

Overview of laboratory activities and staff training

1. Introduction

The School of Life Sciences comprises Sport and Exercise Sciences, Sports Management, Coaching and Development, Psychology and Biological and Analytical Chemical Sciences. All physiology laboratory activity falls within the realms of Sport and Exercise Sciences. The Head of Department is Prof. Kevin Thompson (FBASES) and the laboratories are under the directorship of Dr Glyn Howatson.

Current Situation of the Physiology Laboratories - I have been a member of the academic staff at Northumbria University since September, 2009. I was appointed as Laboratory Director and hence responsible for quality assurance and procedures within the laboratory. Northumbria has historically had BASES accreditation, however this has expired some years ago, consequently as part of the quality assurance process it is now my role to seek re-accreditation for the laboratories and the processes we engage. The Head of Department has given me his full support in pursuing accreditation and performing on-going consultation and a letter to this effect is enclosed with the application.

Regrettably, I have not been in a position to know how the laboratory was managed before my arrival, therefore I am unable to ascertain exactly what support work had been carried out or what continuation training had been delivered to staff prior to September 2009. The technical staff and I have investigated the whereabouts of the laboratory's documentation, such as calibration and service records, reliability data, risk assessments, COSHH assessments and so on. It would appear that much of this documentation was not of a sufficient standard or had expired. There was little evidence of longitudinal reliability, service and maintenance being carried out. Many records appeared to be missing and consequently there was a need to bring the laboratory to a sufficient standard to gain BASES Laboratory Accreditation.

In light of these previous issues, the technical support staff and I have taken steps to identify the requirements for re-accreditation and consequently I have implemented a course of action to address those needs. Instruments are now regularly serviced and calibrated (where necessary), and reliability checks are continually made. Risk assessments and COSHH now exist for all activities within the laboratory that cover a wide range of protocols. In addition there are supporting documents for ethical approval (research activity) and a laboratory practical catalogue is also in place on the university intranet.

The Laboratory Director - The Laboratory Director joined the department in September 2009. He has been accredited scientist since 2005; he has been involved in physiological support of athletic populations for approximately 13 years and is a Fellow of the American College of Sports Medicine (FACSM). He is the Convenor for the BASES Laboratory Directors Group and Laboratory Accreditation Group and has led and implemented the new laboratory accreditation process for BASES. He is the Laboratory Director, Associate Director for Research, and is the Manager of the Enterprise Unit within the Department of Sport and Exercise which provides support services spanning all aspects of the sport and exercise science. Since his arrival he has been working to bring the laboratories to the required standard to apply for laboratory accreditation, by ensuring technical and academic staff are appropriately equipped and trained to carry out good laboratory practice and is able to deal with the day-to-day running of the laboratories.

2. Laboratories

Site and situation – many of the laboratories are now situated on the 1st floor in a newly completed £32M sports complex (Sports Central) and comprise of the following:

- Integrated performance laboratory (159m²) – which largely used for teaching purposes
- Metabolic kitchen (35 m²) – for nutrition associated work

- Performance analysis suite (36 m²) – for notational analysis work
- Physiology laboratory (83 m²) – for teaching, research and consultancy
- Biomechanics laboratory (83 m²) – for teaching, research and consultancy
- Gait laboratory (96 m²) for research and consultancy
- 50 m running track (498 m²)
- Male and female changing/showering facilities (80 m²)

In addition, there are complimentary facilities on the 4th floor of the adjoining Northumberland Building that is preferentially used for research activity and comprise of the following:

- Physiology research laboratory (~60 m²)
- Biochemistry laboratory (~15 m²)
- Neuroscience laboratory (under construction)
- Body composition laboratory (~9 m²)
- Environmental chamber (~24 m²) – heat and cold (range -20°C to +40°C), humidity (up to 95% RH), hypoxia (>8000m)

All laboratories (except body composition) are fully air conditioned climate control. There are also change and shower facilities situated in this section of the building. Both sections (Sports Central and Northumberland Building) have disabled access and have access to telephone communications, and 1st aid (including AED).

