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Susceptibility testing methods, resistance and breakpoints: what do these terms really mean?

P. Silley

MB Consult Limited, Enterprise House, Ocean Village, Southampton SO14 3XB, United Kingdom
Department of Biomedical Sciences, University of Bradford, West Yorkshire, BD7 1DP, United Kingdom

Summary
The Clinical and Laboratory Standards Institute and the European Committee on Antimicrobial Susceptibility Testing can be considered the major international contributors to antimicrobial susceptibility testing. In this review, the author considers the differences between the respective organisations, examines the terminology used in antimicrobial susceptibility testing and argues for an urgent need to harmonise these definitions. While this may seem somewhat surprising, the terminology used to define resistance does differ. In this context, attention is given to the trend for 'resistance' to be defined by the epidemiological cut-off value, rather than by the long-established clinical breakpoint. The author goes on to discuss susceptibility testing methodologies and present an approach to setting clinical breakpoints.

Keywords
Breakpoint – Clinical and Laboratory Standards Institute – Clinical breakpoint – Epidemiological cut-off value – European Committee on Antimicrobial Susceptibility Testing – Harmonisation – Resistance – Susceptibility testing – Wild type.

Introduction

Laboratories have been testing the *in vitro* susceptibility of bacteria to antibiotics since the discovery of penicillin and, while much history surrounds the respective approaches of antimicrobial susceptibility testing (AST) (13, 21), there still remains an urgent need to harmonise and further understand the methodologies and terminologies used in susceptibility testing. While it might be expected that conducting AST and the subsequent interpretation of data is straightforward, this is not the case (16, 17). The need for standardisation of testing methodologies was understood at a very early stage and the World Health Organization (WHO) initiated efforts to develop a method that could be used by all laboratories. In 1971, WHO published methods that were for many years considered the AST 'gold standard' (7). Currently, a number of competent bodies provide instructions for performing AST and these methodologies have been published both nationally and internationally. The Clinical and Laboratory Standards Institute (CLSI) (2, 3, 5) and the European Committee on Antimicrobial Susceptibility Testing (EUCAST) (www.eucast.org) can be considered as the major international contributors to AST, while, at a national level, bodies such as the British Society for Antimicrobial Chemotherapy (BSAC), the Deutsches Institut für Normung e.V. (DIN) and the Comité de l'Antibiogramme de la Société Française de Microbiologie (CA-SFM) make ongoing and valuable contributions. It has been pointed out that, when comparing the detail of the AST procedures recommended for different organisms, variations can be seen in the proposed media and supplements, incubation times and conditions and inoculum sizes. Moreover, different breakpoints are listed in the respective AST documents (16, 17).

This review considers the terminology used in AST and argues for an urgent need to harmonise the definitions. It may seem somewhat surprising that not all surveillance

programmes define resistance in the same way (18). This means that it is not possible simply to compare resistance rates from different studies, as they are not necessarily measuring the same parameter. There are two fundamental reasons for this:

– the trend for 'resistance' to be defined by the epidemiological cut-off value rather than by the long-established clinical breakpoint; and

– no standardised way of defining the epidemiological or wild-type cut-off value.

While the use of epidemiological cut-off values might be important to detect decreased susceptibility, it is inappropriate to use this value to determine the percentage of clinical resistance (18).

Definitions

As has already been stated, CLSI and EUCAST can be regarded as the major international bodies focused on AST, and this review primarily considers the definitions and procedures advocated by these organisations. In brief, EUCAST focuses principally on setting human breakpoints and the work of EUCAST is largely involved with human medicine. The CLSI, however, has separate standing sub-committees to consider antimicrobials in human medicine (antimicrobial susceptibility testing) and veterinary medicine (veterinary antimicrobial susceptibility testing).

