

Impact template (REF3a)

Institution: University of Glasgow
Unit of Assessment: Unit 6; Agriculture, Veterinary and Food Science
a. Context

Unit of Assessment 6 (UoA6) has a strongly applied focus, which translates to extensive impact on society. The main non-academic user groups or beneficiaries of research outputs in UoA6 are (1) government policy makers, (2) farming industry development organisations, (3) veterinary pharmaceutical, equipment and feed companies, (4) veterinary practitioners and consultants to livestock owners, owners of livestock and pets, (5) international agricultural and human health development agencies and other non-government organisations. The spectrum of research activity in UoA6 ranges from very applied work funded by industry organisations, such as the comparison of methods for humanely killing poultry (*McKeegan**), to basic science funded by research councils, such as antiviral RNA interference in tick cells (*Schnettler*). There are complementary University and College level strategies to maximise impact where it is appropriate. This is supported by collaboration with the Moredun Research Institute, which has a strong obligation to deliver outcomes to its farming stakeholders, and by internal programmes intended to support impact-generating research. (*Throughout this document, staff returned in REF 2 are in **bold text**.)

b. Approach to impact

The following lists the dominant approaches to impact used by the research groups in UoA6 with some relevant examples. User groups are noted according to the list in a. above.

1. Engagement with government (end users: government policy makers; farming industry development organisations; veterinary pharmaceutical, equipment and feed companies; veterinary practitioners and consultants to livestock owners; owners of livestock and pets) by influencing policy development and service provision.

1.a. Research underpinning policy development: Sustained investment and capacity building in high level quantitative epidemiology has greatly facilitated the engagement with government such that research to influence policy is a strength of UoA6. Examples of this approach include the development of bovine tuberculosis (bTB) testing regimes described in detail in the Kao case study (*Kao, Mellor, Logue* – bovine TB) and the Scottish Government's Centre of Expertise on Animal Disease Outbreaks (EPIC, *Mellor, Kao*). The Kao bTB case study clearly demonstrates the responsiveness of academic staff at Glasgow to complex real-world problems. The EPIC project exemplifies a well-funded project that delivers immediate impact through policy formulation for the Scottish Government. It is a partnership of the University of Glasgow (*Kao, Mellor, Zadoks*), the University of Edinburgh, Biomathematics & Statistics, Scotland (BIOSS), the James Hutton Research Institute, the Moredun Research Institute and Scotland's Rural College. The overarching purpose for EPIC is to provide high quality advice and analysis on the control of animal diseases important to Scotland. In EPIC, University of Glasgow Postdoctoral Research Assistants are physically located part time within the offices of Scottish Government, resulting in real-time interactions between government and the ongoing research programme.

1.b. Service provision: Many of our academic staff serve on expert advisory committees in animal health. *Mellor*, the leader of one University component of the EPIC project, is a member of the Scottish Government Animal Health Surveillance Advisory Panel and has a 0.2 FTE appointment at Health Protection Scotland, where he consults on all aspects of veterinary public health. Academic staff at the University of Glasgow also provide an ongoing consultancy to Animal Health Ireland regarding the development of guidelines for control of bovine respiratory diseases and bovine Johnes disease (*Geraghty*). *Stear* and *Jonsson* in 2012 consulted to the Australian livestock industry to develop a prioritised list of research goals in the area of genetics of disease resistance, influencing the next call for research in this area.

2. Engagement with livestock and pharmaceutical industries: (users: veterinary pharmaceutical, equipment and feed companies; veterinary practitioners and consultants to

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livestock owners; owners of livestock and pets).

2.a. Industry-funded research or research and KE projects: There are many strong examples of industry-funded projects within UoA6, including several **BBSRC Industrial Partnership Awards (IPA)**. University of Glasgow UoA6 is currently home to several BBSRC IPA and training grants (*Palmarini* – Optimising selection criteria of seed strains and production of bluetongue virus vaccines; *Jonsson* – Sub-acute and acute ruminal acidosis (SARA); an interdisciplinary approach to understand and prevent a multifactorial disease; *Hosie* – Using a novel field strain to develop an improved FIV vaccine). The IPA is an effective means of developing longer term and deeper level partnerships. AB Vista, one of the partners in the SARA project has subsequently committed to investing in a research project with the University of Glasgow Polyomics Facility on comparative rumen transcriptomics and metagenomics (*Jonsson*). Aside from BBSRC IPA, there are several large projects such as a BBSRC Industrial CASE studentship supported by Zoetis on feline immunodeficiency virus vaccination (*Hosie*); and the Paraban knowledge exchange project for the control of bovine Johnes disease, funded by the Scottish Funding Council, Quality Meat Scotland, DairyCo and Food Standards Agency (*Mellor*). UoA6 is also home to many small scale projects such as mastitis diagnosis in dairy cattle (*Viora*) and Cryptobeef – a collaborative project with the Moredun Research Institute and funded by Harbro, Alpharma and QMS to develop strategies for the management of cryptosporidiosis (*Jonsson*).

