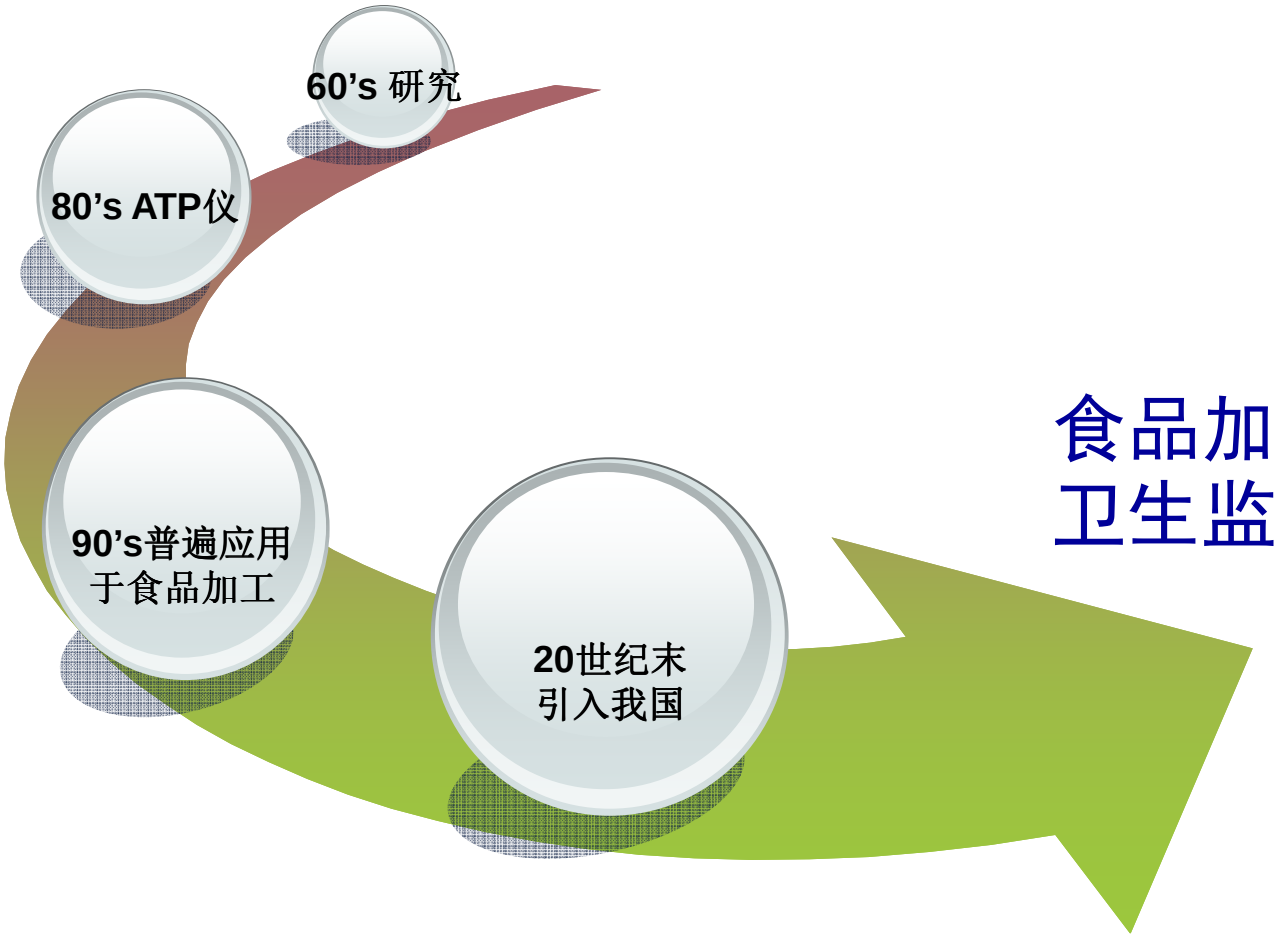
3M™ Clean-Trace™ ATP荧光检测系统

内容

- ATP荧光检测技术的发展及应用
- 为什么要进行ATP检测？
- ATP荧光检测技术的原理
- 如何选择一台优质的ATP？
- 3M™ Clean-Trace™ ATP荧光检测系统的介绍

ATP荧光检测技术的发展



食品加工成熟
卫生监控方法

为什么要进行ATP检测？

方法比较

- 肉眼观测不足以验证清洁状况
- 微生物检测时间慢、繁琐、不准确、检测“无菌”而非“清洁”
- 食品企业需要一种快速可靠的系统来进行卫生检测与管理”

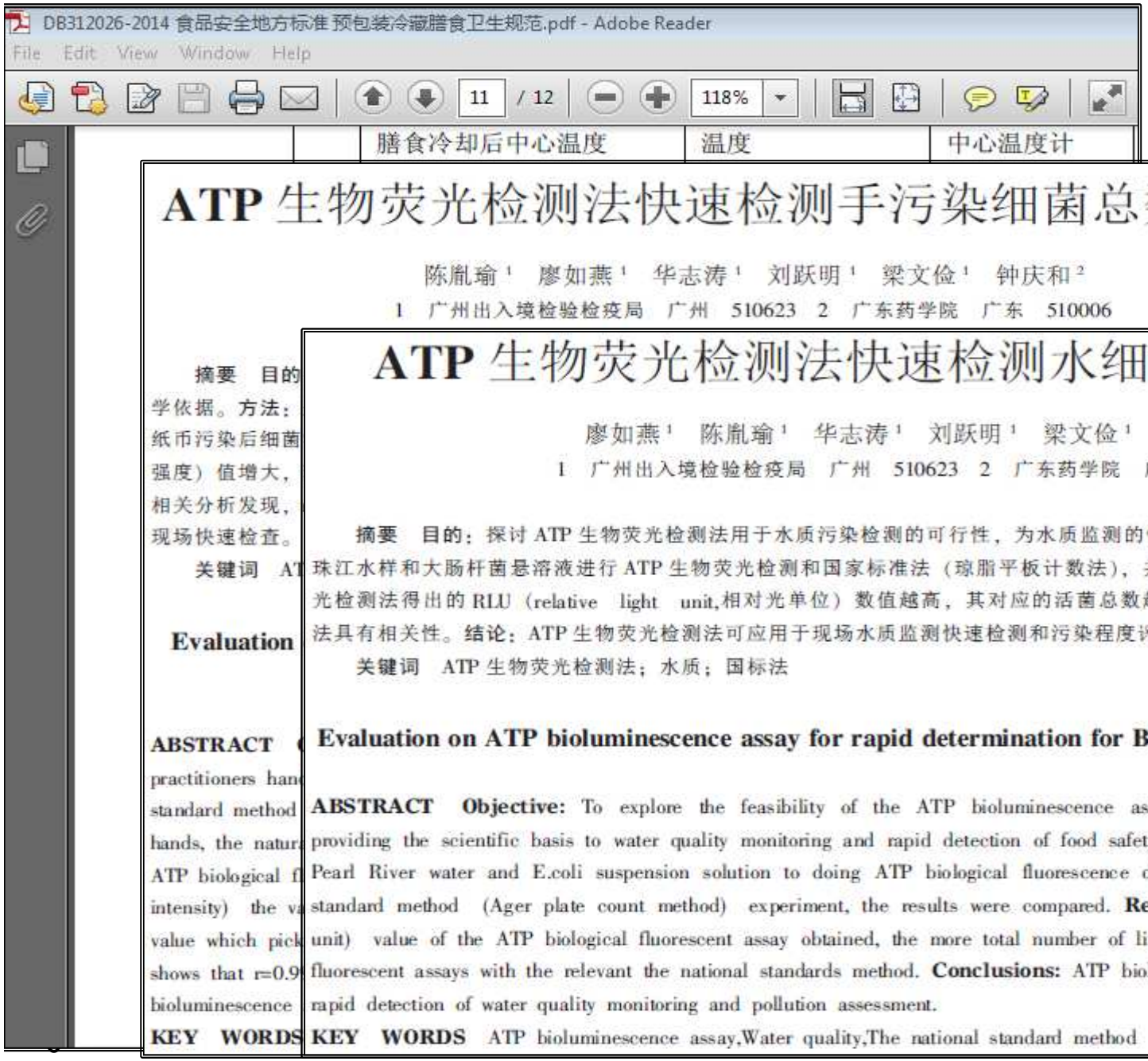
	肉眼检测	微生物检测	ATP 检测
快速	+	--	+
灵敏	--	+	+
定量	--	+	+
检测食品残留	+	--	+
简便性	+	--	+

英国零售商协会(*BRC* British Retail Consortium)

