

# Conda News

Facts about Micro & Molecular Biology

September, 2010

## An Article on Chromogenic Media

Dr. Massoud Vosough, MD, PhD

*The word 'chromogenic' consists of two elements – 'chromo-' from the Greek word, chroma, meaning 'color', and -genesis meaning 'creation'. Accordingly, it can be said that the word 'chromogenic' holds as its meaning the idea of 'producing color' or 'producing pigments'.*

**IN BRIEF**, chromogenic media can be referred to as microbiological media suitable for incubation, differentiation, or selection of different microorganisms by means of color production.

### APPLICATION

**PRIOR TO** describing the function of chromogenic media, enzymes need to be reviewed. Serving as proteins, enzymes perform and accelerate chemical and biochemical reactions. All the biological reactions are performed through the active role of enzymes depending on the incubation temperature and the specific biological pH. To ignore the significant role of enzymes is to ignore life.

**THE SUBSTANCE** which is cleaved by an enzyme is called a substrate. In accordance with their active role, enzymes cleave specific types of substrates.

**CHROMOGENIC MEDIA** serve as nutrient systems for the cultivation of microorganisms. However, the aforementioned role of chromogenic media is not the only one. Differentiation and selection of microorganisms being their main roles, all chromogenic media serve as cultivation systems in general or specific terms.

**FOR THE** most part, the components of chromogenic media cover nutrients such as peptones, amino acids, yeast extract, minerals and vitamins, as well as inhibitors and

solidifiers, e.g. agars and indicators depending on each media.

**THE INDICATOR** performance in chromogenic media is extremely accurate and rapid. Certain media cause the indicator to develop in accordance with the specified microorganism.

Chromogens match the essential substance for the target microorganism (substrate) and a chromophore. Needless to say, the chromophore is chosen in such a way that the produced color and the medium color contrast. For a better and simpler diagnosis, the specified microorganism, provided it exists, produces a specific enzyme which is responsible for the cleavage of the substrate inside the chromogen. This process occurs when the sample is incubated.

In order to cleave the substrate, the bond between the two parts of the chromogen is broken by the enzyme. Thus, the chromophores are released. The grouping of chromophores around the microorganism leads to the production of color, distinguishing this colony in the medium.

The procedure of the chromogen production is also identifiable through a certain enzyme corresponding to the target microorganism.

In general, enzymes and chromogens are the major means to differentiation, selection and function in chromogenic media. The pigmentary differentiation occurs through the action of the microorganism enzymes. The majority of the substrates used in chromogens are sugars, while the chromophores used in chromogenic media are mainly derivations of indole. It must be mentioned here



that when released, chromophores need to bond in order to produce color.

### ADVANTAGES

The tests are selected in such a way that only the target microorganism is indicated. However, the differentiation can probably occur for several types of microorganisms. Several types of antibiotics, depending on their function and the need of the medium, are used in order to avoid the development of microorganisms other than the target. The incubation can be specific to the target microorganism and, therefore, only one confirmative test will be necessary to omit the need of further tests.

The previously explained technology was developed in the early 1970s. It was a revolutionary development in the field of clinical laboratory tests. The variety of those developed tests and their accuracy were responsible for the appropriate level of market they have reached to. Researchers were eager to expand their studies on chromogenic media.

One of the benefits of chromogenic media is the rapid diagnosis which takes place, within 48 hours only. Nevertheless, the majority of the diagnoses occur in 24 hours. The results are detected visually without the need of a special skill or machine. A positive result indicates the existence of a microorganism, whereas a negative test confirms the absence of one. The possibility of performing more tests on the colored bacteria is due to the pigmentary change which occurs through these highly accurate chromogenic tests.

For instance, the virulence of a certain microorganism can be detected simultaneously with its differentiation and selection. The coagulase and fibrinolytic tests can also be carried out simultaneously within a medium.

The application of chromogenic media is not limited to microorganisms, covering also a large part of biochemical reactions, e.g. biotin diagnosis kit, LAL Test, and blood tests concerning the coagulable factors such as thrombin and fibrin.

Chromogenic media also comprise nutrients and make possible the survival of damaged microorganisms which are about to disappear.



**pronadisa**  
Micro & Molecular Biology



**Dr. Massoud Vosough,**  
MD, PhD



The variety of chromogenic media is another added value. All of them are labeled with a four-digit code providing the user with the name, specifications and the method of use. The variety is to such an extent that the diagnosis can be carried out with more than 20 types of media.

