Bacterial rainbow for microbial ecology studies

Brovko LY, Wang H, Kruis M, and Griffiths MW
Canadian Research Institute for Food Safety, University of Guelph, Guelph, Ontario N1G 2W1, Canada

Growth and survival of bacteria in food are of major importance for food safety specialists. Existing methods of tracking bacteria in food matrices are time and labor consuming. Cultural methods provide information only on numbers of bacteria without any knowledge on their spatial distribution. Recently genes for fluorescent proteins with a wide range of emission spectra starting from cyan to red were cloned. Recombinant bacteria internally labeled with different fluorescent proteins provide an opportunity of monitoring both location and growth of bacterial directly in food samples and in real-time. However, detection of fluorescent bacteria in vivo in some cases proves to be difficult due to the autofluorescence of live bacterial cells as well as sample matrix. Recombinant bacteria E. coli were constructed that carry genes for fluorescent proteins of different colors (ECFP, EGFP, EYFP, and DsRed). Several approaches were employed to image bacteria in pure culture and in mixture including flow cytometry, epifluorescent microscopy, confocal microscopy and spectrofluorometry. Advantages and limitations of each method are discussed.