

tive component to pain, for which the search in on for animal models.

Another symposium zeroed in on the discussion about behavioural guidance by predicted reward. The prediction of future events based on ongoing sensory processing constitutes basic brain computing. A stimulus, when repeatedly paired with a reinforcer, can promote goal-directed behaviour. The protagonists here are the dopaminergic neurons, the stage for the acquisition being the nucleus accumbens and the prefrontal cortex. The processing is phasic with activation of dopaminergic neurons by cues that predict reward. The acquisition pathway seems to differ from the habit pathway, with the latter involving the striatum. Various drugs of abuse, e.g. cocaine addiction, have revealed this dissociation between acquisition of the behaviour guided by predicted reward and its transition to the striatal habituation pathway.

A symposium was devoted to translational medicine in brain research and covered the whole spectrum of translational models of cognitive function, and detailed how models, including behavioural and knockout models of depression and anxiety can be used for drug discovery and development.

Food-seeking in obese people and other obsessive compulsive disorders and the influence of dopamine D2 and kappa opioid receptors were also dealt with. The meeting had much mention of receptor

types and sub-types, agonists, antagonists and inverse agonists, showing just how fast the field of neuropharmacology advances and how complex it can get. Pharmacokinetics of these substances, be it neurotransmitters, their agonists, antagonists and inverse agonists and drugs, and possible transport mechanisms through the blood-brain barrier were also discussed.

The symposium on social behaviour with particular reference to neurotransmitter-receptor systems and their role in animal-animal interactions received particular attention. The role of mu opioid systems and their involvement in mother-pup interactions in rodents was discussed, the model used being mu knockout mice. Opioid systems influence social behaviour; morphine, an agonist reduces affiliation, while naloxone an antagonist increases social affiliation. The involvement of the dopamine system in social attachment in male-female interactions and pair-bonding and male-male interactions in voles formed an interesting talk. Dopamine D1 activation impairs bonding, while D2 activation enhances it. The role of inhibitory neurotransmitter GABA and GABA-serotonin interactions in aggression behaviour, particularly in those elicited by alcohol were dealt with. The molecular biology of aggression has thus far not been able to identify genes for aggressiveness. What is proven is that low serotonin levels lead to aggression,

serotonin transmission in alcoholic models of mice seem to occur in 'bursts', with serotonin agonists reducing aggression; positive modulation of GABA receptors, on the other hand, increase aggression. The story, however, gets more complicated when one considers monoaminergic crosstalk and feedback control not only by excitatory glutamate and GABA, but also by modulatory neuropeptides. The psychopharmacology of play behaviour in adolescent rats was also discussed.

To complement these symposia there were poster sessions on the themes Parkinson's, Alzheimer's, schizophrenia, anxiety, depression, stress, addiction, cognition, learning and memory – using drugs, agonists, antagonists, inverse agonists, knockout models, behavioural models from the academia and from the industry. In all, as the themes of the symposia indicate, there was a nice blend of industry and academia, with the approach throughout being both clinical as well as neuropharmacological. This effort of the EBPS highlighted the advances in the field thus far, and emphasized on what possible directions future research in neuropsychopharmacology and future drug development for treatments should take.

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MEETING REPORT

Seminar on male infertility*

In our overpopulated country, the presence of infertility, its increasing trend and its clinical management come as a surprise to some. The healthcare system in India is characterized by multiple systems of medicine, mixed ownership patterns and different kinds of delivery structures. People with infertility problems should have immediate access to an integrated multidisciplinary service that provides efficient and accurate assessment of the

clinical situation. This should lead to individualized management founded on evidence-based principles of care. It should be reinforced by access to adequate information, appropriate counselling services, and ethical and cultural considerations. At all times, the infertile couple should be treated with respect, and supported in making informed choices about their care and management.

India is emerging as the most favoured destination for medical tourism. This is because of its infrastructure and technology, which are on par with those in USA, UK and Europe. India has some of the best hospitals and low-cost treatment

centres in the world, providing the best facilities. To establish India in a leading position in the global infertility treatment, a holistic approach to the management of infertility is a must. To look at the advances in infertility diagnosis and treatment in ayurveda, allopathy, unani-tibb, siddha and homeopathy, a national seminar on male infertility was organized recently. There were 160 participants from different institutes of India.

