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APPENDIX 1

PANEL MEMBERSHIP

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Professor Kay-Tee Khaw, University of Cambridge

Professor David Kipling, Cardiff University

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APPENDIX 2

BACKGROUND TO AGEING RESEARCH FUNDED BY BBSRC

Introduction

In 1995, the former Office of Science and Technology (OST, later OSI, now DIUS, the Department for Innovation, Universities and Skills) launched the EQUAL initiative - Extending Quality of Life. Its aim was 'to use the combined resources, expertise and capacity for innovation of the science and engineering base to extend the active period of people's lives'.

All the research councils were involved in funding research to address the EQUAL initiative. No funds were specifically ear-marked for the programme, however, and it was left to individual research councils to decide on the appropriate level of funding. In response to this, BBSRC established the Science of Ageing (SAGE) initiative, which was launched in 1997.

BBSRC funding of ageing research

SAGE

SAGE focused on the biological processes of ageing at the level of individual cells, systems and whole populations. Its aim was to understand the fundamental biology of the ageing process, and to develop the UK's research capability in the biology of healthy ageing to complement work already underway into the diseases of old age. 29 grants were funded, with a total value of £5M. Details of the grants funded are given in Appendix 3.

The initiative focused on the following areas:

- Cellular senescence: the mechanism of tissue damage and breakdown
- Biochemistry of stress, repair and accumulation of damage
- Ageing in biological systems, particularly neurosciences and immunology
- The ageing population and evolution: understanding the primary mechanisms of ageing and underlying genetic determinants of life span and reproduction potential.

A dedicated SAGE Panel was established which assessed grant applications and assisted with running the initiative. Two members of the SAGE Panel, David Kipling and Gordon Lithgow, acted as coordinators, who liaised with applicants on the progress of the research and assisted BBSRC with the organisation of annual workshops and other meetings. SAGE grantholders were expected to attend the annual workshops and were required to provide a short progress report for review by the SAGE panel. The workshops were aimed at exploring the development and application of the research and gaining added value by the exchange of ideas and techniques.

ERA

Further funding was announced by BBSRC in 2001, with the launch of the Experimental Research on Ageing (ERA) initiative. The aim of ERA was to understand the basic biology of healthy ageing, focusing on normal ageing at the molecular, cellular, systems and behavioural levels. It was hoped that such information could eventually lead to new treatments that could reduce age-related decline and so increase healthspan and improve quality of life for the elderly. As for SAGE, two ERA panel members and grantholders acted as coordinators: David Kipling and Brian Merry. 19 grants were funded, with a total value of £4.15M. Details of the grants funded are given in Appendix 3. Eight SAGE grantholders also received funding under ERA.

For strategic reasons, and in order to differentiate this initiative from simply being a follow-on fund for SAGE, applications were limited to the following areas:

- Genetics of normal ageing
- Interventions in ageing: including small molecule pharmacological agents, such as free radical scavengers
- Model systems

Low priority was given to applications in areas already well funded under the SAGE initiative, including changes in neural function at the cellular level, and cellular immunology. Coordinated proposals were also invited to improve UK access to aged rodents or other model species that allow the analysis of mutant or transgenic animals.

BBSRC is currently involved in three further initiatives in ageing: New Dynamics of Ageing (NDA), Strategic Promotion of Ageing Research Capacity (SPARC) and Centres in Lifelong Health and Wellbeing.

New Dynamics of Ageing (NDA)

The New Dynamics of Ageing Programme is a seven-year interdisciplinary research programme involving five research councils: BBSRC, EPSRC, MRC, ESRC and AHRC. The programme was launched in 2006 and aims to stimulate research into the changing meanings and experiences of ageing and the key factors, including biological, that shape them. Its central objectives are to:

- explore the ways in which individual ageing is subject to different influences over the life course
- understand the dynamic ways in which meaning, understanding and experience of ageing are currently changing and becoming more diverse
- investigate the diverse ways in which ageing is/has been understood and represented at different times and in different cultures
- encourage and support the development of innovative interdisciplinary research groups and methods
- provide a sound evidence base for policy and practice (including the development of prototype systems, procedures and devices) so that research contributes to well-being and quality of life.

BBSRC has allocated a total of £2M to this programme. The first phase of the programme has funded:

- 2 Collaborative Research Proposals, totalling £3.2M
- 11 Preparatory Network Awards, totalling £275,000
- 12 Programme Grants, totalling approximately £3.5M

None of which were made to SAGE/ERA grantholders. The second phase of the programme is currently in progress with a call for Collaborative Research Proposals launched in September 2007. This will be followed by a call for Programme Grants in April 2008. The second phase of this programme will be more focused on biology.

Strategic Promotion of Ageing Research Capacity (SPARC)

The Strategic Promotion of Ageing Research Capacity (SPARC) programme was launched in January 2005 and is a four-year programme, funded by BBSRC and EPSRC (www.sparc.ac.uk). The intention is to build capacity and bring researchers closer to end-users. SPARC aims to ensure that older people benefit from advances in science and technology, stimulating research by:

- showcasing the latest research findings from design, engineering and biology to all stakeholders in older people's issues and listening to the issues raised by practitioners and by older people about the realities of ageing

- lobbying policy makers about the needs of older people and how these needs can be met and quality of life enhanced
- providing pump-priming funds to newcomers to ageing research.

To date, SPARC has awarded 34 grants totalling £1.3M within two rounds. None of the Principal Investigators funded by SAGE or ERA have received funding via SPARC - they are not eligible as the nature of the initiative is to encourage investigators new to ageing research. However, two Research Assistants (one from each of SAGE and ERA) have received funding from SPARC - in each case this was their first grant as a Principal Investigator.

Centres in Lifelong Health and Wellbeing

As part of joint Research Council Initiative on Ageing (MRC, BBSRC, EPSRC and ESRC), MRC announced a call for outline applications for Centre Grants in 'Lifelong Health and Wellbeing' in May 2007. The call has been designed to invite proposals that will help to strengthen multidisciplinary and collaborative research into 'Lifelong Health and Wellbeing' within the UK. Three key areas were highlighted: The Ageing Brain, Frailty, and Health Related Quality of Life. BBSRC will contribute up to £2M to support applications with research topics that address its current priorities for ageing research. Of the 14 expressions of interest received, 7 have been invited to submit full applications which will be assessed in January 2008. SAGE/ERA grantholders have engaged well with this initiative.

Centre for Integrated Systems Biology of Ageing and Nutrition (CISBAN)

In 2005, BBSRC (in collaboration with EPSRC) invested £6.5M over 5 years to establish the Centre for Integrated Systems Biology of Ageing and Nutrition (CISBAN), based at the University of Newcastle (PI is Professor Tom Kirkwood, a SAGE grantholder). It is engaged in major programmes of experimental, modelling and bioinformatics research, including a 'virtual ageing cell', 'virtual ageing tissues' and eventually a 'virtual ageing organism' to allow the development of predictive ageing research (www.cisban.ac.uk).

Responsive mode funding in ageing research

Since 1997, i.e. at the same time as the SAGE and ERA initiatives were running, 256 responsive mode grants have been funded by BBSRC in ageing, with a total value of £57M. Some of these were grants that had been rejected by the SAGE/ERA Panels as they had not met all the criteria of the initiatives, which were then re-submitted for responsive mode funding.

BBSRC has identified ageing research as a priority area in its 2005-08 Delivery Plan (www.bbsrc.ac.uk/about/pub/policy/delivery.html) and recently announced further funding of up to £2.5M for research into 'Ageing and its Environments' as part of the New Dynamics of Ageing initiative.

BBSRC is also a member of the UK Age Research Forum (UKARF), formerly the Funders Forum for Research on Ageing and Older People (www.ukarf.org.uk). UKARF is a strategic partnership between government, research councils and charities that aims to make a positive difference to the lives of older people through research. It comprises a group of funders of research on ageing, covering the range of disciplines, who have a key interest in the vision of the Forum. This includes funding of high quality research on ageing and older people that is effectively targeted and monitored, inter-disciplinary when appropriate, closely engaged with potential research users, and that ultimately has a beneficial impact on the quality of life of people as they age.

Engaging with the public

BBSRC is aware that it needs to consider public opinion of its ageing research and, in 2006, funded an IPSOS MORI poll on public attitudes to ageing and held a public dissemination meeting for discussion of the findings of the SAGE and ERA initiatives (see details below).

Public consultation

In Spring 2006, an IPSOS MORI public consultation was carried out on ageing, specifically looking into public attitudes towards BBSRC and MRC-funded research. It was commissioned on behalf of RCUK by BBSRC and MRC, and examined the concerns and aspirations of the UK public in relation to ageing research. In particular it looked at:

- identifying the concerns and aspirations of the UK public in relation to ageing research that falls within BBSRC's and MRC's remit
- understanding what the public sees as the main current and future problems for older people
- understanding the public's view of the issues surrounding the feed-through of research outputs to healthcare policy and new treatments, lifestyles, etc
- understanding how the public prioritises ageing research against research in other areas
- identifying the assumptions upon which the public bases their decisions about priorities for scientific research in this area

The results of the study were announced at a stakeholder event in July 2006. The main outcomes, supported by attendees at the stakeholder event, were that the public identified prevention of deleterious age-related conditions as the single most important area for research, and likelihood to contribute to improving quality of life as the most important criterion upon which to base funding decisions. The study also showed a low public awareness of research into ageing and participants expressed a desire for more public engagement and involvement in research funding decision-making. There was strong support for research into ageing to maximise quality of life for older people.

BBSRC and MRC are currently taking forward the results of the study by developing a small travelling exhibition into ageing. The exhibition was launched at a Parliamentary event in Autumn 2007 and will be used as a focus for stakeholder events to discuss the impact of our research and future strategy.

Dissemination meeting

This meeting was held in May 2006, with the aim of showcasing BBSRC support for UK ageing research and to highlight the achievement of projects funded under SAGE and ERA. Leading researchers from the initiatives outlined the scientific highlights of their work and presented posters. In addition to the grantholders, a wider community including representatives from across the public and voluntary sectors were invited to attend to discuss the importance of supporting basic research into the underlying biological mechanisms of ageing.

