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conference proper, areas of major concern were highlighted, and research directions and conceptions with the greatest potential were proposed and rationally justified. Novel approaches to therapy were discussed, along with new screening strategies that may yield efficacious drugs that would be difficult to discover using more established strategies.

There were several informative presentations concerning important issues in drug development such as the optimal use of biomarkers, gene expression based *in vivo* assays, neuroimaging in psychiatric drug development, challenges in obtaining novel indications for drugs, and commonly overlooked issues related to successfully selling a drug (David Michelson, Eli Lilly; Michael Mallamaci, Astrazeneca; Terry Brown, MIICRO, Inc.; Steve Romano, Pfizer; and Martin Brecher, Astrazeneca). Innovations in clinical research that should aid the characterization of drugs in humans were highlighted. Also, data were presented concerning several novel targets and compounds that could be therapeutically more effective than presently favored drugs in the treatment of various psychiatric disorders such as schizophrenia, mood and anxiety disorders and depression.

Overall, the conference served to give an overview of the broad array of challenges facing the psychiatric drug development community and addressed those challenges by highlighting newly developed strategies. Only time will tell which of these strategies will prove fruitful in addressing those challenges.

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Memorable mnemonics

A thought-provoking tonic on the lighter side

Column by Raymond C. Rowe, AstraZeneca, UK

Please note that these are the personal opinions of the author and do not necessarily represent those of AstraZeneca.

One of my most popular articles of recent years as judged by both the number of full-text downloads and the number of e-mails I received was on mnemonics [1]. My interest in the subject was rekindled on receiving from a reader (my sincere thanks to him) a copy of a long out of print book, which I had been itching to get hold of ever since I had read an article on it in the Lancet [2]. Entitled Irving's Anatomy Mnemonics by Alastair Smith [3], it provides lists of fascinating word mnemonics and extended acronyms dedicated, as stated in the preface ' to the simple-minded, to the crammers for exams and to those whose stumbling feet find the anatomical pathway difficult'. At about the same time I decided to seek out other mnemonics on chemistry, biochemistry and biology and the more research I have done, the more fascinated I have become in this form of memory device. Some mnemonics are memorable indeed!

Chemical mnemonics

It is not surprising that the majority of chemical mnemonics relate to the periodic table. The first ten elements (H, He, Li, Be, B, C, N, O, Fe, Ne) can easily be memorised by the mnemonic 'Hi Helen, Little Betty Boron Can Not Often Find Neddy' Of course this is not the only one around. Others are ' Hell, Here're Little Beatniks Brandishing Countless Numbers Of Flick kNives' and 'Happy, Healthy Little Beggar Boys Catching Newts Or Fish' My favourite for the following seven elements (Na, Mg, Al, Si, P, S, Cl) is 'Naughty Maggie Always Sips Pure Sweet Claret'. There are several mnemonics for remembering the Lanthanides (La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Tb, Lu); among the most memorable are 'Let's Collect Pleasingly Novel Pansies Since Every Good Type Does Have Extra Thin Young Leaves' and the more risqué 'Little Cute People Need Plenty Sex Every Given Time Despite Having Enough Through Young Love'. Mnemonics also exist for remembering the elements vertically in the periodic table. For example for the alkali metals (Li, Na, K, Rb, Cs, Fr) there is a mnemonic 'Limping Native King Robbed Caesar's Friend'. An interesting feature of this mnemonic is that each word contains the second letter, if appropriate, of the element it alludes to.

Of course, mnemonics exist for many other series in chemistry and biochemistry. I have trouble remembering the electromagnetic spectrum detailing the distribution of

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electromagnetic waves according to their wavelength. A good mnemonic for the shortest to the longest wavelength (Cosmic, Gamma, X-rays, Ultraviolet, Visible, Infrared, Microwave, Radio and Television) is 'Cary Grant eXpects Unanimous Votes In Movie Reviews Tonight'. Mnemonics for recalling the common names of the saturated dicarboxylic acids up to ten carbon atoms (Oxalic, Malonic, Succinic, Glutaric, Adipic, Pimelic, Suberic, Azelaic and Sebacic) are 'Oh My, Such Good Apple Pie, Sweet As Sugar' and 'Oxford Makes Such Glittering Advances Picking Subtle Aztec Sedatives'. I must admit I find the former easier to remember probably because I always associate oxalic acid with rhubarb pie!

