The Physiological Society Magazine

July 1994
No 15

Four of the symposium speakers

Members of the Liverpool departments at the Chinese Banquet

Susan Wray, receiving her bouquet

Dick Tsien (right), the Sherrington Lecturer, drawing a Benevolent Fund raffle ticket for David Eisner (left) at the Dinner

Bill Winlow (left) and Hilary Howard (right) watching Jane Ault receive her birthday cake

Front cover photo

A stained glass window in the Hall of Caius College, Cambridge, commemorating Sir Charles Sherrington, who was a Fellow of the College from 1887 to 1893 and an Honorary Fellow from 1905. The window, commissioned from Maria McClafferty, is a coloured rendering of one of Sherrington's own diagrams showing "Two excitatory afferents with their fields of supraliminal effect in the motoneurone pool of a muscle".

Photography by Adrian Newman and Ian Bolton

The Trade Exhibition, in a teaching classroom

A Demonstration

Contents

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Action Points

- **Abstract Submission Forms** New abstract submission forms are to be used with effect from the Newcastle Meeting.
- **Affiliate Travel Grants** The next deadline for applications is **31 July**.
- **Grey Book** Amendments to Members' entries for the next edition of the *Grey Book* must be received at the Administration & Publications Office by **8 July** or given in person to Jane Ault at the Society's stand at the Cambridge Meeting.
- **Newcastle Meeting** Abstracts may be submitted between 22 August and 1 September. Please note that this is a Designated Meeting and that new abstract submission forms are to be used with effect from this Meeting.
- **Postgraduate Support** The next deadline for applications is **31 July**

Grey Book

The next edition of the *Grey Book* is about to go into production. Members whose details have changed since the last (1993) edition or whose addresses will be changing in the near future should send the appropriate amendments to reach the Administration & Publications Office in Oxford by 8 July at the latest. Amendments can also be given in person at the Society's stand at the Cambridge Meeting. Members are particularly requested to review their Email entries.

GUIDELINES FOR CONTRIBUTORS

These guidelines have been drawn up by the Editor both to assist authors in writing their contributions to the *Magazine* and to reduce the subsequent editing process. The *Magazine* Editorial Group is trying to ensure that all submissions are written in a journalistic style so that articles will have an immediate interest value for a wide readership and will be readable and comprehensible to non-experts.

Format of articles

The main message or question posed by the article should be introduced within the first two or three sentences. The background for the topic should then be established leading up to the final denouement or conclusion of the article.

Length of articles

This will be determined by the subject matter and agreed between the contributor and the commissioning editor. Articles will vary in length from 200 words to a maximum of 800 words.

Submission of articles

The Editorial & Production Office encourages authors to submit text in the form of a disk accompanied by a printout. Use of disks reduces the risk of introduction of errors during re-typing. When disks are submitted, it is helpful to give brief details of the computer, operating system and software package(s) used (DOS formatted Wordperfect 5.1 files preferred, but not essential).

Deadlines for submission

If in doubt, see Schedule of Meetings Publications Deadlines for 1994 or contact the Editorial & Production Office. Late submissions will not be accepted or publication will be deferred to a later issue.

Illustrations

Authors are encouraged to submit diagrams, drawings, photographs or other artwork to illustrate their articles or, if they cannot provide these themselves, to suggest what artwork might be appropriate. Photographs may be colour or black and white, prints or transparencies.

Author photographs

The *Magazine* normally includes photographs of the authors of articles and authors are asked to submit photographs (colour or black and white; prints rather than transparencies if cropping is required) of themselves direct to the Editorial & Production Office.

References

Authors are requested to keep the number of references to a minimum (preferably no more than two or three).

Suggestions for articles

These should be made (in writing, by phone, or in person at Scientific Meetings) either to the Editor, to the Editorial Assistant or to the relevant member of the *Magazine* Editorial Group (see above).

Sir John Vane will deliver the 1994 Bayliss-Starling Lecture, entitled "The Secretions of the Endothelium which control the Circulation", at 4.30 pm on Thursday 7 July.

THE BAYLISS–STARLING LECTURER: A SHORT AUTOBIOGRAPHY

My scientific career began when I moved from King Edward's High School in Edgbaston to the University of Birmingham (which was just across the road) to study Chemistry. However, my enthusiasm for experimentation in chemistry was soon dampened, for at university experimentation was non-existent. The only unknown in the practical class was the percentage yield in the chemical synthesis involved. It was, I suppose, at this stage that I began to realise that my interest lay not in chemistry but more in experimentation. Thus, when Maurice Stacey, the Professor of Chemistry, asked me what I wanted to do when I graduated, I said, "Anything but chemistry".

From chemistry to pharmacology

Stacey then told me that he had received a letter that morning from Professor Harold Burn in Oxford asking whether he could recommend another young chemist (he had sent one the previous year) to go to Oxford to be trained in pharmacology. Without hesitation I grasped the opportunity and immediately went to the library to find out what pharmacology was all about! That brief exchange with Stacey reshaped my whole career.

I went to Burn's department in 1946. I had no biological training of any sort and very little motivation. I found inspiration in working with him and caught his enthusiasm for pharmacology. If anyone can be said to have moulded the subject of pharmacology around the world, it is he. He did this through his particular style of research, through the lucidity of his writings, but most of all through the school which he founded.

Young, impressionable scientists from various disciplines and older, less impressionable pharmacologists all came to work with him. His laboratory gradually became the most active and important centre for pharmacological research in the UK and the main school for the training of young pharmacologists. It was his energy and inspiration that set my career into one of adventure in the fields of bioassay and pharmacology. It was Burn who reinforced for me the essence of experimentation and that is, never to ignore the unusual.

After qualifying for a BSc in Pharmacology, I spent a few months in Sheffield University as a research worker in the Pharmacology Department but then went back to Oxford to the Nuffield Institute for Medical Research in order to study for a DPhil with Dr Geoffrey Dawes. In 1951 I was awarded the Stothert Research Fellowship of the Royal Society and this enabled me to complete my doctorate in 1953.

Then, in 1953, at the invitation of Dr Arnold Welch, the new Chairman, I joined the Department of Pharmacology at Yale University as Assistant Professor in Pharmacology. That was a lively and bustling department and, after a two year postdoc, I returned to the UK.

18 years at the Royal College of Surgeons

I started work with Professor W D M Paton at the Institute of Basic Medical Sciences of the University of London at the Royal College of Surgeons of England. This was an unusual department, for the teaching was only for graduates and was not time consuming. Thus, I had plenty of time for research. I stayed there for 18 years, progressing from Senior Lecturer to Reader to Professor of Experimental Pharmacology. From 1961 to 1973, Professor G V R Born, a close friend from my Oxford days, was the Chairman of the Department and we enjoyed a strong symbiotic relationship, each maintaining an active group of graduate students and research workers. Interestingly, our fields of research endeavour (platelets and prostaglandins) only coalesced in a significant way after we had both moved on.

It was here that I developed, together with my group, the cascade superfusion bioassay technique for measurement of, dynamically and instantaneously, the release and fate of vasoactive hormones in the circulation or in the perfusion fluid of isolated organs. In the mid 1960s, our attention was focused on prostaglandins, leading in 1971 to the forging of the link between aspirin and the prostaglandins.

A move to the Wellcome Foundation

In 1973, I was offered and accepted the position of Group Research and Development Director for the pharmaceutical company: the Wellcome Foundation, then wholly owned by the medical charity, the Wellcome Trust. In making my decision, I was conscious that Henry Wellcome, 70 years before, had recruited Henry Dale to work in (and soon to direct) the Wellcome Physiological Research Laboratories, the forerunners of the present Research and Development Directorate. When Henry Dale, then at Cambridge, first received the offer from Wellcome, he hesitated over accepting it. "Friends to whom I mentioned this approach," he said, "were almost unanimous in advising me to have nothing to do with it. I should be selling my scientific soul for a mess of commercial potage". Nevertheless, he accepted and had no regrets.

I also found amongst a few of my friends a resistance to the idea of me entering into industrial science. It was as if to say that good science can only be promulgated in academia. Those friends were wrong: like Dale, I accepted and had no regrets. I took with me from the Royal College of Surgeons a nucleus of colleagues and this gradually expanded into a Prostaglandin Research department under the leadership of Dr Salvador Moncada. It was in this department that prostacyclin was discovered and its pharmacology developed.

For discoveries in the field of prostaglandins and for the elucidation of the mechanism of action of aspirin I was awarded the Nobel Prize for Physiology or

Medicine in 1982, jointly with Sune Bergström and Bengt Samuelsson. This was followed within two years by a knighthood from the Queen for services to the pharmaceutical industry.

The William Harvey Research Institute

1578 - 1657

In 1985, I left Wellcome and the following year established the William Harvey Research Institute at St Bartholomew's Medical College in London. With the help of a generous grant from Glaxo, part of the Physiology Department was converted into laboratories and offices to accommodate approximately 25 scientists and other staff. The Institute was set up to investigate the role of endothelial cells and the substances released from them in thrombosis and atherosclerosis.

A year later EDRF, one of these vasorelaxant, anti-thrombotic substances, was identified as nitric oxide by Salvador Moncada (now Research Director at Wellcome) and his colleagues. Following this discovery, in 1988, a group of Japanese scientists in Tsukuba University found a potent vasoconstrictor substance made by endothelial cells, which they named endothelin. This discovery widened the field of endeavour at the Institute and indeed the first International Workshop on Endothelin was held at St Bartholomew's Medical College in December 1988. The Institute hosted scientists from around the world.

Since then, the William Harvey Research Institute has expanded to accommodate other areas of cardio-vascular and inflammatory research and my role is now that of Chairman of a greatly enlarged organisation, which was granted charitable status in 1990. It has also attracted further major grants and initiated two further ventures: the William Harvey Research Conferences, through which top class scientific meetings are arranged, and William Harvey Contract Research Limited, which offers some of the Institute's research expertise to the pharmaceutical industry.

I joined The Physiological Society in 1953 and became an Honorary Member in 1988.

Sir John Vane

University of Oxford

MRC Research Centre in Brain and Behaviour/McDonnell-Pew Centre for Cognitive Neuroscience

AUTUMN SCHOOL IN COGNITIVE NEUROSCIENCE
3-5 October 1994

A three day Autumn School in Cognitive Neuroscience will be held in Oxford from 3 to 5 October 1994. It is intended for new graduate students as well as other graduate students and postdoctoral scientists at Oxford and at other universities, and for third year graduates at Oxford and at other universities who are considering the possibility of research in neuroscience and would like to find out more about it. Each day will be devoted to a particular area of cognitive neuroscience as follows:

Day 1: **Motor Control**

Lecturers: T Aziz, P Bolam, P Haggard, R C Miall, R E Passingham, J F Stein (Oxford); G R Barnes, M Glickstein (London); J Cole (Poole)

Day 2: **Vision (Visual information processing by different cortical areas)**

Lecturers: P Azzopardi, C Blakemore, A Cowey, E T Rolls, J F Stein (Oxford); C Heywood (Durham); A Hulbert (Newcastle); D Perrett (St Andrew's)

Day 3: **Language and Cognitive Neuroscience**

Lecturers: N Chater, M Davies, J Higginbotham, J Marshall, K Plunkett (Oxford); E Funnell, D Howard, R Wise (London)

This course is offered free of charge to undergraduates and graduates. A limited number of bursaries are available to undergraduates and graduates at universities outside Oxford to contribute to travel and accommodation costs.

For further information and application forms, please contact:

The Administrative Secretary, MRC Research Centre in Brain & Behaviour/McDonnell Pew Centre for Cognitive Neuroscience, Dept of Experimental Psychology, South Parks Road, Oxford OX1 3UD
Tel: (0865) 271364 (am) or (0865) 272497 (pm) Fax: (0865) 310447
Email: cogneuro@vax.oxford.ac.uk **Deadline for applications: 20 August**

ION CHANNELS

Designated Session & Symposium at the Liverpool Meeting

The Ion Channels Special Interest Group held a two day symposium on the structure and function of ion channels following on from the Ion Channels Designated Session at the Liverpool Meeting. The two day symposium was held jointly with the British Biophysical Society and so had the benefit of giving both physiologists and biophysicists an "over-the-fence" look at how another discipline viewed the ubiquitous ion channel. Surprisingly, this is the first time that physiologists and biophysicists have got together like this in Britain, although people from Britain often attend the ion channel sessions each year at the American Biophysical Society meetings.