2.b. Provision of consultancy services Conducting clinical trials for vet pharma is an increasingly competitive field and although it is a traditional area of activity of veterinary clinical academics, we recognise that the systems required to deliver in this area are best provided by commercially oriented groups such as Moredun Scientific Ltd. We have therefore agreed a memorandum of understanding with Moredun Scientific whereby we refer to them any requests for studies on clinical pharmaceuticals for livestock. In contrast to clinical pharma, we continue to develop capacity for nutrition and production-related livestock research. At the Cochno Farm Research Centre, we undertake ongoing consultancy services worth over £100,000 per annum, primarily for the evaluation of intraruminal devices for cattle (*Hastie, Jonsson*) and reproductive therapeutics (*Evans, Hastie*); other staff continue to provide consultancies to industry.

- 3. Professional leadership** (users: veterinary practitioners and consultants to livestock owners; owners of livestock and pets). Members of clinical staff associated with researchers throughout UoA6 make a large contribution in this domain. The main approaches to impact here are (1) provision of veterinary continuing professional development courses (*all clinical staff*), (2) development of new clinical procedures and techniques (eg *Love* – real time equine laryngeal functional evaluation; breath ¹³C-ureide for equine colic evaluation), (3) training of veterinary specialists, (4) development of training resources (eg Virtual Abattoir – *Steele, Mellor* in collaboration with Scotbeef; *Hosie* – Matrix Vaccination Guidelines), and (5) holding office in professional organisations (*Logue, Jonsson* – BVA; *Hosie* – European Advisory Board for Cat Diseases (EABCD)). UoA6 contains 24 academic staff who are recognised specialists (diploma holders) in a clinical discipline. There are currently 27 residents undertaking specialist training in veterinary clinical disciplines within the School of Veterinary Medicine, which translates to approximately 10 new specialists per annum. These are the veterinary clinical leaders of the future and they are all involved in veterinary clinical research at the University of Glasgow as part of their training programmes.
- 4. Public engagement (PE)** (users: farming industry development organisations; veterinary pharmaceutical, equipment and feed companies; veterinary practitioners and consultants to livestock owners; owners of livestock and pets). Within UoA6, researchers are encouraged to reach out to the public and are supported by an effective Corporate Communications unit servicing the University. There are several examples of PE, based on one-off research discoveries and arranged as annual events. An indicative example is provided by the Passive Smoking in Pets project (*Knottenbelt*). In this case the researcher identified a high risk to pet health from passive smoking, and initiated a public awareness programme, using national media outlets. Public interest was substantial, with nationally televised interviews on BBC and considerable international interest, as reflected in web-based news outlets. The major,

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organised, public engagement activity in the UoA6 is the annual **Glasgow Science Festival**, where the Boyd-Orr Centre for Population and Ecosystem Health (a recent winner of a Queen's Anniversary Prize for Higher and Further Education) and the Centre for Virus Research (CVR) have driving roles. The CVR runs a public engagement programme to help members of the public to better understand the nature of viruses and how they cause ill-health. The CVR works in close collaboration with the Glasgow Science Centre running annually the "DNA Technology Workshop" and "Meet the experts" sessions. The hands-on workshop on DNA technology introduces secondary school students to molecular biology techniques. During the Glasgow Science Festival the CVR runs "Build a virus" activity for children of all ages. The CVR has also produced a stunning display on the history of virology, which has been shown at the Glasgow Science Centre and in secondary schools. Each year the **Moredun Foundation/Roadshow** runs a series of knowledge exchange seminars around the UK, where topical issues are addressed and results of current research projects are presented to the farming and veterinary community. University of Glasgow researchers from UoA6 are regular presenters at these seminars (**Jonsson, Ellis, Geraghty, Denwood, Eckersall, Mellor**), which influence the strategies for managing livestock health throughout the UK.

5. **Development of new products** (users: veterinary pharmaceutical, equipment and feed companies; veterinary practitioners and consultants to livestock owners; owners of livestock and pets. University of Glasgow UoA6 researchers are active in the discovery of new diagnostic tests and vaccine candidates. **Diagnostic tests** – Acute phase proteins (APPs) are circulating proteins that can be used to monitor the response of animals to infection, inflammation or trauma. Research at the University of Glasgow (**Eckersall**) has resulted in a suite of biochemical tests that can be used to assess APPs in veterinary practice. These diagnostic tests have been commercialised via ReactivLab and are to be offered by IDEXX Laboratories. **Vaccines and therapeutics** – Bluetongue virus vaccines – developed by **Palmarini** and colleagues, with support from BBSRC IPA (£493,000) and Merial Animal Health. This research has resulted in an effective vaccine for which a patent application has been filed.

