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A SUGGESTED CLASSIFICATION FOR BACTERIOLOGICAL MEDIA

HENRY W. SCHOENLEIN, JR.

The compilation of the formulae and methods of preparation of the media and substrata described in the literature for the support of growth of microorganisms is a task that has seemed of sufficient practical importance to warrant its being undertaken by the bacteriological laboratories of the college. In order that these data, with reference to each medium, and an elaborate system of cross indices might be prepared, it was necessary to have some definite scheme of classification. A review of the literature shows that several types of classification for media have been suggested by different authors.

Doryland¹ (1916) used the chemical composition of the constituents of the media as a basis for classification. This system is very complete in so far as synthetic materials (materials of known composition) are concerned, but it is not entirely satisfactory since the chemical composition of a great number of materials used in media is not known.

According to Kuster² (1921) media might be classified primarily on their physical characteristics and secondarily on the composition of the constituents. His two main divisions are (1) liquid media and (2) solid media. Under liquid media a further division is made separating those composed of inorganic materials only, from those containing organic substances.

The subdivisions under solid media are (1) those that are initially liquid and capable of being solidified and (2) those that are initially solid.

Harvey³ (1921) has compiled the formulae and methods of preparation of a large number of media. He deals chiefly with the media used for the cultivation of pathogenic bacteria. His classification is not based on physical state or composition of constituents, but rather upon the general use to which the medium is to be put.

¹ Doryland, C. J. T. Preliminary report on synthetic media. *J. Bact.*, vol. **1**, pp. 135-152. 1916.

² Kuster, Ernest. *Kultur der Mikroorganismen*. Leipzig-Berlin. 1921.

³ Harvey. *Bacteriology and laboratory technique*. *Ind. Jour. Med. Res.*, vol. **9**, pp. 66-131. 1921-22.

Inasmuch as no complete classification has been formulated wherein the large number of media described can be filed and an elaborate cross index system worked out, it was decided to attempt to develop one based primarily upon the physical state in which the medium is to be employed and secondarily upon the chemical composition of the constituents of the medium. The primary classification recognizes two main groups (1) liquid and (2) solid. The latter is subdivided into reversible and irreversible. These are again subdivided until as shown in the outline some nine groups based upon physical characteristics are recognized. The secondary classification as indicated on the succeeding sheets is based upon the composition of the constituents. Each medium will key out to a certain division in the classification and an index number corresponding to that division will be assigned it. For example, a medium containing water, agar, beef extract, peptone, NaCl, K_2HPO_4 and glucose may be assigned as follows. It is a reversible solid, solidified by the addition of agar agar (A_2). It contains water plus other constituents (A_2). One or more of the constituents are organic (B_2). The composition of at least one of the constituents is not definitely known (C_2). It contains a digest (D_1). This digest is a prepared peptone (E_1). Some of the other constituents are organic (F_2). The composition of at least one of these other constituents (namely beef extract) is not known (G_2). This substance (beef extract) is of animal origin (H_2), and is an extract (I_3). Another of the constituents (glucose) is organic (J_2). Therefore the complete index number for this particular medium is II, $A_2B_2C_2D_1E_1F_2G_2H_2I_3J_2$. Each medium in addition to the index number is given a sheet number. This number might be called a series number and has nothing to do with the classification, but enables one to refer to an individual medium in a group of media having the same index number. If at any time too large a number of media are assigned to a common index number, the classification may readily be further subdivided on the basis of *nature of the additional nitrogenous and carbonaceous constituents*.

We invite criticism and new ideas on this classification for if this compilation of media is to be of any value to other bacteriologists, one of the fundamental principles will be a simple, but appropriate means of classification and an elaborate system of cross indices.