推荐使用ATP方法应用于卫生监控

4.11.23	As a minimum for food contact surfaces and processing equipment ~~I~~limits of acceptable and unacceptable cleaning performance shall be defined This shall be ~~,~~ based on the potential hazards (e.g. microbiological, allergen ~~or~~ foreign body contamination or product to product contamination). Acceptable levels of cleaning may be defined by visual appearance, ATP bioluminescence techniques (see Glossary), microbiological testing or chemical testing as appropriate. Where cleaning procedures are part of a defined pre-requisite plan to control the risk of a specific hazard t~~T~~he cleaning and disinfection procedures and frequency shall be validated and records maintained.
4.11.34	The resources for undertaking cleaning shall be available. Where it is necessary to dismantle equipment for cleaning purposes or to enter large equipment for cleaning, this shall be appropriately scheduled and, where necessary, planned for non-production periods. Cleaning staff shall be adequately trained or engineering support provided where access within equipment is required for cleaning.
4.11.45	The cleanliness of equipment shall be checked before equipment is released back into ~~full~~ production. The results of checks on cleaning, including visual, analytical and microbiological checks, shall be recorded and used to identify trends in cleaning performance and instigate improvements where required.
4.11.56	Cleaning equipment shall be: • hygienically designed and fit for purpose • suitably identified for intended use, e.g. colour coded or labelled • cleaned and stored in a hygienic manner to prevent contamination. Equipment used for cleaning in high-care and high-risk areas shall be visually distinctive and ~~shall be~~ dedicated for use in that area.
4.11.67	**Cleaning in place (CIP)**
4.11.67.1	Cleaning-in-place (CIP) facilities, where used, shall be monitored and maintained to ensure their effective operation.
4.11.67.2	A schematic ~~plan~~ diagram of the layout of the CIP system shall be available. There shall be an inspection report or other ~~verification~~ validation that: • systems are hygienically designed with no dead areas, limited interruptions to flow streams and good system drain ability. • scavenge pumps are operated to ensure that there is no build-up of cleaning fluids in the vessels. • spray balls effectively clean vessels by providing full surface coverage and are periodically inspected for blockages. Rotating spray devices should have a defined operational time.

相关标准、文献



DB312026-2014 食品安全地方标准 预包装冷藏膳食卫生规范.pdf - Adobe Reader

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	膳食冷却后中心温度	温度	中心温度计

ATP 生物荧光检测法快速检测手污染细菌总数的评价

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1 广州出入境检验检疫局 广州 510623 2 广东药学院 广东 510006

摘要 目的

学依据。方法：

纸币污染后细菌

强度）值增大，

相关分析发现，

现场快速检查。

关键词 AT

Evaluation

ABSTRACT

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standard method

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ATP biological f

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bioluminescence

KEY WORDS

ATP 生物荧光检测法快速检测水细菌污染的评价

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1 广州出入境检验检疫局 广州 510623 2 广东药学院 广东 510006

摘要 **目的**：探讨 ATP 生物荧光检测法用于水质污染检测的可行性，为水质监测的快速检测提供科学依据。**方法**：同时对珠江水样和大肠杆菌悬溶液进行 ATP 生物荧光检测和国家标准法（琼脂平板计数法），并将结果进行比较。**结果**：ATP 生物荧光检测法得出的 RLU（relative light unit,相对光单位）数值越高，其对应的活菌总数越多，ATP 生物荧光检测法与国家标准法具有相关性。**结论**：ATP 生物荧光检测法可应用于现场水质监测快速检测和污染程度评估。

关键词 ATP 生物荧光检测法；水质；国标法

Evaluation on ATP bioluminescence assay for rapid determination for Bacterial contamination of water

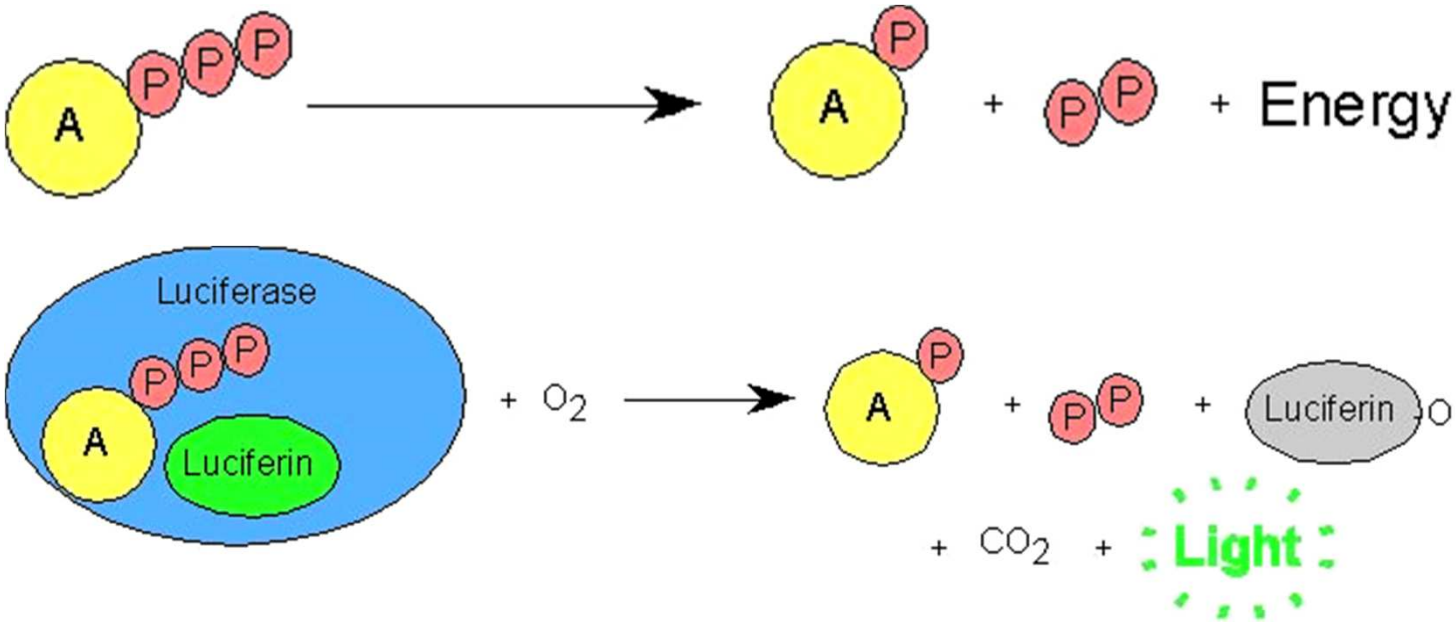
ABSTRACT **Objective:** To explore the feasibility of the ATP bioluminescence assay for water pollution detection, and providing the scientific basis to water quality monitoring and rapid detection of food safety. **Methods:** At the same time on the Pearl River water and E.coli suspension solution to doing ATP biological fluorescence detection experiment and doing national standard method (Ager plate count method) experiment, the results were compared. **Results:** The higher RLU (relative light unit) value of the ATP biological fluorescent assay obtained, the more total number of live bacteria have, so the ATP biological fluorescent assays with the relevant the national standards method. **Conclusions:** ATP bioluminescence assay can be used on-site rapid detection of water quality monitoring and pollution assessment.

KEY WORDS ATP bioluminescence assay,Water quality,The national standard method

ATP检测原理 — 生物荧光

荧光素(Luciferin) / 荧光素酶(Luciferase)

ATP通过脱去磷酸基来释放能量



荧光素获得ATP释放的能量后发光

ATP 主要来源

微生物

- 细菌
- 酵母 & 霉菌

人员!!