Both the Designated Session and the symposium were heavily subscribed: certainly this must have been at least partly due to this year's choice of Sherrington Lecturer, Richard Tsien, who complemented his excellent Sherrington Lecture with a detailed talk at the symposium on the effects of single amino acid changes in Ca channel structure on block and permeation of the calcium channel.

In connection with the Ion Channels Designated Session, Carol Leighton was awarded a Pfizer Prize. She gave an excellent Communication which was judged to be well worthy of this prize. Congratulations and well done, Carol.

The Communications and poster presentations at the Meeting and the talks at the symposium illustrate how widely the techniques of molecular biology are being applied to questions on receptor and channel structure and function. These applications can range from studies of the effects of single amino acid changes to simply using an expression system as a convenient means of gaining access to an otherwise inaccessible (*eg* presynaptic) ion channel. However, it is also clear that there is a great need for good physiology to be done on native channels so that the physiological significance of structure-function studies is not lost. While some physiologists at the symposium may have developed serious visual disturbances trying to focus on 3-D images of the structure of α-helical or β-sheet polypeptides, the structural biophysicists would have been inspired by the fact that single channel recording is probably only about 10,000 times too slow to be related to single amino acid movements in channel proteins!

As ever, the success of the symposium was only possible because of help from numerous sources. However, we are particularly grateful to the Liverpool Physiology Department for their help. In addition, as well as support from The Physiological Society and the British Biophysical Society, the symposium was supported by Sandoz, Glaxo, Wyeth, Smith-Kline Beecham, the Wellcome Foundation, Novo-Nordisk, Eli-Lilly and Pfizer.

Following on from this symposium, we would enjoy hearing suggestions from Members for future Ion Channels Interest Group events. Should we have sessions covering a broad range of topics or specialist sessions on a single subject? Is it preferable to have one or two events per year or more? Would an occasional techniques-based session be of wide interest?

Noel Davies & Alastair Gibb
Email: uckldag@ucl.ac.uk

PFIZER PRIZES

The Committee extends its congratulations to the two young physiologists, Carol Leighton and Aine O'Connor, who have been awarded Prizer Prizes for the excellence of their presentations at the Liverpool Meeting.

Carol Leighton presented a Communication entitled *Modulation by phosphorylation and neurotransmitters of voltage-dependent calcium channel currents in cultured rat cerebellar granula neurons* as part of the Ion Channels Designated Session. Carol started her PhD work in the Dept of Pharmacology at the Royal Free Hospital Medical School in January 1992.

Aine O'Connor presented a Communication on *Gastrin and vasoactive intestinal polypeptide release in response to endurance exercise* as part of the Gastrointestinal Tract Designated Session. Aine works in the Dept of Medicine at the Queen's University of Belfast.

HEART AND CARDIAC MUSCLE

Future Meeting

Thanks to everybody who attended the last Designated cardiac meeting at Liverpool. Particular thanks go to Sue Wray and David Eisner for organising the excellent symposium on cellular control of cardiac and smooth muscle.

In addition, I want to alert members of the Heart and Cardiac Group to the forthcoming Joint Meeting of the Society with the Japanese Physiological Society in Okazaki on 27 and 28 March 1995. Due to the "joint" nature of the Meeting there will not be specific Designated Sessions. However, the Meeting will be organised into "themes", one of which will be "Ion Channels and the Cardiovascular System". I encourage Members to submit work to this Meeting as they would to one formally designated as a Heart and Cardiac Muscle meeting. Grants will be available from the Society towards the cost of the trip. Finally, I will be in contact with the members of the Group concerning the timing of other Designated Sessions, once a firm timetable for future Meetings is available.

Godfrey Smith

WOMEN AT BEDFORD COLLEGE: A SHORT HISTORY

Physiology was taught at Bedford College as early as 1882. This was only eight years after Physiology teaching began at the London School of Medicine for Women, at the Royal Free Hospital. Then physiology laboratories were opened in 1896, at the new school in Hunter Street, but Bedford College had to wait for their laboratories until 1913, when the new buildings in Regent's Park were completed[1]. During these early days (1886-1930), Dr J S Edkins was head of the department. He was not only very active in this respect, but also had the distinction of discovering gastrin. The 1920s were halcyon days when the rights of women to be educated and contribute intellectually was at last on a firm basis, and a great pool of intelligence was attracted to Bedford College resulting in considerable attainments by the Physiology and other departments. 80% of women studying Physiology, as opposed to medicine, at London University, did so at Bedford College. The failure rate was only 4% and the course was recognised for second MB. The Physiology graduates provided all the staff (excepting the professors) for these courses, for the London School of Medicine for Women, for King's College of Household & Social Science, together with about half a dozen staff in medical schools, to which women had not yet been admitted. One Bedford College graduate became a professor of Physiology in an Indian medical school and, later, more than ten women from this small department obtained the DSc degree, over six became professors at medical schools and five were made FRS[2].

Dr Nora Edkins was head of the department from 1931 to 1947[3] and Prof Margaret Murray succeeded her, retiring in 1959. They continued in the vigorous tradition of J S Edkins, providing thorough, up to date and friendly teaching, and their contributions to physiology are described in the book *Women Physiologists*[4]. Student numbers did not fall during World War II when the department was evacuated to Cambridge, where it was a guest in E D Adrian's laboratory. Preparations for the war had brought more opportunities for posts, especially in blood banks, for both teaching and research posts were relatively scarce during the 1930s. When hostilities ceased, all medical schools, which had not previously admitted women students, were now obliged to take at least 15% and this led to the concept that there should also be more women on the teaching staffs. Three from Bedford were given this opportunity and served for upwards of 35 years: Marjorie Nutt at Birmingham, Nancy Cole at Bristol and the author at St Thomas's in London.

Prof Wilfred Faraday Widdas succeeded to the chair in 1960 and continued the tradition of sound teaching, providing well-trained physiologists who were most welcome in the large variety of posts available at the time. In 1963 the department was split and biochemistry was given a separate chair. 1965 saw the admission of male undergraduates to the college under a new charter.

When Prof Widdas retired in 1981 the original decision to retain the chair at Bedford College was quickly reversed, owing to a change in University policy. This now required that physiology teaching be concentrated in medical schools. Government funding was being reduced and practical subjects are expensive, so making Physiology a natural subject for the "chop". Moreover, by modern standards the department was considered to small to be viable. Further, the College's lease on their crown land in Regent's Park was nearly at an end - renewal would be too costly. So further rationalisation of University sources were to see a union of Bedford College with Royal Holloway College on the latter's site at Egham, in 1985. This union saw the end of the Physiology department, in 1990.

During its last ten years, there were brave efforts to keep the teaching going by a few faithful members of the staff; research continued under great difficulties but was not considered sufficient by the authorities.

Below: the old Royal Free Hospital Medical School building in Hunter Street. Photograph courtesy of the Royal Free Hospital Medical School.

Right: Tuke Building, Bedford College, from Educating Women, *a pictorial history of Bedford College, University of London, 1849 - 1985 (1991). Linna Bentley, Alma Publishers, Surrey*

So the department was demoted first to a sub-department of psychology, then to zoology and, finally, disbanded, with one member of staff remaining to teach physiology in the department of biology. During these changing times applications to study physiology did not fall off and those who graduated found no problem in making successful applications for the wide range of posts which were, and still are, available after such training.

Phoenix will arise, again, from the ashes - as did the buildings of Bedford College in Regent's Park, after the last war. Notwithstanding the present fashion for those most important subjects of cellular and molecular biology, the conclusions they provide must be tested, finally, in the whole animal and in man. Prof Widdas considers that the site at Egham has great potential for physiology in the 21st century. It could be an outpost of London University without being strangled by residential and transport problems. The advances in computer technology could bring the central library facilities into the laboratory; clinical research projects could flourish through contacts with local hospitals and drug firms. The latter are already suffering from the dearth of well trained applicants with physiological expertise throughout the country.

Maureen Young

Many thanks are due to Prof W Widdas and to Miss M Packenham-Walsh for very helpful suggestions in writing this manuscript.

Sources

1 Margaret J Tuke (1939) *A history of Bedford College for Women (1849-1937)* Oxford University Press

2 Records of London University, Senate House, Bloomsbury, and Bedford College archives at Royal Holloway and Bedford New College, Egham

3 Maureen Young (1977) Dr Nora Edkins: Obituaries, *Bedford College Assoc Magazine*: 4-6.

4 Bindman L, Brading A & Tansey T (eds) (1993) *Women Physiologists*. Portland Press, London

THE PATON MEMORIAL LECTURE

A history of blood-gas and acid-base measurements

Professor John Severinghaus

The Paton Memorial Lecture has been established by the History of Physiology Special Interest Group, in memory of W D M Paton. The first lecture has been arranged in collaboration with the Respiratory Physiology Special Interest Group.

It will be given during the Aberdeen Meeting of The Physiological Society on Wednesday 14 Sept 1994, at approximately 5.00 pm.

LONDON CONFERENCE ON MODELLING AND CONTROL OF VENTILATION
(VIth Oxford Conference)

Royal Holloway & Bedford New College

Sponsored by The Physiological Society

These Conferences were started in 1978 and the first meeting was in the Physiology School at Oxford. Conferences have ben held at three-yearly intervals in the UK (Oxford), USA (twice), France and Japan. The initial purpose of the Conferences was to bring together physiologists and systems engineers with an interest in modelling and the control of breathing. This year the Conference will be held in the Royal Holloway and Bedford New College, University of London (17-20 September 1994). The five main themes of the Conference are:

- Neurophysiology of Breathing Control
- Exercise and Pulmonary Ventilation
- Chemical Control of Breathing; Peripheral and Central
- Pathophysiology of Breathing Control
- Breathing: Awake and Asleep

The Conference is residential. The full registration fee is £350 which includes meals and accommodation for 3 days (4 nights), a welcoming reception, and a Conference banquet. The number of delegates is limited to 120 and 5 places are reserved for Young Physiologists at a registration fee of £175. Those requiring further information and a registration form should write to:

Mrs Liz Murray, Dept of Medicine, Charing Cross & Westminster Medical School, Fulham Palace Road, LONDON W6 8RP, UK

At present there are no facilities for providing further information over the telephone.

HORMONES AND HOST DEFENCE: THE HYPOTHALAMO-PITUITARY-ADRENAL IMMUNE AXIS

Glucocorticoids have frequently been described as wonder drugs because of their powerful anti-inflammatory and immunosuppressive actions. For over 40 years these drugs have provided relief for many thousands of patients suffering from chronic inflammatory and allergic diseases (eg rheumatoid arthritis, asthma). In addition, they have become key players in the fight against allograft rejection in transplant patients. Until comparatively recently these powerful properties of the steroids attracted little interest from physiologists, mainly because the doses needed to achieve a beneficial clinical effect normally exceed by far the realms of physiology. Now, however, the tide is beginning to turn and a subtle story about endogenous steroids and host defence is beginning to emerge.

Glucocorticoids regulate immune responses

In the last decade scientists have begun to realise that the glucocorticoids secreted by the adrenal cortex may indeed play an important role in the control of immune responses and the concept of a hypothalamic-pituitary-adrenal-immune axis has rapidly gained credence. Critical to this development was the recognition (Munck *et al*, 1984) that the life saving actions of these steroids in protecting the body from stress are due partly to their immunosuppressive/anti-inflammatory properties. These actions enable the steroids to contain the normal pathophysiological responses to injury, inflammation or infection which, if left unchecked, may themselves threaten the survival of the host. This hypothesis predicted that the hypothalamo-pituitary-adrenocortical (HPA) axis should respond to challenges to the immune system with elevations in glucocorticoid secretion and that long term disturbances in HPA function should compromise immune function and, hence, host defence.

Immune cells activate the HPA axis

There can now be little doubt that, in many instances, insults to the immune system initiate the release of glucocorticoids and the data available suggest that the dynamics and magnitude of the response depend on the nature, duration and intensity of the challenge. It looks as though the adrenocortical responses are driven primarily, although perhaps not exclusively, by mediators released from activated immune/inflammatory cells, the complement of which will depend on the stimulus. Such mediators include cytokines (*eg* TNFα, IL-1 and IL-6), enzymes (*eg* phospholipase A_2), amines (*eg* histamine, 5-HT), eicosanoids and pro-inflammatory peptides (*eg* CGRP). The mechanisms by which each of the various mediators stimulate glucocorticoid secretion (Fig 1) is the topic of much current research.

