

การพัฒนาใช้ ATP Bioluminescence ตรวจสอบความสะอาดของภาชนะใส่อาหารในสถานที่ ประกอบอาหารผู้ป่วยในโรงพยาบาล

Adenosine triphosphate (ATP) Bioluminescence for hygiene monitoring of utensils used in hospital's kitchens

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Rational ATP bioluminescence is a technique used to measure the cleanliness of a surface. It measures the amount of Adenosine triphosphate (ATP) which is an energy source of all living organisms such as plants, animals and microbial biomass. The ATP collected from a surface reacts with Luciferin/Luciferase compounds present in the sample swab to create bioluminescence light. The amount of bioluminescence light is measured by the Luminometer and is expressed in Relative Light Units (RLU). RLU numbers are directly proportional to the amount of ATP, and therefore the amount of organic/food residue or microbial biomass on the sampled surface. This method provides a rapid and actual estimation cleanliness of the surfaces, which includes dirt or filth or microbial contamination. However, the luminometric results cannot be directly converted to the number of microorganisms. Therefore, it is necessary to establish acceptable limits before the ATP test is applied. In this study, we focussed on the utensils used in the hospital kitchens because the patients are more vulnerable than normal people. If they have got more illness from food-borne diseases caused by contaminated food in the hospital, it will lead to more serious illness or even death.

Objectives:

1. To assess effectiveness of cleaning systems of utensils used in the hospital kitchens
2. To set up cleanliness standard of the utensils used in the hospital kitchens

Methods

1. Selected the target hospitals which have achieved the GREEN and CLEAN standard or the hospitals that have food sanitation certification for hospital's kitchen.
2. Set up a sampling plan to collect the samples by using ATP luminometer
3. Collect the samples at the same times (after washing the utensils used for breakfast and before serving lunch or after washing the utensil used for lunch and before serving dinner) every consecutive day for 5 days
4. Swabbing methods:
 - a. use 1 swab for 1 utensil
 - b. select the utensils used for patients: stainless tray, stainless bowl, ceramic bowl, melamine tray, spoon, & fork (5 pieces for each utensil for 1 utensil)
 - c. swabbing area: 10x10 cm. (mostly contacted with food)
5. The ATP results were recorded and analysed using descriptive statistics.

Results

The samples of utensils were collected from five hospitals; two hospitals in Nontaburi province, the others from Pisanulok, Ratchaburi and Rayong provinces. The ATP results (RLU) of the utensil samples are in table 1.

Table 1 The ATP (RLU) collected from the utensil samples used in five hospitals.

Utensil types	No. samples (piece)	Average ATP (RLU) per piece	Standard ATP (RLU)
Stainless tray	83	68.86	150
Stainless bowl	60	126.83	150
Ceramic bowl	59	112.14	150
Melamine tray	55	67.30	150
Stainless spoon	25	219.76	150
Stainless fork	25	146.60	150
Stainless spoon-fork (pair)	44	144.68	150
Total	351		

Conclusion & suggestions

The results showed that most of the utensils except stainless spoon had lower ATP values than the standard value of the clean utensil (150 RLU). However, the ATP values varied according to the type of utensils which can be divided into two groups, the containers (bowl and tray) and the apparatus (spoon & fork). The containers had lower ATP than the apparatus when compared 67-126 RLU from bowls and trays with 144-219 RLU from spoons and forks. The highest ATP value was from stainless spoon, which was higher than the standard value. The results demonstrated that cleaning procedure of the utensils in the hospital kitchens was satisfied only with the containers but not the apparatus. According to the results, it is necessary to improve effectiveness of the cleaning procedures either by automatic machine or manual washing for the apparatus which are difficult to clean because of their physical shapes or scratch. The ATP bioluminescence can be used to monitor or verify an effectiveness or quality of cleaning and sanitizing of food contact surfaces to increase the margin of safety as well as reduce contamination of food and risk of foodborne diseases. The lowest ATP were melamine trays, followed by stainless trays, ceramic bowls and stainless bowl. The highest ATP values were stainless spoon, which higher than the standard

This paper will propose steps that can be implemented using current, commercially available technology, to improve the quality and consistency of flexible endoscope cleaning procedures, and. Routine use of cleaning monitors based on detection of adenosine triphosphate (ATP) from residual biological soil can provide real time feedback on the adequacy of the manual cleaning process for each flexible endoscope. This real time feedback can indicate the need for additional cleaning,

ATP reacts with luciferin in the presence of the catalyst -luciferase enzyme, and the effect of this oxidation reaction is emission of light, recorded by a luminometer.

This method is commonly used to test if cleaning requirements are achieved satisfactorily.

- by measuring the amount of adenosine tri-phosphate (ATP) in a sample

Collecting adenosine tri phosphate (ATP) from a contaminated surface in the environment or a surgical instrument is as easy as swabbing with the 3M™ Clean Trace™ ATP Surface Test.

As an integral part of the 3M™ Clean-Trace™ Hygiene Management System, the Clean-Trace Surface Test, uses adenosine tri-phosphate (ATP) luminescence to measure presence of organic matter on a surface in the environment or surgical instrument.