kikkoman

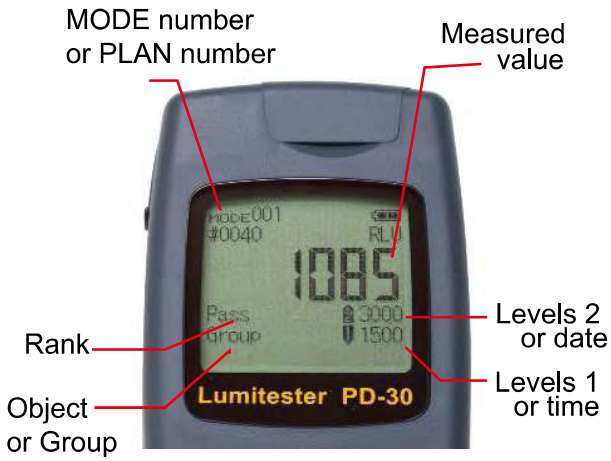
ATP+AMP surface hygiene monitoring

～Application manual for food and beverage industries～

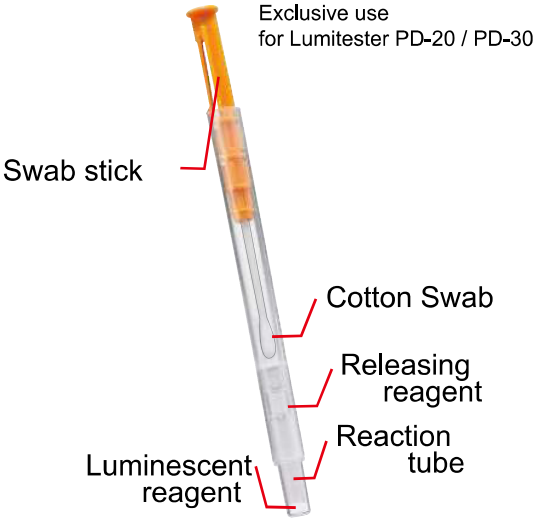
A majority of food poisoning incidents are caused by cross-contamination due to ineffective or improper cleaning. ATP+AMP hygiene monitoring is a convenient test method for quickly measuring the degree of cleanliness on site. This provides an excellent tool for hygiene training and cleanliness control to prevent food poisoning.

Reagents and instrument required

Lumitester PD-30



LuciPac Pen



Make sure the swab stick is orange.

Features of ATP+AMP surface hygiene monitoring

1. Rapid

The results are available immediately!

Conventional Method (culture method) →

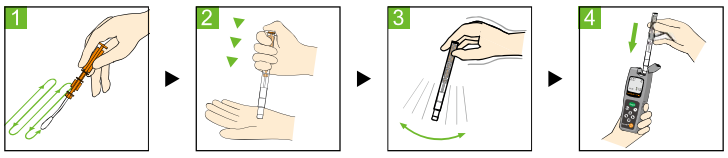
Time required
1 to 2 days

ATP+AMP method →

Time required
30 seconds
(including measuring time of 10 seconds)

Occurrence of food poisoning arising from short cleaning in food manufacturing site can be prevented.

2. Simple



Swab. ▸ Push. ▸ Shake well. ▸ Measure with PD-30 for 10 seconds.

3. Numerical

- Results are displayed numerically as RLU (Relative Light Unit).
- Collected data can be transfered to PC easily and used to analyse from various aspects.

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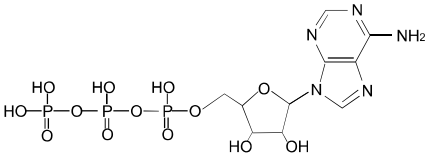
Principle of ATP plus AMP detection

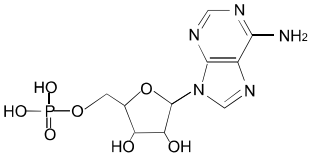
What is ATP? What is AMP?

