Introduction from HSE’s Chief Scientific Adviser

I am reviewing the quality of the Health and Safety Laboratory’s science and technical outputs. This will take four years to complete.

These reviews are designed to provide an independent, though time-limited, view of the work of HSL. They are to give assurance to me - and through me, to the HSE Board and Government Chief Scientific Adviser - that the quality of HSL’s work stands scientific scrutiny from its peers. On this occasion, the review team consisted of Prof Sir Anthony Newman-Taylor, Prof Paul Blanc, Dr Trevor Ogden and me.

As a team, we assessed the broad capabilities and capacity of HSL's scientists and facilities, and reviewed them with comparable British and other national organisations providing similar scientific and technical support. We visited a number of laboratories at HSL, where the scientists presented a showcase of some of their recent work.

This record includes an action plan to address the issues raised by the review.

The review team identified one issue which it was not possible to examine to my complete satisfaction during the visit to HSL. During presentations and discussions with HSL scientists, the reviewers became concerned that the way HSE commissioned work from HSL was constraining HSL scientists’ work.

As a regulator, HSE needs access to evidence that supports our operational and policy work. Evidence from scientific and technical support is one, but not the only basis for the judgements we take in our operational and policy work.

Without HSE customers being present during the review to explain the context and to correct any misconceptions, this review team were not able to get a balanced picture of the working relationship between HSL and HSE. Thus the record of the review may give an overly critical impression that HSE is not making the best use of the capabilities and capacity of HSL to deliver quality scientific and technical support.

For example, the review team gained the impression that HSE had blocked occupational asthma research. However, the context of this decision was that it was inappropriate for HSL to engage in a situation where HSE was looking at possible enforcement action, and this important point was not made during the reviewers’ visit.
I am concerned that some scientists did not know why the work they do for HSE – particularly in policy areas - can sometimes be limited to a number of specific questions instead of more broadly scoped research. Arrangements have been made to raise scientists’ awareness of how science supports policy working.

The following ongoing arrangements are in place to address scientists’ appreciation of HSE’s needs:

• HSE customers continue to explain the context of their needs when working with HSL scientists.
• There are regular meetings between HSE’s science managers and HSL’s account managers which underpin communications between scientists and customers.
• There is a three-year rolling Science Plan, developed by policy and operational staff in HSE with support from scientists, engineers and analysts in HSE and HSL. The plan identifies the ongoing support and research projects required by HSE to help deliver its objectives. HSL are making proposals for the next 3 year Science Plan 2011/14.
• Arrangements are in place to identify the scope and researchable questions to be delivered through research projects. Stage and gate arrangements ensure that work does not progress to the next stage without the agreement of customer and scientist.

Finally, I have made arrangements for HSL to propose and develop a number of strategic research projects which will have a longer-term perspective than much of HSE's commissioned work, which will in part enable HSL staff to develop their capability to support HSE’s current and future needs. This is complemented by existing arrangements for Futures Work and Horizon Scanning.

The next science review of HSL is due in October 2010, covering fire and explosions, process engineering and controls and support for investigations. Customer representatives will support the reviews from now on.

The review team appreciated all the work the scientists put in to the making the review work well, and I thank the scientists for this too.

Patrick McDonald
HSE Chief Scientific Adviser and Director CSAG
HSE’s Chief Scientific Adviser (CSA) intends to review the whole of the Health and Safety Laboratory’s (HSL) scientific activities over a four-year period. The 2009 Science Review is the first of the four to be completed. The CSA asked the independent reviewers to focus on the following issues: quality of research and other outputs, quality of staff, national and international standing, adequacy of facilities and equipment, adequacy of collaborative engagement, and how research work was commissioned, solicited, planned and prioritised.

After working through an extensive information pack before the visit, the review group made a 2-day visit to HSL Buxton on 7-8 October 2009, and met with HSL management and staff and toured some of the laboratory facilities. The review group recognised the high standard of people, facilities and work at HSL.

It became clear as the review progressed that the commissioning of research by HSE from HSL was identified by the reviewers as the main issue that affected the quality of HSL’s outputs and that now requires attention.
1. Purpose of Review

1.1 The HSE Chief Scientific Adviser seeks assurance that the Health and Safety Laboratory’s (HSL) scientific activity and outputs compare favourably with the work of similar organisations in the UK and overseas.