Biological mnemonics

The order of the taxonomic categories- Kingdom, Phylum, Class, Order, Family, Genus and Species- has spawned a multitude of mnemonics. In general these can be divided into groups that start with the words 'Kings Play' as in 'Kings Play Cards On Fine Grain Sand' or 'King Phillip' as in 'King Phillip Can Only Farm Green Spinach' or 'Kids' as in 'Kids Prefer Candy Over Fresh Green Spinach' or 'Ken' as in 'Ken Poured Coffee On Fran's Good Shirt'. I must admit I like 'Keep Putting Chemistry Off For Greater Subjects'. Some mnemonics also extend into subspecies classification (i.e. Variety and Breed) as in 'King Phillip Called Out Fire-Get Someone Very Brave'.

A memorable mnemonic for remembering the direction of the citric acid cycle in biochemistry (cis-Aconitate, Isocitrate, α-Ketoglutarate, Succinyl-CoA, Succinate, Fumarate, Malate, Oxaloacetate and Citrate is 'Actors in Kansas Should See Foreign Movies Of Course'. Recalling the names of the white blood cells in descending concentration in blood (Neutrophils, Lymphocytes, Monocytes, Eosinophils and Basophils) can be done using the mnemonic 'Never Let Monkeys Eat Bananas' There are many mnemonics for remembering the twelve cranial nerves and I have dealt with these previously [1]. However remembering whether the nerve is sensory, motor or both is another matter. Two memorable but risqué mnemonics that can help are 'Some Say Marry Money, But My Brother Says Big Boobs Matter More' and 'Some Surgeons Make Money But My Brother Says Buxom Blondes Make More'. Each word relates to the cranial nerve of the same number; words beginning with S allude to nerves that are sensory, those beginning with M, motor and those beginning with B, both.

'Idle word play or useful memory device?'

Medical mnemonics

In medicine mnemonics are often used as memory aids in two main areas, the anatomical pathway and differential diagnosis. There exists such a plethora of detail in these areas that books of mnemonics have been specifically collated to help [3,4]. An interesting feature of many medical mnemonics is their longevity, lack of political correctness having been devised in a different era and irreverence. Good examples of this are listed in Irving's Anatomical Mnemonics by Alastair Smith, first published in 1939. For instance, the branches of the common carotid artery (superior thyroid, lingual, facial, occipital, post auricular, ascending pharyngeal, superficial temporal and maxillary) are given as 'Sweet Little Flappers Occupy Positions As Stenographers Mainly'. Further sub branches of the superior thyroid branch (muscular, infrahyoid, superior laryngeal, sternomastoid, cricothyroid and glandular) can be recalled using the mnemonic 'May I Softly Squeeze Charlie's Girl?' A memorable mnemonic for the fibro-osseous compartments, extensor tendons and synovial membranes beneath the extensor retinaculum of the wrist is 'A Beautiful Little Bride Looks Distressed If Minus Undies'. The book provides a fascinating read for those interested not only in anatomy but also in the variety of word mnemonics that have been devised.

Although these are memorable they are no more than simple words strung together. However, probably the best mnemonics are those that consist of pertinent words or phrases constructed specifically to represent the domain for which they are meant. Good examples of this concept are listed in Differential Diagnosis Mnemonics by Donnelly and Giza [4], first published in 2001. For instance, nausea and vomiting are common symptoms and may be associated with several causes. A mnemonic for these causes is 'I VOMIT' alluding to Increased intracranial pressure, Vascular aetiologies, Obstruction of gastro-intestinal tract, Metabolic causes, Infectious aetiologies and Trauma. As I have said before [1] my favourite is the mnemonic for the clinical symptoms and signs for hypertension ' I CHECK A BP' standing for Idiopathic, CNS disorders, High output states, Endocrine diseases, Coarction, Kidney disease, Acute stress, Birth control drugs and Pregnancy.

Comments

Word mnemonics are in essence simple words linked together to form a phrase that can assist in memorizing a list of possibilities and many regard them as exercises in idle word play. Indeed memory does need extra methods otherwise nothing is committed and all methods require practice to perfect. Word mnemonics can be made more memorable if the phrase formed from the words has extra familiarity (sometimes by simply being nonsense) or is pertinent to the domain itself. The former will be specific to individuals and their personal recall procedures and explain the wide variety of mnemonics around for the same list of facts. However, once a mnemonic has been adopted it is often remembered long after its usefulness has expired.

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