The meeting featured the following talks:

- Ageing, stress and immunity in the elderly: Janet Lord
- The basis for decreased responsiveness to immune challenge in the elderly *in vivo*: Arne Akbar
- The causes of individual differences in normal cognitive ageing: the Lothian Birth Cohort of 1921: Ian Deary
- Structural and functional changes of muscle-tendon in ageing: implications for locomotion: Gladys Pearson
- Insights into normal human ageing from premature ageing syndromes: Richard Faragher

APPENDIX 3

SAGE grants

PI	Reference	Title	Institution	Value
Akbar AN	SAG10002	The control of immunosenescence in CD8+ T lymphocytes	University College London	£149,791
Collins A R	SAG09965	Do ageing processes in body systems reflect fundamental changes in cellular metabolism and molecular integrity?	Rowett Research Institute	£209,200
Cook SJ	SAG10012	The role of MAP and SAP kinases in oxidant-induced gene expression and cell senescence	Babraham Institute	£148,896
Cox L	SAG10001	Investigation of the molecular basis of replicative senescence: regulation of p21 and its role in imposing a replication block	University of Oxford	£215,288
Deary IJ	SAG09977	Molecular genetic influence on cognitive ageing in healthy old people	University of Edinburgh	£263,547
Duncan G	SAG09971	The role of autocrine factors in the age-related differences in growth rates of human lens cells	University of East Anglia	£113,064
Dunn-Walters D	SAG10045	Molecular aspects of normal human humoral immune senescence	Kings College London	£144,696
Edwards D	SAG09958	Molecular mechanisms involved in the loss of TGFbeta repression of matrix metalloproteinase gene transcription during cellular senescence	University of East Anglia	£169,552
Faragher RGA	SAG09948	Dissecting the mechanisms of human cell senescence	University of Brighton	£157,428
Gems D	SAG09982	Biological determinants of ageing: insulin/IGF signalling, dietary restriction and reproduction in <i>Drosophila melanogaster</i> and <i>Caenorhabditis elegans</i>	University College London	£204,455
Grencis RK	SAG09972	Ageing effects on the immunoregulation of parasite infection	University of Manchester	£233,989
Jackson MJ	SAG09956	Ageing-related muscle dysfunction: A failure of adaptation to oxidative stress?	University of Liverpool	£162,665
Jamieson DJ	SAG09989	Characterisation of prohibitin-protein interactions and their effect on stress responses and yeast ageing	Heriot-Watt University	£57,456
Kill I	SAG09921	A strategy for cloning genes responsible for cellular senescence	Brunel University	£100,762
Kill I	SAG09932	Assessing the role of the senescent fibroblast in aged skin pathology	Brunel University	£161,819
Kill I	SAG09935	Assessing the role of the senescent fibroblast in aged skin pathology	Brunel University	£72,085
Kipling D	SAG09947	Dissecting the mechanisms of human cell senescence	Cardiff University	£149,208
Kirkwood T	SAG10015	Integrative models of cellular ageing	University of Newcastle	£121,331
Lithgow G D	SAG09988	Mechanisms of extended lifespan in <i>C. elegans</i> age mutants	University of Manchester	£168,122
Lord J	SAG09987	The effect of age on neutrophil function and apoptosis: Role of superoxide anion and PKC isoenzymes	University of Birmingham	£154,834
Merry BJ	SAG09938	Mitochondrial respiration kinetics and superoxide generation in calorie restricted rats exhibiting retarded ageing	University of Liverpool	£178,325
Piper PW	SAG09922	Using yeast molecular genetics to determine the importance of base-excision repair to the survival of oxidative stress and ageing	University of Sheffield	£139,808
Saffrey MJ	SAG10013	Diet-related death of neurons in the ageing gut: causes and effects	Open University	£263,466
Smith J	SAG10075	Programmed cell death and senescence in skeletal muscle stem cells	University of Birmingham	£82,645
Speakman J	SAG10032	Tests of the free-radical damage theory of ageing in a mammal	University of Aberdeen	£195,660
Toescu EC	SAG09930	CA2+ homeostasis and metabolic changes in aged neurons	University of Birmingham	£351,152

PI	Reference	Title	Institution	Value
Watson A	SAG09911	Age-related changes in the monoaminergic innervation of the autonomic preganglionic neurones supplying the pelvic viscera	Cardiff University	£158,495
Wilkinson LS	SAG09973	Longitudinal and cross-sectional studies of normal ageing in mice: cognitive, neurochemical and neural analyses	Babraham Institute	£324,808
Yau J	SAG10011	Prohormone activation by the brain enriched cytochrome P450, Cyp7b: relationship with ageing and cognitive function	University of Edinburgh	£152,137

ERA grants

PI	Reference	Title	Institution	Value
Akbar AN	ERA16274	The basis for decreased responsiveness to immune challenge in the elderly in vivo	University College London	£197,656
Anderson R	ERA16311	Variations in the density and spatial properties of the achromatic and SWS-driven retinal ganglion cells with age	University of Ulster	£102,220
Aspinall R	ERA16279	Modification of Il-7 and the reversal of thymic involution in aged mice	Imperial College London	£221,288
Cox L	ERA16310	Development of small molecule inhibitors of WRN: a model system of ageing	University of Oxford	£213,236
Faragher RGA	ERA16270	Linking senescence and tissue degeneration through Werner's syndrome	University of Brighton	£202,828
Ingram CD	ERA16326	Age-related changes in neuroendocrine signalling characterisation, underlying mechanisms and functional rescue	University of Newcastle	£204,758
Jackson MJ	ERA16251	Extracellular reactive oxygen species as propagators of tissue ageing	University of Liverpool	£212,680
Kipling D	ERA16281	The impact of replicative senescence on age-related tissue degeneration: an ovine model	Cardiff University	£205,596
Lord J	ERA16062	Age-related changes in the hypothalamo-pituitary-adrenal axis: Role in immunosenescence and effect of DHEA replacement	University of Birmingham	£242,084
McLellan L	ERA16290	Antioxidant response and resistance to oxidative stress in Drosophila with respect to ageing	University of Dundee	£180,736
Merry BJ	ERA16417	The effect of calorie restriction and lipoic acid supplementation on age-related redox status and transcription factor profile	University of Liverpool	£308,712
Morgan A	ERA16235	Proteomics of yeast ageing	University of Liverpool	£238,312
Narici M	ERA16254	Structural and functional changes of muscle-tendon in ageing: implications for locomotion	Manchester Metropolitan University	£226,612
Partridge L	ERA16222	Cost of reproduction, caloric restriction, oxidative damage and ageing in Drosophila	University College London	£307,352
Santer RM	ERA16241	Androgen, neurotrophin and amino-acid neurotransmitter receptors in pelvic floor motoneurons throughout adult life	Cardiff University	£245,784
Saunders RDC	ERA16289	Antioxidant response and resistance to oxidative stress in Drosophila with respect to ageing	Open University	£215,036
Smith RK	ERA16303	Soft tissue ageing is characterised by a failure of matrix synthesis and the accumulation of fragmented matrix proteins	Royal Veterinary College	£202,728
Viney ME	ERA16140	Ageing in the parasitic nematode <i>Strongyloides ratti</i>	University of Bristol	£176,644
Wilkinson LS	ERA16250	Gene expression profiling of brain and cognitive ageing in mice	Babraham Institute	£234,580

APPENDIX 4

QUESTIONNAIRE RESULTS AND ANALYSIS

Questionnaires were sent to all Principal Investigators (PIs) who received grants under the SAGE and ERA initiatives. This analysis is based on the responses for 21 SAGE grants and 14 ERA grants, a response rate of 72% of 74% respectively. The questionnaires are given in Annex 4 on pages 61-70.

In several cases the findings and comments from the questionnaire survey were similar for both initiatives so, where appropriate, these are combined. In other cases it is more appropriate to present the findings separately. However, even though some results for SAGE and ERA are presented together, the data on outputs and outcomes are not directly comparable. This is for two reasons: firstly, the number of grants funded under ERA was fewer than that for SAGE (19 compared with 29) and, secondly, some of the ERA grants have only just been completed, so there is very little updated information since the final report. One grant has not yet finished and, although a questionnaire was sent to the PI asking for any available data to date, no response was received.

1. Please indicate which funding bodies you had funding from at the time of applying for a SAGE or ERA grant.

Grantholders reported funding from a range of sources prior to applying to SAGE/ERA, with several receiving funding from healthcare charities.

Summary of responses:

SAGE			ERA		
Total number of responses	21		Total number of responses	14	
Source of funding	No.	%	Source of funding	No.	%
BBSRC	5	24	BBSRC	4	29
			BBSRC SAGE initiative	7	50
MRC	2	10	MRC	2	14
EU	1	5	EU	3	21
Wellcome Trust	6	29	Wellcome Trust	4	29
Healthcare charity: Arthritis and Rheumatism Council, Cancer Research Campaign, Leukaemia Research Fund, Peter Samuel Trust, Research into Ageing	5	24	Healthcare charity: Arthritis and Rheumatism Council, Association of International Cancer Research, Dr Hadwen Trust, Human Ageing Trust, Juvenile Diabetes Foundation International, PPP Foundation	4	29
Industry: Glaxo-Wellcome	1	5	Industry: Fujisawa plc	1	7
Other: Royal Society, Lister Institute of Preventive Medicine, MAFF, Wolfson Foundation, UMDS	8	38	Other: Horserace Betting Levy Board, NERC, Wales Office for Research and Development (WORD)	5	36

2. Was this your first grant in ageing research?

For SAGE there were a number of grantholders who were new to the field, with a smaller number for ERA. For one of the SAGE grantholders it was their first grant as a PI.