The documents from CLSI are produced by experts working on document development committees, sub-committees or in working groups, under the direction and supervision of a consensus committee. The development of CLSI standards is a dynamic process. The Subcommittee on Antimicrobial Susceptibility Testing of CLSI is composed of representatives from the professions, government and industry, including microbiology laboratories, government agencies, healthcare providers and educators, and the pharmaceutical and diagnostic microbiology industries. Using the CLSI voluntary consensus process, the Subcommittee develops standards that promote accurate antimicrobial susceptibility testing and appropriate reporting. The CLSI, for example, differentiates between 'standards' and 'guidelines'. A 'standard' is a document that clearly identifies specific and essential requirements for materials, methods and practices, to be used in an unmodified form. A standard may, in addition, contain discretionary elements, which are clearly identified. In contrast, a 'guideline' is a document describing criteria for a general operating practice, procedure or material for voluntary use. A guideline can be used as written or modified by the user to fit specific needs. The current CLSI document for testing antimicrobial susceptibilities of bacteria isolated from animals, M31-A3 (3), is an approved standard and cannot be used in a modified form. Clear and precise instructions are given on how to perform AST *in vitro,* including, for example, the medium to be used (including any supplements required to support the growth of specific bacteria), the inoculum density, the incubation time, the temperature and test conditions. These instructions are not optional, but are strict rules that must be adhered to for good laboratory practice. Thus, statements such as, 'Susceptibility testing mainly followed the recommendations given in the CLSI document M31-A3', are not acceptable (16, 17). Any deviation from the approved test conditions, such as the use of a different medium or extended incubation times for slow-growing bacteria, has to be specified and justified by the authors.

In contrast to CLSI, EUCAST is a standing committee, jointly organised by the European Society of Clinical Microbiology and Infectious Diseases, the European Centre for Disease Prevention and Control and European national breakpoint committees. In addition to dealing with breakpoints and technical aspects of phenotypic *in vitro* antimicrobial susceptibility testing, EUCAST also functions as the breakpoint committee of the European Medicines Agency (EMA), but only for breakpoints used in human medicine. Breakpoints in veterinary medicine within Europe are not determined by EUCAST. The Committee does not deal with antibiotic policies, surveillance or containment of resistance or infection control. The Steering Committee is the decision-making body. It is supported by a General Committee, with representatives from European and other countries, the Federation of European Societies for Chemotherapy and the International Society of Chemotherapy. The Steering Committee also consults on EUCAST proposals with experts within the fields of infectious disease and microbiology, pharmaceutical companies and susceptibility testing device manufacturers. Most antimicrobial minimum inhibitory concentration (MIC) breakpoints in Europe have been harmonised by EUCAST. Breakpoints for new agents are set as part of the licensing process through EMA. EUCAST breakpoints are available in devices for automated susceptibility testing but with some limitations, depending on the system. A disc diffusion susceptibility test method calibrated to EUCAST MIC breakpoints is also available.

Clinical resistance and clinical breakpoints

EUCAST differentiates between clinical resistance and the associated clinical breakpoints, and microbiological resistance and epidemiological cut-off values. In the first instance, the author considers clinical resistance and clinical breakpoints, terms common to EUCAST and CLSI. Both EUCAST and CLSI provide for three categories of identification: susceptible, intermediate and resistant. The

EUCAST definitions are presented on the EUCAST website (8) as follows.

Clinically susceptible (S)

– A microorganism is defined as susceptible by a level of antimicrobial activity associated with a high likelihood of therapeutic success.

– A microorganism is categorised as susceptible (S) by applying the appropriate breakpoint in a defined phenotypic test system.

– This breakpoint may be altered with legitimate changes in circumstances.

Clinically intermediate (I)

– A microorganism is defined as intermediate by a level of antimicrobial agent activity associated with uncertain therapeutic effect. It implies that an infection due to the isolate may be appropriately treated in body sites where the drugs are physically concentrated or when a high dosage of drug can be used; it also indicates a buffer zone that should prevent small, uncontrolled, technical factors from causing major discrepancies in interpretations.

– A microorganism is categorised as intermediate (I) by applying the appropriate breakpoints in a defined phenotypic test system.

– These breakpoints may be altered with legitimate changes in circumstances.