食品

- 水果
- 乳制品
- 蔬菜
- 肉类
- ...等

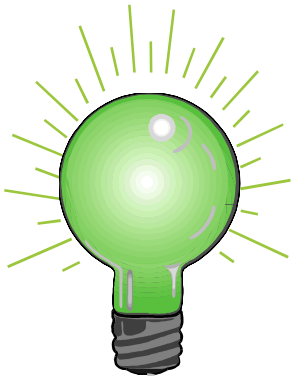
所有生物细胞均含有ATP

ATP = 食品残渣/微生物存在

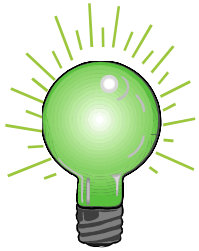
细菌类	mol/cell
Escherichia coli (埃希氏菌属大肠杆菌)	1.4×10^{-18}
Staphylococcus xylous (葡萄球菌)	2.0×10^{-18}
Bucillus subtilis	2.3×10^{-18}
Lactobacillus brevis (乳酸菌)	1.9×10^{-18}
真菌类	**mol/cell**
Saccharomyces cerevistae (酵母菌)	1.2×10^{-16}
Zygosaccharomyces rouxii	2.2×10^{-15}
Zygosaccharomyces bailii	1.2×10^{-15}

食品	含有 ATP mol/g	残渣的检出界限
烤鲑	10^{-7}	10 ng
生贝、谷类芽、猪肉、橘汁	10^{-8}	100 ng
豆腐	10^{-9}	1 μg
生菜、金枪鱼生鱼片、猪肉、生乳油	10^{-10}	10 μg
牛乳、海苔、面包	10^{-11}	100 μg
果酱、米饭	10^{-12}	1 mg

ATP与食物和微生物的关系



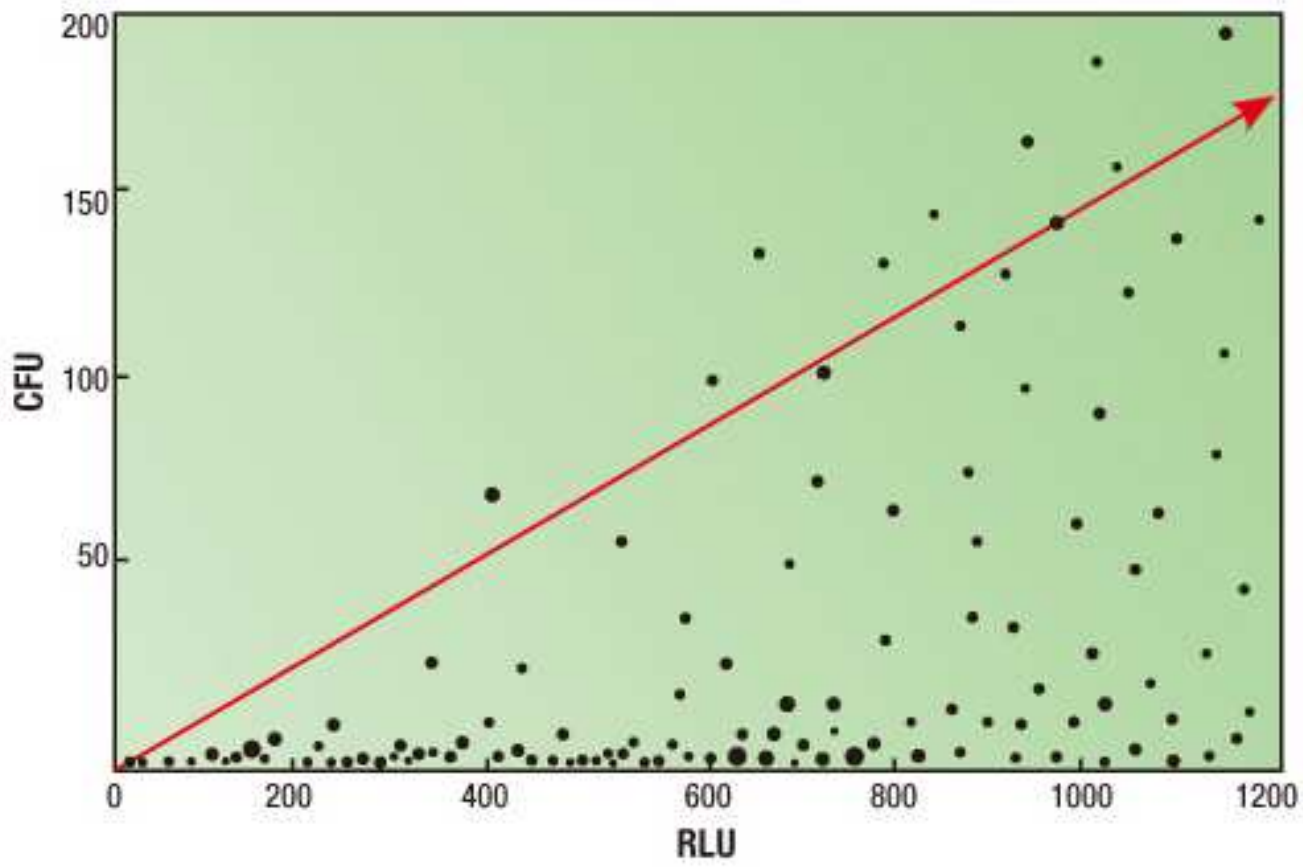
发光强度 (RLU)