Summary of responses:

SAGE	ERA
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Number	% of all replies	Number	% of all replies
13	62	4	29

Grantholders who were new to the field were asked to give details of the subject areas that they previously worked in. Some, but not all, respondents provided this information:

SAGE:	ERA:
<ul style="list-style-type: none"> • growth factors, oncogenes, signal transduction • DNA replication control, cell cycle, cancer and tumour suppressors • pathology, immunology, cancer biology • cancer biology • immunity to infection • yeast oxidative stress responses • telomere biology • regulation of apoptosis, mechanisms of chronic inflammation • analysis of stress resistance and stress proteins, using yeast genetics • Ca signalling, intracellular Ca oscillations and control by InsP3 and ryanodine (mainly exocrine cells); role of intracellular Ca stores in neuronal signalling 	<ul style="list-style-type: none"> • molecular mechanisms of exocytosis • tendon biology

The remaining PIs, who were not new to the subject, had been working in ageing for the following amount of time:

	SAGE		ERA	
	Number	% of all replies	Number	% of all replies
< 5 years	3	38	7	70
5-10 years	1	13		
> 10 years	4	50	3	30

3. Did you need to alter the direction of your research to fit into the remit of the initiative?

Several PIs in SAGE were new to the ageing field, but most of them did not need to alter their research to fit into the initiatives, rather they continued their existing studies but with a modified approach.

None of the ERA PIs who replied had to alter the direction of their research substantially, though most made some changes. For some of the SAGE PIs who received further funding via ERA, this was a natural progression and expansion of their SAGE grant.

Summary of responses:

	4 (substantially)	3	2	1 (not at all)
SAGE				
Number	2	3	8	8
% of all replies	10	14	38	38
ERA				
Number		4	6	4
% of all replies		29	43	29

4. Did the fact that this was an initiative encourage you to apply?

A high proportion of PIs felt encouraged to apply because SAGE and ERA were initiatives. As ageing had been identified by BBSRC as a priority area, they felt that it was a good area to move into and one which might provide sustained funding in the future. This was the first time that research into the basic biology of ageing had been funded by the research councils: it had previously been funded mainly by charities. One PI thought the initiative would offer them more opportunities for collaborative research.

Several PIs commented that they had been encouraged by the fact that a specialist panel had been set up to evaluate applications for the ageing initiatives, because in the past they felt that the research committees did not have the necessary expertise in the ageing area. A respondent from a BBSRC-sponsored institute commented that this was the only way that institute scientists were able to apply to BBSRC for grant funding so it was a definite advantage for them at that time. (Note: this has since changed; for some years there was a cap on the amount of responsive mode funding that institutes could apply for but they can now apply on the same terms as universities.)

Summary of responses:

SAGE		ERA	
Number	% of all replies	Number	% of all replies
20	95	12	86

5. Please indicate your current research interests and summarise in up to five keywords

Summary of responses:

SAGE			
	Number	% of all replies	Keywords reported in each category
My current research interests are entirely focused on ageing	6	29	bioenergetics; C. elegans; dietary restriction; genetics; genetics of ageing and longevity; immunology; insulin/IGF-1 signaling; mitochondria; molecular biology of cell ageing; oxidative stress; senescence; systems biology; T cell differentiation; T lymphocytes; telomeres; Werner's syndrome
Ageing research is a significant component of my current research	11	52	autonomic; Ca2+ homeostasis in ageing; chaperone function; cognitive ageing; collagen; excitotoxicity; fibroblasts; frailty; function decline over time; glucocorticoids; growth; hippocampus; immunosenescence; inflammation; intervention; lens; mitochondrial physiology; music biology; neuronal network properties (gamma oscillations); neuronal vulnerability; neurosteroids; normal brain ageing (as opposed to neurodegenerative states); oxidative stress; premature ageing; progeria; senescence; sensory; skin; spinal cord; spontaneous mutations; stress; stress signaling; telomeres; transdifferentiation; vaccination; Werner's syndrome
Ageing research is a minor component of my current research	2	10	angiogenesis; cancer; cell cycle; oxidants; proteases; senescence; signal transduction; stress; tissue repair
My current research projects do not include research on ageing	2	10	GI tract; immunity; infection; parasites; proteomics; stress responses; yeast fermentation

ERA			
	Number	% of all replies	Keywords reported in each category
My current research interests are entirely focused on ageing	4	29	autonomic nervous system; bioenergetics; dietary-restriction; immunology; incontinence; mimetics of DR; mitochondria; oxidative-stress; pelvic floor; senescence; spinal cord; T cell differentiation; T lymphocytes; telomeres; Werner's syndrome
Ageing research is a	8	57	age-related macular degeneration; colour vision; dietary

significant component of my current research			restriction; Drosophila; epithelial cells; extracellular matrix; frailty; genome stability; genomics immunosenescence; inflammation; insulin/IGF signaling; intervention; mitochondrial theory of ageing; model systems of ageing; premature ageing; replicative senescence; retinal function; senescence; spatial summation; stress signaling; stress; T cell development; telomeres; tendinopathy; tendons; thymis; triplet repeats; Werner syndrome; WRN
Ageing research is a minor component of my current research	2	14	exocytosis; genomics; nematode biology; phosphorylation; yeast ageing
My current research projects do not include research on ageing			

Outputs and outcomes

Please provide details of all research outputs arising as a direct result of this grant.

6. **Publications:** publications data were compiled from information in final reports for all grantholders plus additional information for those PIs who returned the questionnaire, so the figures quoted here are likely to be an underestimate.

Summary: publications arising from SAGE and ERA initiatives:

	SAGE	ERA
Number of refereed papers*	126	58
Number of papers per grant	4.3	3.1
Number of journals that papers appeared in	75	34
Other publications (review articles, edited conference papers, book chapters and articles in popular magazines)	32	18

* SAGE: the actual number of publications reported by PIs in their questionnaire responses was 133, 7 of which were reported by more than one PI.

ERA: the actual number reported was 59, with one duplicate.

Distribution of refereed papers by year:

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
SAGE	1	3	29	22	27	14	18	6	6	
ERA					2	9	14	19	10	4

The number of papers published by each PI is given in the Outputs Tables, and the full list of references by PI is given in Annex 2.

7. **Other outputs/outcomes:** grantholders were asked to give details of other outputs arising from the grant.

3Rs: PIs reported that their project had contributed to the 3Rs: the replacement, reduction or refinement of animals in experiments, as follows:

SAGE: 7 PIs (33%)	ERA: 5 PIs (36%)
<ul style="list-style-type: none"> Work performed exclusively on human T cell lymphocytes Use of human donor tissue only Use of invertebrates throughout Development of a 3-D skin model Use of neutrophils from elderly hip-fracture 	<ul style="list-style-type: none"> Work performed exclusively on human T cell lymphocytes Development of RNAi reagents suitable for WRN knockdown in human cell cultures in vitro, avoiding use of transgenic mice New animal model removes need for dietary

<p>patients for studying trauma as a possible replacement for animal studies</p> <ul style="list-style-type: none"> • Development of model of neuronal 'ageing in the dish' using long-term primary cultures of neurones • Use of skin from aged rats from another researcher in the initiative. 	<p>restricted feeding to obtain the extended survival trajectory characteristic of this feeding regime; should allow a more targeted approach to increasing animal survival and delaying age-related pathology</p> <ul style="list-style-type: none"> • Minimum number of animals used to ensure statistical significance for every experiment • Development of device to load tendon explants which can be used to identify tendon degeneration mechanisms without the need to exercise experimental animals and enables concepts of tendon ageing to be established and tested in vitro before applying to in vivo animal models.
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Public engagement: PIs participated in a number of activities to enhance public engagement with the biosciences, which included:

SAGE: 17 PIs (81%)	ERA: 8 PIs (57%)
<ul style="list-style-type: none"> • Media interactions, with TV, radio and print media • Interviews for TV programmes on ageing • Public talks: Reith Lectures, Royal Institution, Women's groups, rotary clubs, charities, etc • Open days for the public, organisation of schools days; hosting of school teacher scholarships • Exhibitions and talks at the British Association annual festivals • Attendance at media training on science presentation • Weekly visits by members of the public • Features in BBSRC Business magazine and BBSRC Annual Report • Participation in Brain Awareness Week activities • Attendance at 'Science-Art interface' conference in Romania 	<ul style="list-style-type: none"> • Presentations on visual ageing to school children during National Science Week 2006 • Public talks: Women's Institute, Royal Institution, Help the Aged • Departmental open days for the public • Presentation at 2006 European Science Open Forum, plus resulting media coverage • Interviews on SAGA radio • Contribution to development of public display on ageing at Newcastle Centre for Life • Participation in Showcasing Science schools conference, 2007 • Lay presentations to horse owners at Royal Veterinary College

New technologies: PIs reported the development of new techniques and technologies:

SAGE: 7 PIs (33%)	ERA: 6 PIs (43%)
<ul style="list-style-type: none"> • Fluorescence in situ hybridization for the study of telomere length in intact cells • Development of conditional protein kinases for activation of stress kinases without cellular stress • TaqMan expression profiling of Degradome genes • Novel vectors carrying telomerase and CDK4 • Diamond-like carbon coating of collagen substrates • New technology to immortalize WS cells • Application of top-down regulation analysis to the study of dietary restriction and ageing to understand how they modify mitochondrial function. 	<ul style="list-style-type: none"> • Induction of suction blisters over immune responses in the skin in humans to sample immune cells at the site of a reaction • Development of new methods to measure retinal small bistratified ganglion cell density in vivo in elderly subjects. • New method to prevent cell senescence in WS cells using small molecule inhibitors • Designed and made various DHEA analogues to study DHEA mode of action (in collaboration with a chemist at Edinburgh University) • New mammalian model of extended survival. An ability to 'lock' a dietary induced survival trajectory. • Tendon explant loading apparatus

Other outputs/outcomes: several PIs reported additional outcomes, including:

SAGE:	ERA:
<ul style="list-style-type: none"> • Presenting evidence to House of Lords Inquiry on the Science of Ageing • Membership of Panel for the Foresight Older 	<ul style="list-style-type: none"> • Presenting evidence to House of Lords Inquiry on the Science of Ageing • Presentations at BBSRC Ageing Dissemination

<ul style="list-style-type: none"> • People Task Force • Presentation at Government Policy Programme Seminar for ministers and civil servants • Membership of British Society for Research on Ageing; election to Executive Committee • Organisation of session on ageing at Biochemical Society conference • Organisation of Liverpool 2000 Society for Free Radical Research conference: a four-day conference for European and US workers on free radicals and ageing research • Organisation of Special Study Module for 2nd year Medics on 'Normal Brain Ageing' (the only age-oriented SSC activity in UK Medical Schools) • Participation in Gerontology/Geriatrics Curriculum Development group, through the British Council on Ageing • Adviser to the Wellcome Trust on ageing research 	<ul style="list-style-type: none"> • meeting • Invitation to become Director of SPARC • Presentation at SPARC Workshop • Elected as Chair of British Society for Research on Ageing; established British Council for Ageing • Invited to become Observer on Funders' Forum • Attendance at international workshops organised by Unilever • Elected to Co-Chair Gordon Conference in 2009 • Chair of Research into Ageing grants panel • Member of NDA commissioning panel
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8. **Staff:** please provide details of all staff employed on the grant:

The total number of staff employed in the two initiatives is given below, and the number of staff employed on each grant given in the Outputs Tables.

