ATP+AMP assay can show cleaning efficacy

- detects all kinds of soil
  including microorganism contamination
- ultra sensitive
  – no comparison with visual inspection
- rapid
- easy
- expressing numerically

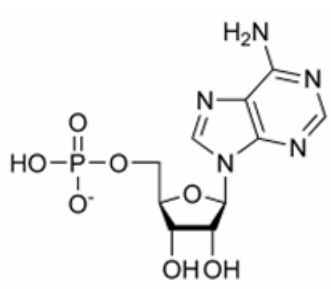
Why ATP+AMP assay can detect soil?

First of all, what is ATP+AMP assay?

→quantitative analysis of ATP(adenosine triphosphate
and AMP(adenosine monophosphate)



ATP



AMP

Why can the quantitative analysis of ATP and AMP indicate cleaning efficacy?

ATP and AMP

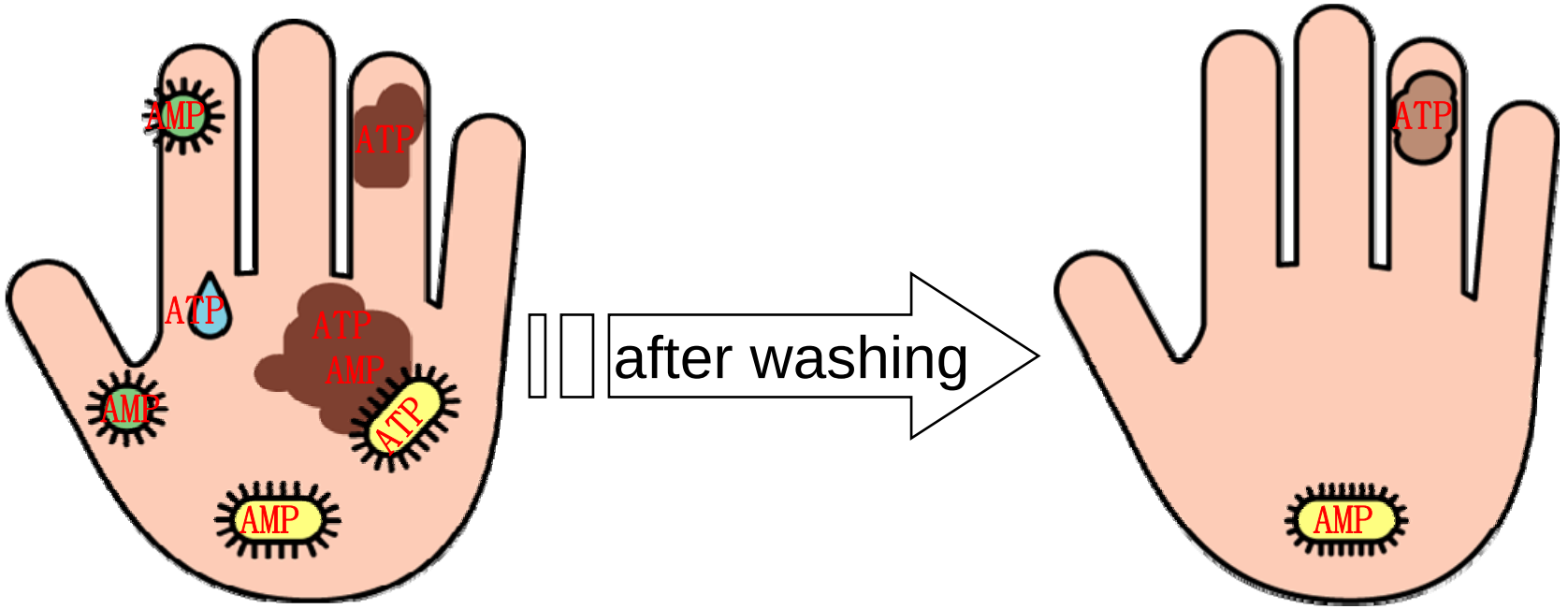
- are included in all kinds of soil of hospital
- are not included in clean water

→ATP and AMP is the most practical index for cleaning

→ATP+AMP assay reveals that your cleaning has been done (or not).

Soils of hospital : blood, lymph, digestive juice, saliva, sweat, dirt, tissue, excrement, microorganisms, etc.

In case of hand hygiene



many soils, dirt or microorganisms

‖

many ATP and AMP

fewer soils, dirt or microorganisms

‖

fewer ATP and AMP
（washed properly）

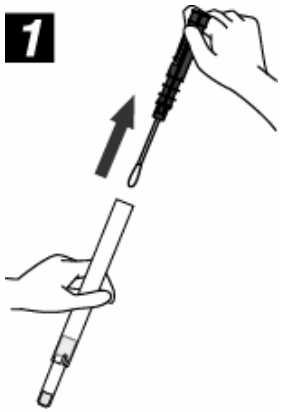
How to use

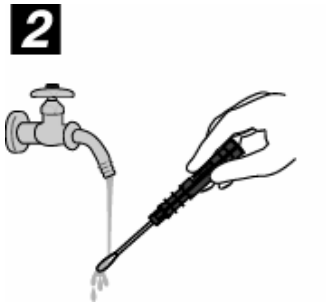
Anyone can does it easily anywhere anytime