1.2 HSE currently commissions ~£31m of work from HSL annually of which ~20% is classified as research and ~80% is scientific and technical support. This work principally supports HSE’s inspection, investigation and enforcement activities as well as the development of health and safety policy, guidance, standards (e.g. exposure limits) and advice. High quality research raises the confidence of HSE’s inspectors, planners and policy makers and in turn, external stakeholders who sustain the reputation of HSE and HSL.

Background

1.3 HSL is an agency of the Health and Safety Executive. HSL deploys an array of scientific skills to the multiplicity of health and safety issues that arise in the workplace. The staff use their experience and know-how to identify the problems and propose solutions that work. They use an extensive range of equipment and facilities to investigate and test the latest theories. All of this allows HSL to focus on how work processes and sites etc. affect and interact with people at work.

1.4 HSL’s main role is to provide HSE with the assistance it needs to meet its strategic targets, and its enforcement and other statutory duties. To this end, HSE commissions support and underpinning research work from HSL. Additionally, HSL has successfully met targets set by HSE to recover part of its overall costs from external customers in both the public and private sector.¹ Most recently, the external revenue was £7.069m for 2007/8 and £7.660m for 2008/9. HSL is a net nil agency which must demonstrate annually to the National Audit Office that it is going concern so that its revenue covers costs. This means that HSL must charge for the work it undertakes at rates that cover the full economic cost of the work undertaken. The HSL Board and management team has built a strong commercial approach to HSL’s work in recent years, applying the science to solving customers’ problems.

Coverage and scope

1.5 The HSE Chief Scientific Adviser intends to review the whole of HSL’s scientific activities over a four-year period. This review is the first of the four to be completed.

1.6 On this occasion, the Review group examined seven technical areas: the Centre for Workplace Health; Clinical Statistics, Clinical Modelling and Epidemiology; Biological Monitoring; the Centre for Interdisciplinary

¹ This does not include direct funding from UK Research Councils for which HSL is not eligible, in common with other government owned laboratories.
The following came within scope of the review:

a) Commissioning of work from HSL by HSE  
b) Staff resources – qualifications, experience, scientific management skills  
c) Equipment and facilities  
d) Quality and relevance of work  
e) Promotion and dissemination of results  
f) Engagement with the national and international scientific community including networks, collaboration, standards bodies, and conference presentations

Acknowledgements

The CSA wishes to thank both the review group and the HSL managers and scientists for the time and work they contributed to this review.

Review report prepared by

Richard Lewis  
Corporate Science Unit  
Health and Safety Executive  
Merton House  
BOOTLE L20 7HS  
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2. Review Method

2.1 The review group was:

- Patrick McDonald: Chief Scientific Adviser, HSE
- Prof Sir Anthony Newman-Taylor: Faculty of Medicine, Imperial College, London
- Prof Paul Blanc: School of Medicine, University of California, San Francisco
- Dr Trevor Ogden: editor-in-chief, Annals of Occupational Hygiene

2.2 Before the review took place, the members of the review group were sent a sizeable information pack – some 500 A4 pages - containing:

a) An overview of each technical area within the scope of the review including
   1) the type of work carried out and the customer base, together with examples of projects carried out over the last 5 years;
   2) details of staff qualifications, professional networks, and facilities;
   3) a bibliography of recent scientific publications; and
   4) examples of outcomes of work such as guidance documents for inspectors, training DVDs and courses, e-learning tools, newsletters for industry, customer reports, and peer-reviewed scientific publications.

b) Background information about HSL including:
   1) the most recent Annual Report and Accounts;
   2) and an overview of processes to ensure quality, to develop staff, and to use the in-house Investment Research Programme to secure the HSL’s future vitality as an expert provider of scientific and technological expertise related to health and safety.

2.3 The review group made a 2-day visit to HSL Buxton on 7-8 October 2009. During the visit, the group met with HSL management and staff, and had time to work by themselves. The review opened with an outline of HSL’s business and a tour of the Laboratory.

2.4 The review group attended unit meetings where HSL staff selected and presented some of their recent project work, demonstrated some of their facilities and discussed issues raised by the review group.

2.5 The review group divided into two groups and each group spent two hours each with three technical areas. The whole review group met with the Centre for Interdisciplinary NanoResearch.²

2.6 The CSA asked the reviewers to focus on the following issues, during their review of the technical areas:
   a) Quality of research output (including relevance and innovation)

² An outline timetable of meetings and presentations is at Annex A.
b) Quality of other outputs (e.g. technical support)  
c) Quality of staff 
d) National and international standing  
e) Adequacy of facilities and equipment  
f) Adequacy of collaborative engagement  
g) How research work was commissioned, solicited, planned and prioritised 

2.7 The CSA stressed that HSE’s requirements of HSL were mainly applied research and support, and that this would contrast when making comparisons with more academic institutions. 