	SAGE	ERA
Number of staff employed	29	25
Number of RAs	22	19
Number of technicians	7	6

On completion of their employment on the grant, their first destinations were as follows:

Destination	SAGE		ERA	
	Number	%	Number	%
Remained in same group	5	17	2	8
Academic	9	31	9	36
Industry	4	14	4	16
Further training	2	7	5	20
Not employed	1	3	2	8
Retired	1	3		
Self employed			1	4
Overseas	6	21	2	8
Not known	1	3		

Two of the RAs on grants went on to receive funding via SPARC; for both this was their first grant as a PI (one from SAGE and one from ERA).

9. **Training:** did any other training in ageing research arise from your grant, e.g. studentship projects supervised by yourself or your collaborators?

A small number of studentships had arisen from the grants, which were funded from a variety of sources (see Outputs Tables).

Networking and collaboration

10. Workshops: did you or a member of your group attend any of the workshops associated with the initiative?

All PIs attended at least one workshop, with most attending all that were organised during the period of their grant. In most cases they were accompanied by the RA employed on the grant.

11. If you attended any workshops, how useful were they?

The workshops were very successful. They created a community feeling between the researchers (who were from quite diverse disciplines), and facilitated discussion and the exchange of expertise and ideas. Those who were new to the ageing field found them particularly useful, as they found that the more established researchers were very helpful and willing to engage with them.

Attendance at the workshops led to several important contacts, resulting in formal research collaborations, some of which were funded within the ERA initiative.

Summary of responses:

	4 (very useful)	3	2	1 (not at all useful)
SAGE				
Number*	17	3		
% of all replies	85	15		
ERA				
Number	10	3	1	
% of all replies	71	21	7	

*one respondent did not reply to this question

12. Do you have any suggestions for how the workshops could have been improved?

Most PIs felt that the SAGE and ERA workshops had been well organised. They were mostly happy with the arrangements and commented that the structure of the sessions was better at the later workshops, having improved with experience. One PI commented that more exchange of research tools (cells, biological samples, etc) could have facilitated further interactions.

Another PI suggested that it would be worth organising a 'Clinic' or 'Question/Answers' session(s) on topics to be proposed by the participants. Participants would be asked to propose the titles in advance of the meeting and then a few topics could be selected and the relevant speakers invited. The PI also suggested a deeper involvement of the Industry, with presentations of either the science or overviews of strategic directions in the field of ageing, as seen from their standpoint.

13. Did you find the advice/feedback received at the workshops helpful in your research?

Most PIs who responded to this question felt that the feedback was helpful, although one PI commented that it would have been helpful if the written assessments had been more detailed.

Others commented that the most helpful aspect was being able to interact with researchers from a wide range of disciplines, and discuss methodological and other problems with established researchers in the field.

Summary of responses:

	4 (very helpful)	3	2	1 (not at all helpful)
SAGE				
Number	8	10	3	
% of all replies	38	48	14	
ERA				
Number	7	5	1	1
% of all replies	50	36	7	7

14. **Contacts and collaborations:** please give details of any new or improved contacts or collaborations, and comment on the impact that they had on the progress of your research.

SAGE: all except 2 respondents (19: 90%) reported new or improved contacts or collaborations as a result of participating in the initiative. Most of the new contacts were with academics, both in the UK and overseas, many of which led to new research collaborations resulting in joint publications and further funding. A large number of these collaborations are still continuing: for example, a large multi-laboratory initiative funded by the Wellcome Trust, and an EU FP6 project involving 35 European research labs being coordinated by one of the SAGE grantholders. Some collaborations between SAGE grantholders resulted in joint funding under the ERA initiative. One respondent reported improved interactions with clinical colleagues at their own institution.

International collaborations were established with the world's leading DNA repair laboratory in Norway, and with the University of Lleida in Spain.

ERA: 12 of the 14 respondents (86%) reported new contacts and collaborations, mostly with academics in the UK and overseas. Some of these were with SAGE/ERA grantholders. Several of the new contacts led to full research collaborations resulting in joint funding from BBSRC and other sources.

Overseas contacts were made with the Bulgarian Academy of Sciences and with Japanese scientists (funded by BBSRC via a Japan Partnering Award). Industrial contacts were with Geron, Unilever and Destiny Pharma. Some contacts led to sharing of tissue samples between grantholders.

Summary: number of contacts and collaborations:

		SAGE		ERA	
		No.	%	No.	%
New or improved academic contacts	UK	15	71	10	71
	Overseas	10	48	6	43
New or improved industrial contacts	UK	5	24	2	14
	Overseas	3	14	2	14
New formal academic research collaboration (e.g. joint publication, joint funding application)	UK	5	24	7	50
	Overseas	4	19	3	21
New formal industrial research collaboration (e.g. joint publication, joint funding application)	UK	6	29	3	21
	Overseas	1	5	2	14

Funding

15. Please give details of any further funding that you have received to continue or develop the work funded by the SAGE/ERA grant.

The following number of SAGE and ERA grantholders reported that they have received funding to continue or develop their research:

SAGE		ERA	
Number	% of all replies	Number	% of all replies
18	86	11	79

The number of PIs receiving funding from each source is summarised below, with details of funding source and value (if supplied) for each grantholder in the Outputs Tables.

SAGE	No.
BBSRC	6
BBSRC studentship	3
BBSRC ERA initiative: Experimental Research on Ageing	7
SPARC: Strategic Promotion of Ageing Research Capacity	2
MRC	1
EU	3
Wellcome Trust	3
Healthcare charity: Research into Ageing, Humane Research Trust, Action Research, Dr Hadwen Trust, PPP Foundation, Alzheimer's Research Trust, Juvenile Diabetes Foundation International	7
Industry: Unilever	1
Other: US National Institutes of Health, US National Science Foundation	2

ERA	No.
BBSRC	6
BBSRC/CASE studentship	2
Other studentship: Department of Education & Learning NI, Research into Ageing, Wellcome Trust	3
SPARC: Strategic Promotion of Ageing Research Capacity	2
Wellcome Trust	2
Healthcare charity: Research into Ageing	2
Industry	1

Seven SAGE grantholders reported further funding via the ERA initiative (one as a co-investigator). Some PIs commented that they had applied for funding to BBSRC but had been unsuccessful.

Also, two Research Assistants in SAGE and ERA were successful in gaining funding from SPARC for their first awards as PIs.

16. If you have not yet applied for further funding, are you planning to do so?

SAGE: one of the 3 grantholders who have not received further funding yet had applied to BBSRC for funding but had not been successful. The other 2 PIs do not intend to apply for further funding.

ERA: all 3 of the PIs who have not yet received further funding are intending to apply in future.

Aims and objectives

17. Was your project successful in meeting its original objectives?

In the view of grantholders, over 80% of SAGE projects were successful and met their original objectives; just under 80% of ERA projects were successful.

Summary of responses:

	4 (very successful)	3	2	1 (not successful)
SAGE				
Number	13	4	4	
% of all replies	62	19	19	
ERA				
Number	4	7	3	
% of all replies	29	50	21	

The PIs who selected option 2 above gave the following reasons:

	SAGE	ERA
Staff, e.g. difficulties in recruiting and retaining staff	1	
Experimental/methodological/technical reasons	1	1
Lack of resources, e.g. funding, equipment, facilities		1
Insufficient time to complete experiments	2	1

One PI reported significant technical problems which affected the progress of the project and they did not have enough time to complete it.

Another reported that they had problems getting support from the micro-array facility in Cambridge, and eventually had to use another facility in Glasgow, from which they managed to get good support. They also reported technical problems which slowed down the progress of the project.

For both initiatives, even some of those PIs who reported that their grant was successful had encountered problems with recruiting and retaining suitably qualified staff, which resulted in progress on the grant being slower than anticipated.

18. Did the grant support your wider research aims?

All respondents confirmed that participation in the SAGE and ERA grants had supported their wider research aims.

Both initiatives had a positive impact on the careers of PIs. In particular, 2 SAGE PIs said that it had a major effect on their careers - for one it was their first grant as a PI, the other had become a permanent member of academic staff as a result of the SAGE grant. Also,

two RAs working on SAGE and ERA projects progressed to becoming a PI under the SPARC initiative.