## CLASSIFICATION

Media can be classified into 18 groups, the ten most important of which are as follows:

- (1) General Media
- (2) Differential and Selective Media
- (3) Maintenance Media
- (4) Transport Media
- (5) Plate-Count Media
- (6) Sensitivity Detection Media
- (7) Antibiotic Assay Media
- (8) Sterility Media
- (9) Chromogenic Media
- (10) Fermentation Media

The differential and selective media can be divided into three other groups: clinical testing, nutritional testing and aquatic testing media.

Among the 10 groups initially mentioned above, the first two groups are widely used in hospitals, especially for urinary infections. Chromogenic UTIC medium is extensively used in urinary infections. The sample inoculation occurs in-depth and the type of urinary infection is diagnosed. The pathogens involved, such as enterobacteria can be selected and identified. The differentiation of low rates of *Staphylococcus* (such as 0.5-6.0%) is also possible.

The medium allows the development of all pathogens. At the same time, it prevents the *Proteus* swarming. Complete selection occurs in this medium making the coliforms turn dark blue and purple, and the enterococci turn blue and its variants. The accurate detection of *Staphylococcus* is another benefit of this medium. The results are normally ready within 18 to 24 hours, allowing patients to receive suitable treatment.

There are chromogenic media available for food industry tests, of which *Salmonella*, *Campylobacter*, *Listeria* and coliforms can be mentioned. An initial nutritional enrichment can be performed within 24 hours prior to the test in order to achieve best results. The enrichment allows the operator to have more microorganisms in the sample before the main test is performed. Other media related to this type of test include *Enterobacter sakazakii* in simple formula, and *Vibrio parahaemolyticus*.

Water industry testing media come in a variety of types which are compatible with samples such as treated, surface, recycled and even waste water. With a pretest filtration, the sensitivity of the aquatic testing media is almost one cell per 100 ml. Aquatic testing media pave the way for the diagnosis of several types of aquatic pathogens and bacteria.

## Some Conda's Chromogenic Media

### CANDIDA CHROMOGENIC AGAR CAT. 1382

The medium includes glucose, peptone, chloramphenicol, chromogenic combination and the bacterial solidifier factor.

### ENTEROBACTER SAKAZAKII CHROMOGENIC AGAR CAT. 1446

Differentiates the possible *Enterobacter sakazakii* from dairy products including salt, yeast extract, sodium deoxycholate, glucoside and crystal violet.

### E. COLI COLIFORMS CHROMOGENIC MEDIUM CAT. 1340

A selective medium which is used to detect *E. coli* and other coliforms from water and food industry samples.

### LISTERIA CHROMOGENIC AGAR BASE CAT. 1345

A selective medium which is used to detect several types of *Listeria* and monocytogenes.

### MEI AGAR BASE CHROMOGENIC CAT. 1412

Bearing in mind that the samples must be filtered prior to testing, this medium is used to detect several types and the quantity of aquatic enterococci.

### MRSA AGAR CHROMOGENIC CAT. 1423

A medium which is used to detect the several types of methicillin-resistant *Staphylococcus aureus*.

### SALMONELLA CHROMOGENIC AGAR CAT. 1122

A medium used to differentiate *Salmonella* from clinical and food industry samples.

### TBX CHROMOGENIC AGAR CAT. 1151

A medium used to detect and count the several types of *E. coli* in food industry samples.

### URINARY TRACT INFECTIONS CHROMOGENIC AGAR CAT. 1424

A medium which is used for the possible differentiation of the microorganisms responsible for urinary tract infections.

### NEW RELEASES:

#### LAURYL SULFATE CHROMOGENIC BROTH CAT. 1465

A medium that allows the detection of total coliform and *E. coli* count at the same time due to the Chromogenic-Fluorogenic Mix.

