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Short Communication

CANAL DISH (CD), THE NEW ANTIMICROBIAL TESTING APPARATUS

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ABSTRACT

Objective: This writing aims to introduce new antimicrobial test apparatus called Canal Dish (CD), theoretically.

Methods: We have designed two types of CD such as Circular CD (CCD) and Square CD (SCD). Internally, the CCD is a 80 mm diameter circular while the SCD is a 80×80 mm square CD plate. Both of them contain 2(40×2) mm parallel travelling canals from the each CD-centre having radius of 3 mm. Canals are 6 mm in depth.

Results: The features of CCD and SCD indicate possible allowance of various size, low media consuming, the inclusion of multiple microorganisms and/or test samples/doses, ease of handling; therefore, understanding, rapidity, and economy.

Conclusion: CD may replace currently used Petri dishes due to its cost-effectiveness, rapidity, ease of handling and a wider range of applicability.

Keywords: Antimicrobial assay, Canal dish, Circular, Square, New apparatus

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The antimicrobial assay is generally aimed to control the growth or kill microorganisms in food, drug, and other health consumption areas. Pathogenic bacteria and fungi are the main targets. Besides other applications, microbial screening is a crucial step in drug discovery and development (screening of extracts from plants, animals, fungi, marine or other microbial origin), existing antibiotics, structural modification, study of antimicrobial agents like assessing their potency, dose, sensitivity and/or resistance capacity towards microbes and so on. Latin-square method, disk diffusion, well diffusion, swab technique, serial micro-dilution [1-9] and E-test are the commonly used antimicrobial assay methods. Unfortunately, all of them are time-consuming and less economy of culture media used. Sometimes, performing some of these methods specially latin-square and well diffusion assays appear to be difficult for researchers. Otherwise, the difficulty and cost of operation relate to their apparatus/devices incorporated in the assay procedure. Otherwise, rapidity, easy, cost-cutting measure, readily explicable methods are a prospective bat to the researchers.

In addition, drug discovery and development from natural origins is a long way to go. Saving every single second of its journey is the seconds saving to the consumer going to going to consume the final product. Therefore, swiftness in every single step is a key consequence. However, for any invention, it takes novel touches of some God gifted hands, in which theoretical knowledge is the mother of visible scientific products. It is, however, vital to share knowledge for a better scientific communication. Taking into account of the above-mentioned situations, theoretically Circular Canal Dish (CCD) and Square Canal Dish (SCD) apparatuses are being postulated as below.

The CCD is a glass or plastic made 40 mm (radius) circular dish (inside: 80 mm in diameter). It consists of a canal body (CB) with an adjustable cover. CB is canaled from the center of the dish. The center is 6 mm in diameter (r = 3 mm), which allows 12 canals up to the circular sidebar of the body. Each canal is 2 mm in diameter and 6 mm in depth and is directly connected to the centre which is of same depth as canals. This is for maintaining same thickness of the culture medium, allowing applied drugs for it to the canals containing microorganisms (swabbed). Canals are separated by 12 equal hyperbolic protrudes (areas; HBP). Each equal HBP allows to outdo 2 canals aside of it. For equal distance maintenance between the canals, the uniqueness of the HBP is crucial. These HBPs are at least 2 mm more in height than the edges of the canals, thus they reside 8 mm above from the bottom layer of canals. This will allow neither the culture medium nor the drugs in these portions. The sidebar of the circle of the CB is extended 2 mm more at its edge, thus in total 10 mm in height, which is 3 mm higher than the cover plate. A drawing of this apparatus is shown in fig. 1.

The SCD apparatus is is also made by same materials (glass and/or plastic) as used for CCD. It is 82X82X10 mm (inside L×L: 80X80 mm) SCD. It also consists of a canal body (CB) with an adjustable cover (height = 7 mm). The SCD body allows 32 canals from 8 separated CD-centers up to the sidebar of the square. The canals and centers and heights of HBPs are also same as above. By this time, the HBPs between the two unidirectional canals coming from the same CD-centers maintain 2 mm gap between them, whereas 4 mm and 1 mm between the two CD-centers and CD-centers and the sidebar (wall), respectively. A drawing of this apparatus is shown in fig. 2.

Saving of culture medium

Circular CD

Area (CD centre+canals) = Area (CD–HBP)

$$\text{Saving (\%)} = \frac{[\{2\pi r(\text{dish})\} - \{LW \times 12(\text{canals}) + 2\pi r(\text{CD-centre})\}]}{2\pi r(\text{dish})} \times 100$$

Where, r = radius of dish/CD-centre; L = length of canal; W = width of canal.

Thus, at any thickness level, it will save 63.93% culture medium in comparison to an ordinary circular dish for a single dish operation.