Summary of responses:

	SAGE		ERA	
	No. of PIs	% of those who replied	No. of PIs	% of those who replied
Enabled extension of your research into new areas	20	95	11	79
Provided funding for activities that other bodies would not fund	13	62	7	50
Strengthened the skill base of the group, e.g. techniques, cross-disciplinary skills	14	67	14	100
Helped to publicise the importance of your field of research	11	52	9	64
Strengthened the standing of your research group in the field	16	76	13	93
Contributed to maintenance/development/purchase of equipment/facilities	7	33	4	29
Contributed to the development of tools, technologies, or reagents	12	57	8	57
Enhanced the progress of your career	18	86	7	50
Other (broadened research interests)	1	5	1	7

For Questions 19 to 24, the PI responses are summarised here, but are given in full in Annex 3.

19. To what extent do you think your project contributed towards:

- (a) an increased understanding of ageing, and
- (b) improved quality of life for the ageing population

While most PIs in both SAGE and ERA agreed that their projects had contributed towards an understanding of the basic biology of ageing, they felt that it will be some time before this can provide options for improving the quality of life for elderly people. This was seen to be a much longer term outcome from very basic research.

Summary of responses (combined responses for both SAGE and ERA):

	4 (considerably)	3	2	1 (not at all)
(a) an increased understanding of ageing				
Total number	18	10	6	1
% of all replies	51	29	17	3
(b) improved quality of life for the ageing population				
Total number*	5	4	8	17
% of all replies	15	12	24	50

*one ERA respondent did not reply to this question

20. The original aim of the SAGE initiative was “to understand the fundamental biology of the ageing process”. Do you think the initiative was successful in meeting this aim?

SAGE: the majority of SAGE PIs (18: 86%) agreed that the initiative had been successful in meeting its original aim. The general view was that it had moved knowledge on considerably and had contributed to the development of a research base in ageing in the UK.

Summary of responses:

	4 (very successful)	3	2	1 (not successful)
SAGE				
Number	13	5	3	
% of all replies	62	24	14	

The original aim of the ERA initiative was “to understand the basic biology of healthy ageing”. Do you think the initiative was successful in meeting this aim?

ERA: 13 ERA PIs responded to this question, all of whom agreed that the original aim had been met. There had been significant advances on previous knowledge and the UK research base in ageing had been strengthened further as a natural progression to the work covered by SAGE. One respondent commented that the ERA initiative had revolutionised ageing research in the UK, allowing a critical mass of biological research to be developed in this area.

Summary of responses:

	4 (very successful)	3	2	1 (not successful)
ERA				
Number	9	4		
% of all replies	69	31		

Other

21. Was there any added value to you in being part of an initiative, or do you think you would have made similar progress in your research by receiving a grant via normal responsive mode?

Most SAGE and ERA respondents commented on this question, most of whom agreed that there was added value to them in being part of the SAGE and ERA initiatives.

SAGE: 18 respondents commented on this question, all of whom agreed that there was added value. The workshops were cited as the main reason for this, as they led to the development of a community feeling among researchers, which would not exist under responsive mode funding. The workshops gave PIs the opportunity to meet other researchers in the ageing field and were particularly useful for researchers who were new to the field.

Also, some researchers commented that it had been very difficult to get funding in the ageing field at that time, so they welcomed the initiative. The charities had very small research budgets and there was no funding available from the Government or research councils.

The SAGE initiative had a major impact on the careers of two of the grantholders. One commented that they might have left science altogether had it not been for the initiative, as

they were having problems getting funding for their research; another said they would not even have thought of doing the study without the prompt of the initiative.

ERA: of the 12 respondents to this question, 10 (83%) agreed that there was added value for them. However, the other 2 felt that it was minimal and that they would have made the same progress via a normal responsive mode grant.

Reasons given for added value were the advantages of an informed panel for evaluating research proposals, the improved level of networking between research groups, and becoming part of a community. One respondent commented that there had previously been a lack of funding strategy in ageing research, so the initiative was well received by the research community.

22. Do you have any comments on the management of the SAGE initiative by BBSRC?

Several PIs made comments on the management of the initiative (SAGE: 62%; ERA: 64%) most of whom felt it had been managed well by BBSRC.

SAGE: one PI made two specific comments on the SAGE initiative. One said that there had been inadequate discussion of changes in grant direction, with little written permission received from BBSRC, and that more feedback from the mentors would have been useful, possibly even including site visits during the grant. Another respondent commented that the management had been light-touch, however, which had suited them well.

ERA: PIs said that the management of ERA had been excellent; BBSRC had been helpful at all times, responding quickly to their queries.

23. Did you receive sufficient support from BBSRC during the progress of your grant?

SAGE: 17 PIs (81%) commented on this question and, of those, all except two thought they had received sufficient support from BBSRC. Of the 2 who did not agree, one reiterated the comments they made in question 22 above, regarding the lack of discussion of changes in direction of the research. The other one said that there was a lack of infrastructure support for ageing animal colonies and that, for financial reasons, they had to terminate their aged rat colony, which had been a significant resource for 20 years.

ERA: 12 PIs (86%) commented on this, all of whom said that they had received sufficient support.

24. Please feel free to express your views on any other aspects of the SAGE initiative.

Respondents felt that the SAGE and ERA initiatives were very successful. They provided much needed funding for ageing research, brought new researchers into the field, made good progress in understanding the basic biology behind ageing, and improved the UK's standing in this area of science.

However, several respondents commented on the difficulties of getting further funding for their research after the initiatives had finished: quite a few had applied to BBSRC for responsive mode funding but had been told that their research did not fit within the remit. They feel, therefore, that continued funding of this area via initiatives might be the most appropriate mode of funding.

Annex 1: Outputs Tables

SAGE

PI Name	Grant No	Returned questionnaire	Refereed publications	Contribution to 3Rs	Public engagement	New techniques/ technologies	Trained staff	Studentships	Further funding
Akbar	SAG10002	✓	6	✓		✓	1		BBSRC: £258k, £442k; ERA: £197k; Research into Ageing: £479k
Collins	SAG09965		1						
Cook	SAG10012	✓	4		✓	✓	1	1	BBSRC: £211k
Cox	SAG10001	✓	2		✓		3		ERA: £213k
Deary	SAG09977		5						
Duncan*	SAG09971	✓	5	✓	✓		1		BBSRC CASE studentship: £42k; Humane Research Trust: £121k; SPARC: £50k
Dunn-Walters	SAG10045	✓	7				1		Charity: £45k
Edwards	SAG09958	✓	5		✓	✓	1	1	Action Research: £50k
Faragher	SAG09948	✓	7		✓	✓	1		BBSRC: £249k, £230k; ERA: £202k; SPARC: £1.2M; EU Imagine Network: £15k; JDFI**: £130k
Gems	SAG09982	✓	4	✓	✓		3		EU AgeGen (FPV): £144k; Wellcome Trust: £1M
Grencis	SAG09972	✓	1				1		
Jackson	SAG09956		2						
Jamieson	SAG09989	✓	1		✓		1		
Kill	SAG09921	✓			✓	✓	1		
Kill	SAG09932	✓		✓	✓	✓	3		BBSRC studentship
	SAG09935								
Kipling	SAG09947	✓	12		✓	✓	1		BBSRC: £420k; ERA: £205k
Kirkwood	SAG10015	✓	9		✓		2		BBSRC/BEP: £422k; BBSRC/CISBAN: £6.4M; EU/LINK-AGE: €1.1M, €10M; Wellcome Trust: £1.7M; Industry: £21k, £229k
Lithgow	SAG09988	✓	12		✓		1	4	NIH: \$5M; Foundation: \$4M
Lord	SAG09987	✓	4	✓	✓		1		ERA: £242k; Dr Hadwen Trust studentship; PPP Foundation: £115k; BBSRC ISIS: £11k
Merry	SAG09938	✓	7		✓	✓	2		BBSRC CASE studentship: £33k; ERA: £308k
Piper	SAG09922	✓	4		✓		1	1	BBSRC: £201k, £170k
Saffrey	SAG10013		1						
Smith	SAG10075		2						

PI Name	Grant No	Returned questionnaire	Refereed publications	Contribution to 3Rs	Public engagement	New techniques/ technologies	Trained staff	Studentships	Further funding
Speakman	SAG10032		7						
Toescu	SAG09930	✓	15	✓	✓		1	2	MRC: £161k
Watson	SAG09911	✓	5				1	3	ERA: £246k
Wilkinson	SAG09973		3						
Yau	SAG10011	✓	2	✓	✓		1		Wellcome Trust: £105k; Alzheimer's Research Trust: £184k

* Professor Duncan died in 2007, reply received from Dr Michael Wormstone, the RA on the grant.

** Juvenile Diabetes Foundation International

ERA

PI Name	Grant No	Returned questionnaire	Refereed publications	Contribution to 3Rs	Public engagement	New techniques/ technologies	Trained staff	Studentships	Further funding
Akbar	ERA16274	✓	9	✓		✓	1	1	BBSRC: £258k, £443k
Anderson	ERA16311	✓	6		✓	✓	1	2	DELNI studentship, £40k
Aspinall	ERA16279	✓	2				1		
Cox	ERA16310	✓	1	✓	✓		1		BBSRC, £429k, £135k, RIA studentship
Faragher	ERA16270	✓	3	✓	✓		1		BBSRC JPA, £50k; SPARC, £1.2M,
Ingram	ERA16326								
Jackson	ERA16251		2						
Kipling	ERA16281	✓	8		✓	✓	1	1	BBSRC, £421k, SPARC*
Lord	ERA16062	✓	4		✓	✓	3	2	Industry, £200k
McLellan	ERA16290		1						
Merry	ERA16417	✓		✓	✓	✓	3	1	BBSRC CASE studentship, £33k
Morgan	ERA16235	✓	2				2		Wellcome Trust Prize studentship, £126k
Narici	ERA16254								
Partridge	ERA16222	✓	13		✓		3		BBSRC, Wellcome Trust
Santer	ERA16241	✓	4	✓			1		
Saunders	ERA16289	✓	1				3	1	BBSRC, £27k; BBSRC studentship; RIA studentship
Smith	ERA16303	✓	1	✓	✓	✓	3	1	
Viney	ERA16140	✓	2		✓		1		RIA, £50k
Wilkinson	ERA16250								

*Strategic Promotion of Ageing Research Capacity.