Shrishailsh Amarkhed (J. N. Medical College, Belgaum) in his inaugural address spoke on current understanding of the male reproductive system, endocrinology and spermatogenesis. Vaidya Pawan-

*A report on 'VRISHYA 07 – A National Seminar on Male Infertility' held at Shri B.M.K. Ayurveda Mahavidyalaya and Hospital, Belgaum during 26–27 October 2007.

kumar Godatwar (National Institute of Ayurveda, Jaipur) in his plenary talk presented reappraisal of the concepts of *Kāma Vājīkaraṇa* and *Śhukra*. Health professionals need to develop comfort and competence to address the concerns of their clients at a level appropriate to themselves, their clients and the clinical situation, with the option of referral to higher levels of management. Research indicates that sensitization/desensitization in attitudes and values, basic knowledge of the genital structure, the sexual response cycle and changes in the life cycle as well as competence in communicating with a client on sexual and relational issues are considered essential (core) components of most sexuality education programmes. The average age when people first receive sex education in India is 15.6 years, while the world average is 13.2 years. B. Srinivas Prasad (Shri B.M.K. Ayurveda Mahavidyalaya and Hospital, Shahapur, Belgaum) spoke on etiopathogenesis of male infertility, discussed the principles of ayurvedic management of male infertility, *panchakarma*, management of azoospermia, varicocele, etc. Madhava Diggavi (Government Taranath Ayurvedic Medical College, Bellary)

spoke on understanding of *samprap-tighataka* in male infertility and counseling. S. I. Neeli (KLES Prabhakar Kore Hospital, Belgaum) spoke on investigations regarding male infertility and their clinical interpretation, and discussed the latest protocols followed in evaluating reversible and irreversible conditions in infertile male, significance underlying medical pathology, genetic and/or chromosomal abnormalities that may affect either the patient or his offspring. Niranjana Rao (S.D.M. College and Hospital of Ayurveda, Udupi) spoke on medical management of male infertility: *samprap-ti vighatana-chikithsa*, *Dhatu saamyachikithsa*, *panchakarma*. T. Shridhara Bairy (Folklore Medicine Research Centre) in his keynote address spoke about single herbal drugs in male infertility. Understanding the dynamic properties of herbs in the light of ayurvedic principles can help us choose them. Sometimes just one herb, if it is well suited to the individual, can be effective. It is important to strengthen *agni* and cleanse *ama* before giving proper treatment, or combine the appropriate herb with light, warming and stimulating herbs like *Ela*, *Shunti* or *Pip-pali* to make them easier to digest.

R. S. Hiremath (Shri B.M.K. Ayurveda Mahavidyalaya and Hospital) spoke on single mineral drugs concerned with male infertility. He discussed about different drugs like *Vajeekara*, *Shukravardhaka*, *Shukrastambhaka*, *Dhwajabhanganashaka*, *Shukramehanashaka* and *Ksheenashukra*. Anup Thakar (Gujarat Ayurved University, Jamnagar) spoke on recent researches in ayurvedic management of male infertility and clinical assessment of certain *vajīkaraṇa* drugs in the management of male infertility.

In the panel discussion and valedictory function, clinicians stressed the need for a holistic approach to the management of infertility, ranging from the basics such as sex education and medication to advanced forms of treatment, including *in vitro* fertilization, intra-cytoplasmic sperm injection and other assisted reproduction techniques.

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RESEARCH NEWS

Malaria control: New avenues

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Malaria is an acute infectious disease caused by the parasites, *Plasmodium* spp. and spread by the vector, the female anopheles mosquito. Today over 3.2 billion people in 107 countries/territories are living under the threat of malaria¹. It is spreading worldwide due to the emergence and spread of drug-resistant strains. This poses major health and economic problems for the population living in endemic areas as well as travellers². If no new control measures are developed, the number of malaria deaths is projected to double in the next 20 years³.

Therefore, there is an urgent need for developing new strategies to control malaria. Several new drugs are under development, which are likely to be used in

combinations to slow the spread of resistance, but the high cost of treatments would make these drugs difficult to sustain. Malaria vaccine, RTS, S/AS02, has shown promise in endemic areas and will shortly enter further trials. Other vaccines are being studied in clinical trials, but it will probably be at least ten years before a malaria vaccine is ready for widespread use⁴. The other approach involves control through vector, and in the last few years there have been several developments in this field.

Riehle *et al.*⁵ looked into natural resistance of mosquitoes to *Plasmodium*. According to them, *Anopheles gambiae* population in a West African malaria transmission zone has naturally occurring

genetic loci that control mosquito infection with the human malaria parasite, *Plasmodium falciparum*. This genetic resistance can segregate as a simple Mendelian trait. They have sampled the isofemale pedigrees from wild mosquitoes as female *A. gambiae* mate only once and each mosquito pedigree is the progeny of a single pair cross that has occurred in nature. The strongest *Plasmodium* resistance loci cluster in a small region of chromosome 2L and each locus accounts for at least 89% of parasite-free mosquitoes in independent pedigrees. All the clustered loci form a genomic *Plasmodium*-resistance island and are responsible for most of the genetic variation for malaria parasite infection of mosquitoes