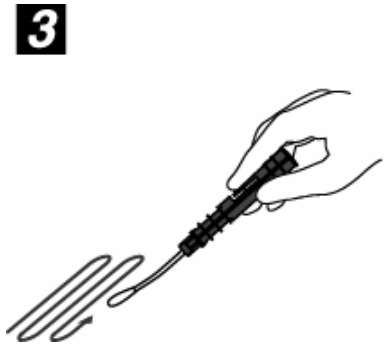
swab the surface of a test object

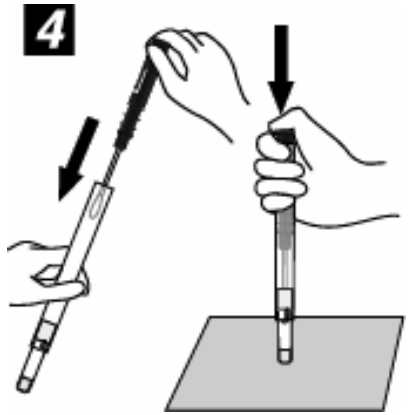
measure with Lumitester
（The result comes within 10 sec.
）

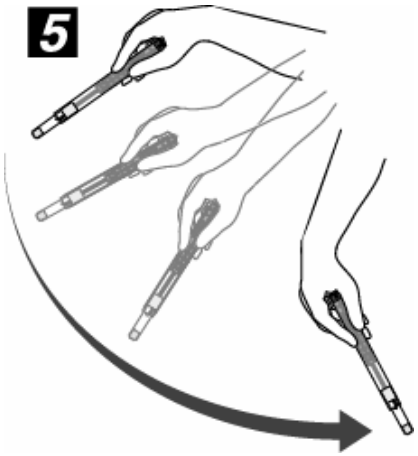
How to use

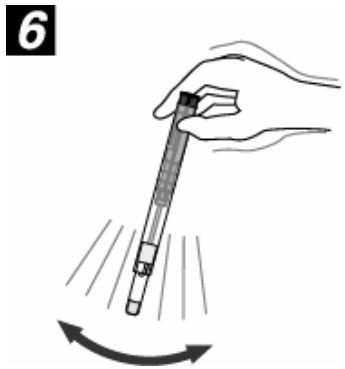








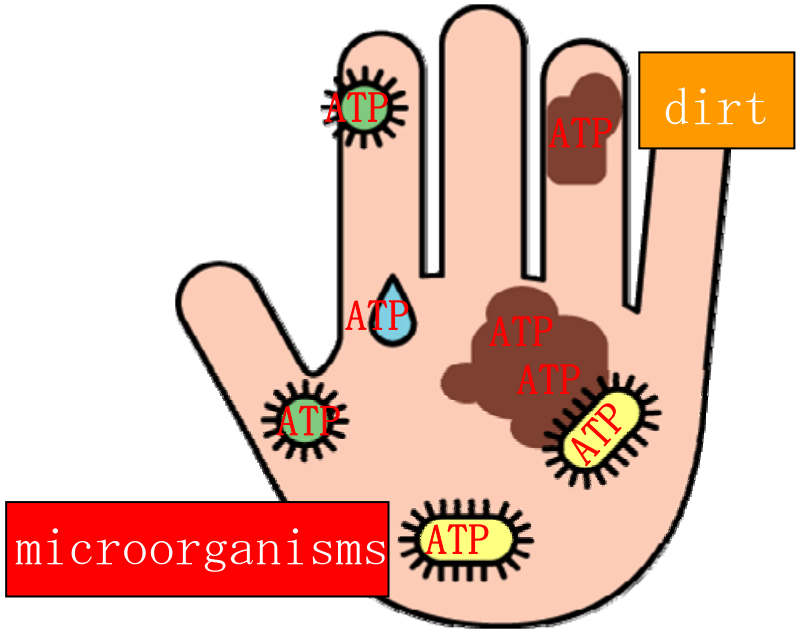




ATP+AMP assay is useful and effective in many cases

1. Education of hand hygiene
2. Environmental inspection
3. Checking cleanness of surgical instruments
4. Checking cleanness of endoscope
5. Checking cleanness of cooking instruments

1. Education of hand hygiene



There are a lot of dirt and microorganisms on the surface of hands

First, infection control starts from hand hygiene

1. as an effective tool for education

- measure the surface of hands before hand washing
  →let them know their hands on duty are not so clean
- hand washing lesson
- measure again (the value should be lower)

→let them know hand hygiene is very important
→the hand hygiene lesson is done in about 15 min.
(stamp method takes 2 days at least)

2. Environmental inspection

Environment cleansing is very important to prevent person to person infection

→ Anyone can does it easily anywhere anytime






3. Checking cleanness of surgical instruments

ATP assay is filed on the guideline for cleaning of surgical instrument, published by Japanese society of medical instrumentation

3. Checking cleanness of surgical instruments

Evaluation methods

Direct method

- visual
- protein assay
- ATP + AMP assay

advantage :
easy
high sensitive
rapid
expressing numerically
re-washing is not needed

Indirect method

- indicator （test soil plate）

3. Checking cleanness of surgical instruments

A question : How we set a benchmark?