Annex 2: publications in refereed journals

Compiled from information in final report forms for all projects, plus additional updated information for those PIs who returned the questionnaire.

SAGE:

Akbar - SAG10002

Borthwick, N.J., Lowdell, M., Salmon, M. & Akbar, A.N. (2000) Loss of CD28 expression on CD8+ T cells is induced by IL-2 receptor α -chain signalling cytokines and type-I IFN and increases susceptibility to activation-induced apoptosis. *International Immunology*, 12, 1005-1013.

Plunkett, F.J., Soares, M.V.D., Annels, N., Hislop, A., Ivory, K., Lowdell, M., Salmon, M., Rickinson, A. & Akbar, A.N. (2001) The flow cytometric analysis of telomere length in antigen-specific CD8+ T cells during acute Epstein Barr Virus infection. *Blood*, 97, 700-707.

Faint, J.M., Annels, N.E., Curnow, S.J., Shields, P., Pilling, D., Hislop, A.D., Wu, L., Akbar, A.N., Buckley, C.D., Moss, P.A.H., Adams, D.H., Rickinson, A.B. & Salmon, M. (2001) Memory T cells constitute a subset of the human CD8+CD45RA+ pool with distinct phenotypic and migratory characteristics. *Journal of Immunology*, 167, 212-224.

Taams, L.S., Vukmanovic-Stejic, M., Smith, J., Fletcher, J., Plunkett, J., Dunne, P.J., Rustin, M., Bijlsma, J., Salmon, M. and Akbar, A.N. (2002). Antigen-specific suppression by human CD4+CD25+ T cells. *European Journal of Immunology*, 32, 1621-1630.

Dunne, P.J., Faint, J.M., Gudgeon, N.H., Fletcher, J.M., Plunkett, F.J., Soares, M.V.D., Hislop, A.D., Annels, N.E., Rickinson, A.B., Salmon, M. and Akbar, A.N. (2002). Epstein-Barr Virus-specific CD8+ T cells that re-express CD45RA are apoptosis-resistant memory cells that retain replicative potential. *Blood*, 100, 933-940.

Soares, M.V.D., Plunkett, F.J., Verbeke, C.S., Cook, J.E., Faint, J.M., Belaramani, L.L., Fletcher, J.M., Hammerschmitt, N., Rustin, M., Bergler, W., Beverley, P.C.L., Salmon, M. and Akbar, A.N. (2004). Integration of apoptosis and telomere erosion in virus-specific CD8+ T cells from blood and tonsils during primary infection. *Blood*, 103, 162-167.

Collins - SAG09965

Duthie, S.J., Whalley, L.J., Collins, A.R., Leaper, S., Berger, K. & Deary, I.J. (2002) Homocysteine, B vitamin status, and cognitive function in the elderly. *American Journal of Clinical Research*, 75, 908-913.

Cook - SAG10012

Garner, A.P., Weston, C.R., Todd, D.E., Balmanno, K. & Cook, S.J. (2002) Δ MEKK3:ER* activation induces a p38 alpha/beta 2-dependent cell cycle arrest at the G2 checkpoint. *Oncogene*, 21, 8089-8104.

Molton, S.A., Todd, D.E. & Cook, S.J. (2003) Selective activation of the c-Jun N-terminal kinase (JNK) pathway fails to elicit Bax activation or apoptosis unless the phosphoinositide 3'-kinase (PI3K) pathway is inhibited. *Oncogene*, 22, 4690-4701.

Todd, D.E., Densham, R.M., Molton, S.A., Balmanno, K., Newson, C., Weston, C.R., Garner, A.P., Scott, L. & Cook, S.J. (2004) ERK1/2 and p38 cooperate to induce a p21CIP1-dependent G1 cell cycle arrest. *Oncogene*, 23, 3284-3295.

Molton, S.A., Weston, C., Balmanno, K., Newson, C., Todd, D.E., Garner, A.P. & Cook, S.J. (2005) The conditional kinase DeltaMEKK1:ER* selectively activates the JNK pathway and protects against serum withdrawal-induced cell death. *Cell Signal*, 17, 1412-1422.

Cox - SAG10001

Rodriguez-Lopez, A.M., Jackson, D.A., Iborra, F. & Cox, L.S. (2002) Asymmetry of DNA replication fork progression in Werner's Syndrome. *Ageing Cell*, 1, 30-39.

Rodriguez-Lopez, A.M., Jackson, D.A., Nehlin, J.O., Iborra, F., Warren, A.V. & Cox, L.S. (2003) Characterisation of the interaction between WRN, the helicase/exonuclease defective in progeroid Werner's syndrome, and an essential replication factor, PCNA. *Mechanisms of Ageing and Development*, 124, 167-174.

Deary - SAG09977

Whalley, L.J., Starr, J.M., Athawes, R., Hunter, D., Pattie, A. & Deary, I.J. (2000) Childhood mental ability and dementia. *Neurology*, 55, 1455-1459.

Leaper, S.A., Murray, A.D., Lemmon, H.A., Staff, R.T., Deary, I.J., Crawford, J.R. & Whalley, L.J. (2001)

Neuropsychological correlates of brain white matter lesions detected on MRI in the ABC1921 cohort. *Radiology*, 221, 51-55.

Shenkin, S.D., Starr, J.M., Pattie, A., Rush, M.A., Whalley, L.J. & Deary, I.J. (2001) Birth weight and cognitive function at age 11 years: the Scottish Mental Survey 1931. *Archives of Disease in Childhood*, 85, 389-397.

Deary, I.J., Whalley, L.J., St Clair, D., Breen, G., Leaper, S., Lemmon, H., Hayward, C. & Starr, J.M. (2003) The influence of the ϵ 4 allele of the apolipoprotein E gene on childhood IQ, non-verbal reasoning in old age, and lifetime cognitive change. *Intelligence*, 31, 85-92.

Deary, I.J., Whiteman, M.C., Starr, J.M. & Whalley, L.J. (2004) The impact of childhood intelligence in later life: following up the Scottish Mental Surveys of 1932 and 1947. *Journal of Personality and Social Psychology*, 86, 130-147.

Duncan/Wormstone - SAG09971

Davidson, M.G., Wormstone, I.M., Morgan, D., Malakof, R., Allen, J. & McGahan, M.C. (2000) Ex vivo canine capsular sac explants. *Graefes Archive for Clinical and Experimental Ophthalmology*, 238, 708-714.

Tamiya, S., Wormstone, I.M., Gavrilovic, J., Marcantonio, J.M. & Duncan, G. (2000) Induction of matrix metalloproteinase 2 and 9 expression following stress to the lens. *Experimental Eye Research*, 71, 591-597.

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Annex 3 - full responses to questions 19-24

**Question 19: To what extent do you think your project contributed towards:
(a) an increased understanding of ageing, and
(b) improved quality of life for the ageing population**

SAGE:

- Considering where the research is now and how this research has eventually underpinned our current aims of developing therapeutic interventions in human premature ageing.
- Our research was designed to be very much basic lab work developing model systems for use in understanding the fundamental biology of ageing cells, so our immediate contribution to quality of life has, realistically, to be minimal. However, we believe such projects are vital for understanding the process of ageing to try to find out where intervention may be beneficial and what form such intervention should take.
- The work will underpin benefits to quality of life but this is a longer term outcome. It has significantly helped to underpin advanced understanding which is important for subsequent benefits.
- Too basic at this stage to have direct effect on the life of older people.
- With an initiative whose objective is the development of an understanding of the mechanisms of ageing this is a difficult question to answer. The benefits to the ageing population will be downstream of a full understanding of the biology of ageing and how such mechanisms relate to age-related pathology. Once a fuller understanding of the basic biology of ageing is available, it will be clearer how best to intervene to improve the quality of life in an ageing population.

ERA:

- It is difficult to answer this question because the initiative was aimed to enhance the UK research base in experimental ageing research. The long-term practical applications of basic biological research are impossible to predict. However, if the results of the ERA study with lipoic acid supplementation are applicable to the human, then the current practice of taking lipoic acid supplementation with a full diet will lock the survival trajectory to the norm, and not convey any long-term survival benefits. This is the situation for many individuals in the USA and Europe who are supplementing their diet with exogenous lipoic acid. Further, this effect of lipoic acid is very long-lasting, very persistent and almost impossible to reverse even after ceasing to take lipoic acid supplementation. It is only when the enhanced survival trajectory is established by prior dietary restricted feeding, before lipoic acid supplementation feeding with a full diet, that retarded ageing effects are observed. Thus the question this poses for future research is to determine the nature of the epistatic mechanisms being modified by lipoic acid. Once these are known, then this compound can be modified to augment and target its effects on delaying the onset of age-related pathology and increasing long-term survival.

Question 20:

The original aim of the SAGE initiative was “to understand the fundamental biology of the ageing process”. Do you think the initiative was successful in meeting this aim?

The original aim of the ERA initiative was “to understand the basic biology of healthy ageing”. Do you think the initiative was successful in meeting this aim?