Immune mediators

Particular attention has focused on TNFα, IL-1β and IL-6 which are released sequentially from activated macrophages in response to an endotoxin challenge and are widely regarded as the major factors mediating the pronounced hypersecretion of the glucocorticoids that the toxin precipitates. A variety of *in vivo, in vitro* and histological studies indicate that these cytokines act primarily at the hypothalamic level to initiate the

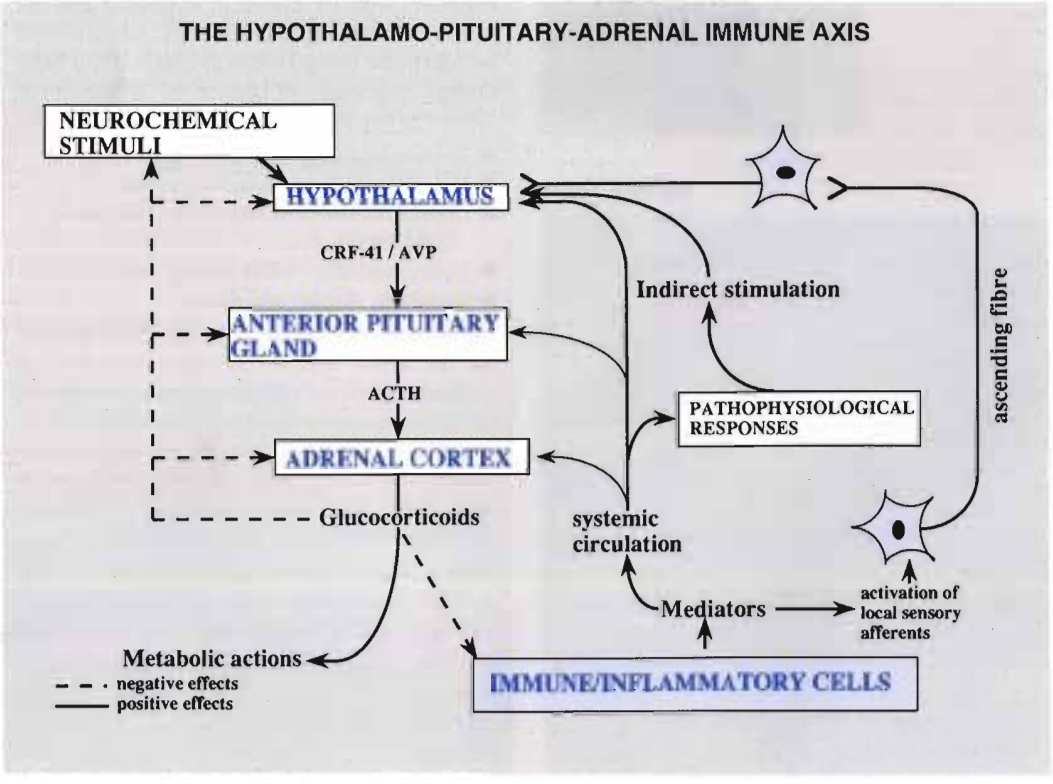

Fig 1

The hypothalamo-pituitary-adrenal axis - schematic diagram

release of the corticotrophin releasing factors (CRF-41 and AVP) by mechanisms which appear to involve the local generation of eicosanoids. The hypothalamic site of action may, however, not be the only site and, in some instances, these cytokines may also act directly on the anterior pituitary gland and adrenal cortex to stimulate the release of ACTH and corticosterone respectively.

There is a problem in explaining how cytokines (which are proteins of molecular weight >17kDa) released from peripheral immune cells cross the blood brain barrier and so get access to their "target cells" in the hypothalamus to stimulate the release of CRF-41 and AVP. Several recent studies have suggested that their actions are indirect and dependent on the generation of cytokines within the hypothalamus which then act locally to initiate peptide release. Others, however, have advocated entry of the cytokines to the CNS by mechanisms which may include (i) simple diffusion via either a fenestrated region of the blood brain barrier (*eg* OVLT) or a zone in which permeability is increased in the face of an immune/inflammatory lesion or (ii) specific transport mechanisms - a hypothesis largely discredited by early studies but which is presently finding more favour.

Many other immunokines, eg phospholipase A_2, which is released in large quantities in conditions of septic shock, may also pass via the systemic circulation to target the HPA axis directly. Others, however, may activate the axis in other ways. Some such as bradykinin and 5-HT appear to act at the site of the immune/inflammatory lesion to stimulate local sensory/afferent neurones, thereby initiating a "neuroendocrine reflex" which triggers the release of the CRF-41/AVP from the hypothalamus. In other cases the stimulation of the HPA axis may be indirect, occurring as a consequence of the pathophysiological responses provoked by the mediators (*eg* hypotension).

Tailoring the glucocorticoid response

Not surprisingly, the magnitude of the adrenocortical response to a given immune challenge is dependent to a large degree on the prevailing glucocorticoid tone. These steroids temper, in a dose dependent manner, the release of many of the immune/inflammatory mediators which trigger the neuroendocrine response. In addition, the steroids also exert powerful negative feedback effects at the levels of the pituitary gland, the hypothalamus and elsewhere in the brain and thereby suppress secretion of ACTH and CRF-41/AVP initiated directly or indirectly by the mediators (Loxley *et al*, 1993; Taylor *et al*, 1994). Thus, the magnitude of the glucocorticoid response may be tailored so as to be sufficient to contain but not prevent the pathophysiological response to the insult and thus to restore homeostasis.

Immune responses when HPA function is disturbed

Do long term disturbances in HPA function compromise the body's host defence mechanisms? Anecdotal data amassed over years certainly suggest that they do. For example, chronic stress due to *eg* bereavement, divorce or unemployment is frequently linked with an increased incidence of disease, as too is the hypercortisolaemia manifest in primary and secondary disorders (eg depression) of the HPA axis. In the same vein, the elevation in serum cortisol evident in ageing individuals parallels the decline in immunocompetence and increased prevalence of disease (eg infections, cancer) apparent in this population. Thus, increased activity of the HPA axis is associated with reduced immune function.

In converse, scientific evidence pinpointing deficiencies in HPA function as a primary cause of immune/inflammatory disorders is rapidly accumulating from studies in rodents. Thus, for example, the vulnerability of the Lewis rat to experimentally induced arthritis is associated with a hypothalamo-pituitary dependent adrenal insufficiency and is readily corrected by administration of glucocorticoids. For a number of reasons, hard clinical data to this effect are difficult to obtain. Nonetheless, evidence is beginning to accumulate to suggest that disturbances in HPA function and/or steroid sensitivity are manifest in at least some patients with auto-immune disorders (Chikanza *et al*, 1992) and that pharmacological blockade of glucocorticoid receptors may initiate inflammatory responses (Goulding & Guyre, 1992). A deeper understanding of the complex interplay between the HPA and immune system in both laboratory animals and man is now paramount, for it may not only provide new insight into the aetiology of immune/inflammatory disorders but also identify potential novel targets for therapy.

Julia Buckingham

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This work was supported by the Wellcome Trust and the Medical Research Council

EXERCISE AND IMMUNE FUNCTION

For colour illustrations, see back cover

In recent years, interest in the acute and chronic effects of exercise on the immune system has been prompted by increasing evidence which suggests that athletes involved in prolonged strenuous training programmes are more susceptible to communicable opportunistic infections than their sedentary counterparts. Research in many laboratories worldwide is now focused on establishing which specific components of immune function are affected by exercise and the time course of such effects. However, a paradox appears to exist in that moderate regular exercise seems to stimulate some aspects of the immune response, whereas intense exercise and overtraining can induce a degree of immunodeficiency.

Immune system status in humans has been most commonly estimated in terms of the numbers of circulating leucocytes and their functional capabilities. At Coventry University, we have concentrated on investigating the effect of exercise on the predominant leucocytes and major phagocytic and bactericidal cells in human blood, the polymorphonuclear neutrophils. Other workers are looking at the effects of physical activity on lymphocytes, monocytes, serum immunoglobulins, cytokines, complement and acute phase proteins.

Exercise increases circulating leucocytes

It has been known for over 50 years that an acute bout of exercise causes an increase in the number of circulating leucocytes. However, at least for exercise lasting less than one hour, most of these extra leucocytes do not enter the circulation from the bone marrow, but rather are released from the marginated pool of leucocytes that are normally stuck to the vascular endothelium of the blood vessel walls at rest. The sizes of the marginated and circulating pools of leucocytes are approximately equal at rest, so complete demargination could potentially double the circulating leucocyte count. The mechanism of demargination during exercise (Fig 1) probably involves both the mechanical effects of increased blood flow rate, physically moving cells into the circulating stream, and the effects of stress hormones, such as adrenaline, which decrease the adherence of leucocytes to the endothelium via interaction with β receptors on both cell types.

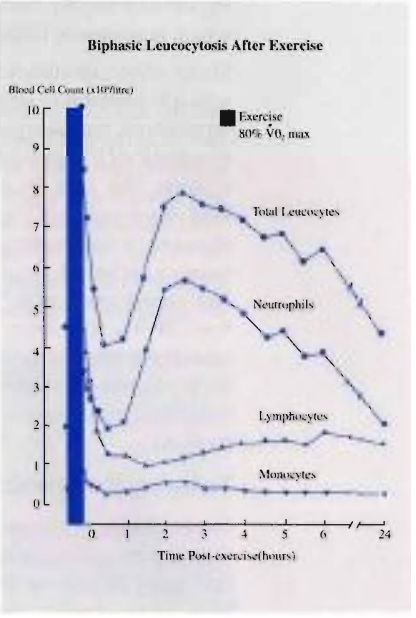
There is also an influx of lymphocytes from lymphatic vessels and release of some leucocytes from temporary storage sites in the liver and spleen sinusoids. Another possible source is from the recruitment of previously dormant capillaries in muscle and the lungs. The movement of leucocytes away from the walls of lung capillaries could account for the increased incidence of respiratory infections in athletes, although it must be remembered that during physical activity, exposure of the lung tissue to airborne pathogens is increased due to the increased rate and depth of breathing during exercise.

What happens to the leukocytes after exercise?

A biphasic leucocytosis follows an intense bout of exercise. Immediately after such exercise, the circulating blood leucocyte count may be doubled (the actual magnitude of the increase depends on the mode, relative intensity and duration of the exercise bout). The time it takes for the leucocyte count to return to normal after exercise is also dependent on the exercise intensity and duration. After very intense brief (<10 min) exercise the leucocyte count may continue to rise for up to 15 min into recovery. After less strenuous, longer lasting exercise the leucocyte count immediately falls on cessation of exercise and usually takes 10-60 min to return to basal levels.

The sites to which leucocytes are redistributed during recovery from exercise are currently unknown, but within a further 1-3 hours the leucocyte count exhibits a secondary rise, almost exclusively due to an increase in neutrophils (Fig 2). This secondary leucocytosis appears to be due to release of neutrophils from the bone marrow as a result of the delayed effects of cortisol. This steroid hormone is known to have immunosuppressive effects *[see previous article]* and studies on neutrophil function a few hours after cessation of exercise indicate a reduction in adherence and phagocytic capability in response to in vitro stimulation by bacterial extracts. Most studies have used dynamic modes of exercise (cycling and running), but recent work from our lab indicates that a similar biphasic leucocytosis also occurs with sustained static (isometric) muscle contractions.

Fig 2
See also inside back cover



Acute bouts of high intensity exercise are also known to induce an acute phase response with temporary elevations of acute phase proteins such as C-reactive protein, and altered plasma levels of interleukins, notably IL1, IL2 and IL6. Decreases in plasma glutamine concentration (an important fuel source for leucocytes), decreases in blood pH and elevation of body temperature during exercise may also exert effects on the functional capabilities of leucocytes. Decreased lymphocyte proliferative responses to mitogens have been reported after intense exercise and well trained athletes appear to have a lower resting lymphocyte count compared with age-matched sedentary controls.

Exercise, stress and immunity

Many scientists believe that the effects of intense exercise on immune function may be similar to that of other forms of stress that are known to suppress immunity such as surgical trauma, physical and thermal injury, sepsis and extreme emotional distress. Exercise can be viewed as a very useful model of stress, since its duration and intensity can be accurately controlled and reproduced in the laboratory.

Animal studies also have an important role to play in examining the effects of acute and chronic physical activity on the immune system. With animals, more direct and invasive investigations of the effect of exercise on immunity can be done by challenging them with infectious agents and determining the severity and duration of infection in exercised animals compared with sedentary controls. Such studies have already revealed that (enforced) training with moderate intensity exercise enhances immune status in mice. However, somewhat paradoxically, it is also known that exercise performed during the incubation period of some viral diseases (*eg* poliomyelitis and Coxsackie B induced carditis) substantially worsens the disease.