3. Staff

There is around 30 FTE academic and technical staff across disciplines in the department. The following staff are specialising in physiology and nutrition:

BASES Accredited

Dr Glyn Howatson – Laboratory Director, BASES Accredited
 Prof Kevin Thompson – Head of Department, BASES HPSA Accreditation
 Dr Duncan French - Senior Lecturer, BASES Accredited
 Dr Emma Cockburn – Lecturer, BASES Accredited
 Phil Hayes – Senior Lecturer, BASES Accredited
 Kevin Thomas – Graduate Teacher Assistant, BASES Accredited
 Jonathan Leeder - PhD Student, BASES Accredited

Supervised Experience

Jonathan Prichard – Technician, BASES SE
 Phill Bell – PhD Student, BASES SE
 Jamie Tallent - PhD Student, BASES SE
 Richard Ackenhead - PhD Student, BASES SE

Other Laboratory Users

Ruth Steinberg – Senior Technical Officer
 Dr Emma Stevenson – Senior Lecturer
 Dr Caroline Reynolds (nee Dodd) - Senior Lecturer
 Dr Mick Wilkinson – Senior Lecturer
 Dr Les Ansley – Senior Lecturer
 Dr Paula Ansley - Reader
 Prof Alan (Zig) St Clair Gibson – Director of Research and medically qualified doctor

Many staff also hold professional qualifications in the department (S&C, biomechanics, nutrition, performance analysis, performance lifestyle, and psychology) also contribute to support programmes and collectively we can offer an interdisciplinary approach to scientific support.

4. Activities

Support activities are conducted under the direction of Dr Glyn Howatson, for example:

- Much of the support we provide is multi- and interdisciplinary support to Team Northumbria, the university's performance sports teams
- We also have formal arrangements with the English Institute of Sport, predominantly in knowledge transfer activity such as recovery strategies, neuromuscular adaptation, and performance enhancement
- Newcastle United FC – Knowledge transfer partnership and PhD student providing physiological and S&C support to Premier football club
- AFC Sunderland – physiological testing, research project, and nutrition support.
- Newcastle Falcons RFC – field testing of 1st team squad throughout the year
- GB Triathlon – physiological support of regional GB athletes, typically VO_{2max} , lactate threshold, anthropometric assessment, exercise prescription
- Local club cyclists, runners and triathletes have also been supported using a similar battery of tests to those above, but carried out using sport specific ergometry
- School visits – We have regular visits from local schools who participate in some simple laboratory experiments in order to support GCSE and A level curriculum. This also serves to widen participation for the University and raises the profile of BASES by keeping the organisation in the public eye
- Workshops – delivery of bespoke workshops. An example of this is delivery of activities to Tyne and Wear Sport as part of their Coach Education programme.

Research activities within the department are under the direction of Prof Alan St Clair Gibson (Director for the Centre for Sport, Exercise and Wellbeing <http://www.northumbria.ac.uk/sd/academic/lifesciences/resinn/rescentres/sew/>). The centre is divided in to three primary areas, 1) biomechanics and the physiology of running; 2) neuromuscular adaptation and regeneration; 3) health science and exercise immunology. A strategic aim for the university is to double the research in come and output within the next REF cycle. As a consequence, most departmental academic staff have active research profiles active. There are three post-doctoral appointments and around twenty full-time PhD students that support the three strands of research in the department. There is also extensive collaboration within the UK, Europe, USA and South Africa, which has raised teh profile of the department on an international scale. Since 2008, the department has published approximately 70 peer reviewed papers and has generated in excess of £500,000 in research related income.

Training and CPD is conducted on a regular basis, there is a good budget available for staff to attend training days, workshops and conferences. The consultancy money that is generated over the year is also used to fund additional staff CPD activities such as workshop and conference attendance. In addition, there is a regular seminar series that allows internal and external speakers to present their work to the department. There are some in-house training sessions provided where necessary, such as the use of new instruments (for example; online gas analysis, near infrared spectroscopy, environmental chamber). Numerous staff that hold independent qualifications such as ISAK level one and phlebotomy training; furthermore many staff have attended BASES workshops addressing numerous activities such as body composition, field testing, child protection and so on. There are 12 members of technical and academic staff that hold both a current HSE recognised 1st aid and AED certificate.

It is my intention as Laboratory Director to continue with the implementation of good practice within our laboratory to attain BASES Laboratory Accreditation, which I see as a necessary part of providing existing and potential clients with quality assurance from our governing body. The on-going CPD that is provided will help to increase the skill base within the department and raise awareness of the standards that we wish to maintain and uphold.