Clinically resistant (R)

– A microorganism is defined as resistant by a level of antimicrobial activity associated with a high likelihood of therapeutic failure.

– A microorganism is categorised as resistant (R) by applying the appropriate breakpoint in a defined phenotypic test system.

– This breakpoint may be altered with legitimate changes in circumstances.

These definitions are largely equivalent to those used by CLSI (3); although CLSI uses the term, 'interpretive criteria/breakpoint', both employ the MIC or zone diameter value to indicate susceptible, intermediate and resistant. The respective definitions are:

Susceptible (S)

– A category that implies that an infection due to the isolate may be appropriately treated with the dosage regimen of an antimicrobial agent recommended for that type of infection and infecting species, unless otherwise indicated.

Intermediate (I)

– A category that implies that an infection due to the isolate may be appropriately treated in body sites where the drugs are physiologically concentrated or when a high dosage of drug can be used; also indicates a 'buffer zone' that should prevent small, uncontrolled, technical factors from causing major discrepancies in interpretations.

Resistant (R)

– Resistant isolates are not inhibited by the usually achievable concentrations of the agent with normal dosage schedules and/or fall in the range where specific microbial resistance mechanisms are likely (e.g. β-lactamases), and clinical efficacy has not been reliable in treatment studies.

In addition to standards and guidelines, CLSI also produces reports and has, in report X08-R 'Generation, presentation and application of antimicrobial susceptibility test data for bacteria of animal origin' (4), provided guidance on antimicrobial resistance surveillance programmes, including issues such as methodology, data presentation and data interpretation, and, in particular, addressing situations in which CLSI-approved veterinary-specific clinical breakpoints have not been established. This report provides a definition for a category other than S, I or R, termed: 'non-susceptible antimicrobial susceptibility test interpretive category'. This is a category used for isolates for which only a susceptible interpretive criterion has been designated because of the absence or rare occurrence of resistant strains. Isolates that have MICs above or zone diameters below the value indicated for the susceptible breakpoint should be reported as non-susceptible. The authors make the point that an isolate that is interpreted as non-susceptible does not necessarily have a resistance mechanism.

The definitions are clearly laid out in the respective CLSI publications. Conversely, all EUCAST data can be found on the EUCAST website, although not all the data will be found in a common section of the website. Unfortunately, there is no harmonisation in the way that breakpoints are presented. For instance, EUCAST presents susceptible (S) clinical breakpoints as $\leq x$ mg/L; intermediate (I) as $>x$ mg/L, $\leq y$ mg/L; and resistant (R) as $>y$ mg/L. In reality, the EUCAST website does not show the intermediate values. However, while CLSI presents susceptible (S) clinical breakpoints in the same way, as $\leq x$ mg/L; and intermediate (I) as a range, e.g. 1 to 2 mg/L; conversely, the resistant (R) breakpoint is presented as $\geq y$ mg/L, rather than >, as in the case of EUCAST.

Epidemiological cut-off values

EUCAST introduced the term, 'microbiological resistance', and it also presents epidemiological cut-off values (ECVs, also referred to as 'ECOFF') for antimicrobials against a

wide range of bacteria. These ECVs are determined on the basis of the distribution of MICs for an antimicrobial and a bacterial species. The population that clearly departs from the normal population ('wild type') is categorised as 'non-wild type'. It has been argued that agreement on the ECVs should not be difficult, as the wild-type MIC distributions make them more or less self-evident (11). The differences between ECVs and clinical breakpoints, the principles of which apply to all antimicrobial compounds, have been adequately addressed (1, 18, 19). The EUCAST definitions for wild type and non-wild type are described as follows.

Wild type

– A microorganism is defined as wild type (WT) for a species by the absence of acquired and mutational resistance mechanisms to the drug in question.

– A microorganism is categorised as wild type (WT) for a species by applying the appropriate cut-off value in a defined phenotypic test system.

– This cut-off value will not be altered by changing circumstances.

– Wild-type microorganisms may or may not respond clinically to antimicrobial treatment.