SUGGESTED CLASSIFICATION OF MEDIA

Primary Classification

Liquid media (employed in a fluid state).....	I
Solid media (employed in a solid state).	
Reversible (liquifiable).	
Solidified by the addition of agar agar.....	II
Solidified by the addition of gelatin.....	III
Solidified by the addition of other materials.....	IV
Irreversible.	
Initially liquid, but becoming permanently solid.	
Organic materials (serum, egg, etc.).....	V
Inorganic materials (silicic acid, etc.).....	VI
Initially solid.	
Organic materials.	
Plant tissue.....	VII
Animal tissue.....	VIII
Inorganic materials (sand soil, etc.).....	IX

Secondary Classification

A ₁ Water only.	
A ₂ Water plus other constituents.	
B ₁ All constituents inorganic.	
C ₁ Nitrogen as free (elementary) nitrogen only.	
C ₂ Nitrogen as ammonia.	
C ₃ Nitrogen as nitrites.	
C ₄ Nitrogen as nitrates.	
B ₂ One or more constituents organic.	
C ₁ All constituents of known composition.	
D ₁ Carbon organic, nitrogen inorganic.	
E ₁ Carbon as carbohydrates.	
F ₁ Monosaccharides.	
G ₁ Pentoses.	
G ₂ Hexoses.	
G ₃ Others.	
F ₂ Disaccharides.	
F ₃ Trisaccharides.	
F ₄ Tetrasaccharides.	
F ₅ Polysaccharides.	
G ₁ Cellulose.	
G ₂ Starch.	
G ₃ Dextrins.	
G ₄ Pentosans.	
G ₅ Gums.	
G ₆ Inulin.	
G ₇ Others.	
E ₂ Carbon as glucosides (non nitrogenous).	
E ₃ Acids and their salts and esters.	
F ₁ Aliphatic.	
G ₁ Monobasic.	
H ₁ Simple.	
H ₂ Hydroxy.	

- H₃ Ketonic.
- G₂ Diabasic.
- G₃ Tribasic.
- F₂ Aromatic.
- E₄ Aldehydes and ketones (except carbohydrates).
- E₃ Alcohols.
 - F₁ Aliphatic.
 - G₁ Mono.
 - G₂ Poly.
 - F₂ Aromatic.
- E₂ Others.
- D₂ Organic nitrogen present.
 - E₁ Nitrogen present as amino acids.
 - E₂ Nitrogen present as cyanogen.
 - E₃ Others.
- C₂ Composition of at least one constituent not definitely known.
 - D₁ Digests.
 - E₁ Prepared peptones, proteoses, etc.
 - F₁ All other constituents inorganic.
 - F₂ One or more of the other constituents organic.
 - G₁ All other constituents of known composition.
 - H₁ All other constituents non nitrogenous.
 - I₁ Additional C as carbohydrates.
 - J₁ Monosaccharides.
 - J₂ Disaccharides.
 - J₃ Trisaccharides.
 - J₄ Tetrasaccharides.
 - J₅ Polysaccharides.
 - I₂ C as glucosides.
 - I₃ C as acids — salts and esters.
 - I₄ C as aldehydes and ketones.
 - I₅ C as alcohols.
 - I₆ Others.
 - H₂ At least one other constituent nitrogenous.
 - I₁ Additional N inorganic.
 - I₂ Additional N organic.
 - J₁ N as amino acid.
 - J₂ N as cyanogen.
 - J₃ N as other.
 - G₂ Composition of at least one other constituent not known.
 - H₁ Plant origin.
 - I₁ Tissue and cells.
 - I₂ Fluids.
 - I₃ Extracts, infusion, and derivatives.
 - H₂ Animal origin.
 - I₁ Tissue and cells.
 - I₂ Fluids.
 - J₁ All other constituents inorganic.
 - J₂ One or more other constituents organic.
 - I₃ Extracts, infusions, and derivatives.
 - J₁ All other constituents inorganic.

J₂ One or more other constituents organic.

I₄ Excreta.

I₅ Others.

E₂ Other organic or tissue digests.

D₂ Others.

E₁ Plant origin.

F₁ Tissue and cells.

F₂ Fluids.

F₃ Extracts, infusions, and derivatives.

E₂ Animal origin.

F₁ Tissues and cells.

F₂ Fluids.

F₃ Extracts and infusions and derivatives.

F₄ Excreta.

F₅ Others.

BACTERIOLOGICAL LABORATORIES,
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