Contemporary Themes

Names for mycobacteria

CHRISTOPHER H COLLINS, MALCOLM D YATES, JOHN M GRANGE

Real names tell you the story of the things they belong to.
J R R TOLKIEN: *The Lord of the Rings*

To the founding fathers of bacteriology the nomenclature of pathogens was straightforward. Tuberculosis was caused by the tubercle bacillus and leprosy was caused by the leprosy bacillus and when these pathogens were allocated to the genus *Mycobacterium* this posed no problem, they merely became *M tuberculosis* and *M leprae*. This golden age of simplicity in nomenclature was, however, short lived as it soon became apparent that tubercle bacilli were not all identical and that some tuberculosis-like infections were caused by other mycobacterial species that normally existed as saprophytes in the inanimate environment.

In our experience mycobacterial nomenclature is a frequent source of confusion to physicians and we will thus attempt to shed some light on this subject.

The tubercle bacillus

The name "tubercle bacillus" is derived from Robert Koch's term "Tuberkelbazillus" which included the causative agents of tuberculosis of mammals, especially man and cattle. During the early part of this century, largely as a result of the work of the British Royal Commission on Tuberculosis, two mammalian tubercle bacilli were recognised, human and bovine. (The avian tubercle bacillus was also described but this is now universally recognised as belonging to a distinct species, *M avium*.) These bacilli eventually became known by the separate specific names *M tuberculosis* and *M bovis*. Subsequently, a third member was added to this group—the vole tubercle bacillus or *M microti*—and more recently the term *M africanum* was introduced as a label for a heterogeneous group of bacilli responsible for cases of tuberculosis in man in parts of Africa.^{1 2} The latter group of strains appears to bridge the gap between the human and bovine types; those from east Africa have features in common with the former while those from west Africa more closely resemble the latter.³

In 1975 Runyon proposed that the term "tubercle bacilli" should include *M tuberculosis*, *M bovis*, *M africanum*, and no others.⁴ These three "species" all have official taxonomic status and are included in an internationally accepted list of species names (see table).⁵ Nevertheless, these, together with

M microti, have been shown by antigenic analysis to form a single species with some degree of infraspecific variation.⁶ As other techniques, such as numerical taxonomy, skin test specificity, and DNA hybridisation strongly support this concept, it has accordingly been recommended that the single term *M tuberculosis* be used to designate all these entities.⁷ This recommendation has, at present, not achieved universal acceptance, and the names of tubercle bacilli and the status of officially named species are likely to continue to be playthings for systematists.

As clinical microbiologists, we find it necessary to temper our concern for taxonomic niceties with a sympathetic consideration for physicians who expect a prompt and comprehensible report from a laboratory that is dedicated to their service. We consider that all tubercle bacilli, within the limits proposed by Runyon,⁴ should be reported as *M tuberculosis*. This avoids any confusion that might arise in clinical practice by the use of new or unfamiliar names, in the notification of cases, and in the follow up procedure of contacts.

We recognise, however, that there are "variants," "varieties," or "subspecies" of *M tuberculosis* with distinguishing cultural characteristics which are shown by simple tests.⁸ As the distribution of these variants is related to the ethnic group or geographical origin of the patients they are of epidemiological interest, but they have no bearing on the treatment of the patient. We therefore define tubercle bacilli for epidemiological interest only as:

- (1) The classic human variety.
- (2) The Asian variety. This appears to have its origin in southern India but occurs among Asians resident in other countries, including Britain.^{9 10}
- (3) The classic bovine variety, synonymous with *M bovis*, infections with which are not necessarily of bovine origin.^{11 12}
- (4) The African variety I. This corresponds to *M africanum* of the type isolated mainly in patients from west Africa.⁸
- (5) The African variety II. This corresponds to *M africanum* of the type isolated mainly in patients from east Africa.⁸

There remains BCG (bacille Calmette-Guérin), which is also

List of approved mycobacterial names

<i>M africanum</i> *†	<i>M gordonae</i>	<i>M phlei</i>
<i>M asiaticum</i>	<i>M haemophilum</i> *	<i>M scrofulaceum</i> *
<i>M aurum</i>	<i>M intracellulare</i> *	<i>M senegalense</i>
<i>M avium</i> *	<i>M kansasii</i> *	<i>M simiae</i> *
<i>M bovis</i> *†	<i>M komossense</i>	<i>M smegmatis</i>
<i>M chelonae</i> *	<i>M leprae</i> *	<i>M szulgai</i> *
<i>M chitae</i>	<i>M lepraemurium</i> ‡	<i>M terrae</i>
<i>M duvalii</i>	<i>M malmoense</i> *	<i>M thermoresistibile</i>
<i>M farcinogenes</i>	<i>M marinum</i> *†	<i>M triviale</i>
<i>M flavescens</i>	<i>M microti</i> †	<i>M tuberculosis</i> *
<i>M fortuitum</i> *	<i>M monochromogenicum</i>	<i>M ulcerans</i> *
<i>M gadium</i>	<i>M neoaurum</i>	<i>M vaccae</i>
<i>M gastri</i>	<i>M parafortuitum</i>	<i>M xenopi</i> *
<i>M gilvum</i>	<i>M paratuberculosis</i> §	

*Documented causative agents of human disease.

†Variants of *M tuberculosis* (see text).

‡Agent of swimming pool granuloma.

§Agent of paratuberculosis, or Johne's disease, in cattle.

||Agent of Buruli ulcer, a tropical skin disease of man.

¶The rat leprosy bacillus.