Study 1　with a digital microscope

A digital microscope / KEYENCE corp. product No. VH-8000

Method

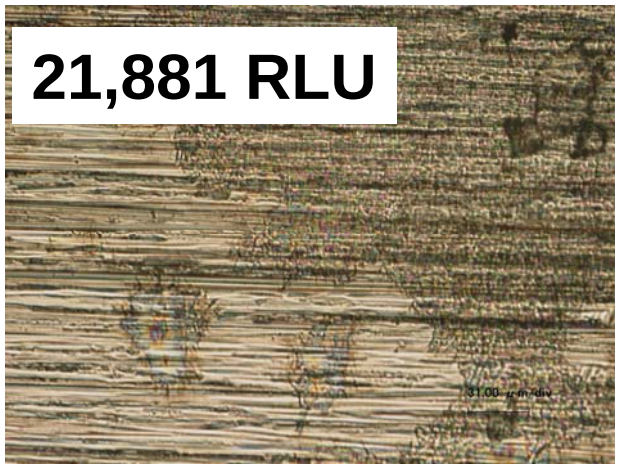
1. Cleaned stainless steel plate
   →photo by microscope→ATP+AMP assay
2. Apply blood on the stainless steel plate
   →ditto
3. Cleaning with 10 sec. ultrasonication
   →ditto
4. Cleaning with furthermore10 sec.(total 20 sec.) ultrasonication
   →ditto
5. Cleaning with furthermore20 sec.(total 40 sec.) ultrasonication
   →ditto

※ microscope : X 3,000
swabbing area 15mm × 55mm （back and forth 5 times）

original stainless steel

after blood applying

after 10 sec. ultrasonication



after 20 sec. ultrasonication

after 40 sec. ultrasonication

3. Checking cleanness of surgical instruments

Study 2　with a washer disinfector

Method

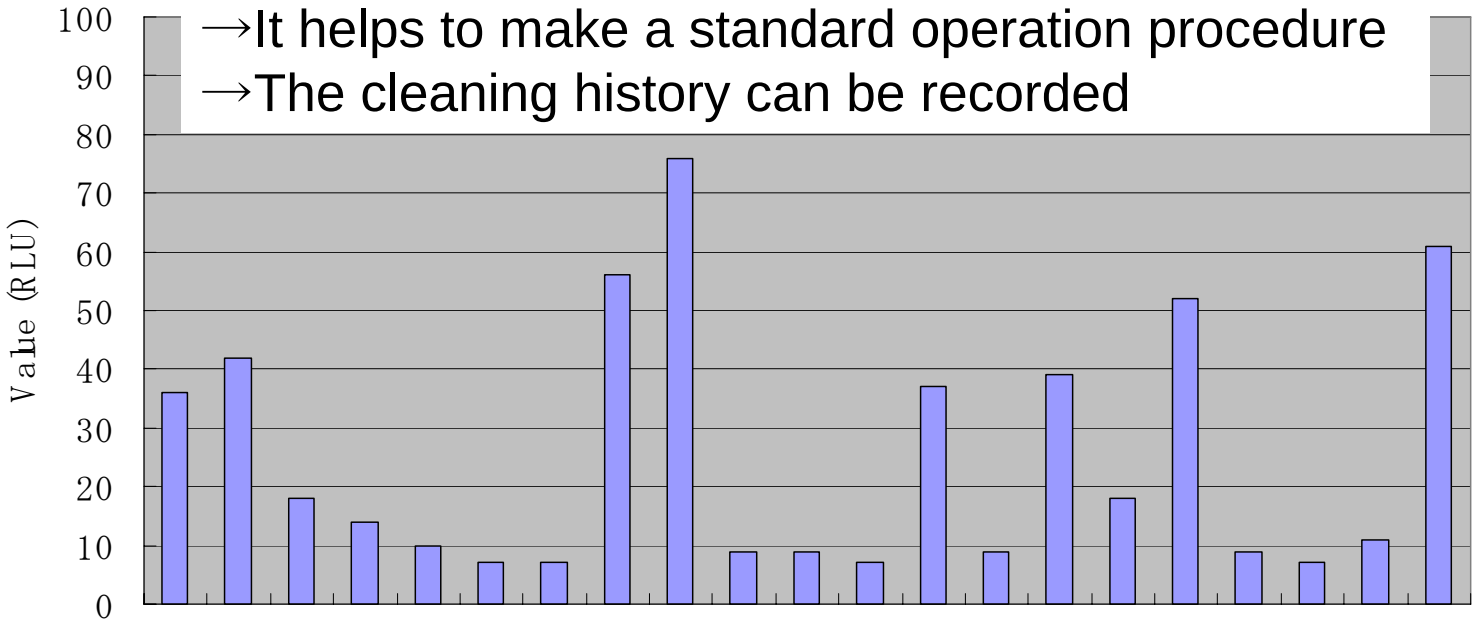
After a surgery
We washed a variety of surgical instruments with a washer disinfector at a hospital
(an indirect indicator <test soil plate> showed the washer disinfector worked properly)
We did ATP+AMP assay

Result

All of the surgical instruments showed less than 100 RLU.

Some other studies are on going.
At the moment, we suggest 100 RLU as the benchmark for surgical instruments.

expressing numerically
→It helps to make a standard operation procedure
→The cleaning history can be recorded



a variety of surgical instruments

4. Checking cleanness of endoscope

The results come within a minute.