2.8 The CSA explained that he doesn’t get closely involved with most projects at HSL: in this respect, HSL’s work resembles contract work for HSE. He asked for a view whether poor or substandard work had been commissioned by HSE or others. 

2.9 Publishing results of HSE-commissioned research in peer-reviewed journals and conference proceedings had been discouraged in recent years by reduced HSE support. Recent steps to address this have been taken by the HSE Chief Scientific Adviser and the HSL Head of Science and are reversing this trend. 

2.10 The CSA also asked the review group for their reflections on the review process including time needed and taken, organisation of the review, adequacy of the information pack, and other improvements that could be made. 

2.11 The review closed with the review group agreeing the key points that they had found during the review, and their outline conclusions and recommendations. These were fed back to HSL in advance of the writing of this report. 

2.12 This report contains the reflections of the review group and includes key points made by HSL scientists and managers during the review. The report does not contain any views from HSE staff as science business partners, project officers or science customers. Recommendations in Section 6 will lead to further discussion and action, and some are covered in detail in section 7.
3. Review group’s reflections on the Chief Scientific Adviser’s questions

3.1 Effect of commissioning arrangements between HSE and HSL

3.1.1 It became clear as the review progressed that the commissioning of research by HSE from HSL was identified by the reviewers as the main issue that adversely affected the quality of HSL’s outputs and which required attention.

3.1.2 The commissioning process appears to have interfered with optimal science at HSL. This includes:
   a) non-science based decisions in HSE stopping for example, the work on allergic extrinsic alveolitis investigation,
   b) research commissioner’s preferences affecting research design blocking for example, the inclusion of yenepuncture in hand-arm vibration studies,
   c) repeatedly commissioning literature reviews rather than real research,
   d) disproportionate cuts in programmes that could undermine future applied research capability for example, in immunology and biological monitoring, and
   e) HSE “deciding” that the problems of occupational asthma have been “solved” so that there is no need to pursue that further.

3.1.3 The reviewers are concerned that the division of responsibilities within HSE might mean that the research question does not come through very strongly or early enough in the commissioning process. For example, in a point made by Dr Ogden, assuming that the primary purpose of occupational hygiene research is more cost-effective control, then this will steer commissioning. Even if we assume that we may know everything there is to know about the causes of occupational asthma, has HSE researched for better ways of controlling exposure to isocyanates or flour dust or for ways of delivering the same degree of control at lower cost?

3.1.4 Longer range research planning e.g. for chronic disease, neurotoxicity, reproductive toxicity is constrained. HSE Board needs to have the debate about the priorities for occupational health, though they have yet to receive a proposal from HSE’s senior managers.

3.1.5 The need for a policy or enforcement question from HSE to be translated into a scientifically answerable question requires more and better interaction between the research commissioners and the research community in HSL.

3.1.6 Scientific interaction between HSL and research commissioners is also needed to ensure that the question asked is not too focussed and insufficiently broad to draw more general conclusions when a better research question could allow this.
3.1.7 HSL scientists feel circumscribed by the commissioning process: it appears to have a short term focus and questions could be better developed. Where work could lead to more important work, engagement with customers seems constraining, sometimes lacking a wider scientific perspective. For example, where there is apparent resistance to feedback from HSL to HSE or where research is being cut off in full flow, scientists don't appear to understand why HSE makes the decisions it does.

3.1.8 The reviewers had concerns about the capability and role of HSE’s customers. Recent turnover of staff in HSE’s policy functions were impacting on HSL’s delivery.

3.1.9 HSE Science business partners and HSL’s business managers need to clarify their roles and HSE’s needs in progressing proposals with HSL.

3.1.10 There is a lack of a transparent, scientifically well-informed process by which research is commissioned. More of HSE’s work should be externally challenged at commissioning.

3.1.11 Further investigation is needed into the commissioned literature reviews. Reviewers were concerned whether the scale of this work is leading to beneficial work or whether it is in danger of becoming a significant activity without some control.