Future research should establish which aspects of exercise are most damaging to the immune system, the mechanisms involved, the time course of such events and how long it takes for recovery of immune function to occur. Only then can definite recommendations be given to athletes about the frequency and intensity of their training that will allow the realisation of the necessary physiological adaptations for increased fitness and endurance without the undesirable effects of immunosuppression.

Michael Gleeson
Division of Biological Sciences
Coventry University

Suggested reading

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DIABETIC NEUROPATHY - A CASE OF ISCHAEMIC DAMAGE?

With the management of hyperglycaemia by insulin, diabetic patients now achieve increased longevity. However, this has revealed the development of chronic complications which affect the vasculature, nervous system, kidney and retina. Distal symmetrical neuropathy is characterised by early subclinical electrophysiological abnormalities, *eg* slowed nerve conduction, which are followed by later structural degeneration. What we are interested in are aspects of microvascular dysfunction which may contribute to the development of slowed nerve conduction. Central to the formation of hypotheses implicating ischaemic damage to axons in the pathogenesis of diabetic neuropathy is the measurement of nerve blood flow in experimental diabetes.

Measuring nerve blood flow in experimental diabetes

We have used laser Doppler flowmetry applied to sciatic nerves of diabetic rats as an index of nerve blood flow. Within the first week after induction of diabetes with streptozotocin, sciatic nerve Doppler fluxes of diabetic animals were reduced compared to those of control rats (Fig 1). This suggests that reduced perfusion of peripheral nerves in experimental diabetes develops before decreased nerve conduction velocity, supporting a causative role. Between three and eight weeks of streptozotocin diabetes, when nerve dysfunction is known to occur, our experiments have consistently demonstrated 40-60% deficits in nerve Doppler flux. Similar decreases were also seen in short term spontaneously diabetic BB rats (compared to respective control animals), demonstrating that such changes are independent of the mode of induction of diabetes. Furthermore, strict blood glucose control by insulin treatment prevented the diabetes-induced nerve Doppler flux deficit in the streptozotocin model, confirming that the phenomenon is not due to streptozotocin toxicity *per se* (Fig 2).

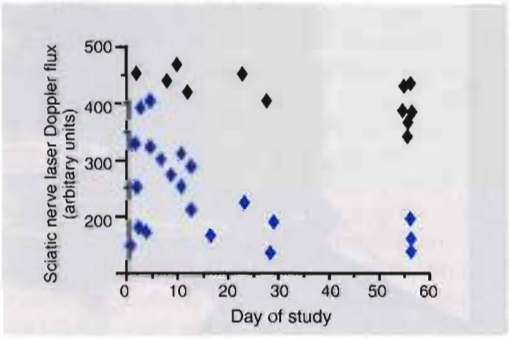


Fig 1
Individual values of sciatic nerve laser Doppler flux in streptozotocin-diabetic rats throughout eight weeks diabetes
♦ *control*
◊ *diabetic*

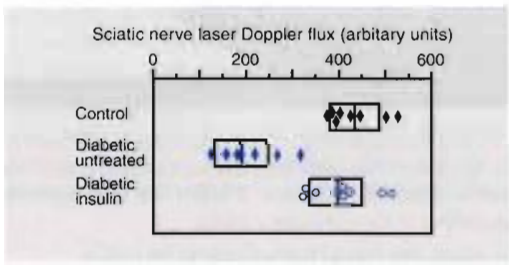


Fig 2
Individual values of sciatic nerve laser Doppler flux in streptozotocin-diabetic rats: effect of 4-6 weeks insulin treatment

As laser Doppler flux data are derived from the number and velocity of erythrocytes, we also needed to determine whether the reductions in nerve Doppler flux reflected changes in whole blood flow. A study was carried out in which both nerve Doppler flux and nerve blood flow, measured by a direct technique using iodo[^{14}C]antipyrine, were recorded in the same rats. Parallel decreases in data obtained from both methods were found in animals with five weeks streptozotocin diabetes, further confirming the presence of reduced nerve perfusion. Such untreated diabetic animals also exhibited slowed motor nerve conduction velocity.

Evening Primrose oil - a treatment for neuropathy?

Treatment of diabetic animals with evening primrose oil prevented the development of slowed motor nerve conduction velocity as well as preventing reductions in nerve Doppler flux. However, the oil did not affect nerve blood flow when measured by the iodo[^{14}C]antipyrine direct technique. A possible explanation for this is a preferential effect of treatment on erythrocyte deformability, leading to the accelerated passage of red cells through plasma. This study thus highlights the need for careful interpretation of results using different techniques for nerve blood flow monitoring and indicates that a combination of methods is of value.

We have recently found that treatment of short-term diabetic rats with the antioxidants α-tocopherol or probucol markedly attenuated nerve Doppler flux deficits (Fig 3). A combined treatment of probucol and evening primrose oil showed little additive effect

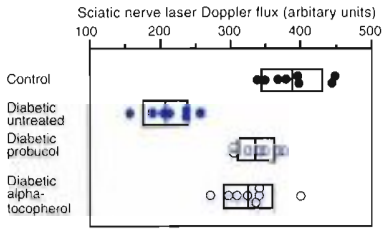


Fig 3
Individual values of sciatic nerve laser Doppler flux in streptozotocin-diabetic rats: effect of 4-5 weeks anti-oxidant treatment

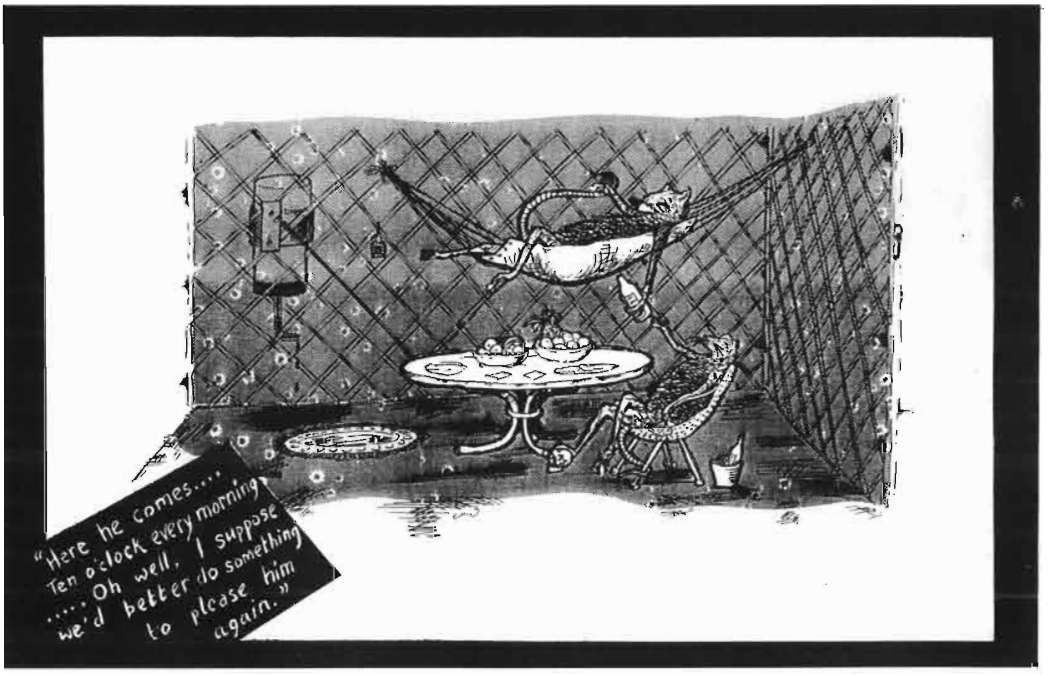
on either the correction of decreases in nerve Doppler flux or nerve conduction velocity. While this suggested similar mechanisms of action, further investigation is required.

Our work to date has thus illustrated poor peripheral nerve blood flow in acute experimental diabetes. The findings support a role for nerve ischaemia in nerve dysfunction and also indicate that antioxidant treatments, perhaps including evening primrose oil, may prove potential therapies for diabetic neuropathy.

This work with Dave Tomlinson was supported by the William Harvey Research Institute via a grant from ONO Pharmaceuticals, Osaka, Japan.

Elizabeth Stevens
Queen Mary and Westfield College
London

Elizabeth Stevens was the winner of a Pfizer Prize for her Communication presented at the King's College London Meeting in December 1993.



"In fact there was only one species on the planet more intelligent than dolphins, and they spent a lot of their time in behavioural research laboratories, running round inside wheels and conducting frighteningly elegant and subtle experiments on man. The fact that once again man completely misinterpreted this relationship was entirely according to these creatures' plans."

D Adams, The Hitch Hiker's Guide to the Galaxy

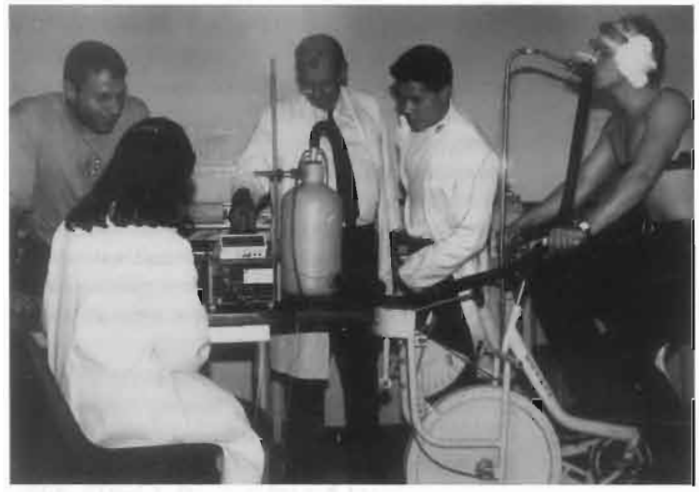
Cartoon by courtesy of John Laycock. Drawn by the Dept of Medical Illustration at Charing Cross & Westminster Medical School.

UNDERGRADUATE PRACTICAL CLASSES: A PERSONAL VIEW

Forty years ago, this student and his contemporaries went unquestioningly to practical classes. Much of the equipment was archaic even by the standards of the 1950s; many experiments did not work except with the loving skills of technicians and demonstrators; and the relevance of many of the exercises was difficult to appreciate. Obtaining results was often laborious since there were no oxygen or CO_2 analysers to give results in a few seconds. Instead, each gas sample had to be analysed on a Haldane apparatus. Reservoirs of mercury, potassium hydroxide and pyrogallol somehow did not stay discrete when handled by medical students. Courses included a mammalian experiment, usually one in which basic techniques for recording blood pressure and ventilation were demonstrated and simple manoeuvres such as injections of noradrenaline and breathing 5% CO_2 were performed. Here the students saw the basis by which much of our fundamental physiological knowledge has been obtained. Today, public and student opinion is vociferously against such experiments and Home Office permission is difficult to obtain. The dangers of virus infections have reduced the number of experiments traditionally performed on the students' own blood. Gone are the days of students making multiple stabs at their cold fingers to get the few cubic mm of blood needed to fill a haematocrit tube or a blood cell pipette.

Many now question the continuance of practicals: students complain that they are time consuming both to perform and to write up; staff may be reluctant to give time for supervision; trendy educationalists doubt their value and effectiveness; schools may resent the allocation of space and resources; finally, our clinical colleagues believe that the content may be irrelevant. Since Physiology is an experimental science based on observations in animals and in man, and since much of our lecturing may be based around these phenomena, it seems important that students should be introduced to them in the laboratory.

How, then, may we defend our practicals? It is important that we consider their value. Firstly they may in themselves be a method of learning or of stimulating interest. In lectures the changes in cardiovascular and respiratory function caused by exercise are often used as examples of how the body systems may rapidly adapt to imposed stresses. This instruction often occurs piecemeal in a number of lectures, but can be integrated in a practical in which many of these adaptations may be measured in a student performing a progressive exercise test on a bicycle ergometer or on a treadmill. We assimilate knowledge and, more importantly, gain understanding of physiological processes, by listening to lectures, reading in books and discussing in tutorials. Observing phenomena and deducing results from practicals may be of equal importance in some carefully chosen fields. A student may sit on an underground train and notice a nystagmus in a passenger sitting opposite but the mechanism will not even cause a thought. Spin a fellow student on a De Barani chair, see his direction of stagger and the direction of his nystagmus and there is a basis for deducing a great deal from a simple diagram of the semi-circular canals. Finally, during their medical course students need to acquire certain clinical skills. Some of these are traditionally taught in the preclinical period, including measurement of arterial pressure, pulse rate, use of the ophthalmoscope and auroscope, spirometry and the passing of a tube into the stomach. Students need to handle other people and to experience being handled like a patient.