→even if the result shows that the endoscope is not clean, the operator can decide to wash it again, and it minimizes a risk of infection.



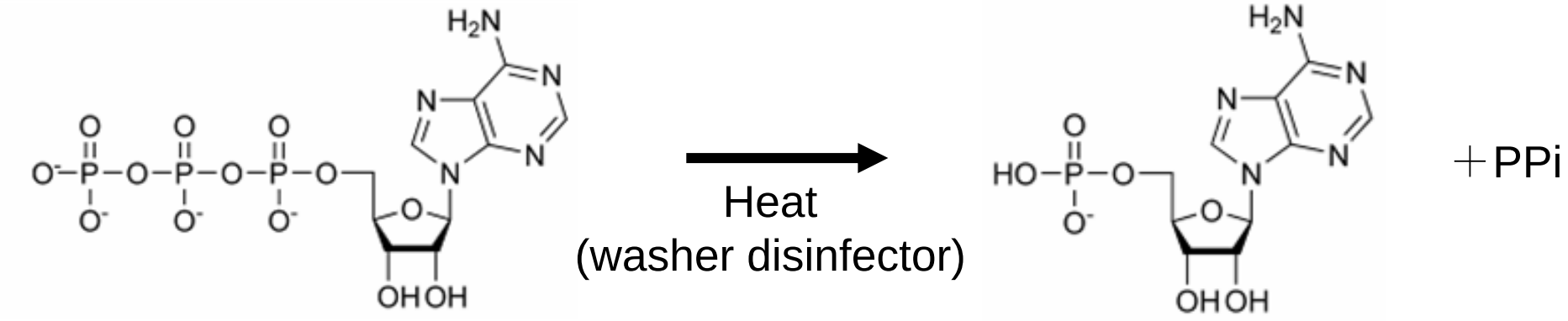
5. Checking cleanness of cocking instruments

ATP assay is filed on the guideline for food hygiene test methods, supervised by the Japanese Ministry of Health and Welfare.

Kikkoman PD-10N and LuciPac W has already been adopted by Japanese health centers, Japan food hygiene association, Japan school meal association, food processing factories, restaurants, hotels, etc.