Microbiological resistance – non-wild type

– A microorganism is defined as non-wild type (NWT) for a species by the presence of an acquired or mutational resistance mechanism to the drug in question.

– A microorganism is categorised as non-wild type (NWT) for a species by applying the appropriate cut-off value in a defined phenotypic test system.

– This cut-off value will not be altered by changing circumstances.

– Non-wild-type microorganisms may or may not respond clinically to antimicrobial treatment.

EUCAST presents wild-type data as WT ≤ *z* mg/L and non-wild-type as NWT > *z* mg/L. While there are reports addressing how epidemiological cut-off values are established (12, 20), this process has yet to be harmonised. The introduction of the term 'microbiological resistance' by EUCAST is somewhat misleading, as the presence of an antimicrobial resistance mechanism does not necessarily imply that the organism will fail to respond to antimicrobial therapy. The EUCAST definition makes the very point that non-wild-type microorganisms may or may not respond clinically to antimicrobial treatment, although, in many cases, authors are reporting isolates outside the normal distribution as being resistant. This point is especially important for antimicrobial classes such as the fluoroquinolones, where there is a relatively large difference between the epidemiological cut-off value and the clinical breakpoint (6, 18). The CLSI X08-R report, 'Generation, presentation and application of antimicrobial susceptibility test data for bacteria of animal origin', addresses these issues in some detail and recommends the following terminology.

– The clinical breakpoint is reserved for the prediction of clinical efficacy, as in: the long-established use of the clinical breakpoint showing resistance of organism *x* to drug *y* is: MIC ≥ *z* µg/mL.

– The ECV, or wild-type cut-off value, is used to separate bacterial populations on the basis of MIC distributions. The ECVs are normally established on the basis of the MIC distribution data (phenotype) created from testing isolates derived from geographically diverse laboratory surveys. The number of bacterial isolates with MIC values between the ECV and the clinical breakpoint should then be reported as percent decreased susceptibility.

The authors of the CLSI X08-R report believe that universal adoption of the above terminology would help to avoid confusion in therapy guidelines for animal care, as well as those designed to detect emerging resistance for public and animal health purposes. Using the above terminology would enable veterinarians to choose appropriate treatment based on information relevant to the individual animal, yet would also recognise that epidemiologists need to be aware of emerging changes in bacterial antimicrobial susceptibility, which may indicate emerging resistance, and thus allow appropriate control measures to be considered.

Clinical breakpoints and epidemiological cut-off values may be very similar or even identical for some bacteria/drug combinations. However, authors must understand that epidemiological cut-off values are determined by a different (and as yet non-harmonised) approach from that used to determine clinical breakpoints, and do not take into account the results of clinical efficacy studies, dosage and route of administration of the antimicrobial agent, or the drug's pharmacokinetic and pharmacodynamic parameters in the animal species concerned. It is strongly argued that the term 'breakpoint' should be used exclusively for clinical breakpoints, and the 'susceptible', 'intermediate' and 'resistant' categories should also be reserved for classifications made in relation to the therapeutic application of antimicrobial agents. When reporting data using epidemiological cut-off values, the term 'resistant' is inappropriate. Instead, bacteria should be reported as 'wild type' if the MIC or zone diameter falls within the wild-type range, or 'non-wild type' if the MIC is higher or the zone diameter smaller than the wild-type range. Indeed, in an international expert proposal for interim standard definitions for acquired resistance, Magiorakos *et al.* clearly stated that a bacterial isolate should only be considered non-susceptible to an

antimicrobial agent when it tests resistant, intermediate or non-susceptible using clinical breakpoints as interpretive criteria, and not epidemiological cut-offs (15).