ATP (adenosine triphosphate) is the primary molecule involved in metabolism in all living organisms. AMP (adenosine monophosphate) is derived from ATP during the processing, such as heat treatment and fermentation.

ATP
(adenosine triphosphate)



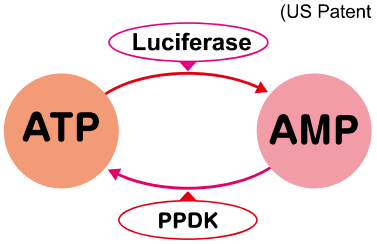
AMP
(adenosine monophosphate)



ATP cycling method

Kikkoman has created a method using the ATP regeneration enzyme PPDK to measure both ATP and AMP as part of the ATP cycle.This method provides enhanced sensitivity.

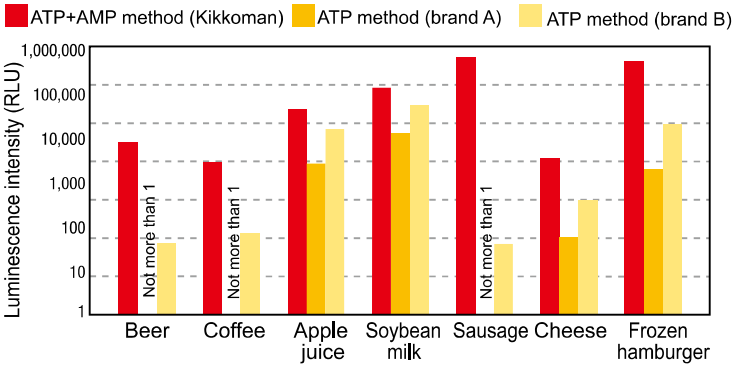
(US Patent No. 5891659).



＊PPDK・・・Pyruvate orthophosphate dikinase

Achievement of super-high sensitivity with both ATP and AMP detection

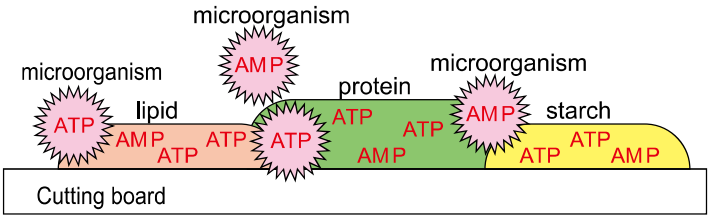
Measurement examples of various kinds of food residues



Measurable even with food residues containing little ATP, such as beer and sausage.

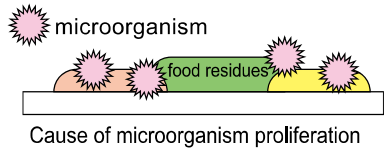
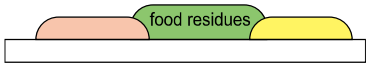
Object to be measured

In ATP+AMP hygiene monitoring, the degree of contaminant is measured using as total ATP+AMP, which microorganisms and food residues have. ATP+AMP is present in microorganisms, food residues, etc. and as such is an excellent indicator of biological contamination.



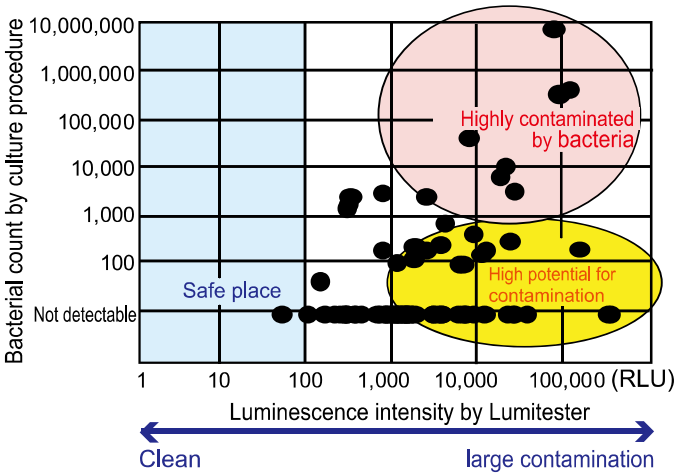
What is the clean state?