ATP 水平的增加

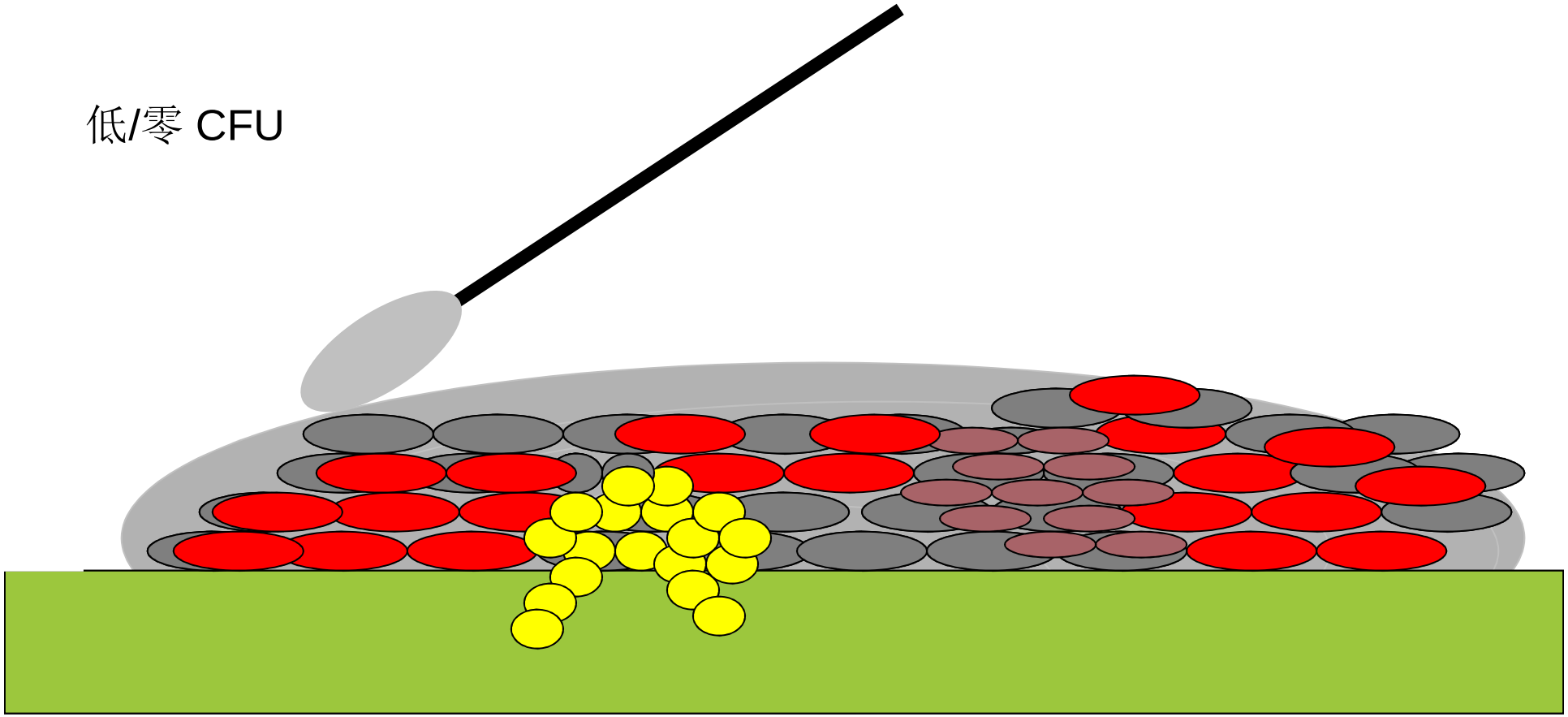
微生物或食物残留量的增加

ATP荧光检测与微生物检测的关系

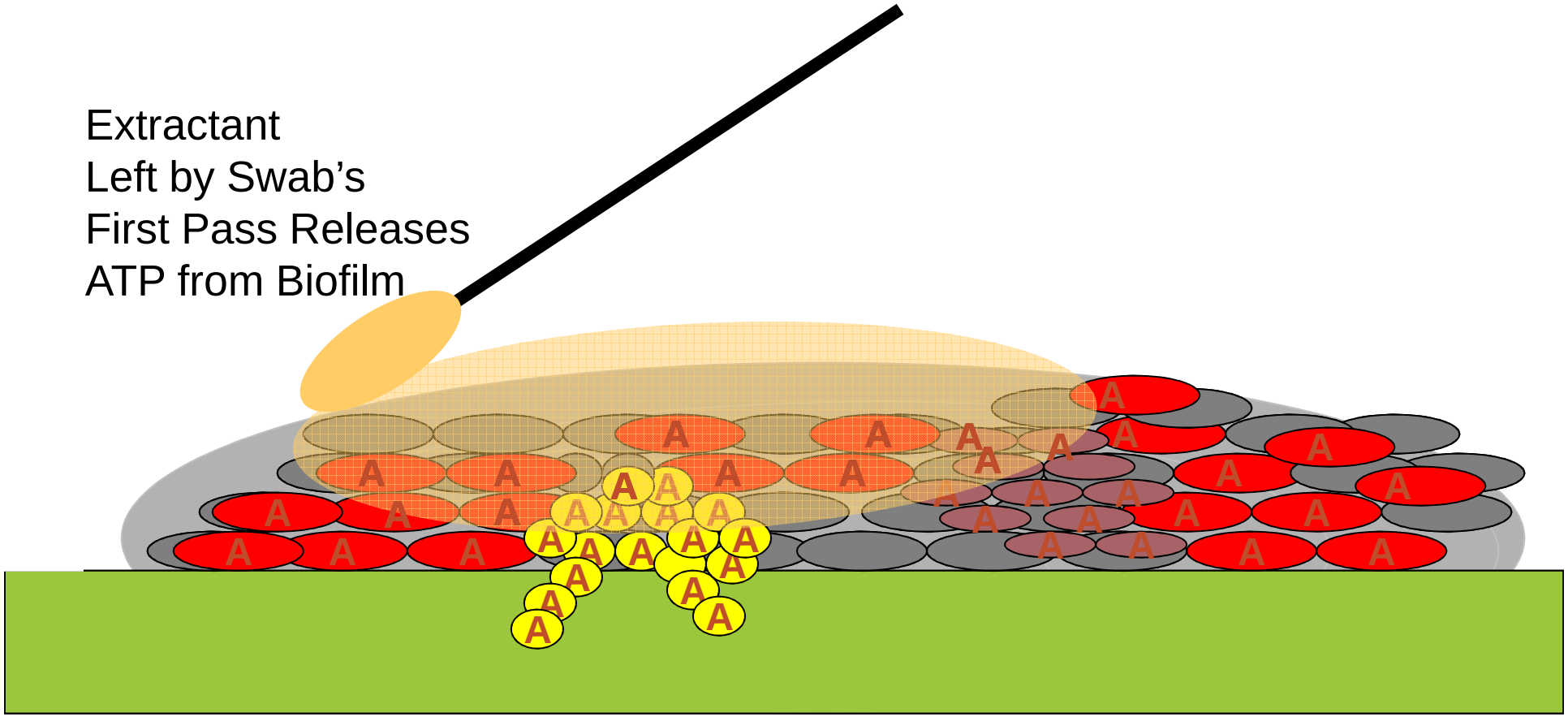


RLU值越高，微生物污染几率越高！

微生物检测

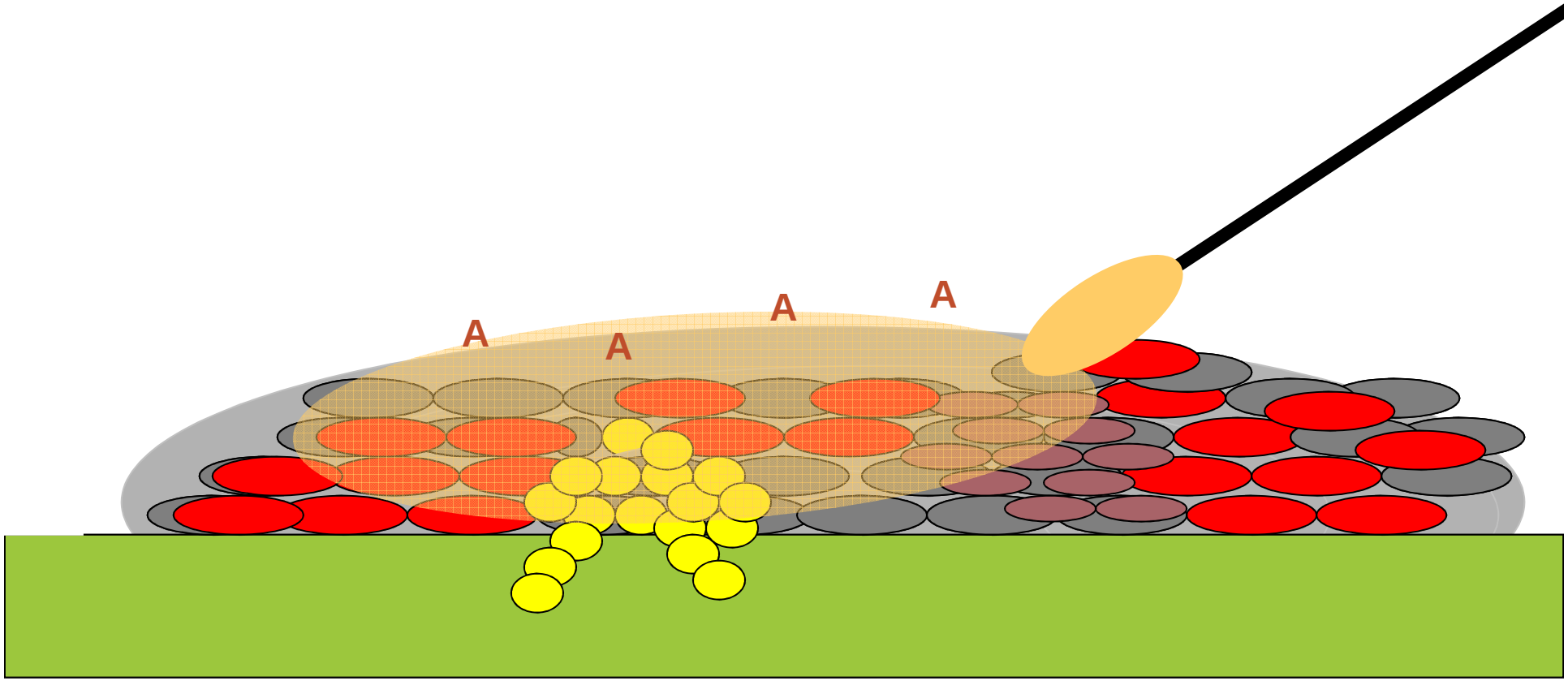


ATP检测



假单胞菌　　硫酸盐还原菌 (SRB)　　李斯特菌

ATP检测



假单胞菌　　硫酸盐还原菌 (SRB)　　李斯特菌

如何选择一台优质的ATP？

What makes a good ATP hygiene monitoring system?

1. 快速出结果
2. 准确性
3. 重复性
4. 简便性
5. 费用
6. 设备的可靠性

by Chris Griffith, Von Holy Consulting, Welgemoed, South Africa.

No one in the food industry doubts the value of effective cleaning or the role that Adenosine Triphosphate (ATP) bioluminescence can play in monitoring and verifying cleaning protocols. Clean food contact and environmental surfaces are increasingly recognised to be important in limiting pathogen spread, preventing cross contamination and in the manufacture of food and beverage products that are safe and of a quality to meet shelf life needs or claims. The problem is how to decide what makes a good ATP bioluminescence detection system.

Choosing a system

Marketing and advertising materials should help – but there is a famous quote "there are lies, damn lies and

Each ATP test system manufacturer tries to establish unique selling features for their own system. They may highlight individual aspects or advantages of their test or instrument without presenting an overall picture or in relation to industry needs and this can be misleading.

There is relatively little reliable information on what industry actually wants from an ATP hygiene monitoring test system although research reporting on this has subsequently been found to be still valid today (see Table 1).

This published research sets out the role of ATP hygiene monitoring

Attributes/ characteristics	Industry ranking
Speed of results	1
Accuracy of results	2
Reproducibility of results	3
Simplicity and ease of use	4
Cost per test	5
Reliability of equipment	6

important if a large number of tests need to be undertaken or, as is often the case, there is only a short window of opportunity for testing cleaning efficacy before production resumes.

A difference of even 10 seconds per test can add up if several hundred tests need to be performed. To an extent the time taken for a result is going to be dependent upon the time the manufacturer has set for the instrument to read the test and the number of steps or stages required to activate the test.

Collectively this is known as the 'time to result' (TTR) which varies by over 60% between some leading instruments. Having a single step in swab activation, apart from being quicker, also helps to reduce variability in results and improve repeatability and reproducibility as well as ease of use.

