

Evaluation of Cognitive and Psychomotor skills in performing Benedict's test amongst Ist M.B.B.S students

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Abstract :

Introduction : Benedict's reagent is a chemical reagent commonly used to detect presence of reducing sugars, however other reducing substances also give a positive reaction. Benedict's test procedure comes under the 'the must know' area of the I.M.B.B.S curriculum.

Aim : To evaluate the psychomotor and cognitive skills amongst I M.B.B.S students, on the basis of their performance and interpretation of Benedict's test .

Methodology : Evaluation was done by the faculty of biochemistry at Kamineni Academy of Medical Sciences & Research centre, L.B. Nagar, Hyderabad, Telangana. A pre-determined check list which encompasses the cognitive and psychomotor domains was framed so as to provide an objective evaluation and avoid bias.

Results : 97% students could achieve the desired psychomotor skills despite the fact that 65 % only followed the instructions meticulously.33.5% could understand the composition, principle and interpretation of the Benedicts test.

Conclusion : Qualitative/ semi -quantitative tests like benedict's test requires assessment of cognitive skills. Emphasis must be laid on the comprehension of the underlying principles in qualitative tests.

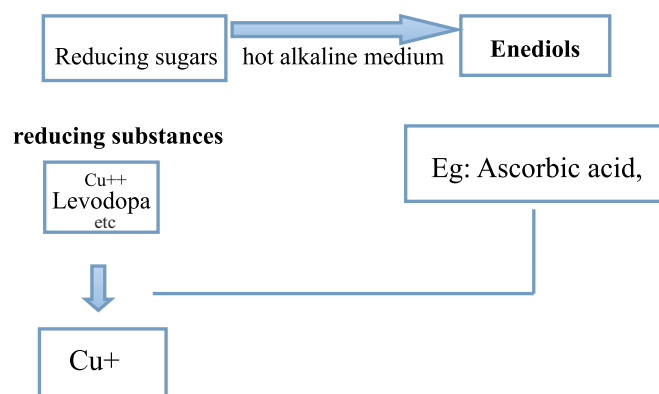
Introduction :

Evaluation of cognitive and psychomotor skills is a pre requisite in the assessment of learning. OSPE (objective structured practical examination) is the most common method of assessing procedural skills and cognitive skills which utilize predetermined checklists in this assessment format¹. Medical under graduates have to understand, perform and interpret a wide range of procedures in their medical curriculum². Benedict's test is a basic, preliminary test which a student of I M.B;B.S must know and perform.

Benedict's reagent is a chemical reagent named after an American chemist, Stanley Rossiter Benedict³. Benedict's reagent is a chemical reagent commonly used to detect presence of reducing sugars, however other reducing substances also give a positive reaction. Reducing substances like ascorbic acid,levo-dopa and homogentisic acid also reduce benedict's reagent .

The principle of benedict's test is that when reducing sugars are heated in the presence of an alkali, they get converted to powerful reducing compounds, i.e "enediols". Enediols reduce the Cupric ions (Cu⁺⁺)

present in the benedict's reagent to cuprous ions (Cu⁺) which gets precipitated as insoluble red copper oxide.



Why do reducing substances answer benedict's test which is a test for reducing sugars. All the three varied reducing substances -Ascorbic acid, homogentisic acid and levo -dopa share a common feature.They resemble "enediol" in structure with a double bond and two 'hydroxyl' groups and hence it also reduces benedict's reagent and gives a false positive impression of the presence of reducing sugars. A positive test with

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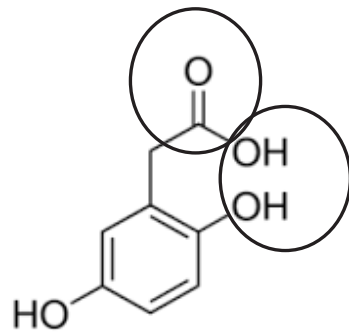
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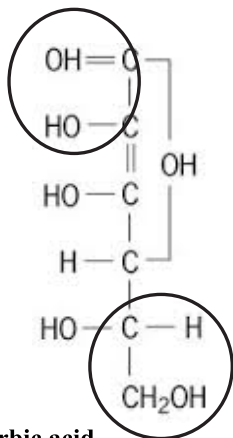
benedict's reagent is shown by a color change from clear blue to a brick red precipitate.