appendix

ATP is decomposed by heat treatment into AMP



ATP AMP

Detecting both ATP and AMP is very important from technical point of view

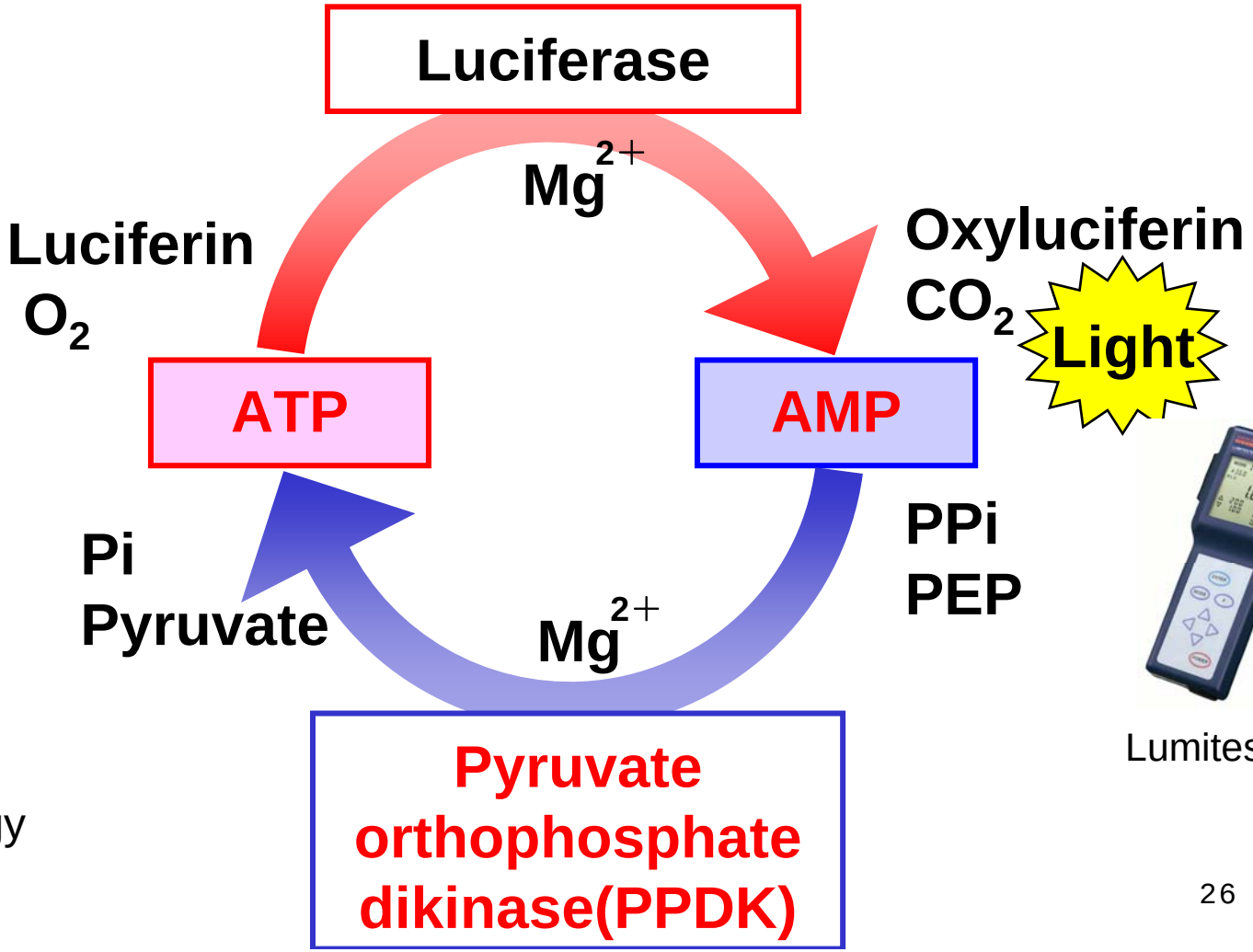
→ Yes, Kikkoman can

→ No, other competitors cannot

Principle of ATP+AMP assay

ATP and AMP are measured by two enzymes, Luciferase and PPDK. ATP and AMP are converted into light finally. The Lumitester detects an intensity of light.