Fred Imms (centre) with students in a practical class.

If we are to run successful courses we need to answer those who criticise us. Experiments must be selected so that their material is important and central to a major aspect of the subject. Ideally experiments should not overlap in content and so far as possible the range should cover the course. In practice, there is an excess of respiratory experiments and for obvious reasons there are none on reproduction. Equipment needs to be modern and reliable and capable of getting results for unskilled operators. Data obtained should be of a primary nature, *eg* volume, concentration, time or distance, from which further data can be calculated such as excretion rate, production rate or velocity. "Black boxes" which produce final answers should be avoided, as performing the calculations forms an important part of the educational process. At the same time, students should not be overburdened with multiple repeat calculations. Computer programmes may be designed to do these calculations but in a manner which requires students to input raw data and carry out calculations in a step-wise manner. A comprehensive instruction schedule needs to be prepared for each experiment, telling the student exactly what is expected and providing tables for results and graph paper as appropriate. Students need to be guided in their write-ups. Rather than the traditional open ended account, it is preferable to pose some questions which ask the students to make deductions from their results and stimulate them to consult their textbooks and, hopefully, a reference book.

Above all, the exercise must be enjoyable. I still find human physiology a fascinating subject and try to enthuse students with the motto: "***Physiology is Fun***".

F J Imms

Sherrington School of Physiology
UMDS, St Thomas's Campus

SAVE BRITISH SCIENCE LOOKS FORWARD

The Save British Science Society is now well established, with a unique role as an influential voice representing the practising community of research scientists and engineers in the science base. During 1993, public meetings organised by SBS were addressed both by William Waldegrave and by the then Opposition Leader, John Smith. Both openly acknowledged the role and effectiveness of SBS. Smith's speech (copies available) shows how far our ideas have become absorbed and presented as the Labour Party's own. The Liberal Democrats are following us, too, and we believe the Government is also listening. Despite the very unfavourable atmosphere for public expenditure, the science vote was maintained in the last Budget and the Prime Minister has promised a small real increase next year - tacit acceptance of our case that the science base is inadequately funded. Few areas of public expenditure fared as well.

In January this year we hosted a symposium at Oxford attended by, among others, leading figures from industry (including two of the new part time Chairmen of Research Councils), the President of the Royal Society, two Vice-Chancellors, and the Chief Executive of the Higher Education Funding Council for England. The topic for discussion was "The Science Base and Industry: Understanding the Relationships". The day went very well, illustrating the value of such informal meetings, under Chatham House Rules, for developing a greater understanding of each other's point of view. Encouraged by the response of our guests, we hope to arrange more such events.

We are constantly on call to the media for comment on an ever widening spread of science related topics. Denis Noble went to the *Newsnight* studio to debate the falling numbers of science A-Levels. Recently I did a double act with Bill Stewart, Chief Scientific Adviser, on Radio Four's *Science Now*. Denis did the same with William Waldegrave during National Science Week on the popular Radio Two *Hayes over Britain* phone-in programme. Denis also has the distinction of being the first person to be interviewed on the new BBC channel *Radio Five Live*!

Whenever there is a significant development or government statement affecting science - like the Budget - the office phone rings with requests for instant, "word-bite" comment. All this requires us to keep ahead of the game on a wide range of issues. The demands on us have now grown to exceed our capacity to meet them on present resources, with an office staffed only by one person half time. We need to expand substantially the scale of our operations. We must become more professional - but without losing contact with our roots across the science base.

We need to build up our membership (currently about 1630) because that and the support we receive from the societies are crucial both to the weight we can carry in speaking for the science base and as a source of income. We do not expect to raise all the additional funds this way, but the stronger the subscription base the better the case we can put to potential donors.

We need YOUR help - please join now! And any suggestions on sources of funds will be very gratefully considered!

John Mulvey

Executive Secretary,
SBS, PO Box 241, Oxford OX1 3QQ
Tel (0865) 273407 Fax (0865) 511370

A EUROPEAN SOCIETY TO PROMOTE THE VALUE OF ANIMAL EXPERIMENTS IN MEDICAL RESEARCH

The US organisation People for the Ethical Treatment of Animals (PETA) has opened offices in London, Hamburg and Amsterdam. PETA is probably the largest antivivisection group in the world, with an annual income of over $7 million. The arrival of PETA reinforces the growth of activity against animal experiments in Europe, where the Coalition to End Animal Experiments (representing 16 antivivisection groups) has begun a campaign for a 50% cut in animal experiments by the year 2000.

As a response to this threat to biomedical research, a group of scientists have launched a new organisation to:

- promote the best laboratory practice for animal welfare
- assist in the formulation of reasonable laws to control animal experiments
- counter the campaigning propaganda of the animal rights lobby

The European Biomedical Research Association (EBRA) was formed at the end of 1993, by an interim steering committee under the chairmanship of Prof Ray Guillery of the University of Oxford. EBRA is in the process of building up a list of members from every European country. The inaugural meeting will be in Strasbourg at the end of 1994. Members who are interested can obtain further details from Prof R Guillery, EBRA, 58 Great Marlborough Street, London, W1V 1DD.

JOB SECURITY - TENURE TRACK POSITIONS IN THE UK?

Although the "permanent" academic job is not quite as permanent as it once was, it is still a goal of many contract research staff in the university system *[see issue no 12, February 1994]*. There are many differences in terms and conditions (status) of the two groups, but the biggest difference is the security you get to plan your research and build up a group when you become a tenured member of the academic staff. The benefits of not having to worry about what or where your next job will be - if indeed there is a next job - are enormous. The uncertainty faced by contract research staff (CRS) has, of course, worsened as the higher education system has been squeezed financially, year after year. The Association of Researchers in Medicine and Science (ARMS) was founded in 1978 to highlight the plight of CRS and to press for the establishment of a rational career structure. These aims were shared with the majority of tenured academics, who recognised what an enormous contribution research assistants, fellows and technicians make to sustaining their research effort, yet without any job security. The situation was however considered insoluble due to the current financial constraints of the system. The misery continues, or does it .....?

The UCL Initiative

At University College London (UCL) a discussion paper has been unveiled which provides a defined career structure for CRS. The working group was chaired by Professor F W Bullock (Vice-Provost), who emphasised that the scheme can not provide job security for all CRS, but is a career structure that UCL will implement. However, in the current financial conditions, Professor Bullock estimates that only 2-3% of CRS will emerge with permanent posts. An important point is that the University is, for the first time, taking a responsibility for CRS as employers.

What is the scheme, then? Basically, after one year of employment (regardless of the length of contract) the "worth of the CRS to the project" is evaluated and a decision is made not only on the continuation of employment but on the likelihood that the appointment will be continued beyond the end of the present contract, subject to review at the end of the third year (Fig 1). At the three year point the crucial decision is taken on the likelihood that the department will wish the appointment to continue beyond the end of the six year period. If the decision is "Yes", the CRS is informed that they are on a tenure track position, which is finally reviewed at the five year

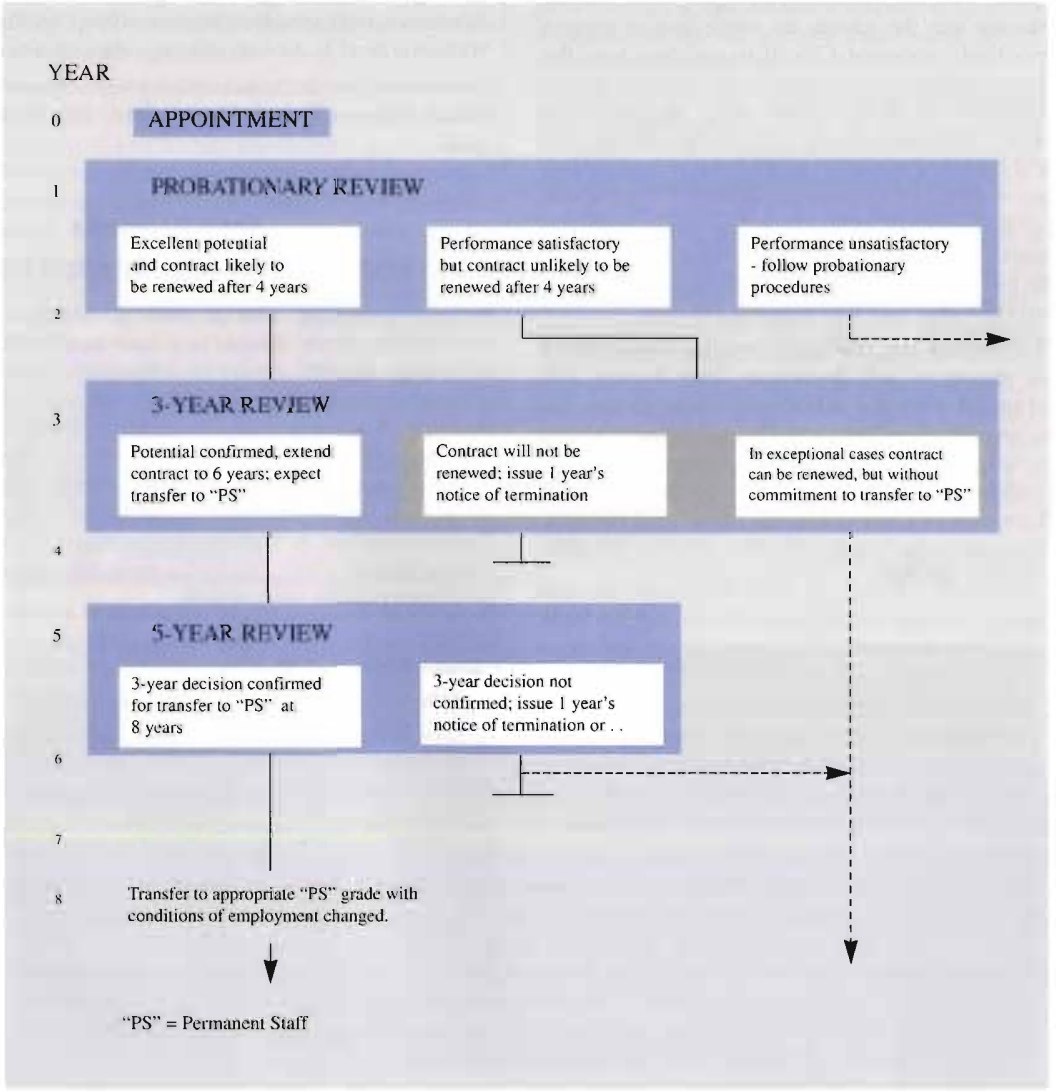


Fig 1
Diagram showing the UCL career structure for contract research staff.

point. After this the CRS contract is extended indefinitely and the conditions of employment are changed at the eight year point to coincide with those of permanent academic staff.

Implications of the UCL Scheme

Clearly for some CRS at UCL this will be a very large step in the right direction and ARMS, in its February Newsletter, congratulated UCL and UCL AUT. It is also clear, as Professor Bullock pointed out, that there has to be "the willingness to take hard decisions about the suitability of CRS to become permanent staff". Heads of departments will exercise much more control over the appointment and continued employment of CRS. This is because if a CRS is changed to a tenure track position, then the department is committed to funding the post in the future either by continuation of contract funds or by reserving or earmarking a vacant post. Thus, career decisions are going to be forced to be made much earlier.

It is not difficult to imagine frictions arising when a grant holder wishes to retain a key postdoc (and has the funds to do so) but is not allowed to do so, either because the department's future cannot be further mortgaged or due to differences in opinion. Professor Bullock points out that the scheme will be greatly enhanced if other funding bodies play a role and put money into the scheme by continuing to support positively reviewed CRS. It is not clear how this scheme will intermesh with fellowships, such as those offered by the Royal Society, which are expected to lead to tenured positions. Will one take priority over the other, for example? Finally, it may make things more difficult for those not following a "traditional" working pattern, *eg* those needing career breaks for family reasons, or part time appointments. They will be less able to compete on such a basis, as their careers and potential may take longer to develop.