Difference in risk perception

ATP+AMP method CONCLUSION	Cutting board contamination condition	Conventional method (culture procedure) CONCLUSION
Contaminated	 Cause of microorganism proliferation	Contaminated
Contaminated Potential risk of microorganism proliferation is able to be detected.	 Defective cleaning condition	No contamination Possibility of overlooking potential risk of microorganism proliferation
No contamination	 Both cleaning and disinfection are OK.	No contamination

When food residue is present, there is a possibility for microorganisms to proliferate quickly. The conventional culture procedure can detect microorganisms but the ATP+AMP method also detects food residues. Consequently, ineffective cleaning can be accurately determined.

Correlation between bacterial counts and ATP+AMP level



Let's achive a clean condition (lower luminescence intensity) free of microorganisms and food residue .

Operation example of ATP+AMP hygiene monitoring

Establish test locations

Test locations should be established at the following points:

- Areas difficult to wash and easy for contaminants to remain.
- Areas where not only cleaning but also disinfection and sterilization are conducted.
- Areas in contact with ready to eat foods.
- Areas at risk of cross-contamination, such as hands and fingers of employees. etc.

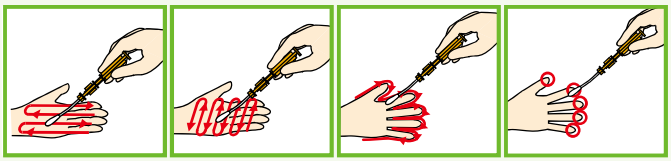
Establish benchmark values

Set the benchmark value as 200 RLU for flat and smooth surfaces (metal, glass, etc.) and 500 RLU for things with surface irregularities and susceptible to scratches (plastic products, etc.).

〈Note〉
- These recommended values are not always applicable to any locations. The goal is to set reasonable targets that can be met with rigorous testing and proper cleaning.
- Decide a swabbing method in accordance with the material and shape of the location to be examined and implement.

Example

〈Hands and fingers〉Swab every direction of the palm, between fingers, fingertips, etc. The pass and fail levels are 1500 RLU and 3000 RLU, respectively.



〈Kitchen〉

Portions for the test	Pass (RLU)	Fail (RLU)	Swabbing method
Cutting board	500	1000	10 cm square around the center
Colander and bowl	200	400	10 cm square of the center bottom portion and top end portion of the inside
Kitchen counter	200	400	10 cm squares at five points on the surface
Knife	200	400	Both overall blade surfaces, joint between handle and blade
Stainless vat	200	400	Corners where contaminants are likely to remain.
Round pot	200	400	Three inside areas (bottom, middle stand, upper stand)
Refrigerator (handle)	200	400	Inside and outside of the overall handle
Refrigerator (inside)	500	1000	All directions of 10 cm square at the shelf center

〈Manufacturing line〉 Valve portions and joints where contaminants are likely to remain.

〈Environmental inspection〉High-frequency contact locations such as telephone sets, door knobs, keyboards and mice of personal computers, etc.

Establish analysis schedule

Conduct the test after cleaning and before disinfection and sterilization.

(Conducting the test while foods are being handled will not result in correct conclusion.)

Operation exmple

The table below provides an example of operational for hygiene control at each location.