Combined responses for SAGE and ERA:

- A three year initiative could only really scratch at the surface. Just compare the funding for cancer research and the long history of research with that of ageing research. 1 in 3 suffer from cancer – everybody ages.
- Ageing is such a complex process that there is no way that a range of three year projects could possibly touch on all aspects. However, I believe that the work presented in the SAGE and ERA workshops represent a significance advance on our understanding prior to the initiative and, importantly, this initiative has strengthened the UK research base in ageing, both in terms of people and quality of data.
- As with SAGE I think that the data coming out of ERA has helped us to improve our understanding of healthy ageing and also identified interventions that could extend healthspan.
- I think it is clear from the workshops and the activities of several groups funded under SAGE that our understanding of the ageing process was increased greatly and in a wide range of areas.
- In my own area – Werner syndrome – SAGE/ERA has seen a sea change in our understanding of this premature ageing syndrome. We started SAGE with knowledge that a recQ helicase was mutated in this syndrome and that there was an effect on replicative senescence. Since then, SAGE/ERA has enabled us to understand the nature of the cell division counter in WS, why it is “ticking faster” in this disease, the nature of the signalling pathway between cell division counters and cell cycle arrest, and the links to the clinical spectrum. We can now make a fairly well-evidenced speculation as to the whole pathway linking the original recQ mutation to the final clinical presentation in the disease, one that has now put us in position to seriously consider therapeutic intervention in this disease (in both animal and human systems). A current Japan Partnering Award from BBSRC (Lead PI is Dr R Faragher) is partly to assist in our contact with a very large WS patient cohort in Japan with a view to forging new links to allow ultimate clinical trials. In short, we have gone from a position of almost complete ignorance about the mechanism of WS to a position where we have a detailed insight, one sufficient that we can consider therapeutic intervention. SAGE and ERA made a very strong contribution to supporting this change in our understanding.
- No idea beyond own work.
- Overall I think that the SAGE initiative helped to move knowledge along in a broad front, particularly from the standpoint of cellular mechanisms of senescence and population aspects of ageing.
- SAGE was without a doubt the very best activity of its kind conducted anywhere in the world. I write as someone who is familiar with European National Programmes, the Framework activities, LINK-AGE and the funding activities of the NDA. It should be a permanent fixture not a one off activity. The potential from the community BBSRC created through this initiative is literally world leading. In terms of whether SAGE met BBSRC goals under EQUAL (i.e. question 20 above) I would refer evaluators to the BSRA evidence submitted to the House of Lords enquiry into the biology of ageing. All the significant breakthroughs are SAGE or ERA research. If just the front runners are pursued (e.g. Akbar, Lord) then these have the potential to save upwards of 40,000 lives per annum in the UK alone (compare with the estimated 1000 lives per annum saved by the introduction of HPV vaccination). This isn't bad for £5 million!
- The SAGE and the later ERA Initiative have revolutionized ageing research in the UK. Before these initiatives there was a real danger because of lack of a coherent funding strategy in the UK of it ceasing to be a major player in this important area of research, effectively surrendering the ground to the USA. Only the medical charities 'Research into Ageing' and the Wellcome Trust funded limited programmes into specific aspects of the biology of ageing. These BBSRC initiatives have allowed a critical mass of basic biological research into the ageing process to be developed. Importantly this development has been sustained through the two SPARC calls and New Dynamics Ageing initiative, and has led to major developments at UCL and the University of Newcastle
- The work of ERA was a natural progression of the work of SAGE. The sheer volume of good data which has come through as a result of these programmes is difficult to over state. ERA has produced

lead molecules that are likely to be the cure for Werner's syndrome and has put the UK scientific community at the heart of a network of international collaborators capable of delivering that cure. The breakthroughs in understanding and intervening in other ageing systems and models are equally impressive.

- Without knowing the outcome of the other grants it is difficult to comment on this.
- Yes, it has been very successful in widening and strengthening the research base in the UK attempting to understand the mechanisms that underlie healthy ageing. At the moment we have an ageing population, a population that is longer lived than previous generations, but not healthy during the additional years of life gained.

Question 21: Was there any added value to you in being part of an initiative, or do you think you would have made similar progress in your research by receiving a grant via normal responsive mode?

SAGE:

- Frankly, I would have left science altogether had it not been for SAGE. I had written nine grants on ageing which had gone unfunded (although I was successful as co-PI in some other areas with grants that I primarily wrote) and I had decided to do something else if my SAGE application was turned down. There was simply no interest in, understanding of or desire to conduct biological ageing research (as opposed to research on age-related disease) funded by Government prior to SAGE. Research Into Ageing (the major NGO funders) had a very small budget at that time and could not support any significant number of researchers. The value of bringing together a new vibrant community of people who desperately wanted to work on the biology of ageing and had the opportunity to do so for the first time was incalculable.
- I am based in a BBSRC-funded Institute and at the time (98/99) BBSRC did not allow its Institutes to apply for response mode projects grants but did allow applications for specific Initiatives. So I found myself in the position of being a new PI with very few funding avenues for getting a post-doc. Consequently a move sideways in the focus of our work was strategically useful and as it turned out opened our eyes to a whole new area of research.
- I think the workshops added value.
- I would not have even thought of doing this study without the prompt from the initiative. Also being able to network with experienced biogerontologists was invaluable to someone entering a field with no prior experience.
- It was good to meet other researchers in the field.
- Not able to get grants via RM.
- Particularly through the workshops.
- The added value was that the BBSRC sent out a strong political signal that it considered this area of research a priority area that it was prepared to fund. It has allowed for previously isolated groups to be brought together as a dynamic research community where there are now clear career opportunities for young RAs. A specific example is Dr A.J. Lambert who moved immediately at the end of the SAGE funding to the position of Senior Postdoctoral Research Fellow, MRC Dunn Human Nutrition Unit, Department of Biochemistry, University of Cambridge, funded by the MRC. He was also part of the Wellcome Programme grant consortium led by Professor Linda Partridge, UCL, into the post-genomic initiative into ageing and he has subsequently been successful in securing a highly competitive 5-year Research Fellowship from the charity 'Research into Ageing/Help the Aged'. This award will enable him to develop further the research he undertook under the SAGE initiative. These studies will be conducted both in Cambridge and the USA.
- The annual meetings that continued throughout both SAGE and ERA went a long way in generating a community of scientists with interests in ageing. This torch is now being carried by SPARC who work hard to keep that community alive. Under NR mode, this community would not exist.
- The meetings led to useful contacts. Hearing about research from very different aspects of ageing research was stimulating.
- The networking aspects of SAGE were tremendous, and were worth their weight in gold, especially for a newcomer to the field like myself. The project would not have gone anything like as well with the isolation of normal responsive mode funding, nor would I have felt as encouraged to continue developing my research in this area of research. This is down to the workshops and the very positive actions and attitude of the community that was built up in SAGE and ERA. The added-value that these workshops brought has been recognized by Research into Ageing, who now run their own grantholders' workshops along similar lines as the SAGE/ERA workshops. Recognising the value of the community that has been built up, RIA usually sends invitations to PIs who were funded under SAGE/ERA, but who are not necessarily funded by RIA, to allow them to attend these workshops.
- The SAGE grant was definitely an added value since: i) it provided me the means to enter the field of ageing (and become an active member of it, where I still am); ii) it is very unlikely that such a grant would not have been funded via "normal" responsive mode, since "ageing" is not (yet) a mainstay of research portfolios.

- The support for networking was important, as was the contribution of SAGE to growth in the research capacity within the field.
- The workshops were useful and it was interesting to see the diversity of approaches and viewpoints in the ageing-research field.
- There was huge benefit in attending the workshops that were part of the Initiative, as it led to valuable input by colleagues whom I would not have come into contact with through any other route. There was a sense of community and being part of something new and exciting which positively impacted on our work and morale.
- Through workshops and meetings a spirit was established between fellow researchers. New contacts were made and this has helped both the research and, as a consequence, my career, greatly.
- Yes, being part of an initiative is helpful. The annual meetings/workshops allowed other researchers with an interest in ageing research to meet up and discuss their work. This has broadened my knowledge of other work that was being carried out in the field of 'normal' ageing.

ERA:

- Added value of the initiative - certainly
- Again the networking that came as part of ERA was invaluable for me and the various interventions I did benefited from discussions with other scientists involved in ERA.
- As a newcomer to ageing research, it was useful to be integrated into the UK ageing community via the workshops
- I believe I would have made similar progress from a responsive mode grant.
- It was extremely valuable to be involved in this initiative. My research direction has been transformed by both SAGE and ERA and my group now works exclusively on immune ageing.
- Minimal
- The added value came from being part of a community of researchers, meeting annually to discuss the research funded under ERA. It is impossible to over-emphasise the importance of this to newcomers to the ageing field (as I was).
- The added value covered many areas as detailed in answer to question 21 in my SAGE evaluation but importantly for me it directed sufficient funding into an area to enable a study to be completed that would not otherwise have been possible to finance. I have also copied my comments here from the SAGE evaluation because they are just as relevant. The SAGE and the later ERA Initiative have revolutionized ageing research in the UK. Before these initiatives there was a real danger because of lack of a coherent funding strategy in the UK of it ceasing to be a major player in this important area of research, effectively surrendering the ground to the USA. Only the medical charities 'Research into Ageing' and the Wellcome Trust funded limited programmes into specific aspects of the biology of ageing. These BBSRC initiatives have allowed a critical mass of basic biological research into the ageing process to be developed. Importantly this development has been sustained through the two SPARC calls and New Dynamics Ageing initiative, and has led to major developments at UCL and the University of Newcastle.
- The initiative was excellent – it enabled my research to continue in this field and enabled cross-fertilisation of ideas from others working in the area. I am now much more aware of the issues relating to human ageing.
- There is huge value in being part of a special initiative even at the cost of slightly lower overall funding rates for grants (special initiative fund rates are often fractionally lower than responsive mode). In my view the best evidence of this is the fate of some of the ERA grant holders' follow-on work. I have seen referees' comments and IM comments on Werner's syndrome (WS) work in responsive mode that clearly indicate no substantial knowledge of the area. For example ERA work on WS (not my own!) described by an unbiased US source as a plausible route to a cure for Werner's was described in referee's comments as 'boring med-chem'. When it is kept in mind that the syndrome is the closest thing to an acceleration of the human ageing process that biologists are ever likely to see this is not really a comment which fully reflects the potential of the work. I am happy to say that the work programme was subsequently funded under SCIBS. Similarly, groundbreaking work on the identification of WS homologues in *Drosophila* underwent two invited resubmissions in responsive mode before it was finally funded. These areas of work are not bad science and this is not a sob story. It is my sober judgment that the Council's budget is simply insufficient to allow it to execute its twin goals of maintaining capacity

in all its areas of remit whilst developing critical mass in areas of national importance through responsive mode. Small, excellent areas of crucial national endeavor (such as, but not restricted to, ageing research) need to be protected by the SI mechanism.