3.2 **Quality of research and routine outputs (technical support)**

3.2.1 HSE is well supported by this science.

3.2.2 It should be possible to demonstrate the value and impact of the work considering the wide range of outputs from these science teams. For example:
   a) The Fibres team provides support for other laboratories, tests the effectiveness of regulations; and
   b) The Biological Monitoring team has a strong culture of dissemination and publishing.

3.2.3 Some of the health issues in the UK now require enforcement arrangements rather than further research.

3.2.4 HSL is capable of providing more response to health investigations – currently infrequently required by HSE. Arrangements for investigator proposed research could be better developed.

3.3 **Quality of staff**

3.3.1 The quality of staff and the science they undertake is high.
3.4 **National and international standing**

3.4.1 Nationally strong, in many areas the scientists’ strong international links are also highly respected.

3.4.2 The reviewers noted one scientist who is a member of the ACGIH Biological Exposure Indices committee. It is unusual for ACGIH to have people from outside North America on these committees, and it is a rare testimony to the international standing of the science team’s work.

3.5 **Adequacy of facilities and equipment**

3.5.1 The facilities in the Laboratory enable good work to be done.

3.6 **Adequacy of collaborative engagement**

3.6.1 HSL needs to develop more of the culture of getting external funding and collaboration. They need to learn how to apply cost-effectively for funding that they stand a good chance of getting.

3.6.2 As the profile of health matters is being raised within HSE, HSE senior managers and customers need to articulate better what they require from HSL. HSL’s Science units are well placed to develop their capability and capacity – including by collaborating with each other - in occupational health and hygiene issues to deliver work to meet HSE’s strategy.

3.6.3 HSL and HSE need to work more collaboratively to establish the problems and identify which ones will lead to credible research.

3.6.4 The reviewers questioned why HSL were commissioned to do some of the studies if they aren’t followed through. In establishing the scope of the research questions, more could be done by HSL to identify other research partners if HSE’s needs were satisfied by more limited studies.

3.6.5 More awareness by scientists of collaboration with other organisations would help them to continue work. Reviewers questioned whether scientists had identified that they could collaborate to use data maintained by other organisations or seek additional funding from academia, charitable research organisations etc.

3.6.6 More collaboration within HSL would support the quality of research. It appeared that work on bakers’ asthma conducted in different teams wasn’t fully joined-up. More joined-up work across teams on handling, analysing and presenting data could be developed e.g. with Geographic Information Systems work.

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3 American Conference of Government and Industrial Hygienists
3.7 Published work

3.7.1 Peer review work demonstrates the high quality of the work being completed.
4. Points raised during visits to science units

4.1 Biological monitoring

4.1.1 The scientists stated that the decline in HSE funded research has been a challenge. The balance of work has changed because of HSE’s changing organisation and needs. The unit depends on ‘core programme work’ to maintain skills and efficiency through fluctuating workloads.

4.1.2 HSE work has moved away from large research projects – there are no volunteer studies on kinetics, metabolism or ‘safe levels’. HSE planned support work now supports occupational hygiene surveys, and research projects are now more likely to come from Other Government Departments. The driver for studies used to be HSE’s role in setting standards e.g. exposure limits and guidance, which has diminished. However, the need for cost-effective controls has not diminished. The unit could have a role in this and there are new opportunities introduced by the REACH regimes. This would provide new opportunities for the team who would like to see a move back to collection of real exposure data.

4.1.3 The scientists noted that isocyanates – a major HSE initiative over the last five years – have replaced lead at the top of the list of analyses.

4.1.4 The scientists highlighted a current, innovative project – measurement of lead in saliva as comparison to blood lead measurements.

4.1.5 The reviewers commended the good record of peer-reviewed publications. They noted that Biological Monitoring appears to be more successful at publishing peer review papers than other parts of HSL. Scientists said that there had been a push from the HSL Head of Science and that they had more opportunity to publish than some sections because of the nature/scope of their research projects.

4.1.6 The scientists stated that the team has more collaborative engagement now than in the past both within HSL and externally. Team members are active in a range of national and international networks. International collaboration (with government labs e.g. DFG) comes about through a combination of approaches to and from potential collaborators.

4.1.7 The reviewers established that what scientists believe makes this laboratory unique is its interpretation of analysis results. It was noted that the laboratory set the original baseline standard for this work, developing the existing methods and now reviews them. There have been no challenges to the quality of analytical methods.