LuciPac W

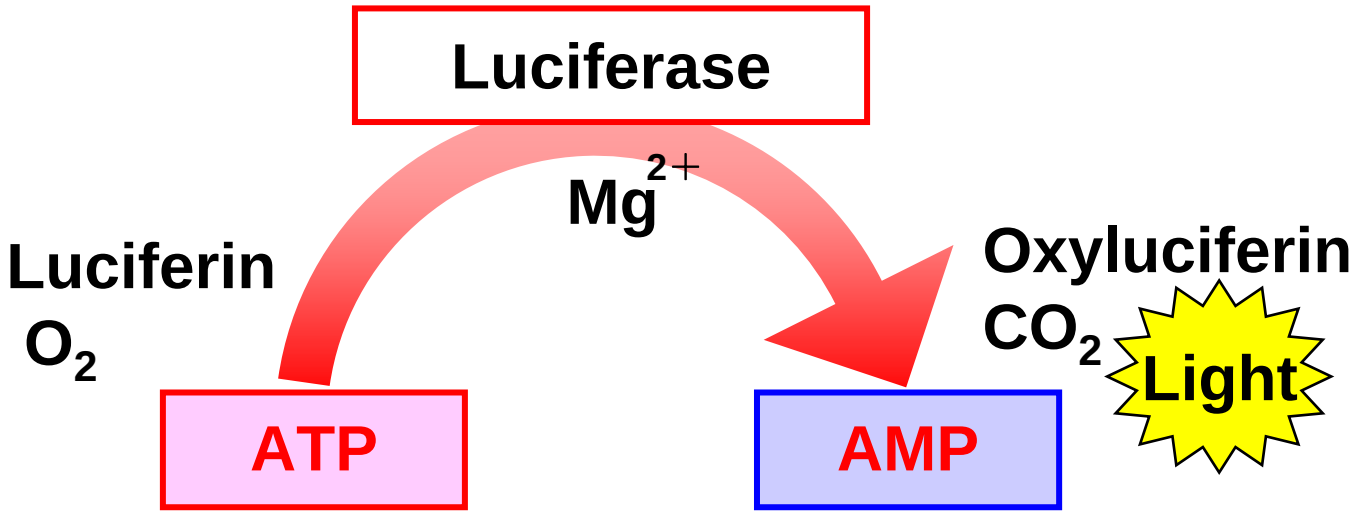


Lumitester

Patented technology

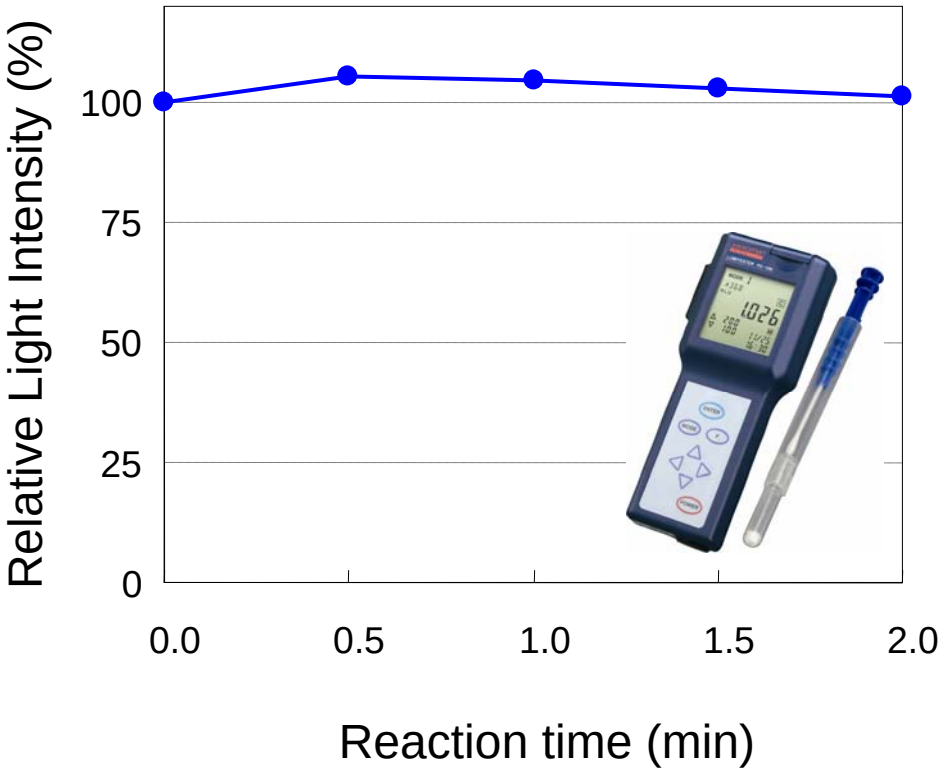
Other competitors

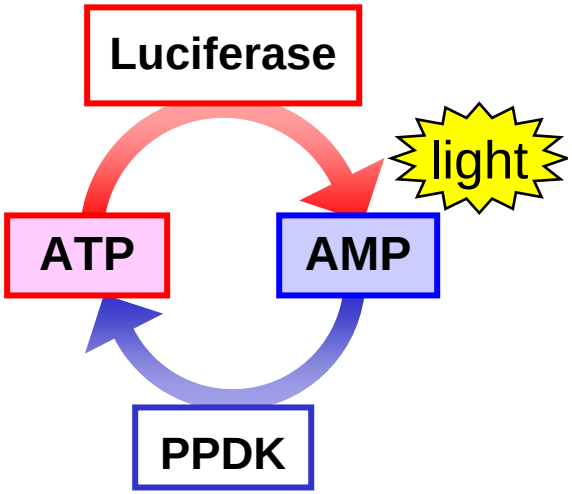
Theirs detect only ATP



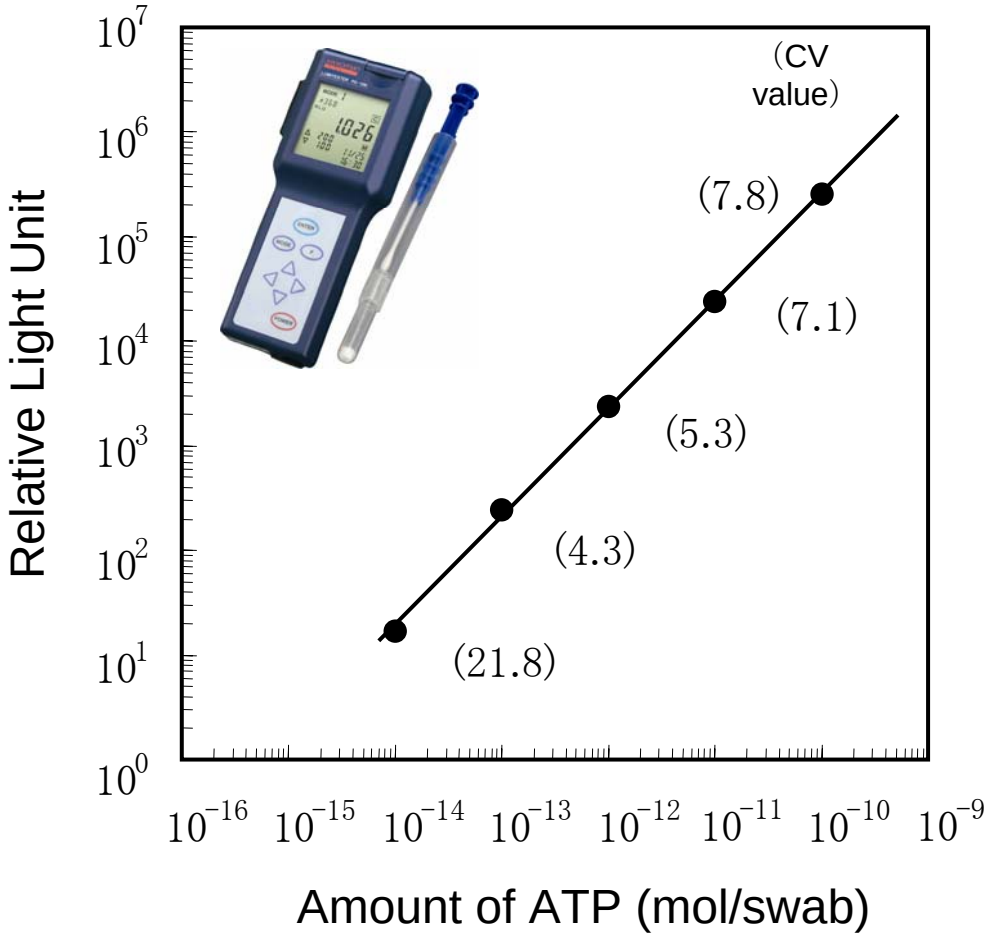
Cycling assay system by two enzymes

It leads stable light emission
→reliable value





Standard curve



good linearity
→precise assay

wide dynamic range
→good adaptability

10^{-15} assay
→superior sensitivity

Lumitester PD-10N

