

# Aviation and space medicine – from intracellular to interplanetary

**The Aviation Medicine ‘Hot topic’ symposium was held on 1 March 2013 at the Royal College of Physicians of Edinburgh**

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**DECLARATION OF INTERESTS** Dr Hodkinson is employed by the Royal Air Force and also works at the Civil Aviation Authority, as part of his Specialty Registrar training programme, so he has worked with, or for, many of the speakers. ©Crown Copyright/MOD 2013. Published with the permission of the Controller of Her Britannic Majesty’s Stationary Office.

Aviation and space medicine is important for ensuring flight safety, to look after those who work in the air, prevent accidents and contribute to the safe transport of passengers and patients. The UK is home to 22,000 professional pilots and 35,000 private, light aircraft and glider pilots. The space industry is a growth area in the UK economy, despite the recession, and space tourism is predicted to ‘take-off’ over the coming decades. With approximately two billion air passengers worldwide per year and 211 million in the UK in 2011, an awareness of the challenges of the flight environment and implications for patients are relevant to almost all medical practitioners.

## SESSION ONE – SAFETY IN THE AIR

Professor Bill Burr (Medical Director of the Joint Royal College of Physicians’ Training Board [JRCPTB]) spoke about the challenge to gain specialty recognition for a relatively small, non-NHS specialty at a time of change in medical training and to secure a training pathway for future specialists in aviation and space medicine.

The first speaker of the day, Wing Commander Nic Green (Royal Air Force Consultant Advisor in Aviation Medicine), set the scene, outlining four key areas to the specialty: 1) the hostile environment and protection systems,<sup>1</sup> 2) clinical assessments of fitness to fly (crew and passengers),<sup>3</sup> aeromedical evacuation, and 4) human factors and accident investigation. His talk included the tragic consequences when things go wrong such as the Helios passenger aircraft accident (lack of cabin pressurisation and subsequent hypoxia) or the recent Red Arrows crash (effects of G-forces).

Dr Sally Evans (Chief Medical Officer, Civil Aviation Authority [CAA]) introduced the work of the CAA regulating civil aviation in the UK, presented in the context of international regulations and the new European Aviation Safety Agency. Those in control of the aircraft or with flight safety critical roles such as air

traffic controllers, have regular assessments of their risk of incapacitation<sup>2</sup> to try and prevent medical causes of aircraft accidents. The CAA has responsibility for contributing to and implementing these medical standards. The CAA also has an Aviation Health Unit that was set up in response to a House of Lords Science and Technology Committee report on Air Travel and Health published in 2000,<sup>3</sup> which highlighted the need for improved research and education about the medical challenges of flight. The Aviation Health Unit acts as a focal point for aviation health in the UK, providing information for passengers and guidance for health professionals on assessing the fitness of their patients for travel by air.

Dr Robina Coker (Consultant and Honorary Senior Lecturer, Respiratory Medicine, Imperial College, London) presented the evidence-base of fitness to fly assessments and advice for our patients when travelling by air as passengers. The first British Thoracic Society (BTS) guidelines on managing patients with stable respiratory disease planning air travel was published in 2002 and identified many areas of weakness in the evidence base, directing research efforts in the intervening years.<sup>4</sup> The recent BTS guidelines reflect the improving evidence base for practice while highlighting that many areas remain weak and require further research.<sup>5</sup> In summary, while passengers with chronic disease might find flying challenging, available data suggest most patients are able to fly safely under specialist supervision; awareness of potential problems and solutions should enable more passengers to fly safely with a variety of chronic conditions.

## SESSION TWO – FROM CELLS TO SPACE

Professor Randall Johnson (Professor of Physiology, University of Cambridge) took us back to basics to consider the cellular response to hypoxia. This included a review of the physiology and genetics of hypoxia-

inducible factor (HIF) pathway, including his team's work on knockout mouse models and Factor-inhibiting hypoxia-inducible factor (FIH) gene products. The latter may represent an important new pharmacological target for manipulating metabolic regulation.

Dr Kevin Fong (Honorary Clinical Senior Lecturer, University College Hospital, London and Wellcome Trust Engagement Fellow for increasing public awareness of science) entertained and educated the audience about the medical challenges found in space (e.g. microgravity, radiation, bone and muscle wasting, cardiovascular changes, immune dysfunction, isolation, distance, etc)<sup>6</sup> that would have to be overcome in order to send humans to Mars and return them safely to Earth.

### SESSION THREE – ARE THEY FIT TO OPERATE

Wing Commander Andy Timperley (Whittingham Professor of Aviation Medicine and Royal Air Force Consultant Advisor in Medicine) and Dr Ewan Hutchison (Head of Aeromedical Centre, Civil Aviation Authority, UK) gave two talks to start the afternoon titled 'would you let this pilot fly into combat?' and 'would you let this pilot fly your family on holiday?' respectively, giving the military and civilian perspectives on fitness to fly considerations. The cases discussed included patients with vestibular migraine, collapse query cause, myocardial infarction and medication treated depression. All were initially grounded, but with time, appropriate investigations, and limitations (e.g. no solo flying, must always fly in multi-pilot aircraft) all could have returned safely to flying.

### SESSION FOUR – DELIVERING THE AEROMEDICAL PATIENT

Group Captain Martin Ruth (Royal Air Force Consultant Advisor in Anaesthetics) spoke about the challenges involved in, and clinical decision-making during, aeromedical evacuation in war zones (Medical Emergency Response Team, using helicopters) and evacuations back to the UK (Critical Care Air Support Teams, using large transport aircraft).

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Dr Geoff Tohill (Chief Medical Officer, First Assist, Surrey) talked about his experiences of civilian aeromedical retrieval, funding considerations and the decision-making process for evacuation or repatriation patient transfers. Along with clinical aeromedical considerations he stressed the importance of local knowledge, good communication, and appropriate team composition and equipment.

Bringing the themes of the day together, Professor David Gradwell (Professor of Aerospace Medicine and Director of Aviation Medicine, King's College, London) spoke about training and career opportunities for aspiring practitioners of aviation and space medicine in the UK. The proposed training scheme, supported by JRCPTB, has passed the Department of Health first stage of new specialty application with approval from the four UK Chief Medical Officers. The second stage application is on hold until completion of the General Medical Council (GMC) Shape of Training Review; if approved it would be passed to the GMC for implementation.

### TAKE-HOME MESSAGE

This RCPE hot topic symposium outlined the breadth of roles doctors may undertake in aviation and space medicine from more familiar clinical decision-making issues, albeit involving a special population or environment compared with normal practice, to work on aircrew life support systems or accident investigation. The symposium highlighted the need for appropriately trained doctors to work in aviation and space medicine to provide care for both crew and passengers, supporting the current attempt to gain specialty recognition. I for one have chosen this as my career and would strongly encourage others to investigate what it can offer.