4.1.8 The reviewers asked whether the team is covering the key issues or is being constrained. Scientists believe the key issues are being covered as far as possible. They are not pushing back the frontiers of science. Their strength is more on the application side: assessing and monitoring exposures, rather than developing new methods.
4.1.9 The scientists expressed concern about the commissioning process which they believe is too short term; 3-yearly commissioning arrangements would help.

4.2 Immunology and Toxicology

4.2.1 In some areas, the balance of funding has shifted in recent years from 100% by HSE to 5% by HSE, reflecting the changing requirements of HSE. Reviewers were concerned about the impact this had on the balance of work in the unit.

4.2.2 In outlining research into allergens in bakery work, scientists expressed concern whether HSE commissions work so that the right science questions are researched, and whether appropriate measures and decisions are taken by HSE following research. This limited level of communication and transparency between customer and scientist can lead to staff frustration, though the impact on quality of outputs was not determined.

4.2.3 The scientists were sometimes unclear how to present the case to HSE for doing further research work. There was more dependence on individuals making things work rather than on using agreed process to progress ideas.

4.2.4 Where scientists conducted desk research, there was recognition that whatever is commissioned by HSE constrains the review. An understanding by HSL of HSE’s regulatory work was needed to help define the research questions.

4.2.5 Where scientists wanted to pursue emerging results from research without HSE’s sponsorship, the reviewers asked if HSL staff explore sources of external funding or create coalitions of interest with industry or other research funders. The initial work for HSE would enable HSL to establish the research questions for further work.

4.2.6 HSL scientists demonstrated that they had experience of collaborating with other organisations or using HSL’s Investment Research Programme to part-fund and complete work.

4.2.7 HSL recognised that recent internal reorganisation and impact on continuity in HSE following the transfer of policy jobs from London to Bootle had significantly disrupted commissioning and completing research.

4.2.8 The scientists had some uncertainty about arrangements for replacing or renewing equipment, especially where these were the responsibility of the PFI owner.

4.3 Clinical statistics, clinical modelling and epidemiology

4.3.1 The scientists demonstrated how models had been computed, sometimes with collaboration from British, overseas national and international
organisations. This included extrapolating human data from animal data, and determining probabilistic models from deterministic models.

4.3.2 The scientists emphasised the need for funding, acquiring and developing data sets from published sources, other organisations and other parts of HSL.

4.3.3 On Chronic Obstructive Pulmonary Disorders (COPD), there is a lack of data on which the unit would develop risk modelling, linked to the fact that HSE had not supported some of the primary epidemiological work that could have produced such data. The reviewers identified where some longitudinal data sets were available to HSL in other organisations, and asked whether reviews of existing COPD literature had helped identify the data needed for modelling.

4.3.4 There was a missed opportunity where working on the internal and external bakers’ data could have been combined with work in the Immunology unit. This would avoid relying wholly on the Dutch data.

4.3.5 The poster sessions demonstrated good work was being delivered, albeit scientists identified some constraints when going back to HSE customers to identify further research questions. This was being mitigated by early planning of requirements and coverage as part of research design.

4.4 Fibres

4.4.1 The reviewers asked how unique is the work being done here. There are plenty of independent laboratories doing similar work, but in terms of the analysis/troubleshooting done for HSE, there is no equivalent in the UK.

4.4.2 The scientists believe that HSE does not always commission the right work, and expressed concern that studies are not always followed through. For example, there was no project to go back into Local Authority enclosures which still had exposures after asbestos removal.

4.4.3 The scientists emphasised the national and international standing of the proficiency testing schemes. The effectiveness of the regulations – for example, in the way in which asbestos removal is done – depends to an important degree on the reliability of results provided by commercial laboratories. Leadership in proficiency testing of 200 asbestos laboratories ensures the validity of measurements which test whether Control of Asbestos Regulations are complied with or not.

4.4.4 The controversial nature of asbestos remains a significant issue for the team. They help answer Parliamentary Questions, Freedom of Information requests, and letters to the HSE Chief Executive. They have established a strong working relationship with HSE on this work.
4.4.5 The reviewers commended the overall high quality of work, and noted particularly the current work on revised model risk banding (exposure/lifetime risk) for WATCH.

4.4.6 There have been no challenges to 943 witness statements.

4.4.7 There are many examples of national and international collaboration including BOHS, NIOSH, PEROSH, UKAS auditing and technical committee, presentations at international conferences, membership of expert review panels, UK and overseas training, and invitations to international asbestos conferences.