Square CD

$$\text{Saving (\%)} = \frac{[\{L \times L\ (\text{dish})\} - \{LW \times 32(\text{canals}) + 2\pi r\ (\text{CD-centre})\}]}{L \times L\ (\text{dish})} \times 100$$

Where, r = radius; L = length; W = width.

Thus, at any thickness level, it will save 51.06% culture medium in comparison to an ordinary square dish for a single dish operation.

CCD and SCD are going to be introduced newly, although the other operational steps of antimicrobial assays like sterilization, sample preparation, and application, inoculation of microorganism's subsequent incubation in association with technical and safety precautions are similar to the disk diffusion and swab technique.

CCD allows up to 12 microorganisms at a time (for single data; which is 6 and 4 for duplication and triplication) while SCD allows up to 32 microorganisms at a time (for single data; which is 16 and 8 for duplication and tetraplication). SCD can be used for multidrug, and doses, including a number of microorganisms (32) at a time. Both CCD and SCD require no scaling for centre detection, microorganism line-up and paper disk containing drug application. The CD allows ease of making in different size and shapes with reusability (glass-CD sets). It also permits plastic setting (sterile).

The linear inhibition zone measurement is more accurate than the un-uniform circular zones. It also permits both paper disk and well at CD-center, thus making ease of sample applicability. In addition, allowance of co-treatment, easiness in the modification, and reproducibility are other few important features of CCD and SCD. Otherwise, canals are separated by HBP regions which are not permitted to cross contaminate to other canals contain, thus the avoidance of chance of mixed-culturing. However, CCD center (single) is permitted only one paper disk/one-fold dose (i.e.–single/ co-treatment) at a time.

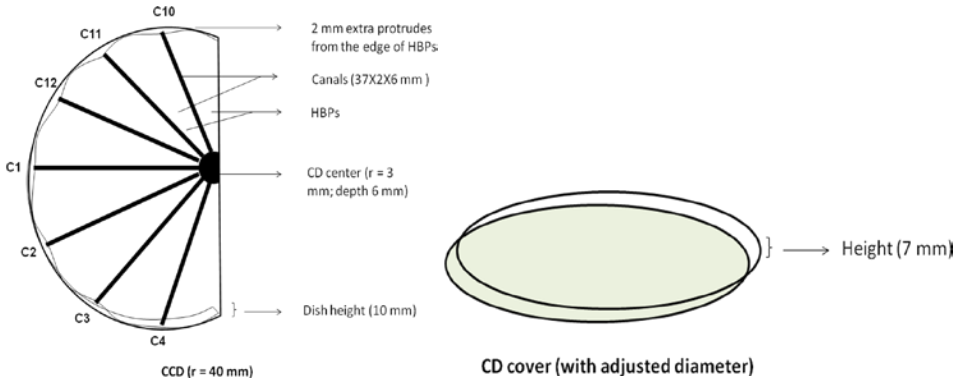

Fig. 1: A typical CCD body and cover

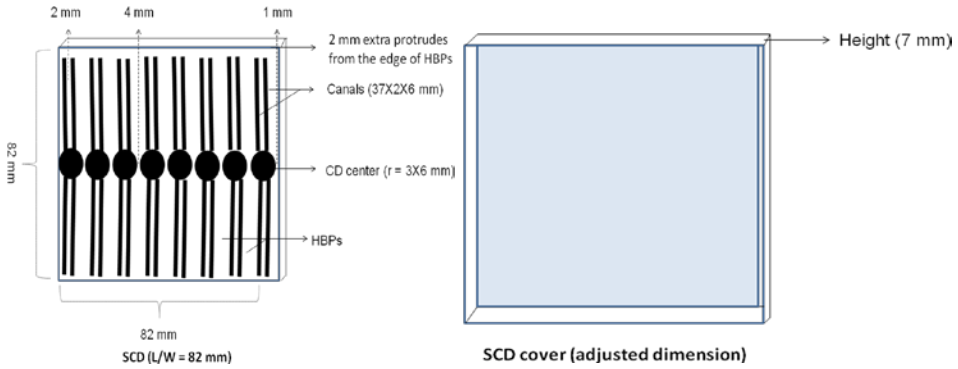

Fig. 2: A typical SCD body and cover

In conclusion, the antimicrobial assay is the crucial testing system in drug discovery, potency testing of antimicrobials, quality control of foods, drinks, and beverages, especially for pharmaceutical products. We have a number of testing apparatus such as test tubes, Petri-dishes, strips and so on. Unfortunately, some of which are time as well as culture media consuming. Therefore, un-swiftness and pricey are the tagged stances. The CD is, however, still in a theoretical sense. But the above discussion concerns that CD may be an important tool in the microbiological assay, aiming whichever more emphasized applicability in the drug discovery and development.

CONFLICT OF INTERESTS

There is no conflict of interest.

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