This scheme may well be the best that can be offered at present by any institution. Does it meet with approval from our Affiliates? - letters, please. Are other institutions doing something already or planning to follow UCL's lead? If you wish to contact or join ARMS, their address is: c/o Clinical Sciences Laboratories, 17th Floor Tower, Block Guy's Hospital, London Bridge,London SE1 9RT, tel (071) 955 4024, fax (071) 407 6689

Susan Wray

St George's Hospital Medical School

Dept of Physiology
University of London

FIVE YEAR POSTDOCTORAL RESEARCH SCIENTIST IN PHYSIOLOGY

(re-advertisement)

A postdoctoral research scientist (new post) is sought under a new five year Wellcome Trust Programme Grant to study flow, transport of macromolecules such as hyaluronan and macromolecular sieving across interstitium in the synovial lining of joints. Trans-synovial transport is fundamental to normal joint physiology and to some clinical tests of joint disease activity. This is a major new programme, supervised by Dr J R Levick (Dept of Physiology, St George's) in collaboration with Prof R M Mason (Dept of Biochemistry, Charing Cross). The laboratory is located at St George's.

Candidates should possess a PhD in Physiology or a related subject and have a good primary university degree. The programme involves microvascular & interstitial physiology, animal research, and ancillary techniques such as HPLC and electron microscopy. Experience in these areas, while desirable, is not vital: training is available. Funding is for five years, so drive, enthusiasm and adaptability are important, plus ability to work later with a junior research assistant. Teaching opportunities exist in this busy department to aid career development.

Starting date negotiable. Salary begins at £20,989 inclusive of London Allowance, with annual increments (Grade 1A Research Assistant; Wellcome level 2). Annual meetings allowance of £500 available.

Further details from: Dr Rodney Levick, St George's Hospital Medical School, Cranmer Terrace, London SW17 0RE, tel (081) 672 9944 Ext 55354.

Keele University

POSTDOCTORAL RESEARCH FELLOW

Neurophysiologist, ideally with postdoctoral experience of mammalian visual physiology and application of computer technology, for SERC funded investigations of spatial characteristics of visual cortical suppression, under the direction of Dr P Hammond. Duration: three years, commencing 1 July 1994 or after. Salary: up to £15,186, according to age, qualifications and experience, together with National Insurance and USS benefits. Please submit CV, publication details and photograph to: Dr P Hammond, Dept of Communication & Neuroscience, Keele University, Keele, Staffordshire ST5 5BG, Email p.hammond@keele.ac.uk, from whom preliminary details are available.

Sixth Form Symposia and Workshops

The Committee has agreed to fund an increase in the amount allocated to the Education and Information Sub-Committee (EISC) for sixth form symposia and workshops. Whereas these have normally been held only once a year, the EISC is now planning to increase the number to five per year. This year, two workshops are already being organised, in Bristol and Newcastle, and it is hoped that a third will be held in London. It is planned to extend the scheme to Scotland and Ireland next year.

These two-day events for sixth formers are part of an initiative to promote a better understanding and appreciation of Physiology. Their aims are to demonstrate to A Level science students the diversity and excitement of Physiology, to give an idea of the kind of work they would do in the course of an undergraduate degree in Physiology and to discuss the careers open to Physiology graduates. They therefore comprise a mixture of lectures, hands-on practical classes and demonstrations covering various major topics in Physiology, such as Heart & Respiration, Nerve & Muscle, Vision & Hearing and Cellular Physiology. A talk on the use of animals in research is also included and, this year, the Newcastle workshop will include 3-4 short presentations on Physiology in Medicine.

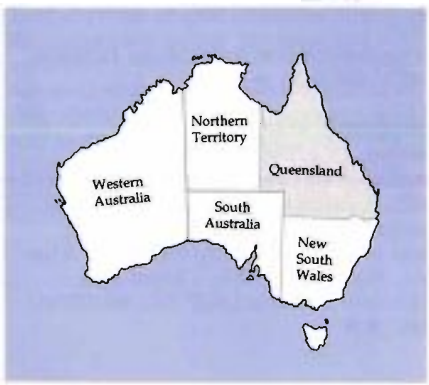
DOWN UNDER: THE AUSTRALIAN PHYSIOLOGICAL AND PHARMACOLOGICAL SOCIETY

The Australian Physiological and Pharmacological Society (APPS) was formed, as the Australian Physiological Society, in 1960. Initially, meetings were held annually at institutions along the East coast but, by 1969, it was necessary to begin a sequence of biannual meetings that has continued.

In 1967, as a reflection of members' interests, the word "Pharmacology" was added to the Society's name although, ironically, an Australasian society specifically representing pharmacologists was also formed in the same year. This division has subsequently been the subject of much debate. Some pharmacologists feel that APPS should revert to being APS while others continue to regard APPS as the best forum for presenting their research. APPS Council's view is that reversion of the Society's title to its original form would unfairly disparage the importance of pharmacological approaches to physiology. Also, a number of tertiary institutions around the country teach both disciplines through the same departments and using the same staff, so the Society must continue to be concerned with both.

As well as a progressive reduction in pharmacological emphasis, the last ten years have seen other changes in the profile of Society membership and meetings. The appearance of an active Australian Neuroscience Society has caused many of the CNS physiologists to secede and the traditionally strong areas of sensory and motor physiology now rarely appear in the programme. By contrast, exercise and sports physiology is emerging as an increasingly popular and multidisciplinary science.

The recent government programme of merging tertiary institutions around Australia has produced a large body of new university staff with no research background. So, in 1994, the Society recognised the need to encourage the research profiles of these people by removing from its membership requirements the stipulation that applicants must have previously communicated a paper. Another change has been the creation of a category of student membership, with industry-sponsored prizes for communications at each Meeting. Student membership is virtually doubling every year and Council believes that participation in Society activities is an important component in the career development of our young scientists. To assist this further, we have now instituted an award for research work carried out during predoctoral and early postdoctoral years. The award has been named after the Society's first President, A K McIntyre.



In 1970, the Society was financially stable enough to begin publication of its own journal, *Proceedings of the Australian Physiological & Pharmacological Society*. The first issue contained, as well as abstracts from the 14th Scientific Meeting, a revealing and entertaining personal history by J C Eccles of intracellular recording from neurones during the 1950s. In the next year, the tradition was established of having an invited lecture, the transcript of which would be published. In 1973, papers from symposia on topics of current interest were also included.

Largely for economic reasons, the traditional process of initially distributing all abstracts and then publishing only those approved by the Meeting was discontinued in 1975. Subsequently, abstracts have been published as submitted and with a disclaimer of the Society's responsibility for scientific accuracy. However, the Society continues to ensure that all abstracts comply with Australian experimental ethics requirements and all authors must verify this in writing as a prerequisite for publication.

Over the last few years, APPS has begun to recognise a responsibility for helping to co-ordinate and improve Australian undergraduate teaching programmes. Given that these involve a spectrum of courses ranging from medicine through paramedical training to basic and applied sciences, and that even for medical training there is no one national course structure, it is not surprising that initial discussions of a national curriculum foundered rapidly and sunk without trace. More recently, a more realistic programme has been started, which aims to create a large national bank of multiple choice questions. The intention is, initially, to provide this bank on disk to all institutions for use in any way that is appropriate. Subsequently, it is planned to develop interactive MCQ-based tutorials for student use.

In 1972, APPS hosted a South-East Asian and Pacific Regional Meeting of IUPS and, in 1983, hosted the 28th Congress of IUPS. More recently, the Society has been influential in creation of the Federation of Asian and Oceanic Physiological Societies (FAOPS). The Society sees its involvement in FAOPS as an important way in which our national experience can be extended to assist the regional development of teaching and research in the physiological sciences.

Christopher Bell

National Secretary and Chief Executive Officer

No notice is carried for more than three successive editions. Notices are starred so that readers can see at a glance whether this is the first (one star) or final (three stars) appearance of the notice. Notices for the July (Cambridge) and September (Aberdeen) edition should reach the Administration Office by 16 May and 18 July respectively.

International Symposium on
ALPHA & GAMMA MOTOR SYSTEMS
11-14 July 1994
UMDS, St Thomas's Hospital, London
Further details from: Prof A Taylor, Sherrington School of Physiology, UMDS, St Thomas' Hospital Campus, London, SE1 7EH, tel (071) 928 9292 ext 2131, fax (071) 928 0729 ★★★

European Neuroscience Association
17TH ANNUAL MEETING
4-8 September 1994
Vienna, Austria
Further details from: Marita Kloosterboer, ENA Congress Office, Keizersgracht 782, 1017 EC Amsterdam, The Netherlands, tel (31) 020 626 1372, fax (31) 020 625 9574 ★★★

Biochemical Society
BIOCHEMICAL SOCIETY MEETING
6-9 September 1994
University of Kent, Canterbury
The major focus and theme for symposia will be proteins. Further details from: The Meetings Office, The Biochemical Society, 59 Portland Place, London, W1N 3AJ, tel (071) 580 5530, fax (071) 637 7626 ★★★

The Biophysical & Physiological Societies of Slovenia
1994 Conference
LIFE SCIENCES
10-15 September 1994
Gozd Martuljek, Slovenia
Topics include: hydration in biological systems, MRI, advanced methods in biophysics, membranes lipsomes & vesicles, nerve & muscle regeneration, ion channels, cell signalling, structure and function of proteins, protein engineering, immuno-chemistry, steroid biochemistry, quantitative image analysis. Further details from: Samo Ribaric, Institute of Pathophysiology, Zaloska 4, 61105, Ljubljana, Slovenia, tel (386) 61 310 841, fax (386) 61 302 272 ★★★

British Neuroendocrine Group
ANNUAL MEETING
12-13 September 1994
University of Manchester
This meeting includes a workshop on cytokine measurement, symposia on interactions between cytokines and the endocrine system and regulation and modulation of neurohypophysial secretion. The Mortyn Jones annual lecture will be given by Prof K Landgraf and there will be free communications and posters. Further details from: Mrs J Clark, School of Biological Sciences, Room 1.124, Stopford Building, University of Manchester, Oxford Road, Manchester M13 9PT, tel (061) 275 5351, fax (061) 275 5363 ★★

Physiological Society Symposium
NERVE GROWTH
AND NERVE GUIDANCE
13 September 1994
Marischal College, Aberdeen
A one-day symposium, sponsored by The Physiological Society, on the day before the Aberdeen Meeting. Speakers: C E Bandtlow (Zurich), J Cohen (London), R W Davenport (USA), P Doherty (London), P Grabham (USA), P W Gordon-Weeks (London), C D McCaig (Aberdeen), K R Robinson (USA) and D M Snow (USA). Further details from: Dr Colin McCaig, Dept of Biomedical Sciences, Marischal College, University of Aberdeen, Aberdeen AB9 1AS, tel (0224) 273016, fax (0224) 273019 ★★

European Society of Cardiology
Annual Meeting and Symposium
WORKING GROUP ON CARDIAC CELLULAR ELECTROPHYSIOLOGY
17-19 September 1994
Arnhem, The Netherlands
To include a half-day symposium on Electromechanical Interactions in the Heart. Further details from: Prof H J Jongsma, Rijksuniversiteit Utrecht, Vakgroep Medische Fysiologie en Sportsgeneeskunde, Vondellaan 24, 3521 GG Utrecht, The Netherlands, tel (31) 30 899299, fax (31) 30 889104 or Dr H Brown, University Lab of Physiology, Parks Road, Oxford, OX1 3PT, tel (0865) 272454, fax (0865) 272469 ★★★

MODELLING AND CONTROL OF VENTILATION
17-20 September 1994
Royal Holloway & Bedford New College, London
Sponsored by The Physiological Society. *See page * for details of themes and costs.* Further details from: Mrs Liz Murray, Dept of Medicine, Charing Cross & Westminster Medical School, Fulham Palace Road, London W6 8RP ★★

International Symposium on
THE PHYSIOLOGY AND PATHOPHYSIOLOGY OF EXERCISE TOLERANCE
21-24 September 1994
University of Ulm, Germany
Further details from: Dept of Sports Medicine, Organising Committee, 89070 Ulm, Germany, tel (010 49) 731 502 6961, fax (010 49) 731 502 6686 ★★★

Associazione Scienze Cardiovacsolori
International Workshop
AN UPDATE OF CARDIOVASCULAR CONTROL: INTERPLAY BETWEEN CENTRAL AND PERIPHERAL MECHANISMS
29 September-1 October 1994
Trento, Italy
Deadline for early registration fee: 31 July. The Scientific Committee welcomes the submission of abstracts. Further details from: Michael P Gilbey, Dept of Physiology, Royal Free Hospital Medical School, Rowland Hill Street, London NW3 2PF, tel (071) 794 0500 Ext 4318, fax (071) 433 1921 ★★