PHLS Regional Centre for Tuberculosis Bacteriology, Public Health Laboratory, Dulwich Hospital, London SE22 8QF

CHRISTOPHER H COLLINS, MBE, MPHIL, senior technical officer
MALCOLM D YATES, BSC, MBIOL, senior microbiologist

Cardiothoracic Institute, Brompton Hospital, Fulham Road, London SW3 6HP

JOHN M GRANGE, MD, MSC, reader in microbiology

Correspondence to: Mr C H Collins.

now recognisable by simple tests even in the absence of clinical information.^{13 14} We agree with Runyon that this should be reported simply as "BCG."¹⁴

We emphasise that this system is pragmatic and in no way prejudices purely taxonomic investigations. It is, however, likely to be of greater value than the official nomenclature in the service of physicians and may be of use to epidemiologists.

The "others"

The collective terms used to embrace all those mycobacteria that cannot be identified as tubercle bacilli have generated a fair amount of discussion and correspondence, especially in the 1960s. In spite of the semantic problems which these names posed, the word "atypical" has come into general use in the United States,^{15 16} while "anonymous" and "opportunistic" are generally preferred in the United Kingdom.¹⁷ Other terms still used from time to time include "tuberculoid bacilli," "MOTT" (mycobacteria other than tubercle) bacilli, and "non-tuberculous mycobacteria." To these names we have recently added our own somewhat poetically inspired epithet "nyrocine mycobacteria."¹⁸

It was expected that such collective names would become redundant as a result of the great flurry of activity in the 1970s, especially by the International Working Group on Mycobacterial Taxonomy, which led to the identification and naming of virtually all of the potentially pathogenic mycobacteria and also of some that are not known to be associated with disease in man. The table lists the names of the mycobacteria approved by the International Committee on Systematic Bacteriology.⁵

This commendable progress has not, however, removed the problems of nomenclature from the practice of medical mycobacteriology. It is desirable, if not always strictly necessary, for interim reports to be sent to physicians saying, in effect, that a mycobacterium has been isolated, that it is probably not a tubercle bacillus, but that it has not yet been identified. For some years now we have used the words "anonymous mycobacterium, identification to follow" on our reports, on the not unreasonable grounds that at that time the unidentified organism was indeed "anonymous." The medical microbiologists and physicians in the 90 or so hospitals served by the Dulwich laboratory have become accustomed to such reports.

The final identification of species (or assignment to group when the ideal cannot be achieved) does not conclude the duties of the mycobacteriologists to the physician or to the microbiologist who submitted the culture. The specific name of an organism may mean very little to a physician whose immediate reaction may well be, "Is it significant?" or "What is it sensitive to?"

When an organism is identified as being one that is not known to cause human disease we consider that the report should also state: "It is probably an environmental contaminant." It has not, for example, been our practice to report *M. gordonae* or *M. flavescens* as such; we describe them as "environmental scotochromogens." On the other hand, as any mycobacterium is potentially pathogenic in patients who are immunocompromised (whether as a result of disease or its treatment) it might be as well, as a standard procedure, to state this possibility on all forms reporting the isolation of these mycobacteria.

Problems arise with organisms that can cause disease in man but are often present in the environment. Examples of these are *M. kansasii* and *M. xenopi*, both opportunistic pathogens but also frequently present in hospital and public water supplies in south east England.^{19 20} These organisms gain access to specimens (by means unknown), may be transitory and benign residents in the human respiratory tract, or may be responsible for overt and invasive disease. We find that it is necessary to draw the physician's attention to all of these possibilities by adding a note to the report which states, "As this organism is present in the environment—for example, in water supplies—a single isolation may not be clinically significant."

These problems in nomenclature emphasise the fact that a

gulf still exists between the academic mycobacterial taxonomist and the medical mycobacteriologist who has obligations towards his clinical colleagues. It is just not enough to give an organism a name and to leave to other people the task of interpreting it.

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What is the effect on blood pressure of (a) driving in high density traffic (b) and sexual activity in the various decades of life?

Car driving has not been shown to have a significant effect on blood pressure in one study of normotensive and hypertensive subjects.¹ Short periods of raised arterial pressure may occur during overtaking but these return quickly to baseline levels. The effect of driving in high density traffic has not been studied. Sexual intercourse has been shown to produce rises in systolic blood pressure of 20% to 107% and diastolic pressure of 31% to 60% and heart rate increases from 25% to 120%.² Peak arterial pressure and heart rate occur at the time of orgasm,³ after which the arterial pressure and to a lesser extent heart rate fall to below the pre-coital levels within 20 to 120 seconds. Continuous monitoring of intra-arterial blood pressure in ambulant hypertensive subjects showed peak blood pressure of 300/175 mm Hg. The mean values for men were 237/138 and for women 216/127.⁴ These effects are greater with new or unfamiliar partners. The influence of age on these haemodynamic measurements has not been determined.—JOAN MARREN, research senior house officer, and EOIN O'BRIEN, consultant physician (cardiology), Dublin.

¹ Littler WA, Honours AJ, Sleight P. Direct arterial pressure and electrocardiogram during motor car driving. *Br Med J* 1973;ii:273-7.

² Littler WA, Honour AJ, Sleight P. Direct arterial pressure, heart rate and electrocardiogram during human coitus. *Repro Fert* 1974;40:321-31.

³ Masters WH, Johnson VE. *Human sexual response*. Boston: Little, Brown and Co, 1966:35-6, 130, 174-6, 278.

⁴ Mann S, Millar Craig MW, Gould BA, Melville DI, Rafferty EB. Coital blood pressure in hypertensives. Cephalgia, syncope, and the effects of beta-blockade. *Br Heart J* 1982;47:84-9.