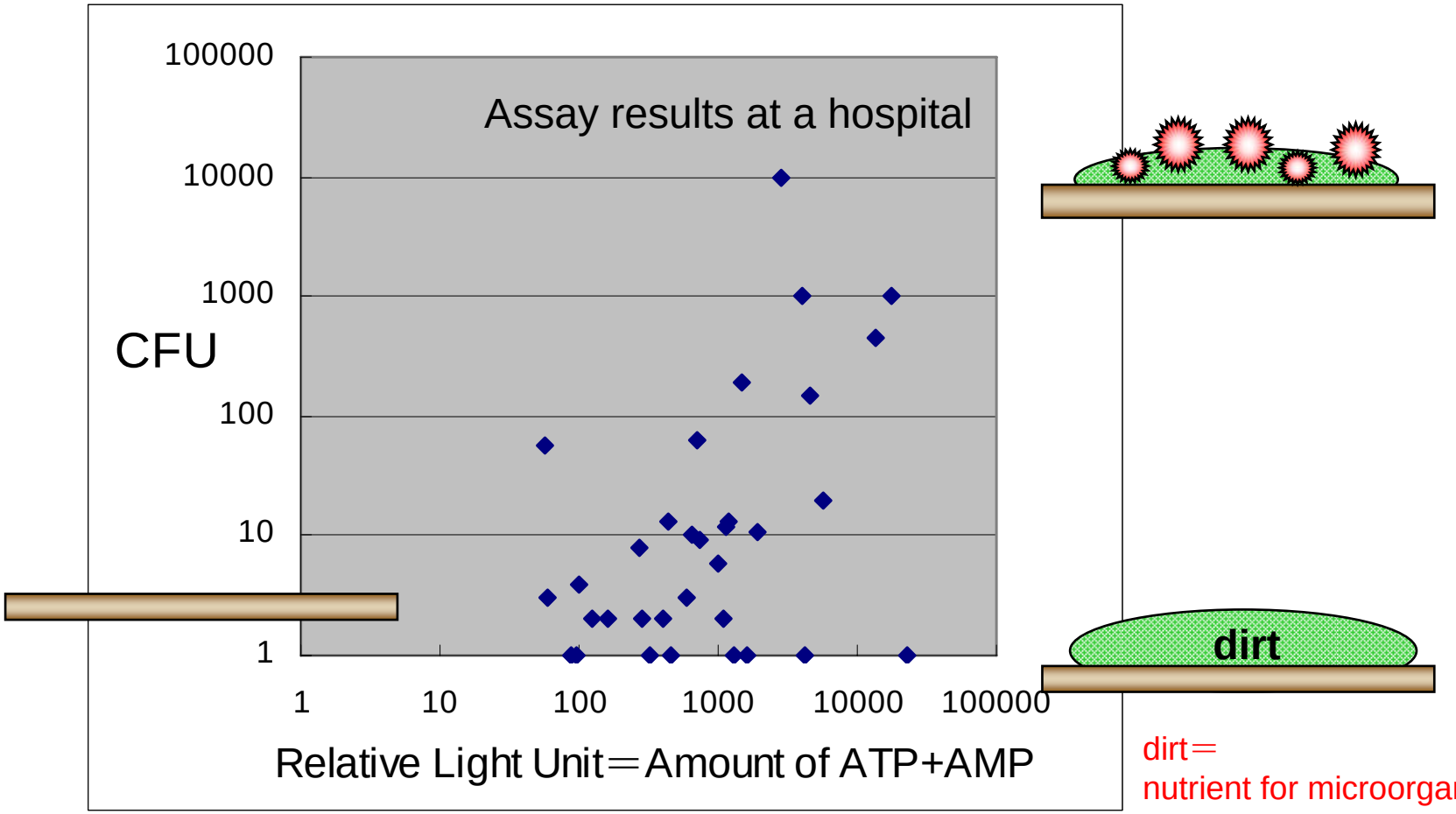
Auto-judgement（A, B or C）

Result (cleanness index)

Preset benchmark

Assay results can be transferred to PC.

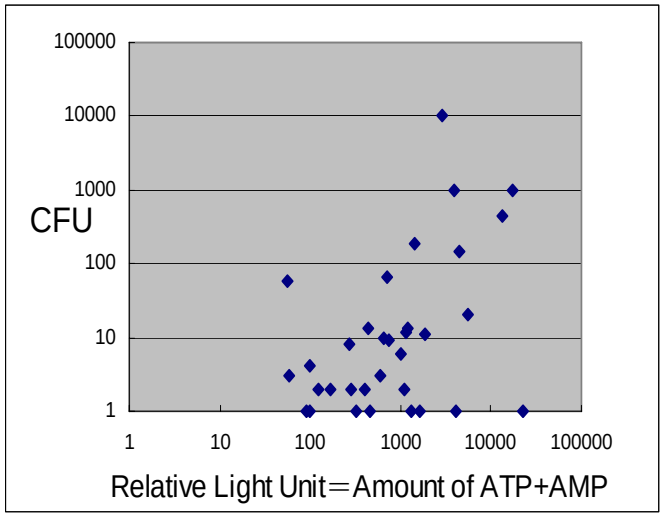
Relationship between amount of ATP+AMP and amount of microorganisms



dirt＝
nutrient for microorganisms

CFU dose not shows its cleaning efficacy

Relationship between amount of ATP+AMP and amount of microorganisms



- No relationship between amount of ATP+AMP and amount of microorganisms
  →assay objects are different