Susceptibility testing methodologies

A variety of laboratory methods can be used to measure the *in vitro* susceptibility of bacteria to antimicrobial agents, since there is no uniform harmonised methodology of AST in human and veterinary medicine. In general, the two most commonly used methods are agar disc diffusion and broth microdilution. However, there is a tendency to prefer broth microdilution over agar disc diffusion, since this is the more robust test method and provides quantitative results. Nevertheless, both are approved AST methods and detailed descriptions of the test conditions have been published by numerous national and international organisations. The details of these methods are provided in full in 'Performance standards for antimicrobial disk and dilution susceptibility tests for bacteria isolated from animals; approved standard', CLSI document M31-A3 (3), which includes a series of recommendations to help standardise the way these tests are performed. In recognition of the need for a global standard for AST for bacteria isolated from animals, the World Organisation for Animal Health (OIE) published test method guidelines in its *Terrestrial Animal Health Code* (*Terrestrial Code*) (22) that are consistent with those contained in CLSI document M31-A3 (3). Globally harmonised test methods are essential if inter-laboratory MIC or zone size data are to be compared in the peer-reviewed literature (16, 17).

Detailed EUCAST procedures for setting breakpoints for antimicrobial agents are available on the EUCAST website. They have also been published in the journal, *Clinical Microbiology and Infection*, as a series of EUCAST Technical Notes. These notes are based on the rationale documents produced by EUCAST for each of the antimicrobial agents studied, with the aim of highlighting important background information underlying the decisions made on breakpoints by EUCAST.

The International Organization for Standardization (ISO) has developed a worldwide standard to determine MICs by microdilution. ISO report 20776-1:2006 (9) describes the broth microdilution reference method to determine MICs, although clinical interpretation of the MIC value is beyond the scope of ISO 20776-1:2006. The report considers that modifications of the basic method are required for certain antimicrobial agent-bacteria combinations to facilitate clinical interpretation. The modifications are included in a separate table to the report. The authors note that it is advisable to compare other susceptibility testing methods with this reference method for validation, in order to ensure comparable and reliable results. Further to this standard, ISO 20776-2:2007 has been published more recently (10). This later standard establishes acceptable performance criteria for AST devices that are used to determine MICs and/or interpretive category determinations of susceptible, intermediate and resistant (SIR) strains of bacteria to antimicrobial agents in medical laboratories. This standard also specifies the requirements for AST devices (including diffusion test systems) and procedures for assessing their performance. It defines how a performance evaluation of an AST device should be conducted, and guides manufacturers in the conduct of performance evaluation studies. The EUCAST and CLSI microdilution methods are both compatible with the final version of the ISO method.

Setting breakpoints

Historically, susceptibility 'S' was largely determined by an evaluation of the MIC distributions of the pathogen(s) under study. The CLSI guideline M37-A3 (2), which addresses setting breakpoints, points out that such susceptibility breakpoints would be weighted towards microbial population distributions rather than towards clinical outcomes in relation to MIC. By examining the MIC distribution pattern in either a clinical or an epidemiological database, we can determine if there are distinct populations that can be differentiated by the presence of wild-type or high MICs. Although the proportion of the MIC distribution above or below the wild-type population can change over time, there is no reason to expect a negative impact on clinical efficacy when choosing to treat a susceptible strain.

The purpose of clinical susceptibility breakpoints is to help select effective therapeutic intervention to treat bacterial infections based on the results of *in vitro* susceptibility tests. These susceptibility breakpoints are, of course, disease-indication and target-animal-species specific. As stated in CLSI guideline M37-A3 (2), by establishing criteria for correlating the necessary levels of drug exposure and the probability of an effective course of therapy, clinically derived susceptibility breakpoints can also minimise the risk of repeated exposure to insufficient antimicrobial drug concentrations, which is one of the factors thought to contribute to the development of resistant bacteria.

There are many factors that contribute to an antimicrobial producing a positive clinical outcome, including the:

– intrinsic activity of the antimicrobial, measured by the MIC (determined under standardised conditions)

– pharmacodynamic properties of the antimicrobial (cidal *versus* static effects, rate of kill)

– characteristics of the host-pathogen response, including host immune status

– pharmacokinetics of the drug in the administered dosage form
– dosage regimen
– propensity of infecting organism to develop resistance.

