EDITORIAL

CIRCUMVENTING THE TIME WARP IN HEALTH PROFESSIONS

Sometime in 1970, I had a conversation with a retired expatriate pathologist, working in the Ministry of Health, Kenya on contract. On learning that I was a new lecturer in pharmacology, University of Nairobi, he volunteered his views on the subject. I learnt that he was an alumnus of Cambridge University, England. A quick mental calculation placed him in his early 60s, which meant he had studied medicine in Cambridge in the 1930s, long before the first antibiotic, penicillin, was put to clinical use. He complained that he found pharmacology a difficult subject during his undergraduate studies. Needless to say, what he was calling pharmacology was "materia medica", a study of material and substances used in medicine, their names, sources, physical characteristics and chemical properties, their preparations and dosages. He could recall such drugs as "tincture of digitalis", "belladonna with antacids" and "Ipecacuanha". A quick review of literature shows that the majority of drugs (over 95%) were discovered after 1950. So what did the learned doctor study at Cambridge?

I recalled this encounter with the doctor the other day while delivering a lecture on drug signalling mechanism. Much of this information has been published in the last six years. Up to the 1990s, pharmacologists were satisfied to explain drug actions in terms of "occupation theory", "rate theory" and "two state model theory". In these simplistic explanations a drug combined with a receptor to elicit a response. Where the observations could not be explained adequately we invoked other subsidiary concepts such as "spare receptors", "inverse antagonism", "supersensitivity". When we were totally unable to account for the observations, we simply called it idiosyncrasy, a polite term for "I do not know".

Enter the 1980s and more theories regarding drug actions were advanced. This trend continues unabated up to now. Indeed any textbook of pharmacology that attempts to document these theories as they unfold is obsolete long before it reaches the publisher. For those in academia, it is mandatory to keep pace with these developments to avoid being caught up in a time warp. However these developments do not have a corresponding impact in the practice of health professions (medicine, pharmacy). For example, the fact that we now understand better how morphine acts through receptors ($delta_1$, $delta_2$, mu_1, mu_2, $kappa_1$, $kappa_2$, $kappa_3$) does not alter clinical uses and even dosages, which are based on empirical data obtained during clinical trials over 50 years ago. Indeed, it is the general trend that drugs are put into clinical use long before their mechanism of action are understood fully.

Recent advances regarding mechanisms of drug action show that many drugs mimick or block intracellular signalling by hormones and neurotransmitters. A drug may transduce extracellular signals resulting from drug-receptor contact into intracellular signals that control cell functions and gene transcriptions. This is usually achieved through a cascade process involving second messengers (cAMP, cGMP, Ca^{++}, IP_3). Through this process, an extracellular signal may be amplified, a phenomenon previously attributed to "spare receptors". The apparent contradiction shown by a drug where, for example, it causes contraction in some tissue and relaxation in others can also be explained.

It is not possible to give details of drug signalling mechanism in this editorial but the information is readily available in literature. Of the five mechanisms documented, those involving G-protein family coupled receptors have been studied extensively as compared to mechanisms involving tyrosine receptors, cytokine receptors and ion-channel gating. The role of second messengers is also extensively documented. Since morphine is capable of interacting with subtype receptors simultaneously, it is now possible to explain the observed multiplicity of pharmacological effects associated with this drug. These include analgesia, sedation, miosis, hypomotility, nausea, respiratory depression and cough suppression. Similarly it is possible to explain why adrenaline has different effects on different smooth muscles

(bronchioles, myocardium, blood vessels). Surprisingly the duration of most undergraduate courses in health professions (medicine, dentistry and pharmacy) have not been increased to enable lecturers cover the new material adequately. Indeed, students would resist increasing the duration of such courses. The alternative is to promote continuous education among health practitioners. The often-quoted saying, "where ignorance is bliss, it is folly to be otherwise" does not apply here.

Editorial-in-Chief