4.5 The Centre for Workplace Health

4.5.1 The reviewers welcomed the collaborative and interdisciplinary approach to establishing the Centre and its work.

4.5.2 The scientists understood and demonstrated a number of ways they seek resources for delivering research and sharing knowledge.

4.5.3 There was an interesting contrast in hand-arm vibrations research between the UK and the USA, from which it was suggested that further collaboration (e.g. with ergonomists) was worth exploring to develop knowledge and the evidence base.

4.5.4 The scientists needed to influence decisions where the integrity of long-term research was at risk from annualised planning and funding by customers.

4.5.5 The scientists had limited visibility of the decision making arrangements between HSE and HSL that impact on the life cycle of long term work.

4.5.6 The reviewers were concerned that unless challenged, customers could be unnecessarily influencing or constraining research design. This comment is based specifically on an example where a single HSE customer had a negative view on design which included serology and blood draws.

4.5.7 The scientists had worked hard to articulate the case for continuing research in occupational asthma, where HSE had decided on a different course of action.

4.5.8 Work on COPD demonstrated collaboration with the Mathematical Sciences Unit.

4.5.9 It was unclear to the reviewers why HSL would have been commissioned by HSE to review the COPD literature when others had recently completed extensive reviews.

4.5.10 The reviewers thought that HSL could use educational specialists rather than workplace psychologists to assist with their guidance and training work for external clients e.g. local authorities.
4.6 Microbiology

4.6.1 HSE is the major customer but there is also a high proportion of non-HSE work which promotes the development of team members, which in turn benefits HSE work.

4.6.2 The team is similar to a number of external research teams (e.g. Health Protection Agency Porton Down), with whom it both competes and collaborates. The main difference and selling point is microbiology in the context of the workplace.

4.6.3 The scientists believe that HSE does not always commission the right things. They would always like more work across a broader range. There has been a decline in the range of work from HSE due to changing HSE priorities and the end of HSE / LA partnership research programme in March 2009.

4.6.4 The scientists are concerned that the balance has swung away from laboratory research towards desk based work including literature reviews and working on guidance. The team would like to take on more bench research.

4.6.5 The scientists outlined the team’s collaborative engagement. It has both a national and an international profile. International collaboration is mainly on European standards. It was noted that there are probably fewer opportunities for European collaborative studies than in other parts of HSL.

4.6.6 The scientists demonstrated that high quality work is being delivered on areas such as waste composting, hospital infections (development of safety cabinets rather than air-fed suits), anthrax testing for Royal Mail and Home Office counter terrorism work (including microbiology training delivered on site for National Counter Terrorist Security Office).

4.7 The Centre for Interdisciplinary NanoResearch

4.7.1 The Centre is virtual, using staff from a number of science units and existing facilities deployed around the site. There is no physical centre or specific work team. The emphasis is on networking and collaboration for the Centre to be successful.

4.7.2 The scientists identified issues working with the mass, numbers and surface area of particles including the development of research equipment and monitoring, experimental design, data collection and interpretation of results. However, it wasn’t always clear whether they had key information to hand.

4.7.3 The reviewers noted a lack of a coherent set of theoretic models of the mechanisms of action that underpin the work done, especially the divergent view of generic particle load versus particle specific properties.
4.7.4 The reviewers asked whether the toxicity of nanoparticles was being investigated. This followed a comment that there was a challenge from industry, other regulators and lawyers seeking to portray nanotechnology health and safety as a non-issue. Further work is being developed on biological monitoring.

4.7.5 The reviewers welcomed the originality of thinking identified in the session, such as the use of personal protective equipment with nanoparticles. The reviewers would like to have seen work on effective controls at source, not just by personal protective equipment. There would be an industrial need for these.

4.7.6 Focus groups would help identify areas of future work such as identifying research into cerium oxide in diesel available in parts of the UK but not in the USA.

4.7.7 Despite the good interdisciplinary work in progress, the strategic purpose of the work was unclear. It did not come across in the presentation. The strategic management of this Centre's work may need attention.

4.7.8 The reviewers identified that some decisions needed to be made about HSE’s role for regulating nanotechnology, but scientists did not identify whether they thought it should be high on the list of health problems to address.

4.8 Occupational asthma and HSL's rapid response for occupational health

4.8.1 Prof Blanc contributed the following view on HSL’s response to occupational asthma – a topic where there was some variation in views between the reviewers – from which a point about HSL’s preparedness for health related work for HSE was drawn by the reviewers. This also concludes that there is far to go with occupational asthma research.