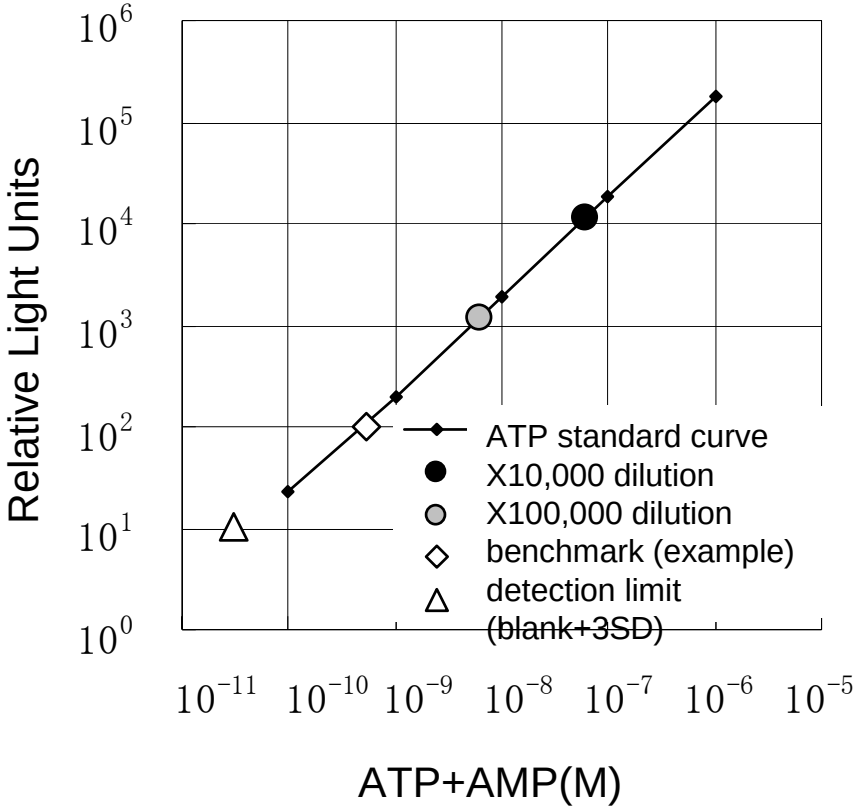
- CFU dose not shows cleaning efficacy
  →Fewer CFU dose not mean cleanliness

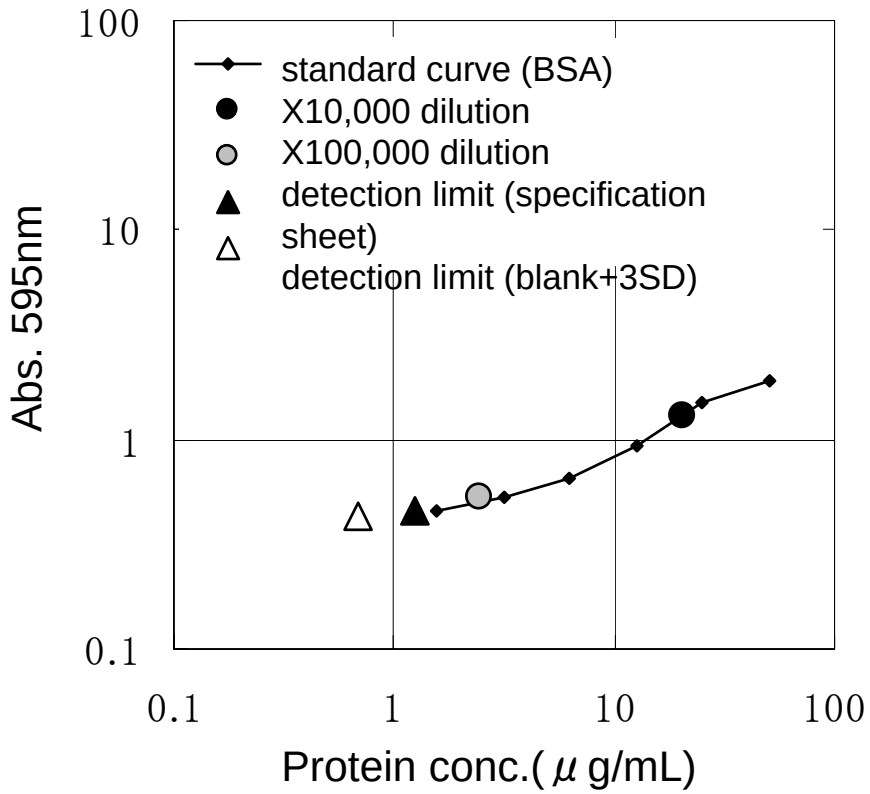
- Fewer ATP+AMP means fewer CFU
  →Microorganisms can not germ in the fewer ATP+AMP condition

(CFU takes 1 or 2 days to get results. ATP+AMP assay takes only a minute)

ATP+AMP assay versus Protein assay from sensitivity point of view

Sample : blood





ATP+AMP assay has 69 times higher sensitivity rather than Protein assay (blank+3SD)