5. Laboratory Directors meetings attended

I have attended all Laboratory Directors meetings since 2005. Since 2007 I have been the convenor of the BASES Laboratory Accreditation and Laboratory Directors' Group and consequently chaired all the Laboratory Directors' meetings since, and including 2007. As part of this role I have reviewed the old Laboratory Accreditation process, and as revised it in light of calls from the BASES membership for elements to be updated. As part of this role I provided BASES guidelines on specific instruments, such as the use of ECG during

exercise testing and provide advice to Laboratory Directors across the UK and Europe on matters pertaining to policy and general good laboratory practice.

Department of Sport and Exercise Sciences, Northumbria University
Physiology Laboratory
Overview of laboratory equipment for accreditation

Where necessary, the most recent reliability and validity data for these instruments are presented in the appendices to support this application.

We employ a “system” reliability check where volunteers (n = 3) conduct 3 incremental exercise trials (much the same as the BASES exercise challenge) over the period of one week. The test comprises the Lode cycle ergometer, monitoring HR, expired gas (Oxycon Pro) and [blood lactate] that are collected throughout the test at a range of intensities below the lactate threshold and above the lactate turnpoint.

1. Anthropometry

- Stadiometer for sitting and standing stature (nearest 0.1 mm)
- Electronic Seca scales (nearest 100g)
- Harpenden skinfold callipers
- Bicondylar callipers
- Anthropometric tapes
- Bioelectric impedance
- BodPod

Callipers are checked for precision using steel ball bearings of varying sizes supplied by the National Physical Laboratories (accurate to 100th mm) bi-annually. Servicing and calibration for scales and the BodPod are carried out annually. Intra-rater reliability using skinfold callipers is carried out bi-annually (see appendices for most recent checks).

2. Haematocrit, red cell count and haemoglobin

- Haematocrit - Hawksley centrifuge
- Haemoglobin - Hemocue analyser
- Other blood chemistries conducted using Biosen C-Line and Reflotron

The Reflotron has a clean and check system which is run prior to usage to ensure it operates within the desirable ranges. Hemocue has a self check cuvette. The Biosen and Reflotron do not require servicing, according to the manufacturers; however regular calibration and servicing are conducted “in-house” and we have service contracts with the manufacturer in the event of malfunction (see appendices for most recent checks on Biosen)

3. Recording heart rate and ECG waveform

- Polar short wave telemetry and Oxycon Pro
- 12-lead ECG system (Oxycon Pro)

HR monitors are checked regularly for serviceability. Oxycon Pro has an annual service contract.

4. Collection of respiratory gases

- Oxycon Pro system
- Douglas-bag system
 - Fortin mercury barometer
 - Digital humidity monitor

The Oxycon Pro is serviced annually. It is calibrated before every test and the reliability is checked every 6 months with a standardised exercise protocol.

5. Microprocessor interfaced cycle ergometer

- Lode Excalibur Sport - for PC interfaced
- Velotron PC integrated ergometer for Wingate testing
- Treadmill for maximal intensity exercise (such as Cunningham and Faulkner test)

The reliability of the Lode is examined every 6 months with a standardised exercise protocol. It is also serviced annually by the suppliers, Cranlea.

6. Motorised treadmill and other ergometry

- Woodway treadmill
- Environmental chamber ready Woodway treadmill
- HP Cosmos Pulsar treadmill
- Concept II rowing ergometer – with integrated force transducers

The treadmills' validity is conducted every six months for speed and gradient in loaded and unloaded states and both are serviced annually (see appendices for most recent checks). These data do not include the environmental chamber treadmill it was installed a short time ago and was checked on installation by Cranlea.

7. Blood lactate analysis

- Biosen C-Line
- Lactate Pro portable system

The Biosen has calibration and standard solutions of known concentrations and are checked before usage. The reliability of the Biosen is examined during a standardised exercise protocol. There are service contracts for both Biosen units. The Lactate Pro has a check strip and calibration strip. No other checks are necessary (see appendices for most recent checks on lactate and glucose using the Biosen C-Line).

8. Other instruments

- Cybex MkII
- Environmental chamber

Both instruments are serviced annually.

A summary of the reliability and validity checks are presented below in the appendices.