Ranked 2 and 3 in importance by industry are accuracy and reproducibility and it is perhaps in this area

consistency of the results between two or more operatives. Clearly both are important, especially when sampling is undertaken by more than one person and results are being used correctly and proactively as part of trend analysis, which is vital to the effective management of cleaning.

Some studies report on factors that actually make no difference to the reliability of the result for real tests on surfaces and are misleading. For example comparing the signal from ATP added to the sampling swab and the signal from ATP that is added to the test reagent which can only be done by dismantling the device, then measuring the difference and reporting this as a measure of 'precision' or 'accuracy'.

In reality, what is important in repeatability and accuracy is the sum of all the components in the test system (see Table 2) and how these factors all interact to achieve the overall final result.

30秒钟出结果!

针对活的微生物和食物残留的卫生检测系统的灵敏度的测评方法

WJ Simpson, JL Archibald & CJ Giles
Cara 技术有限公司，Leatherhead 企业中心，Randalls 路，Leatherhead, Surrey, KT22 7RY, 英国
报告 120906, 2006 年 10 月 13 日

总 结

我们为比较卫生检测系统制定了一套方法，并且利用该方法对两种系统进行了评测(Biotrace Uni-Lite® NG / Clean-Trace® 和 Hygiena 系统 SURE II™ ATP 卫生监控系统 / Ultrasnap™ ATP 涂抹棒)。利用该方法对两种系统检测 3 种微生物和 2 种食物残留的能力进行了测评。利用各个系统所推荐的“不合格”、“警告”和“合格”的标准来进行评估。在所有被检测的样品(n=400)中，Biotrace 系统测得的不合格率为 64.5%，Hygiena 的约为四分之一(26.5%)。Hygiena 系统测得的合格率为 62.3%，而 Biotrace 系统的为 26.5%。本结果表明该检测方案为系统的比较提供了一个客观的基础。Biotrace 系统对食物残留和活的微生物的检测有更好的灵敏度和精确度。

3M™ Clean-Trace™ ATP荧光检测系统

ATP检测仪 + **采样耗材/试剂**

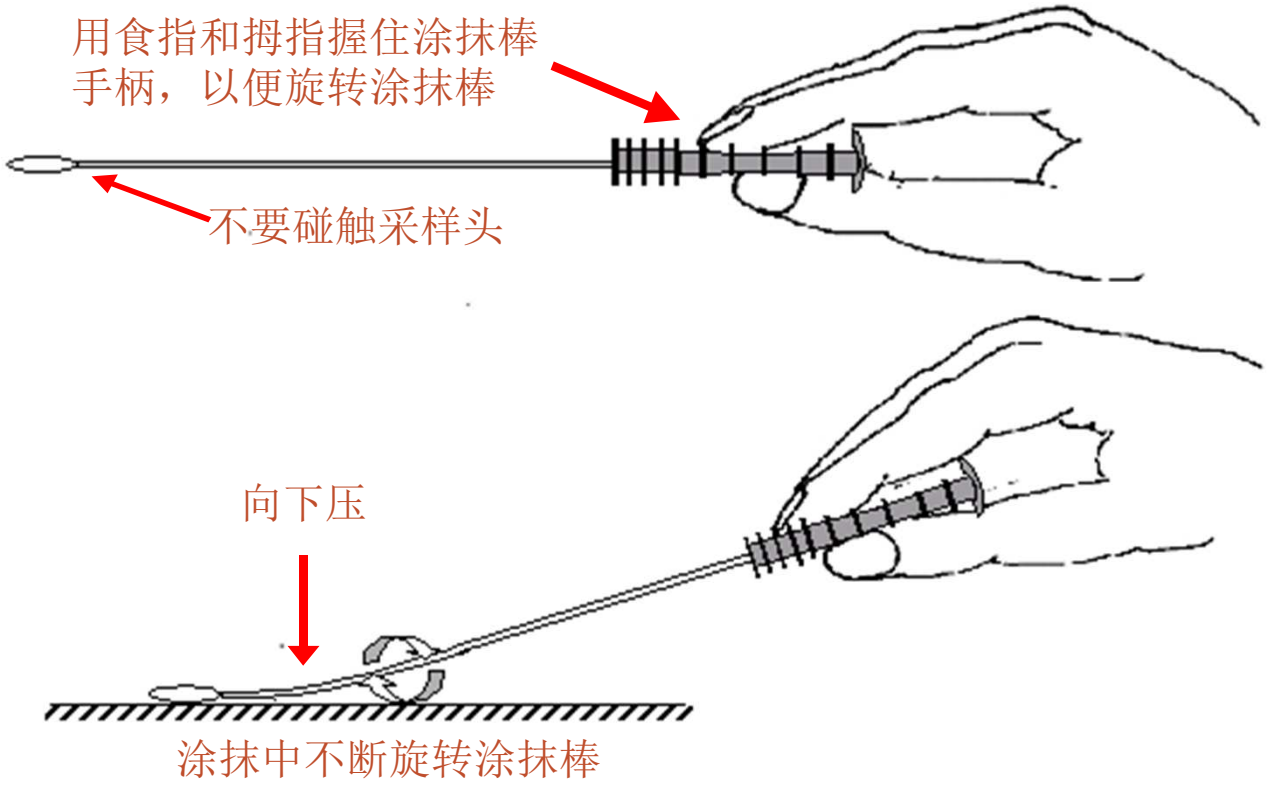
Clean-Trace™表面采样棒

Clean- Trace™水质采样棒

Clean-Trace™表面采样棒

- 用于检测表面卫生的简单，完备的测试工具
- 专门用作清洁后表面的洁净程度

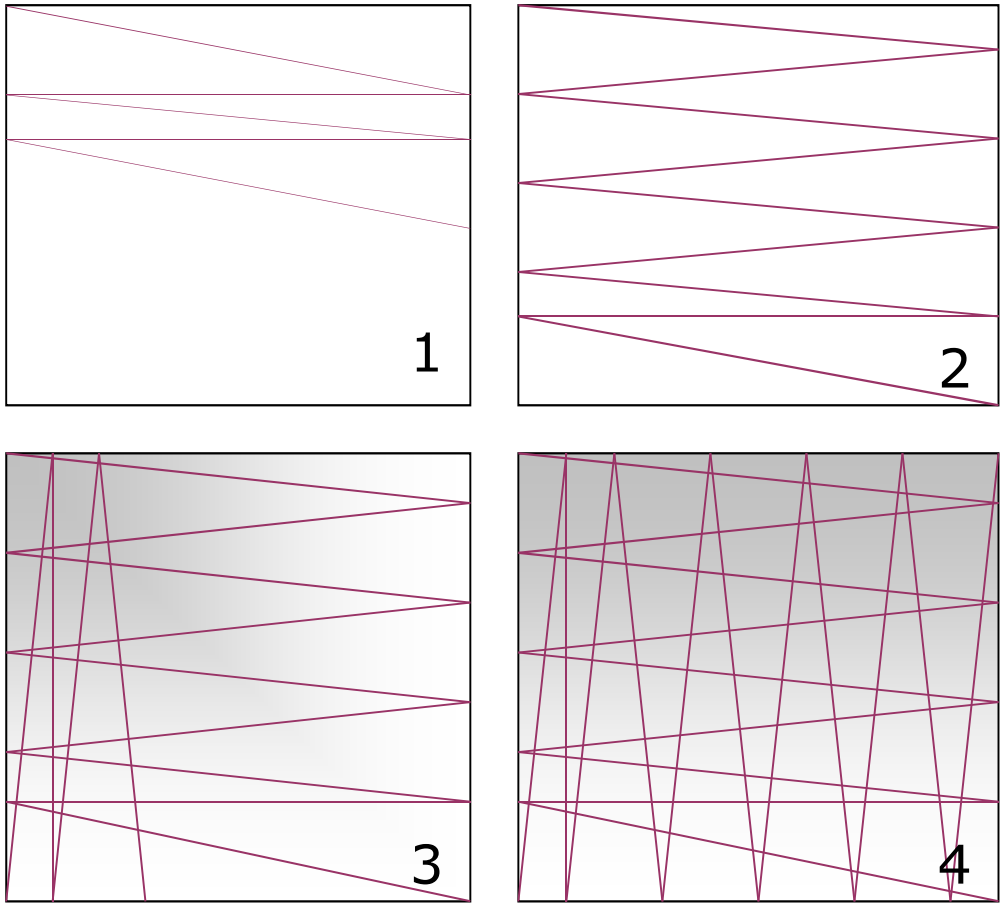
采样方法 — 每次涂抹操作保证一致



- 使采样棒与待测表面成**30度夹角**，用力轻压采样棒致其弯曲，使采样头**紧贴待测位点**。来回涂抹2次。
- 应根据结构和形状，采取相应的有效涂抹手法。各点涂抹手法可以不同，但：**同一位点每次涂抹时手法要一致。**

采样方法 — 规则的平面

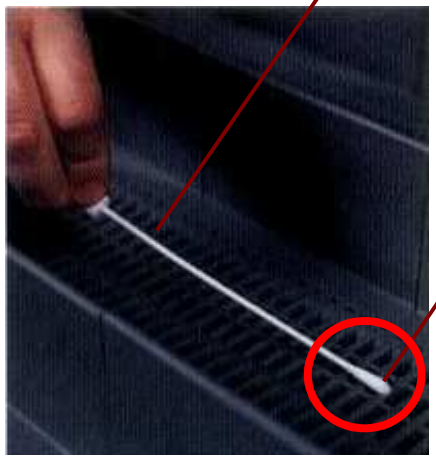
按照以下1-4顺序，以及图示的轨迹进行涂抹



3M™ Clean-Trace™ ATP荧光检测系统

采样棒　　高效ATP提取剂　液态稳定荧光素/荧光酶

采样15秒　+　激活5秒　+　检测10秒　=　结果30秒!