4.8.2 In terms of mechanisms, there may be a good sense of this with high-molecular weight allergens (e.g., enzymes) but, in fact, there is a great deal of causation pathway that is poorly understood poorly with low-molecular weight triggers (e.g., isocyanates, epoxies) and even more so with irritant-induced asthma.

4.8.3 In terms of exposure-response, even for enzymes there are a lot of knowledge gaps to be addressed – this is underscored by the work in Clinical Statistics, Clinical Modelling and Epidemiology. As reviewers pointed out, the immunological team’s rich experience is being ignored (for example, in terms of relative allergenicity of various enzymes) and there is a much needed collaboration with epidemiological groups inside and outside the HSE that is also lacking. This in part can be addressed with industrial hygiene, but a key part of control strategies is knowing what to control (for example, whether there are certain enzymes that should be substituted for others)
4.8.4 In terms of descriptive industrial hygiene and epidemiological outcomes [just for asthma, but of course this is generalisable] there is also a lot more that can be done. There are specific issues cited in the review: the shift of isocyanates to new applications (e.g., in health care) and the use of acrylates in nail salons (an aspect of the educational program with local authorities but without any link to a HSE-driven exposure or outcome assessment arm).

4.8.5 Finally, new causes of occupational asthma do emerge all the time, but there is no rapid response component currently at HSE to investigate outbreaks.

4.8.6 The broader implications of the last point above is developing (or re-developing) the capability for HSL-led outbreak investigations related to occupational disease. Recognising HSE’s decision some years ago to set a low priority for health as opposed to safety issues reflects strongly in this review insofar as this policy appears to have impacted science at the HSE globally and, in at least one reviewer’s view, negatively.
5. **Effectiveness of the review process**

5.1 Planning arrangements and communications were effective and well organised for the reviewers.

5.2 The information pack was essential pre-reading. It helped to keep the reviewers’ visits focussed on the presentations, discussions and tours.

5.3 Information packs were well prepared and consistently and helpfully structured. They could include more evidence of contributions to international meetings (e.g. abstracts) and measures of esteem.

5.4 Presentation skills of scientists determined the overall impact and coherence of the discussions with reviewers.

5.5 The test of quality might vary between the science teams.

5.6 Other metrics could be developed as well as measures of peer reviewed publishing. Journals may not publish reports of competent investigations if they are not generalisable.

5.7 HSL could select appropriate measures in future reviews, for example:
   a) Microbiology: quality is in the evidence and guidance to support new regulation
   b) Biological monitoring: in peer reviewed publications
   c) Fibres: in peer reviewed publications and proficiency testing of laboratories

5.8 Input from HSE’s science business partners and HSL’s business managers could help address issues of commissioning and completion of work that arise during the review.

5.9 It would be helpful to understand the distribution of HSL revenue in relation to science support and research. It would also be helpful to state the proportion of income which comes from external funding and to make clear the vulnerability of the research funding to unanticipated major hazards, e.g. Buncefield.

5.10 The reviewers only saw selected work rather than performed a comprehensive audit. HSL were requested to present work that demonstrated the quality that can be achieved (as is common in the UK’s Research Assessment Exercise).
6. Conclusions and recommendations

6.1 Prof Newman-Taylor summarised his concerns along these lines, and all reviewers drew similar conclusions:

6.1.1 The overriding concern which the reviewers came to appreciate during the visit is that HSE is not getting maximal value for money from its investment in high quality staff and facilities at HSL, because of weaknesses in the commissioning processes, lack of transparency and insufficient staff involvement in both commissioning decisions and determining HSL priorities.

6.1.2 The importance of the commissioning process is because of the need for a policy or enforcement question to be translated into a scientifically answerable question. This will require interaction between the commissioners and the research community in HSL. Scientific interaction between HSL and commissioners is also needed to ensure that the question asked is not too focussed and insufficiently broad to draw more general conclusions when a better research question could allow this.

6.1.3 The importance of external peer review of major research proposals will help to assure their quality and avoid unnecessary duplication e.g. a review where this has recently been undertaken by others. Reviewers appreciate that the quality of support science is tested in the courts and has not been found to be wanting.