All these factors are taken into consideration in the determination of a breakpoint, through a review of MIC distribution data, pharmacokinetics and clinical response. As part of this review process, pharmacokinetics and pharmacodynamics will be taken into consideration. This, of course, necessitates some understanding of the respective pharmacokinetics-pharmacodynamics indices for the different antimicrobial classes used in veterinary medicine. The CLSI Veterinary AST Committee defines the pharmacokinetics-pharmacodynamics index as the quantitative relationship between a pharmacokinetics parameter (e.g. area under the curve or AUC; maximum achievable serum concentration of the test antimicrobial, C_{max}) and a microbiological parameter, such as MIC. Most frequently, these indices are expressed in terms of AUC_{24}/MIC, C_{max}/MIC, or T > MIC (where T = time).

The CLSI procedures for setting veterinary breakpoints are fully detailed in CLSI guideline M37-A3 (2) and the veterinary breakpoints themselves have been published in M31-A3, shortly to be updated to version A4; while CLSI clinical breakpoints for human medicine are published in the M100 series of documents (5) and regularly updated. The EUCAST procedures for harmonising breakpoints for existing antimicrobial agents in human medicine, and for setting breakpoints for new agents, are similar in philosophy but different in practice, and are fully described on the EUCAST website. Breakpoint tables can also be found on the EUCAST website, with links to tables of wild-type MIC distributions and rationale documents produced for each of the antimicrobial agents addressed by EUCAST.

EUCAST has developed expert rules to assist clinical microbiologists and describe the actions that should be taken in response to specific antimicrobial susceptibility test results (14). This has largely been in response to the increasing complexity of and widespread increase in antimicrobial resistance mechanisms and the clinical implications of such resistance.

An expert rule describes an action to be taken on the basis of specific antimicrobial susceptibility test results. The rules are based on current clinical breakpoints and our knowledge of resistance mechanisms. However, with revisions of breakpoints and the discovery of new resistance mechanisms, it is acknowledged that rules may become redundant or require modification (14). The EUCAST expert rules in antimicrobial susceptibility testing, first published in 2008 (www.eucast.org), are divided into intrinsic resistance, exceptional phenotypes, and interpretive rules. The second version of these rules, which has been updated in line with current EUCAST breakpoints, has recently been published. The CLSI addresses these issues with footnotes within the comprehensive tables produced in its respective documents.

An informal exchange of information does occur between EUCAST and the CLSI. However, differences in structure, financing and relationships with regulatory authorities have precluded formal collaboration in setting breakpoints.

Conclusions

Antimicrobial susceptibility testing and subsequent data interpretation is clearly a complex matter and, whilst bodies such as the CLSI and EUCAST provide instructions for these processes, many workers fail to follow them rigorously. It is fundamentally important that those working in this area are aware of the described protocols and that they are followed precisely and not interchanged. In this context, it is important that antimicrobial susceptibility test data intended to aid in recommending clinical therapy should be interpreted and reported using clinical breakpoints. Conversely, data intended for surveillance purposes can be reported using epidemiological cut-off values but the two should not be interchanged, and there is a considerable need to harmonise the process for agreeing epidemiological cut-off values. It is also important for workers to present quality control data and MIC distributions in reported studies. This allows for subsequent evaluation by a third party, and is especially important when evaluating reported data against different interpretive criteria and where such criteria change over time. These conclusions are supported by other workers (16, 17).

It is also interesting to speculate on the possible impact of new technologies on antimicrobial susceptibility testing. Current discussions are addressing how resistance mechanisms that do not confer clinical resistance but result in elevated MICs affect the interpretation of susceptibility test data and the resulting clinical decision-making. Simple screening tests are inevitably the way forward but there must be efforts to embrace the technology available to supplement these tests. While we are becoming increasingly aware of the importance of biofilm in infectious disease, we do not have any screening mechanisms that can take this into consideration. Some of the limitations in our present ability to use susceptibility testing to predict clinical outcomes are almost certainly a result of biofilm formation. New technology in itself will not necessarily move us forward in this challenging area but will almost certainly offer additional insight into what is happening at the site of clinical infection when antimicrobials are present.