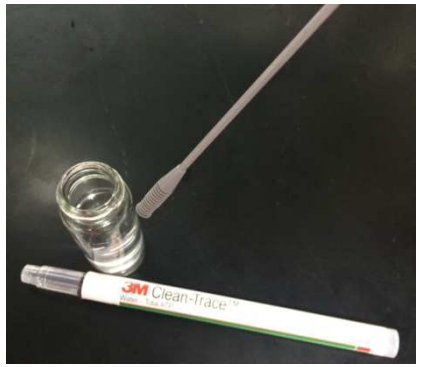
Clean-Trace™水质采样棒

- 专门检测难以用涂抹棒采样的区域清洁后的冲洗水样。
- 主要应用于在位清洁 **(CIP)** 系统

采 样

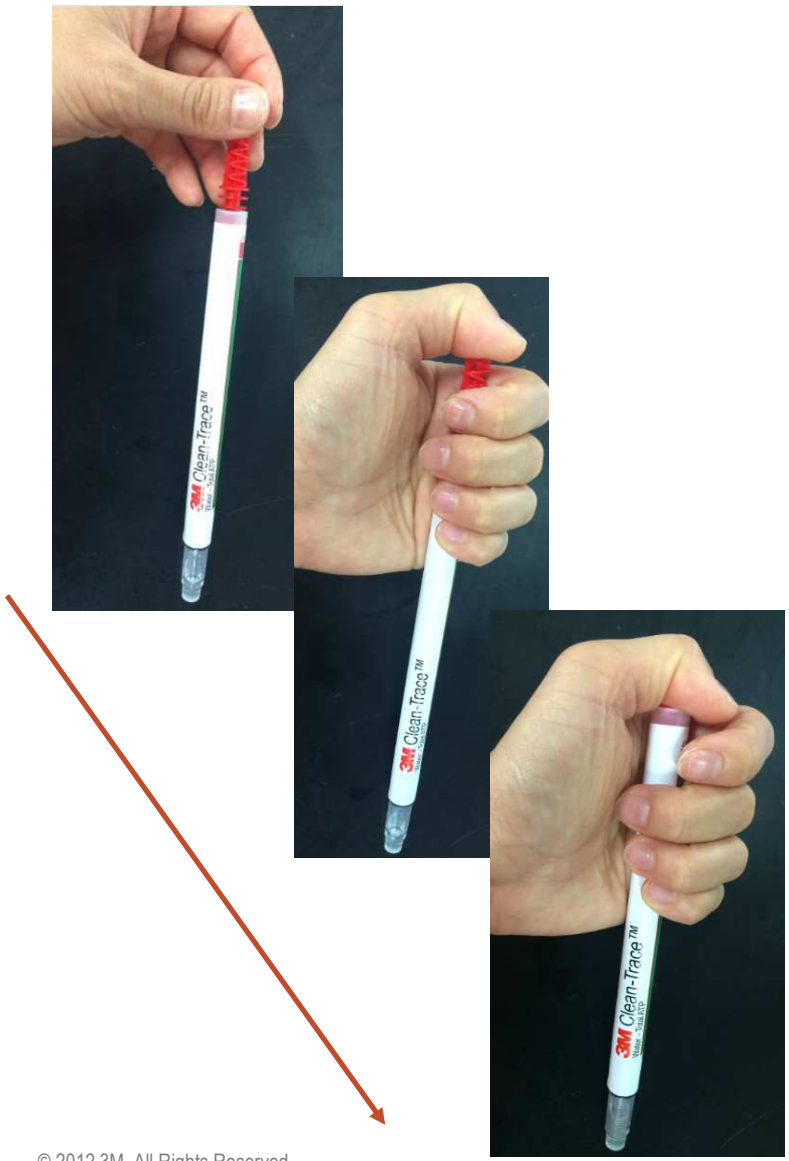
用无菌容器采集水样

取出采样棒



浸入水样内采样

激 活



轻轻地在容器内壁敲击采样棒以除气泡，然后将其放回试管中

立即通过推压红色手柄将采样棒插入到试管中，激活荧光反应。

检 测

反应启动后，振荡5秒充分混合

立即放入仪器检测

读结果（**RLU**）

3M Clean-Trace™ 表面蛋白快速检测棒

•3M Clean-Trace™ 表面蛋白检测表面食品残留和微生物中的**蛋白质**、糖和其它化合物。

•最低可检测 **50µg** 蛋白。

• **半定量** – 颜色越深、颜色变化越快 = 蛋白等越多

化学原理

- 目前世界上最常用蛋白浓度检测方法之一（**BCA** 法 ）
- 基于蛋白对二价铜离子的还原性——双缩脲反应。

$$Cu^{+2} \rightarrow Cu^{+1}$$

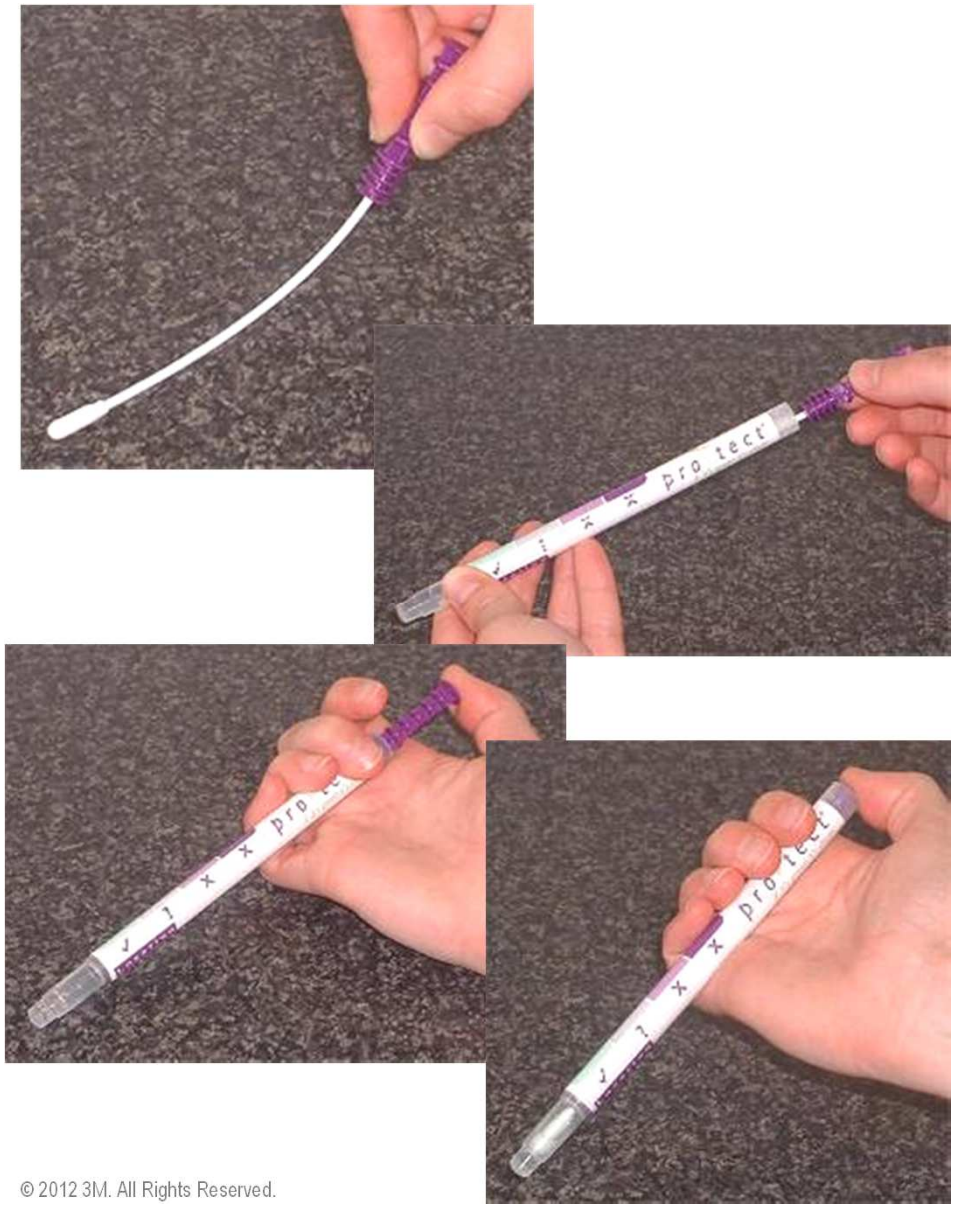
$$Cu^{+1} + 2\ \text{bicinchoninic acid (BCA)} \rightarrow BCA_2Cu^{+1}$$