Orange precipitate indicates - 1.5 gm%

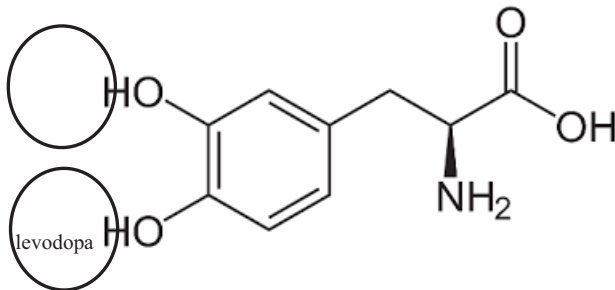
Brick red precipitate indicates - 2.0 gm%



homogentisic acid



ascorbic acid

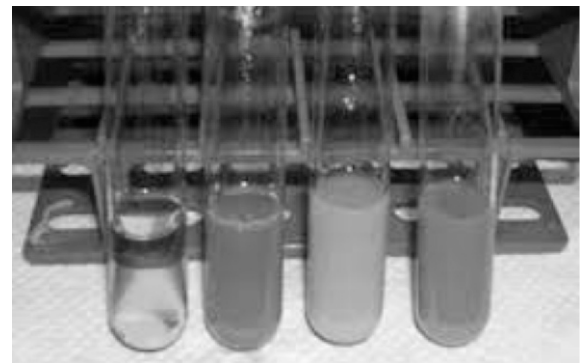


The color of the obtained precipitate gives an idea about the quantity of the reducing sugar present in the solution, hence the test is called as

“**semi quantitative test**”.

Greenish precipitate indicates - 0.5 gm%

Yellowish precipitate indicates - 1.0 gm%



Methodology :

In our study we assessed 150 students of I M.B;B.S (2014-2015). Each student was asked to perform Benedict's test to detect reducing sugars. The students were given a demonstration about the procedure of Benedict's test and were also taught the principle and interpretation of this semi-quantitative test. Benedict's test was chosen as it is not only a qualitative test but also a semi-quantitative test where cognitive skills and psychomotor skills are required. A Check list was prepared by the faculty of Biochemistry to assess the cognitive and psychomotor domains of the students.

The check list was as follows :

- 1) Whether the student dispensed exactly 5 ml of the Benedict's reagent?
- 2) Did the student heat the solution carefully after adding exactly 8 drops of sample?
- 3) Did the student get the brick red precipitate?
- 4) Does the student know the composition of the Benedict's reagent and the significance each of the constituents?
- 5) Was the student able to understand the underlying principle of the test?
- 6) Was the student able to comment on the substances that can give a false positive test and why?

This was followed by a discussion amongst the faculty with regard to the mistakes done by the students and how to overcome these mistakes.

observations	Measured 5ml of benedicts reagent?	Heat the solution after adding 8 drops of ?	Brick red precipitate observed	Composit ion of benedicts reagent	Able to tell the principle	False + and why?
150	100 67%	98 65.3%	145 97.15%	87 58%	72 48%	48 32%

Results :

Out of a total of 150 students, 65% were able to perform the test satisfactorily, 97% could get the desired results inspite of not doing meticulously the procedure as was taught to them and only 32% were able to tell the composition, principle and interpret the test appropriately.

Discussion :

65 % of the students followed the instructions meticulously. Surprisingly, a whopping 97% could achieve the desired result. This can be attributed to the nature of the test. Benedict's test is a qualitative test primarily. But, as it can also give a rough estimate of the reducing sugar in the sample. It is also called as a "semi-quantitative test".

58% could recall the composition, 48% could understand the underlying principle in the formation of the brick red precipitate and a paltry 34% have understood the composition, principle and interpret the results of the test correctly. This data clearly recognizes the need to have more emphasis on the underlying principles and interpretation of qualitative tests and not to forget quantitative tests.

Conclusion :

Broadly tests can be classified either as qualitative or quantitative. Few are qualitative and semi quantitative

like the basic bed side test - benedict's test. Qualitative tests usually assess cognitive skills. Quantitative tests give us an insight into the pipetting ability of the students who are being assessed and thereby one can assess the procedural skill competency.

Neveetheless, Cognitive and procedural skills must be developed simultaneously in the students. There is definitely a need for newer teaching methods to be developed so that the students develop both the skills simultaneously.

Also, emphasis must be laid in the minds of the students that performing tests is not the only objective in the practical classes. Comprehension and understanding of the underlying principles is mandatory in grooming our future medical fraternity.

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