As a final comment on this topic, the author would like to address the focus on antimicrobial resistance at the expense of attempting to establish an understanding of the virulence of test organisms. This is particularly relevant when screening foodborne pathogens and commensal organisms which do not necessarily cause infection. It can be argued that, in addition to understanding something of their antimicrobial susceptibility profile, we need to establish whether these organisms are also carrying virulence genes. Molecular technology now offers us the ability to screen not only for resistance but also for virulence genes; such knowledge would be useful as we attempt to understand more of this complex ecosystem.

Since antimicrobial resistance continues to dominate the minds of politicians as well as scientists, it is inconceivable that the demand for susceptibility testing will decrease. In terms of veterinary medicine and animal health over recent years, much of the focus has been on the surveillance of foodborne pathogens and commensal flora; the importance of surveillance of target animal pathogens is now being recognised and this will undoubtedly become a growth area. Such data are vital to understand the importance of maintaining effective antimicrobials for the treatment of infectious disease in food-producing and companion animals. Moreover, there is now a concerted effort in Europe to monitor the usage of antimicrobials through the European Surveillance of Veterinary Antimicrobial Consumption project, launched by the EMA in September 2009, following a request from the European Commission to develop a harmonised approach for collecting and reporting data on the use of antimicrobial agents. This will inevitably prompt a continuing desire to relate such data to developments in antimicrobial resistance. It thus becomes obvious that we need to ensure that surveillance data are robust, and the principal need at present is to harmonise surveillance schemes so that they all define resistance in the same way.

■

Tests de sensibilité, résistance et valeurs critiques : que signifient vraiment ces termes ?

P. Silley

Résumé

L'Institut des normes cliniques et de laboratoire (CLSI) et le Comité européen pour les tests d'antibiorésistance (EUCAST) sont considérés comme les deux principaux contributeurs internationaux en matière de tests de sensibilité aux agents antimicrobiens. L'auteur de cet article fait le point sur les différences entre les deux organisations et examine la terminologie qu'elles emploient dans le domaine des tests de sensibilité aux antimicrobiens, ce qui l'amène à préconiser une harmonisation urgente de leurs définitions. Aussi surprenant que cela puisse paraître, la terminologie utilisée pour définir la résistance est effectivement différente d'une organisation à l'autre. Dans ce contexte, l'auteur attache une attention particulière à la tendance actuelle de définir la « résistance » à partir du seuil critique épidémiologique, plutôt qu'à partir du concept précédemment bien établi de valeur critique clinique. L'auteur examine ensuite les différentes techniques utilisées pour tester la sensibilité et présente une méthode permettant d'établir les valeurs critiques cliniques.

Mots-clés

Comité européen pour les tests d'antibiorésistance – Harmonisation – Institut des normes cliniques et de laboratoire – Résistance – Seuil critique épidémiologique – Souche sauvage – Tests de sensibilité – Valeur critique – Valeur critique clinique.

■

Métodos de realización de antibiogramas, resistencia y valores críticos. ¿Qué significan realmente estos términos?

P. Silley

Resumen

Cabe considerar que el Instituto de Estándares Clínicos y de Laboratorio y el Comité Europeo de Antibiogramas son las dos principales instancias internacionales en materia de análisis de sensibilidad. Tras examinar las diferencias entre ambas organizaciones y la terminología que emplean en materia de antibiogramas, el autor incide en la urgente necesidad de armonizar las definiciones. Aunque pueda parecer un tanto sorprendente, la terminología utilizada para definir la resistencia es de hecho diferente. En este sentido, el autor examina la tendencia a definir la 'resistencia' por el valor umbral epidemiológico en lugar del tradicional valor crítico clínico. Después pasa a ocuparse de los métodos de realización de antibiogramas y presenta un sistema para establecer valores críticos clínicos.

Palabras clave

Análisis de sensibilidad – Antibiograma – Armonización – Comité Europeo de Antibiogramas – Instituto de Estándares Clínicos y de Laboratorio – Resistencia – Tipo salvaje – Valores críticos – Valores críticos clínicos – Valores umbral epidemiológicos.

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