BCA 绿色；　**BCA_2Cu^{+1}** 深紫色

化学原理

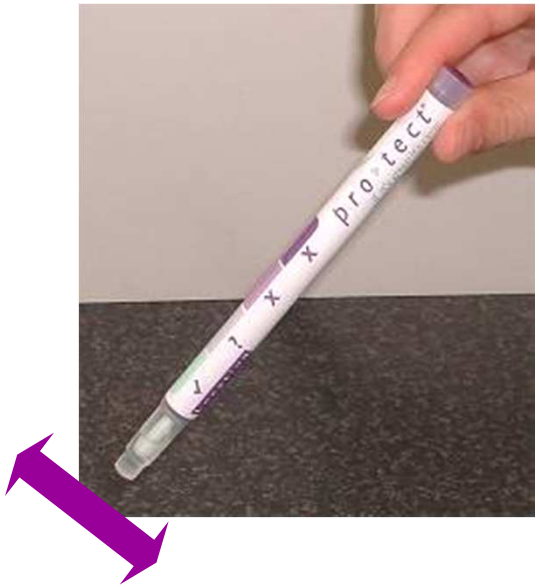
- 由于是基于氧化还原反应，因此检测也对除蛋白以外的其它还原性物质敏感。如：
  - 还原性糖（葡萄糖、 果糖）
  - 还原性化合物（亚硫酸钠）

检测...



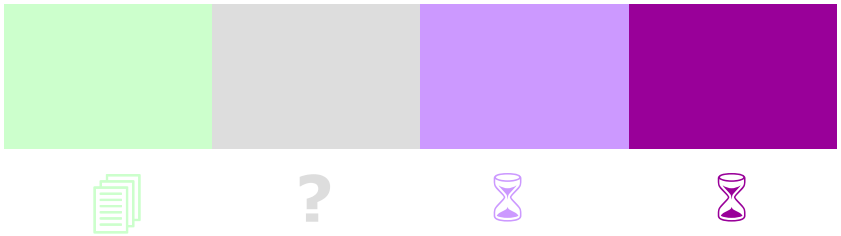
1. 表面涂抹。
2. 将涂抹棒插回装置试管。
3. 用力将涂抹棒头部压入试管底部，激活反应。

检测…



4. 迅速来回振荡至少5秒钟，以确保试剂的充分混合。

5. **室温放置**10分钟后，观察试管底部的溶液颜色，并对比管壁标签上的指示。若采样中污染水平较高，则溶液颜色将迅速变为**紫色**；若采样很清洁，则溶液颜色将由无色变为**绿色**。



绿 – 清洁

灰 – 警惕

紫 – 污染

保存方法

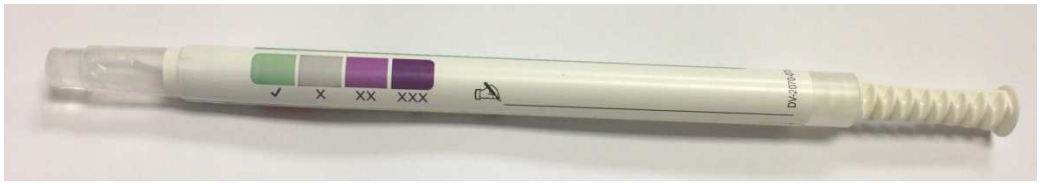
- 室温(2 - 25℃)下保质期18个月，无需冷藏
- 26 - 35ºC下保存2个星期

3M Clean-Trace™ 表面过敏原涂抹棒

{ 3M™ Clean-Trace™ Surface Protein (Allergen) }

3M Clean-Trace 表面蛋白 (过敏原) 检测

- 比色法测蛋白*



- 涂抹，激活，55度加热反应15 min, 判读

- “如果是绿色，则代表清洁…”
- 半定量

- 最低可检测 **3µg** 总蛋白。

3M Clean-Trace™表面过敏原检测

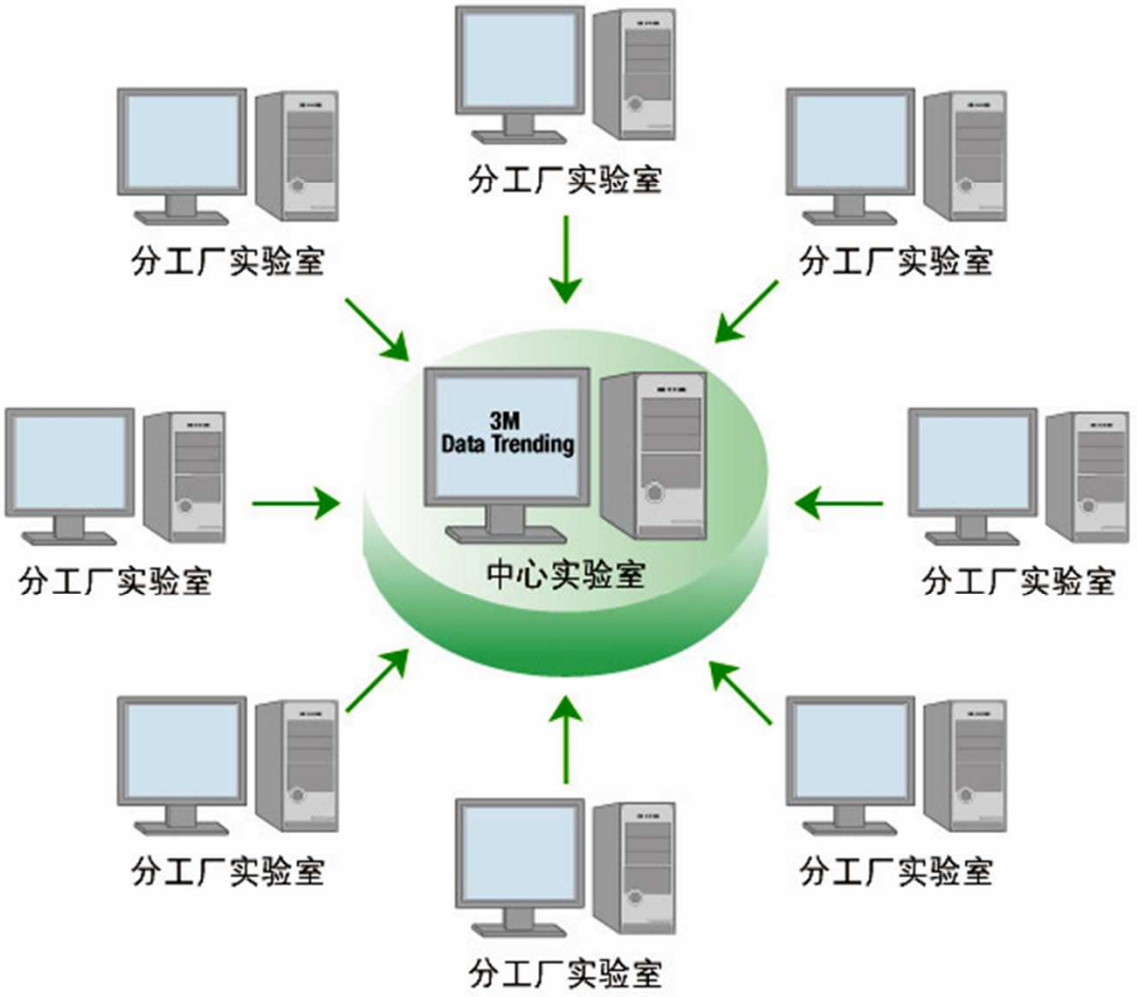
- 非过敏原特异性 – 测的是总蛋白
- 没有蛋白 = 无过敏性蛋白
- 仅用于环境样品 – 不能检测成品中背景值以上的过敏原