6.1.4 The reviewers recognise the need to ensure a sufficient revenue stream to HSL, for to break even and remain a going concern. However, a proportion of the research work, apparently undertaken by HSL, needs to be subject to external challenge for funding to act as an incentive to scientists inside HSL to encourage the highest quality of their research. This can be addressed by HSL increasing its involvement in collaborative research with academic groups outside HSL in grant applications and in investigations of outbreaks. This could enhance the quality of the science as well as increasing external income to HSL.

6.1.5 There is a need for the research staff at HSL to be engaged in, and have the opportunity to influence HSE and HSL research priorities. The decision no longer to fund occupational asthma research by HSE would probably have been better received if the research staff involved had felt that their voice had been heard in the discussion and that HSL was supportive of their making funding applications externally, if this was no longer considered a priority for HSE.

6.1.6 It is important that HSL scientists are encouraged to present their work at international scientific meetings and to publish in the peer review literature. This provides assurance for the quality of the research maintains the profile of HSL and its scientists and provides them with an opportunity for discussion and challenge.
6.2 It is recommended that HSE and HSL should address the points raised above in para 6.1 and detailed throughout sections 3 and 4 of this report.

6.3 It is also recommended that HSL should establish how they would undertake health outbreak investigations for HSE or other organisations and demonstrate the contribution HSL can make on these.

6.4 This would enable HSL to develop the research potential for the units reviewed, and address the concern expressed by reviewers at para 4.8.6.

6.5 The reviewers also concluded that:

6.5.1 Excellent work is being delivered for HSE by HSL.

6.5.2 Staff are good, well qualified and using good facilities available in Buxton.

6.5.3 HSL scientists demonstrated real world and applied work, not blue-sky work. These are areas HSE are rightly interested in.

6.5.4 Staff are well respected outside HSL and overseas.

6.5.5 There is good evidence of high profile international work and collaboration by some individuals and teams.
7. Actions agreed following the review

7.1 Following the review, the following actions have been agreed by the Head of HSE’s Corporate Science Unit and HSL’s Head of Research.

7.1.1 HSE will communicate more clearly the roles and responsibilities of science customers, including the preferred working behaviours, to ensure that HSL’s science quality is good and HSE gets value for money from HSL. To do this, HSE science business partners and project officers will give greater support to science customers so that customers understand their roles and responsibilities when commissioning work with HSL colleagues, especially in the initial stages. For example:

   a) customers will clearly explain the context of the work within HSE’s business strategy to HSL scientists,
   b) customers will show they understand how getting the research questions right and how HSL’s proposed methodology will provide the best available evidence for them,
   c) customers will show they understand when to conduct literature reviews for themselves and how to use the results, and
   d) customers will agree how to manage and communicate changes in HSE’s business needs to HSL scientists, including the need for early termination or changes in the scope of the work.

7.1.2 HSL will assist HSE in this, for example:

   a) by ensuring managers transmit and scientists understand the messages from science customers, especially those messages that have consequences for the work, and
   b) where scientists believe the work for HSE can be enhanced by widening the scope of the research question, by developing and applying new methodologies or by increasing the duration of the research periods, then they will seek to identify partners for this additional work on those occasions when HSE has no business need for the additional work.

7.1.3 Greater attention to the need for literature reviews will be given by HSE and HSL when research is being commissioned. While the CSA requires evidence that prospective research areas have been reviewed before projects are finally commissioned, he expects HSE staff to do most of the reviews. HSL will only recommend conducting literature reviews when it is appropriate. A product description for literature reviews will be developed by HSE’s Corporate Science Unit by April 2010

7.1.4 HSL is developing an approach to health investigations, based on share protocols and assistance from NIOSH. This is being developed by HSL in alignment with work on the future of the Employment Medical Advisory Service and the work of the Health Strategy Action Team.

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4 Agreed 3 December 2009 by Andrew Curran and Richard Lewis
7.1.5 New management arrangements in HSL are being implemented in January 2010, which will bear down on the incidence of competitiveness between science units and encourage greater collaboration between teams.

7.1.6 Gareth Evans has been appointed to give strategic leadership to the Centre for Interdisciplinary NanoResearch, and he is developing terms of reference for HSL’s approach to conducting research in nanotechnology.

7.1.7 HSL’s Head of Science has been commissioned to develop additional metrics of scientific work, covering delivery and quality. These will be ready in good time for the next Science Review.

7.1.8 HSE’s science business partners will have greater involvement in the next Science Review (covering fire, explosions and process safety) in October 2010.