Autumn School
COGNITIVE NEUROSCIENCE
3-5 October 1994
University of Oxford
The three days are devoted to Motor Control, Vision and Language & Cognitive Neuroscience. The course is offered free of charge to undergraduates and graduates. *See page * for details of speakers.* Deadline for applications: 20 August. Further details from: the Administrative Secretary, MRC Research Centre in Brain & Behaviour/McDonnell-Pew Centre for Cognitive Neuroscience, Dept of Experimental Psychology, South Parks Road, Oxford OX1 3UD, tel (0865) 271364 (am) or 272497 (pm), fax (0865) 310447, Email cogneuro@vax.oxford.ac.uk ★

Acta Physiological Scandinavica Symposium
THE ROLE OF EDRF/NO IN THE VASCULAR AND NERVOUS SYSTEMS
21-22 October 1994
Bergen, Norway
To be held in conjunction with the Bergen meeting of the Scandinavian Physiological Society. Key topics: the role of EDRF/NO in normal cardiovascular physiology and in cardiovascular disorder; the role of NO plasticity in the central nervous system. Invited speakers from Denmark, France, Germany, Great Britain, Sweden, USA. Further details from: Prof Knut Aukland, Dept of Physiology, Arstadv 19, N-5009 Bergen, Norway, tel (010 47) 55206406, fax (010 47) 55206410 ★

International Society of Hypertension
16TH SCIENTIFIC MEETING
23-28 June 1996
Glasgow
Further details from: Prof J L Reid, Dept of Medicine & Therapeutics, Gardiner Institute, Western Infirmary, Glasgow, G11 6NT ★★★

Wellcome Centre for Medical Science
One day Open Meetings
The Wellcome Centre, in collaboration with the CIBA Foundation, is organising one day Open Meetings to follow a selection of CIBA Symposia. The meetings are held in the Wellcome Trust Building at 183 Euston Road, London NW1. Registration fee: £10 (£5 for graduate students) in advance for each meeting, including refreshments, lunch and documentation. The calendar for 1994 is:
15 July: *Molecular biology of somatostatin and its receptors*
2 September: *Non-reproductive action of sex steroids*
Further information from: Sheila Pusinelli, tel (071) 636 9456 ★★★

Monograph Wanted
Newman, PP (1974) *Visceral Afferent Functions of the Nervous System.* Monograph No 25. If anyone has a spare copy of this Monograph, which is now out of print, please would s/he kindly contact Dr Alan Sykes, Walthwaite How, Chapel Stile, Ambleside, Cumbria LA22 9JG, tel (05394) 37241. ★★

Professorship in Pakistan

The College of Physicians and Surgeons, Pakistan, is seeking a Professor of Physiology and Professor of Pathology, aged 45-60. Applicants should be medical graduates (MBBS/MD) with postgraduate qualifications of PhD, FRCS, FCPS or equivalent, at least 15 years' teaching experience (including supervision of MPhil and PhD scholars) and a strong research record (at least 20 publications). The salary is US$15,000-20,000 (negotiable), with free furnished accommodation in the College campus, economy class air tickets for self and spouse to place of permanent residence once in two years and financial support for attendance at meetings (twice a year in Pakistan and once a year abroad). Further details from: The Secretary, College of Physicians & Surgeons, Pakistan, 7th Central Street, Defence Housing Authority, Karachi, Pakistan, tel (010 92) 21 566 1234, fax (010 92) 21 566 1513 ★★

Alumni of the University of Leeds

The Alumni Office is seeking to locate graduates and friends of the University with whom they have lost touch. Please contact Jayne Glennon, Alumni Relations Officer, The Alumni Office, 18 Blenheim Terrace, Leeds, LS2 9HD, tel (0532) 336023. ★★★

Missing Members

The Society has lost track of two Members. Diana Trenchard, formerly a member of the Midhurst Medical Research Institute in Sussex, was last known to be living in Hindhead, Surrey. Felicity Maule-Walker left the Babraham Institute in 1987, and was last known to be living in Saffron Walden, doing some part time work with disabled children for the University of Surrey. Please contact the Administration Office, tel (0865) 798498, fax (0865) 798092 if you have more recent knowledge of their whereabouts. ★★★

Overseas Members

Overseas Members receive their Meetings packets only a short time before a Scientific Meeting. As a consequence, making travel arrangements and reservations can be a problem. To help Overseas Members, booking forms for Meetings can be requested in advance of the usual delivery date from the Meetings Secretary's office.

Visiting Scientists

Foreign visitors of the status of at least postgraduate student, working in laboratories of Members of the Society, may be made "Visiting Scientists" by the Society. They are then eligible to receive details of the Society's Scientific Meetings and to attend those Meetings for one year. The names of such persons, with the dates of their visits and a letter of support, should be sent to the Foreign Secretary, Prof O H Petersen, The Physiological Laboratory, University of Liverpool, PO Box 147, Liverpool L69 3BX.

Designated Sessions at Scientific Meetings

The Society has agreed that part of each Meeting can be set aside in advance for a Designated Session on a special topic. Such Sessions will run in parallel with the other sessions of Communications. Suggestions from Members for Designated Sessions at future Meetings can either be made directly to the Special Interest Group organiser or to the Meetings Secretary.

Benevolent Fund Raffle Prizes

At the Bristol Meeting, the Benevolent Fund Raffle was drawn at the poster approval session rather than at the Dinner. Unfortunately, none of the winners was present. The holders of tickets numbered 0685 (first prize) 0578 (second prize) and 0572 (third prize) are asked to contact the Oxford Office to claim their winnings. ★★★

The Benevolent Fund of The Physiological Society

The Fund is to be used:

"... for the purpose of assisting Members of the Society and staff and former staff (who by the nature of their employment can be considered to have contributed to the advance of physiology) employed at teaching research and industrial establishments concerned with the advancement of physiology who are in necessitous circumstances and the wives husbands widows widowers children and other dependants of such persons (hereinafter called "the Beneficiaries")..."

The Trustees have the powers:

"(i) to make weekly or other periodical allowances;
(ii) to make grants and loans (with or without interest) including grants and loans for training or other educational purposes of such amounts and subject to such conditions as the Committee shall from time to time decide;
(iii) to establish and maintain homes and hostels and make grants or pay subscriptions towards the establishment and maintenance of homes and hostels;
(iv) to make grants or allowances for the purposes of medical treatment or care;
(v) to pay subscriptions and make donations to hospitals homes or institutions having amongst their objects the succour of such persons"

Please contact one of the Trustees if you know of anyone whom the Fund might be able to help. The Trustees are currently:

Prof P A McNaughton (Chairman)
Prof M de Burgh Daly
Prof K M Spyer
Dr R Creese
Prof J G Widdicombe (*ex officio*, Treasurer)
Dr C A R Boyd (*ex officio*, Hon Secretary)

Animal Legislation

The Committee of The Physiological Society has an advisory group that monitors the working of the Animal (Scientific Procedures) Act 1986. Members are asked to provide any relevant information relating to its local implementation to:

Tony Angel, Dept of Biomedical Science, The University, Sheffield S10 2TN, tel (0742) 701442

Cecil Kidd, Dept of Biomedical Sciences, Marischal College, University of Aberdeen, Aberdeen AB9 1AS, tel (0224) 640618/273004

Steve Lisney, Dept of Physiology, School of Medical Sciences, University Walk, Bristol BS8 1TD, tel (0272) 303461

Membership of The Physiological Society

The minimum criteria for consideration by the Committee for inclusion on the Membership ballot (as Ordinary or Foreign Members) are:

1 A candidate must have given at least one Communication or Demonstration in person to the Society.

2 A candidate must have published at least one full research paper on a physiological subject in a reputable journal. This paper will form part of the documentation considered by the Committee, so that in the case of a paper that has more than one author details of the contribution made by the candidate must be provided.

3 The candidate must obtain the signatures of SIX Members of the Society who will sign a statement declaring that the candidate is well known to them, is practising in physiology or a cognate subject and is likely to remain so, fulfils the criteria for Membership and is likely to benefit from Membership of the Society and take part in its activies.

There are currently two classes of Membership for which individuals can be considered. Candidates for Ordinary Membership will reside in the British Isles or have worked for a substantial period in the British Isles or have served the Society in some significant way. Candidates for Foreign Membership will normally reside outside the British Isles.

Full details and forms are available from the Administrator (Membership), The Physiological Society, Administration and Publications Office, PO Box 506, Oxford OX1 3XE, tel (0865) 798498, fax (0865) 798092.

◆ Short Paper given rapid review

◆ Short Paper given rapid review

GRANTS AND FUNDING SCHEMES

TITLE	PURPOSE	ELIGIBILITY	AWARDS	APPLICATIONS
AFFILIATE TRAVEL GRANT SCHEME	To enable Affiliates to attend meetings and symposia overseas	Affiliates in the British Isles who have not already received a grant under this scheme (Eligibility continues for a year after election to Membership of the Society)	Up to £600	Applications are considered at the end of January, March, May, July, September and November
BENEVOLENT FUND	To assist persons who have contributed to the advancement of Physiology and are in necessitous circumstances	Physiologists, their staff and dependants	Depend on circumstances	Applications are reviewed immediately on receipt
BURSARIES	To support graduates undertaking MSc courses in physiological disciplines who cannot obtain funds from other sources	Science graduates of institutions in the British Isles	Up to £2,000	Applications are considered at the end of May and November
DALE FUND	To promote new physiological research in the British Isles	Physiologists working in the British Isles	Up to £500 for travel grants for collaborative research, learning new techniques, attending practical workshops and training courses. Up to £300 for travel to conferences and symposia	Applications are considered throughout the year
EASTERN EUROPEAN AND THIRD WORLD SUPPORT SCHEME	To support centres of scientific excellence where high quality physiological research is threatened by lack of resources	Centres of physiological research in Eastern European and Third World countries demonstrating scientific excellence and financial need	Up to £10,000 per annum, for up to three years	Applications are considered at the end of January, March, May, July, September and November
EASTERN EUROPEAN AND THIRD WORLD VISITOR FUND	To allow physiological workers in Eastern European and Third World countries to visit laboratories in the British Isles	Physiologists in Eastern European and Third World countries seeking to undertake collaborative research in the British Isles	Up to £1,500	Applications must be made by the host in the British Isles, and are considered at the end of January, March, May, July, September and November
POSTGRADUATE SUPPORT FUND	To assist the completion of research projects which have been delayed due to circumstances outside the applicant's control	Graduates (normally PhD students) in departments of Physiology or a cognate science in the British Isles, whose supervisors are Members of the Society	Up to £1,000	Applications should normally be submitted before 31 July, but may be considered at other times
RUSHTON FUND	To promote new physiological research in the British Isles	Young physiologists working in the British Isles who are not yet Members of the Society	Up to £500 for travel grants for collaborative research, learning new techniques, attending practical workshops and training courses.	Applications are considered throughout the year
VACATION STUDENTSHIPS	To enable undergraduates to undertake research projects in the summer vacation	Undergraduates in the UK and Eire in their second year or above, for work in the laboratory of a Member of the Society	Up to £500, for maintenance (no support available for consumables or other research expenses)	Applications must be submitted by 31 May

For Office use:		
A	R	L

Confidential

APPLICATION FORM FOR AFFILIATION TO THE PHYSIOLOGICAL SOCIETY

Name (In Capitals) ..... Date of Birth .....

Special Scientific Interest: (eg thesis title or postdoctoral project) .....

.....

Interests: IUPS classes ..... / ..... / ..... (See overleaf for codes) Groups: ..... (See overleaf for codes)

Photograph of Candidate

Work address .....

.....

Tel ..... Fax .....

Electronic mail address .....

Present Course/Postdoctoral Position .....

Qualifications:

Degree	Date	Subject	Awarding Institution

Please delete as applicable:

- I wish to receive Notices, Programmes & *Magazines* only.
- I wish to receive precirculated Abstracts as well as Notices, Programmes, & *Magazines*.

I enclose a cheque for £..... payable to The Physiological Society.

I confirm that the information given above is accurate and up to date and that I hereby authorise The Physiological Society to hold this, and such other personal information as is supplied to the Society by me or my authorised agents or representatives in future, in machine-readable form for use for the purposes registered under the Data Protection Act 1984.

Signed ..... Date .....

Members of The Physiological Society proposing Candidates should read the Guidelines overleaf and sign the following statement.

