



Worthwhile Operational Guidelines & Suggestions

BROILER PROCESSING TIMELY INFORMATION – MAY 2011

ATP Bioluminescence

ATP (Adenosine triphosphate) bioluminescence has been used in many industrial applications since 1970's as a tool to verify cleaning and to monitor gross microbial loads. The ATP is the energy molecule of all living cells, including bacteria. The ATP bioluminescence is based on the use of enzyme luciferase which catalyses the oxidation of luciferin (a pigment). The luciferase enzyme is typically extracted from firefly (*Photinus pyralis*), but genetically engineered luciferase preparations have also been used. An end product of this reaction is energy in the form of yellow-green visible light (measured by a luminometer as relative light units; RLU) that is directly proportional to the amount of ATP in the reaction mixture. Traditional ATP bioluminescence is very sensitive and rapid giving results in seconds. Unfortunately, food and processing environments contain large amounts of ATP that are from sources other than bacteria. The most widely used and accepted application of ATP bioluminescence is surface hygiene monitoring for direct verification of cleaning. This application is only intended for testing residual organic matter. For example, usually ATP bioluminescence measurement of <100 RLU is indicative of an effective surface cleanliness...

Extensive sample preparation and pre-enrichment procedures are required to detect and differentiate microbial loads above the endogenous ATP levels. Typically the limit of detection for bacteria in the absence of organic material is 10,000 CFU/ml. Samples with low counts (10-100 CFU/ml) require 24 h enrichment for a qualitative (present/absent) result. Improvements in ATP bioluminescence technology now allows small, portable, low cost detection systems with improved sensitivity and specificity. In addition to aerobic plate counts, commercial assay kits to for the rapid (<7 h) detection of coliforms, enterobacteriaceae and *E.coli* have been introduced. ATP bioluminescence is not a direct replacement for microbiological testing, but can be used to obtain complementary information.



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