



Dear Food Safety Expert

Culture identification has been around forever, but I'm beginning to hear more about new genotypic methods that are based on DNA technology. How do they compare with conventional methods?

You're right. Growing and identifying bacteria, yeast and mold constitutes the core of the science of microbiology. To this day, images of an earlier era in which bearded scientists peered endlessly through bulky microscopes still define culture identification for many people.

Despite its advanced age, this venerable science is a highly critical component in helping food companies offset economic losses and brand damage that are caused by microbial spoilage. There are two primary culture identification methods: phenotypic and genotypic.

Phenotypic tests, or conventional methods, are highly subjective and employ time consuming procedures to identify morphological, physiological and biochemical characteristics of microorganisms. In recent years, however, phenotypic methods have essentially fallen out of step in our time-crunched industry. Three of the primary reasons are:

- **Incubation times.** Conventional methods may require up to four weeks for yeast and mold colonies to develop.
- **Required expertise.** Hundreds of bacteria and yeast can look similar under the microscope, presenting major identification challenges for both novice and seasoned microbiologists.
- **Poor reproducibility.** Biochemical reactions can vary from strain to strain and can be influenced by external factors (i.e., temperature, humidity, etc.). Testing also requires a reference to compare the unknown organism against.

Given the limitations of phenotypic identification, recent and revolutionary advances in genetic technology are gaining a higher profile in the food industry. Genotypic methods use DNA and RNA determinations to identify microorganisms.

From a scientific standpoint, genotypic tests are more stable, provide more definitive results and eliminate subjective interpretations that are commonplace in conventional methods.

Genotypic systems are flourishing and several manufacturers, including Amersham Biosciences, LI-COR, Applied Biosystems Beckman Coulter and MJ Research Incorporated, are leading technological advances in this area. One particular system – gene sequencing – by Applied Biosystems is drawing considerable attention and acclaim.

Recognized industry-wide as “the gold standard in culture identification,” the system analyzes the ribosomal RNA gene sequence of an organism. Its genetic makeup is then matched to an extensive database that contains the sequences of thousands of known organisms. Over 90 per cent of new species are defined by this method.

Gene sequencing offers a number of distinct advantages, such as shorter turnaround time (TAT) for results (for example, TATs for yeast and mold are reduced from weeks to days), higher specificity and reliability, and reproducibility of results. Following an exhaustive review of genotypic technologies we recently instituted gene sequencing as our primary

methodology for spoilage bacteria, yeast and mold at the Silliker Inc. Research Center.

It is estimated that one quarter of the world's food supply is lost to food spoilage every year, prompting companies to utilize every possible scientific resource at their disposal to safeguard their products. Genetic advances in culture identification provide processors and manufacturers with faster and more reliable information to help prevent food spoilage, improve product formulations, validate processes and pinpoint environmental control problems.

Dr. McNamara is vice-president of Food Safety and Scientific Affairs for Silliker Inc. For more information on culture identification, contact the Silliker Inc. Markham laboratory at (905) 479-5255 or Research Center at (708) 225-1435.

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