I hereby confirm that the Candidate:

(a) is either a postdoctoral worker or registered for a higher degree in Physiology or a cognate subject, and

(b) is a person suitable for admission to Society Meetings.

Name (In Capitals) ..... Signature of Proposer .....

Tel ..... Fax ..... Date .....

Address .....

.....

On completion, please return this form to: The Physiological Society (Affiliation), PO Box 506, OXFORD OX1 3XE, (UK).

GUIDELINES TO MEMBERS OF THE PHYSIOLOGICAL SOCIETY PROPOSING CANDIDATES FOR AFFILIATION

This form of association with the Society is intended for physiologists still in the early stages of their careers working in laboratories in the UK, Eire **or abroad**. It is open to postgraduate students registered for a higher degree in Physiology or a cognate subject and to postdoctoral workers who are not yet Members of the Society. **It is expected that postdoctoral workers proposed as Affiliates will normally be (a) within the first five years of attaining a first professional qualification (PhD or medical degree) or (b) awaiting the outcome of their proposal for nomination for election to Membership of the Society.**

The Committee has authorised the Committee Secretary to consider and accept or reject proposals for Affiliation to the Society as they are received throughout the year, so that these can be processed quickly. The Committee Secretary regards himself as free to withdraw a proposal and return the papers to the Proposer.

Affiliation is for a term of five years in the first instance. Affiliation must be renewed by payment of the appropriate fee at the start of each year (which for this purpose is the academic year, ie October to September). For administrative convenience, Affiliates registered after October will have to pay for the full year. The fees are determined from time to time by the Treasurer; they are currently:-

	UK & Eire	Europe	Non-Europe
With Abstracts	£10	£30	£35
Without Abstracts	£ 5	£15	£20

All Affiliates receive copies of programmes, notices and the Society's *Magazine*. Affiliates can attend Meetings in their own right but must be introduced by a Member of the Society when giving a Communication or Demonstration. Affiliates are not Members of the Society and do not have the right to vote at its General Meetings.

Field of Interest:

01	Anaesthesia
02	Anatomy & Embryology
03	Biochemistry
04	Biophysics
05	Biomedical Engineering
06	Blood
07	Cardiovascular
08	Cellular & Tissue
09	Comparative Physiology
10	Electrolyte & Water Balance
11	Endocrines
12	Energy Metabolism & Temperature Regulation
13	Environmental
14	Enzymes
15	Gastrointestinal
16	General Physiology
17	Immunology
18	Liver & Bile
19	Lipids & Steroids
20	Microbiology
21	Minerals, Bone & Teeth
22	Muscle & Exercise
23	Neuroscience
24	Nutrition & Food
25	Pathology
26	Pharmacology
27	Radiation
28	Renal
29	Reproduction
30	Respiration

You may specify up to three fields of interest.

Special Interest Groups Current Codes

AF	Autonomic Function
BB	Blood-Brain Barrier
CC	Cardiovascular/Respiratory Control
CI	Comparative & Invertebrate Neuroscience
CN	Cellular Neurophysiology
CP	Comparative Physiology
DP	Developmental Physiology
EM	Epithelia & Membrane Transport
GI	Gastrointestinal Tract
HC	Heart/Cardiac Muscle
HI	History of Physiology
HP	Human Physiology
HS	Higher Sensory Functions
IC	Ionic Channels
ME	Microvascular & Endothelial Physiology
MC	Muscle Contraction
NE	Neuroendocrinology
PP	Placental & Perinatal Physiology
RP	Renal Physiology
RE	Respiratory Physiology
SC	Sensorimotor Control
SM	Smooth Muscle
SP	Somatosensory Physiology

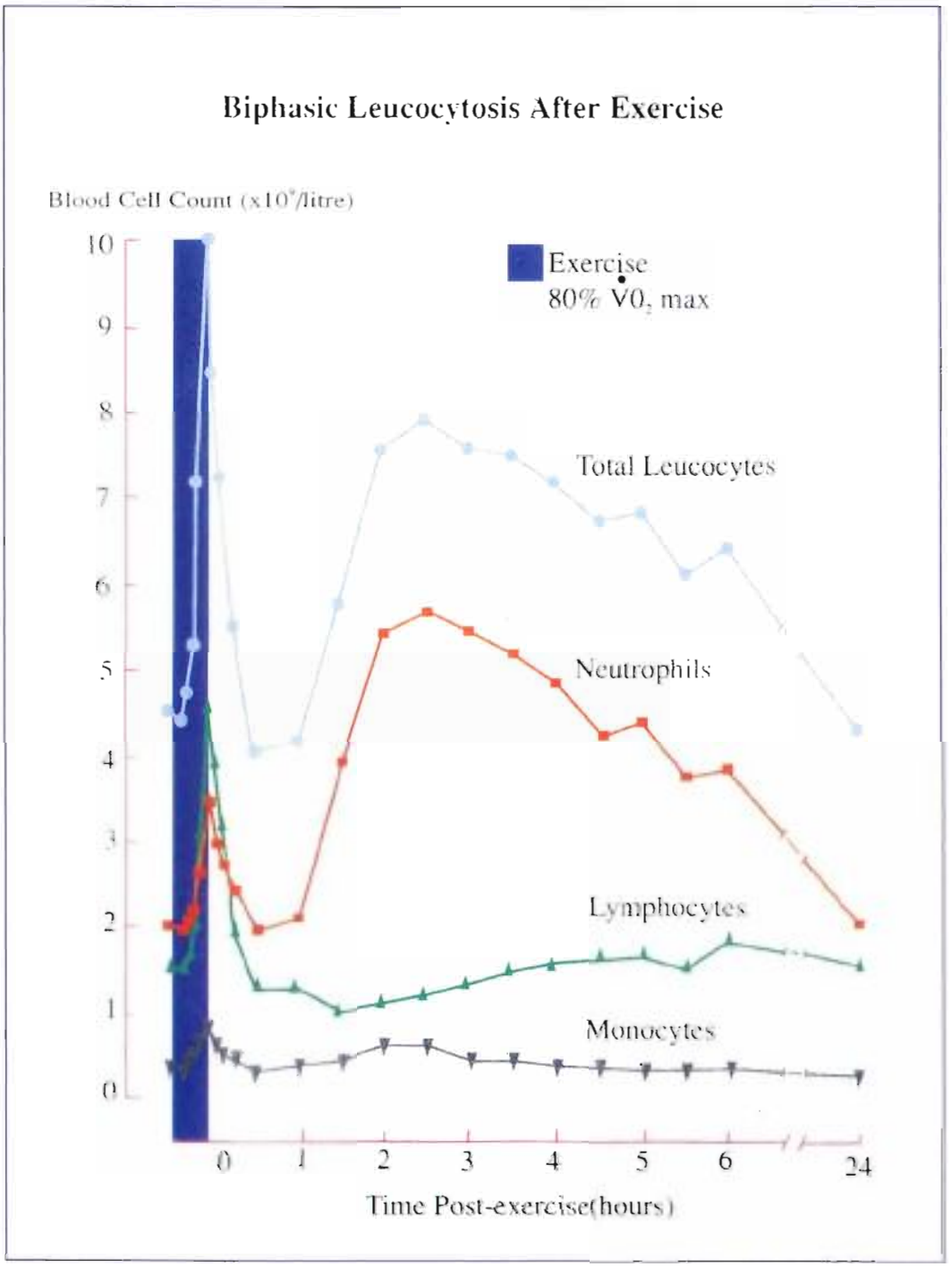


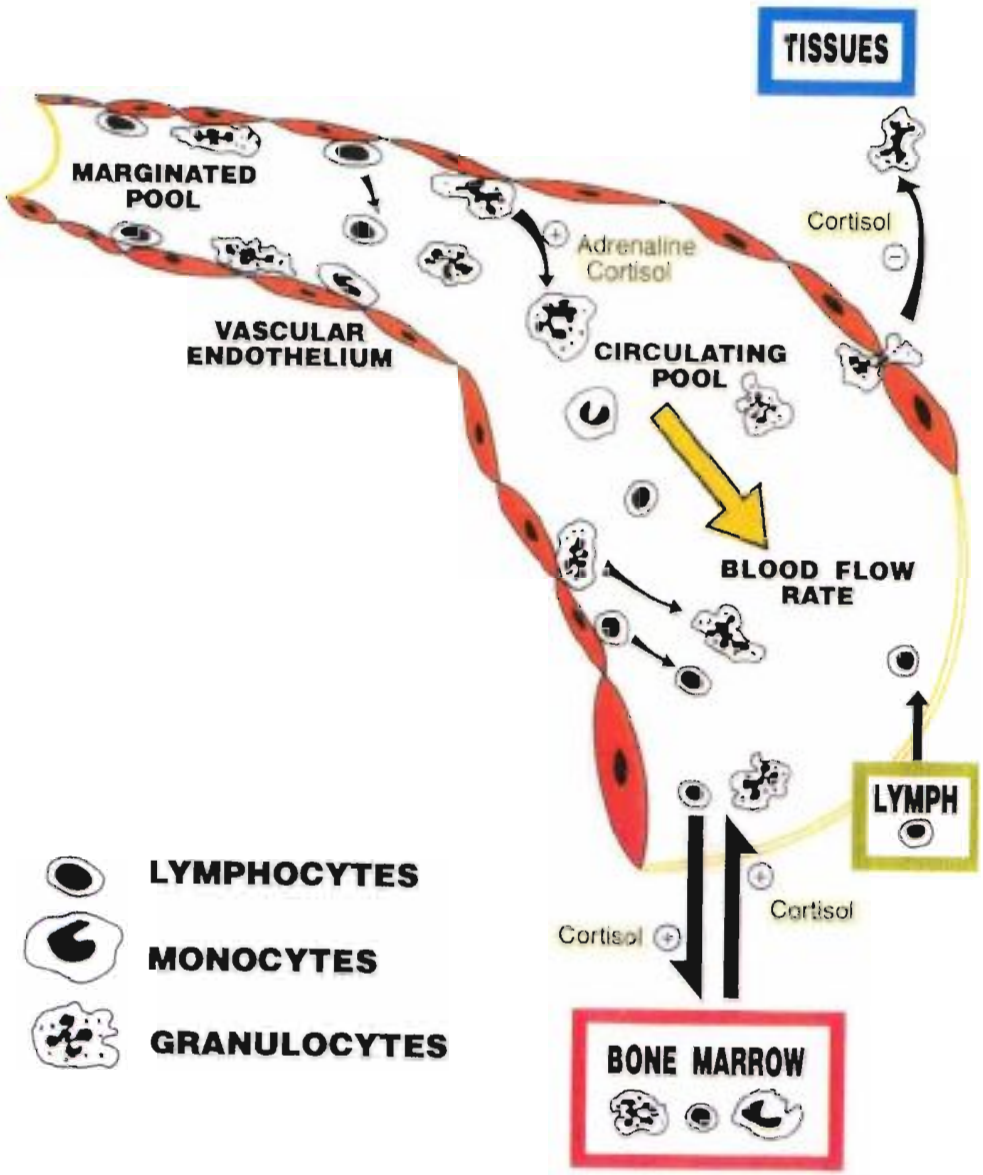
Fig 2 from Exercise and Immune Function (see page 8)

The biphasic leucocytosis of exercise in a male subject who cycled for 15 minutes at a work rate equivalent to 80% of his maximal oxygen uptake. Note the increase in the circulating leucocyte count during exercise and the delayed and more prolonged increase in neutrophils a few hours after cessation of exercise.

Back cover

Fig 1 from Exercise and Immune Function (see page 8)

Diagrammatic illustration of some of the factors influencing demargination and leucocyte entry into and egress from the circulation. The increase in circulating leucocytes during exercise is largely due to the mechanical effects of increased blood flow rate and the effects of catecholamines. Adrenaline and cortisol decrease leucocyte adherence to the vascular endothelium. Cortisol also promotes the release of granulocytes (mostly neutrophils) from the bone marrow and inhibits their egress from the circulation. Conversely, lymphocyte storage in the bone marrow is increased by the action of cortisol, but an increase in the number of lymphocytes occurs during exercise due to demargination and increased entry from lymphatic vessels.


TISSUES
MARGINATED POOL
Adrenaline
Cortisol
Cortisol
VASCULAR ENDOTHELIUM
CIRCULATING POOL
BLOOD FLOW RATE
LYMPH
Cortisol
Cortisol
BONE MARROW
LYMPHOCYTES
MONOCYTES
GRANULOCYTES