International development (Users: international agricultural and human health development agencies and other non-government organisations). This approach to impact is increasingly important to Glasgow UoA6 and has been strengthened by recruitment of staff including **Cleaveland**, whose work with rabies prevention in Tanzania forms one of the Impact Case Studies. Activities of researchers are supported by an increasingly robust framework of formal agreements. We have recently signed agreements with Tanzanian National Parks and Tanzanian Wildlife Research Institute. The establishment of the David Livingstone Fund for Global Health and Biodiversity by the University of Glasgow to serve as a channel for philanthropic support to this area will strengthen our engagement in international development while facilitating future research.

c. Strategy and plans

The College is building on the successes of individual cases in UoA6 with the development of an impact strategy and participation in the BBSRC Excellence with Impact competition. The College-level strategy is consistent with and supported by the University-wide Impact and Knowledge Exchange Strategy 2013-2016. The University's commitment to this area is reflected in its outcome agreement with Scottish Funding Council to increasing knowledge exchange activities by 7.5% year on year, creating 2-3 high growth spin-out companies and expanding the Easy Access IP portfolio (discussed below) by 10 each year. The College strategy is based on four key themes: (1) Understanding impact – ensuring that all staff have a shared understanding of impact in its broadest sense, (2) Enabling impact – provision of skills, knowledge and supportive environment for all academics, (3) Identifying impact – capturing plans for impact and enabling the provision of support, as well as dissemination and publicising of work, and (4) Publicising impact – using internal communications and external media to ensure maximum benefit to society.

University-wide initiatives/plans relevant to UoA6 include

1. **Manifesto for public engagement:** Supporting researchers to develop their abilities to engage with the public, media and policy makers – providing training, support and funding for researchers to take the lead in devising their own skills development opportunities, such as

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The-GIST.org (online science blog) and Bright Club Glasgow (a stand-up comedy night for researchers). The College has introduced public engagement internships to allow researchers to develop a show for the Glasgow Science Festival.

2. **First Step Awards:** Offers innovation grants to SMEs and enables companies to work with our academic staff on short-term feasibility studies. The programme, which aims to reduce the risk of first engagement between a SME and the University, promotes longer term relationships leading to KTPs, consultancy, and further research and/or business grant applications. Financial support of up to £5,000 per project is available for small projects. From 2008, 106 First Step Awards have been granted for a total of £490,000. Of these, 22 were in the College (£99,000), of which 6 awards (£25,353) were in UoA6.
3. **Partnership with IP Group:** We were the first Scottish University to set up a venture fund with a Venture Capital Group (the IP Group), which manages a £5M seed fund for our spin-out companies. We are developing a growing pipeline of potential companies to submit to our partners for seed-corn investments. To date, the IP Group has invested over £2m to support the development of 7 University spin-outs, including the ReactivLabs (*Eckersall*) acute phase protein project in UoA6.
4. **Easy Access IP:** In some cases the University may not be best placed to develop the IP to a stage at which a high value spin out or high value licensing opportunity could be obtained. In those cases, the University will share IP with business and organisations who can benefit from it. To support this we devised, implemented and promoted Easy Access IP, now being adopted by all Scottish Universities and taken up elsewhere in the UK and overseas. The University has completed 8 licenses in the last 12 months, 6 of which have been with SMEs, and one of which is in UoA6.

College-specific initiatives/plans relevant to UoA6 include **partnerships with Moredun Research Institute (MRI) and Moredun Scientific** – MRI and the Moredun Foundation have a mandate to support the Scottish Livestock Industries through the development of solutions to the problems of infectious diseases. The University collaborates closely with MRI on an institutional and individual scientist level, with joint appointments between MRI and the University of Glasgow and currently 4 co-supervised PhD programmes.

d. Relationship to case studies
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Each of the Impact Case Studies fits into one of the 6 approaches to impact outlined in b. above. The Nolan and Reid pain index is a clear example of professional leadership, in which a series of studies was conducted in sheep to identify the underlying pathophysiology and pharmacology of pain and the means by which pain can be controlled and managed by clinicians. They went on to develop the Glasgow Composite Pain Measurement Scale, which has been widely used for assessment and treatment of acute pain in domestic animals in surgical and clinical settings. The Kao and Logue risk-based surveillance for bovine TB is an excellent example of engagement with government. Based on exhaustive studies of cattle test results and cattle movements, it resulted in the exemption of 35% of the Scottish cattle herd from routine testing, saving the government £250,000 annually. The Bain McKeegan work on productivity in the poultry industry demonstrates close engagement with industry to improve welfare and performance. The Cleaveland case study on development of international policy on prevention, control and elimination of rabies in East Africa is an international development approach to impact, based on research that demonstrated the efficacy of low-cost strategies to control the disease.