3M Clean-Trace™ ATP荧光检测仪的软件支持

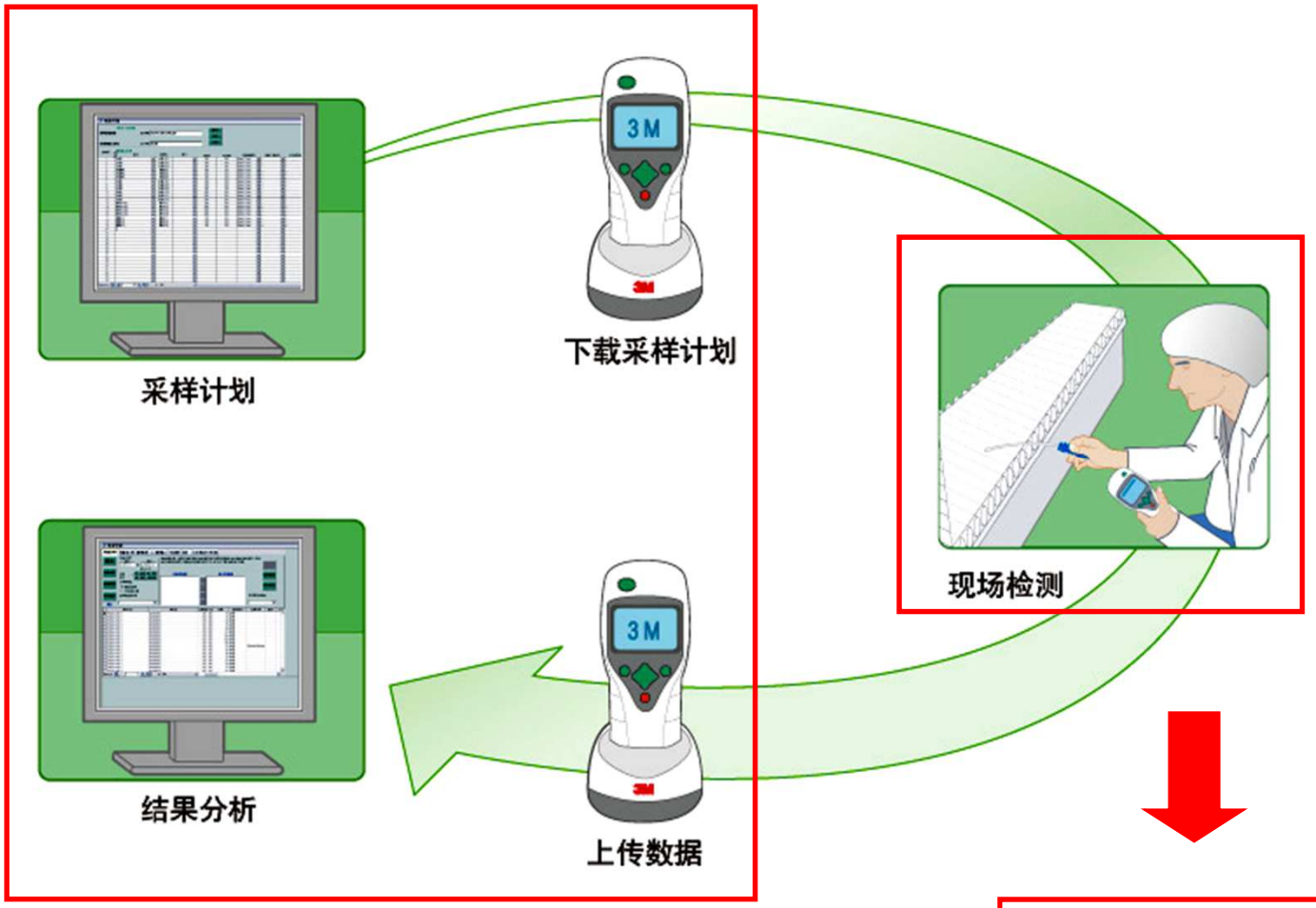
3M Clean-Trace™ ATP荧光检测的技术特点

中央数据处理

3M Clean-Trace™ATP荧光检测仪配套的数据趋势分析软件可实现中心对分点数据的在线收集与汇总，并统一进行分析与管理。



3M Clean-Trace™ ATP 软件



实验室QA负责： 1. 制定ATP采样计划并传输至ATP仪

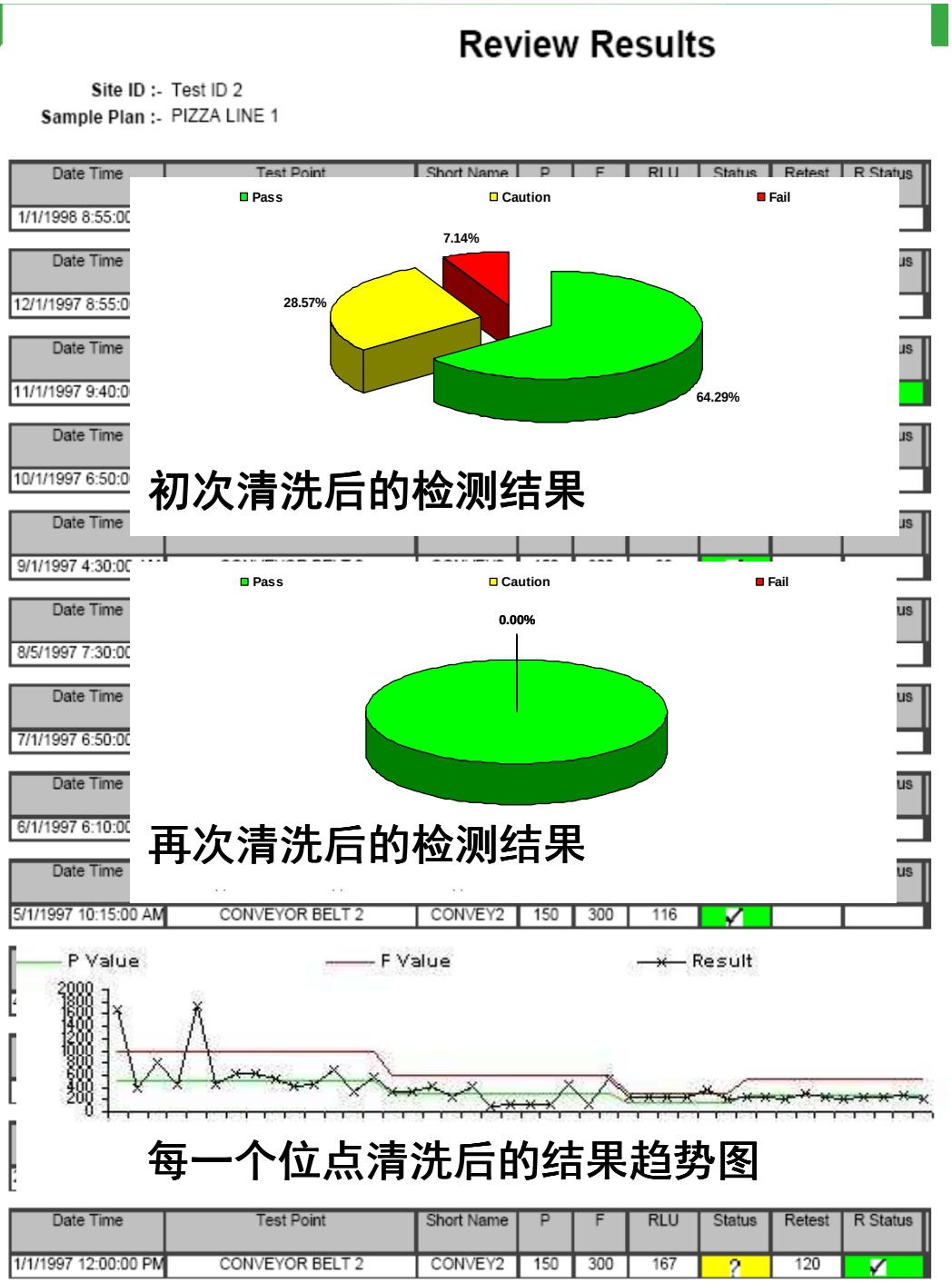
2. 收集现场检测的数据，集中分析

现场QA负责现场实时ATP检测（根据实验室QA制定的采样计划）

3M Clean-Trace™ ATP

3M Food Safety

- 汇总数据，生成结果报告
- 清洗实施效率的评估
  - 初次清洗后即检测
- 清洗最终效果的评估
  - 生产前的检测
- 趋势追踪 – 发现问题，找出影响设备清洗质量的因素



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3M食品安全中国合作伙伴

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全球化布局. 本地化支持.

3M食品安全帮助全球用户尽可能达到最高的食品安全标准！