Tested places	Pass/Fail levels (RLU) Lavel 1	Lavel 2	First measurement		Improvement measures	Second measurement	
Hands and fingers	1,500	3,000	2,412	Caution	Re-cleaning	1,323	Pass
Cutting board	500	1,000	760	Caution	Re-cleaning	349	Pass
Bowl	200	400	174	Passed			
Kitchen counter	200	400	130	Passed			
Vat	200	400	44	Passed			
Refrigerator handle	200	400	820	Failed	Re-cleaning	101	Pass

Setting of Pass/Fail criteria

Not more than level 1	- Pass
More than fail level 2	- Fail
Between level 1 and level 2	- Caution

Procedures for swab test

Preparation

LuciPac Pen

Remove LuciPac Pen from a refrigerator (2-8C) and allow it to reach room temperature.

*Measuring with the LuciPac Pen while it is still cold does not produce correct measurement results.

Lumitester PD-30

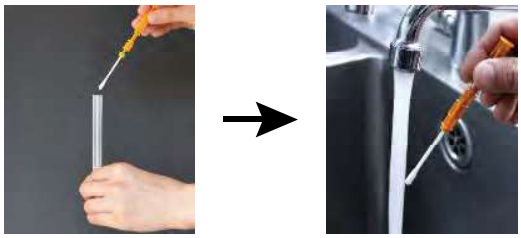
Press “POWER ⏻ ” key to turn ON. After counting down 8 seconds, Lumitester PD-30 is ready to measure.

Use two AA alkaline batteries or two AA nickel metal-hydride batteries. When battery indicator displayed exhaustion sign, turn off the power and replace batteries.

Swabbing

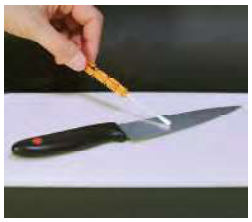
1 Pull out a cotton swab stick (orange) and moisten a swab with tap water.

In the event that the surface to be swabbed is wet with water, the swab does not need to be pre-moistened.



2 Swab the object to be tested.

See page 3 for the swabbing method.



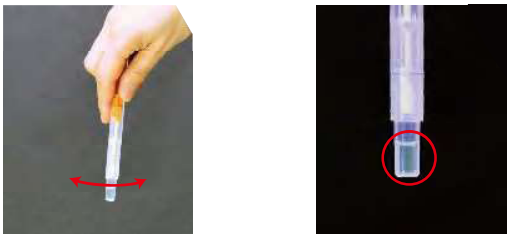
*In the event that alcohol or other disinfectants remain on the surface to be swabbed, results may not be accurate.It is recommended to carry out the test after washing and before using disinfectants. If the test is conducted after using disinfectants, rinse the surface with water or wipe with paper towel, and conduct the test.

3 Put the swab stick back into the main body and push it through all the way.

When pushing it to the main body, take care not to get your finger caught in. Pressing the bottom by hand or against a table helps you push it in more easily.

4 Shake off LuciPac Pen to drop the releasing reagent to the bottom of the reaction tube and dissolve the luminescent reagent.

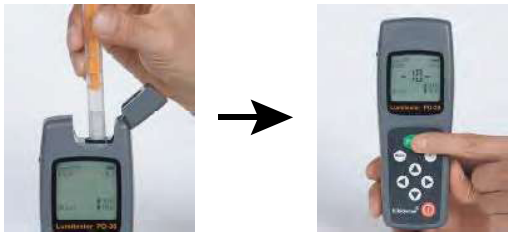
*Make sure all liquid in the capsule falls into the reaction tube.



Measurement

5 Insert LuciPac Pen to the measurement chamber of Lumitester PD-30.

6 Press the “ENTER ENTER ” key of Lumitester PD-30 to start measurement. In 10 seconds, the measurement result is displayed.



*Use the case to stand it if possible. If the stand is not used, do not incline the device more than 60 degrees.

⚠ Upon completion of measurement, be sure to remove LuciPac Pen from Lumitester PD-30. Leaving LuciPac Pen inserted in Lumitester may cause problems resulting from liquid leakage, etc.

After measurement

Dispose of used LuciPac Pen in conformity to regulations of local government.

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