#### PSEUDOMONAS CHROMOGENIC AGAR CAT. 1493

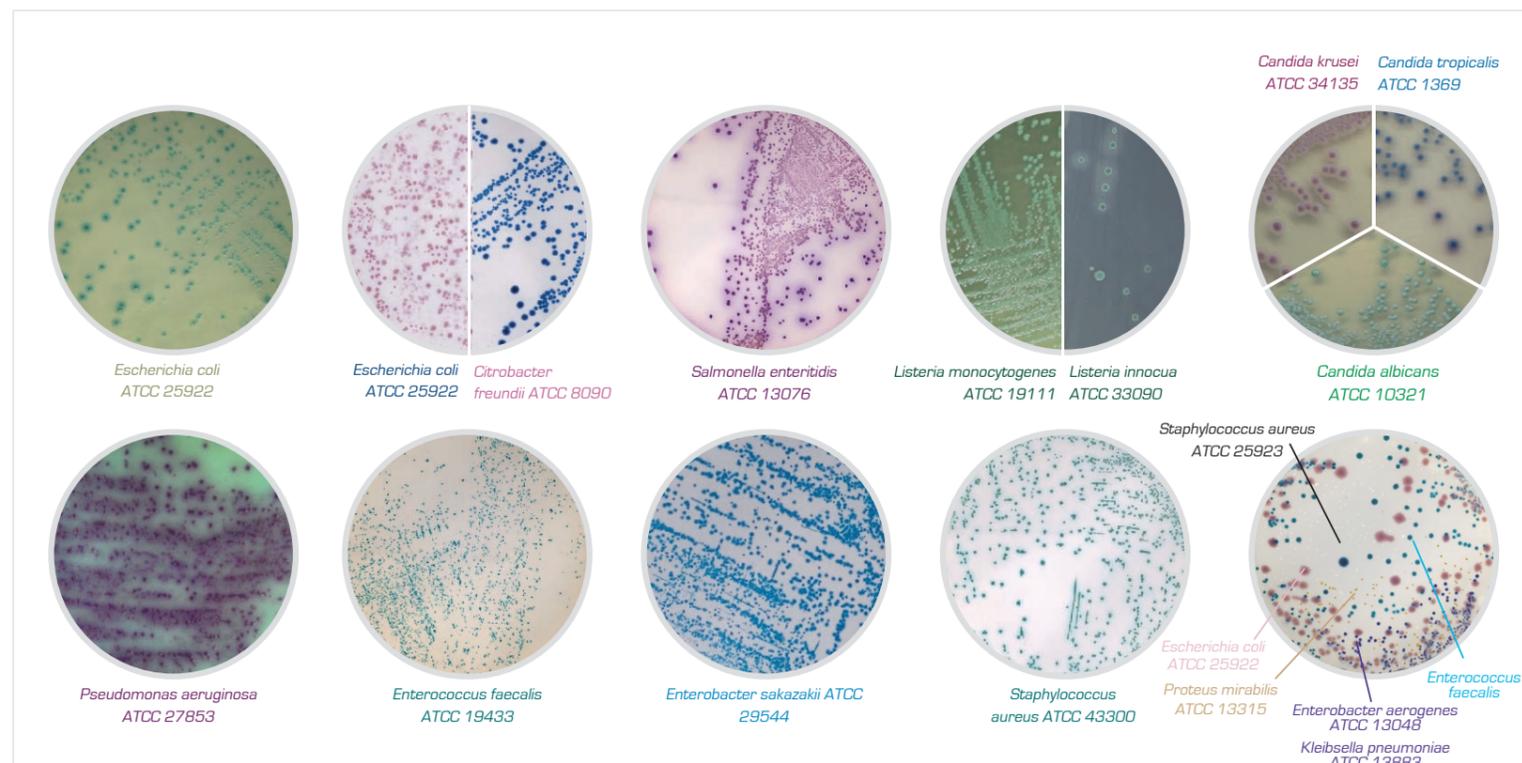
Medium for the presumptive identification of *Pseudomonas* species.

#### E. COLI O157:H7 CHROMOGENIC AGAR BASE Cat. 1588

Medium used for the detection of *E. coli* O157:H7.

#### STANDARD METHODS CHROMOGENIC AGAR (P.C.A.) Cat. 1585

A medium recommended for the enumeration of bacteria of sanitary interest, which are indicators of contamination or microbial load in foods



## PERSPECTIVES

The simple structure of chromogenic media and their benefits have made them popular in research. The comparison between positive and negative results is simpler thanks to the apparent pigmentary change.

The major benefits of chromogenic media are the rapidness, accuracy and simplicity of diagnosis. Even the late samples can be added to the current samples during

the heating period. The results will still be reliable.

Other benefits include the use of virulence factors for the pathogenic diagnosis of a microorganism, and the use of inhibitors for the selection of the target microorganism.

A point to be mentioned is that the differentiation procedure in non-

chromogenic media is not based on the enzymatic system.

With all the benefits and specifications mentioned above, the wide application of chromogenic media faces a bright future.

In no time chromogenic media will replace the currently used media in hospitals and laboratories.