- There was huge benefit in attending the workshops that were part of the Initiative, as it led to valuable input by colleagues whom I would not have come into contact with through any other route.

Question 22: Do you have any comments on the management of the SAGE/ERA initiative by BBSRC?

SAGE:

- As both coordinator and PI I found the management excellent, and it was a pleasure to work with BBSRC on this project
- BBSRC management were always helpful and well organized.
- Generally ok.
- I felt it was generally well managed, though it was unclear at what stage shifts in grant direction were adequately discussed (we had to justify in Final reports but had very little in terms of written permission from BBSRC for a shift in direction). More feedback from mentors would have been useful, with possibly even visits half way through the grant period.
- I thought the initiative was extremely well managed and really helped to support someone entering a new field.
- I would like to congratulate BBSRC for their vision in initiating the SAGE Initiative, and following it with the ERA. I strongly believe that BBSRC should continue to take a leading role in the management of the research council-funded ageing research in the UK, as they have the remit, the experience and the expertise to do that. I do accept the point that whether implementing this role should be done through ring-fenced initiatives is open for discussion; but I strongly believe that it is crucially important that BBSRC encourages applications, in the normal responsive mode, that are dealing directly with the ageing process. Both the science and the society, at all levels, require a better understanding of this process. It is becoming increasingly clear that the reactivity and the responsiveness of the aged body, its metabolic status, is different from that of the “adult” controls that are currently used for reference. This fact has huge implications for the development of effective treatments and approaches that will improve the health and well-being of a part of the population that will soon become one of the largest sections of the society.
- It was very well managed.
- It was well run.
- The management of the Initiative was exactly what was needed. It was a low background noise. It was so well done that it was barely noticeable that it was being done at all. But you had everything you needed, and more, when you needed it.
- Very good.
- Very positive.

ERA:

- As with SAGE, it was first rate.
- Fine.
- I felt it was generally well managed, though it was unclear at what stage shifts in grant direction were adequately discussed to prevent duplication of effort (and I was on the panels so I ought to know). More feedback from mentors would have been useful, with possibly even visits half way through the grant period.
- It continued the good work of SAGE.
- It was excellent. When I had to change my objectives the office were very helpful and supportive.
- Only that it was efficient, helpful and friendly.
- The management of the initiative was excellent. The meetings were run very well and the response of the BBSRC to queries was rapid and helpful.
- The management was excellent. The BBSRC office was helpful at all times. I made numerous contacts that continue until now with other ERA grant holders.
- Well run.

Question 23: Did you receive sufficient support from BBSRC during the progress of your grant?

SAGE:

- Adequate support was offered, and probably I should have been more pro-active in reaching out.
- I cannot imagine how the Council could have been more supportive. It will always be my point of first choice for research support (even when they turn me down!).
- Lack of infrastructure support for ageing animal colonies was a major problem. This restricts the study of ageing in whole body systems, which should be a significant element of this type of research. For financial reasons, we have now had to terminate our aged rat colony which had been a significant resource for 20 years.
- Yes. When Dr Oliver retired part way through the award, BBSRC were helpful in reorganizing the resourcing, work schedule and deployment of personnel.

ERA:

None

Question 24: Please feel free to express your views on any other aspects of the ERA initiative.

SAGE:

- A major problem now that SAGE and ERA have finished is that the BBSRC no longer appears to have a strategic commitment to research into “understand the fundamental biology of the ageing process”. We and other productive groups have had trouble maintaining funding in this vital aspect of ageing research. It appears to have a low rating in other funding panels (and in some other funding bodies) which either have other priorities, or are more interested in novelty, rather than acquiring the fundamental information that underpins advances in the treatment of age-related conditions. Given the importance of ageing research for contemporary society, this is unfortunate.
- A timely, well planned and well executed initiative.
- Exclusion of SAGE applicants from ERA was disappointing. I can see the reason for this, but successful grants/groups could still have enhanced the quality of ERA if allowed to do so. On a personal note – my work featured in the BBSRC’s annual report formed the basis of a grant application. This application sadly was returned several months after submission stating it was not within the BBSRC’s remit. It seems a little contradictory to use this work to justify BBSRC’s purpose and then suggest the same work is inappropriate for them to fund.
- I do hope that the internal assessment of the SAGE/ERA Initiatives will show their success – in terms of 1) generating, and effectively creating, a new (maybe, really, the first) generation of researchers working in the field of basic science of the ageing process and who did not come from the gerontology side; 2) putting ageing firmly on the research map in the UK, and probably giving an extra lead margin in respect to the European effort in research into ageing (but both still lagging a significant way behind the American effort); 3) providing value-for-money and added value to the research activity in the BBSRC portfolio.

In respect to the latter point, it is essential to understand, and make this clear to all the auditing bodies involved with the assessment of these Initiatives, that the research into ageing is expensive, but that those costs are unavoidable, since the responsiveness of the ageing biological systems is different from that of the adult’s controls. However, these costs will be fully justified at the translational stage.

Particularly in the field of neurosciences, too many treatments for age-associated diseases (e.g., stroke) prove ineffective at the stage of clinical trials. One of the reasons for these failures is that the basic science experiments that led to the therapeutic proposals were performed on young or very young animals. Many times the choice of the experimental model is driven by the existence of established paradigms, reduced costs and simple convenience. The savings made at this initial stage by use of younger animals, become significant overspending later on, at the time of setting the clinical trials.

Starting from the facts that 1) population in UK, as elsewhere in the world, is ageing significantly and 2) maintenance of health and well-being in the aged population does not mean only dealing with the age-associated pathology, but also with prevention of such pathology and maintenance and development of physical and mental fitness, BBSRC should continue to promote, in the most active way possible, the research activity in the field of normal ageing.

- It was frustrating to have achieved all the objectives (and more) of the work proposed under the SAGE funding only to have the renewal rejected under NR mode. There seemed to be no linkage between the aims and objectives of SAGE and those of NR. The upshot was that I lost the post-doc trained (and was a major influence in developing this work) in this work to another laboratory. The post-doc still has all the lab books despite repeated requests to return them so I am unable to complete writing up this work. This has had an impact on the quality and volume of output from the SAGE initiative.
- My main issue is with regard to access to tools and resources – such as ageing cell models. In hindsight I think we could have made more progress had we pushed to swap materials more with other groups, or had there been a central repository that could have been accessed easily. Overall though, I think SAGE was an excellent initiative, and there is a lot to recommend it.
- My research has been focused into ageing as a result of this very successful initiative. It was well organized and I made numerous contacts in the ageing field in the U.K and worldwide as a result of SAGE.
- SAGE should not be an initiative. It should be an ongoing process to deal with a massive ongoing problem. Would anyone seriously consider holding a three year special programme on Cancer or AIDS or osteoporosis starting from next to nothing and then saying that these fields should be left to fight it out

alongside biofuels or protein structure prediction? Ageing is the biological challenge of this century and it contains both marvellous science and the prospect of marvellous results. Thus SAGE style support needs to continue until scientists no longer ask themselves “will it be a good career move to work on ageing?” They should ask themselves “would it be a good career move to work on anything else?”

- SAGE was an excellent initiative; it helped a lot of people into the field of ageing research and created a small UK base of researchers in the area. I maintain many of my initial contacts. B. I have found it very difficult getting funding for ageing research since then, and continue my research in this area in a very small way. If it were not for SAGE I would never have been able to even start.
- This initiative helped to bring into the ageing field researchers who may have considered their work peripheral to ageing but whose contribution has been exemplary. It is an excellent means of capacity building.
- This was an excellent initiative, and its success should encourage further initiatives of this type.

ERA:

- Could have been allocated more funds for the number of successful groups but not necessarily for more individual groups.
- I found the level of monitoring, regular presentation, report writing and expectation of progress rather stifling. This present form is a prime example even 3 years later!!
- I think ERA carried on the good work of SAGE and had a major impact upon ageing research in the UK and has certainly changed the course of my research.
- May I take this opportunity to thank Office staff for all their hard work in this area. The future of ageing research in the UK is looking increasingly unsteady. However it is only thanks to BBSRC that the biology of ageing in Britain has either a past or a present.
- My only other comment is that I feel I was not able to convey as well as I would have liked the importance of our results. Much of ageing research internationally looks at organism longevity while I am interested in trying to prevent the effects of ageing of specific tissues so as to improve morbidity in ageing populations (be they horse or human). The ERA initiative was more closely focused to this area and hence my research was appropriate to the initiative. I feel that the progress on understanding tendon ageing was advanced significantly by this grant and so was somewhat disappointed by the B grade awarded by the committee. However, at the stage we submitted the final report, the project had only just finished and so no publications had been produced at this stage. This has now been rectified (see above) and I anticipate that the work funded by this grant will be the bed-rock on which further work is undertaken.
- This initiative helped to bring into the ageing field researchers who may have considered their work peripheral to ageing but whose contribution has been exemplary. It is an excellent means of capacity building.
- Through funding by ERA, I have developed the theme of ageing in my entire current research. In addition, I have initiated a new affinity group of the British Society of Immunology (Differentiation and Immunosenescence), have become involved in a framework 6 programme in ageing (IMAGINE), have made collaborative contacts with the National Institutes of Health Ageing Institute. With the NIAID and my European partners, I co-organized an international symposium on immune ageing in Paris in 2006. I therefore consider that both SAGE and ERA have been extremely successful initiatives that have promoted research into ageing in the U.K. and hope the BBSRC will seriously consider a third similar initiative into ageing to consolidate the success that has been achieved already.

Evaluation of the Science of Ageing (SAGE) initiative

Questionnaire

Name of Principal Investigator:

Institution:

Grant No:

Title:

1. Please indicate which funding bodies you had funding from at the time of applying for a SAGE grant.

(please tick)

BBSRC	<input type="checkbox"/>	EU	<input type="checkbox"/>
MRC	<input type="checkbox"/>	Wellcome Trust	<input type="checkbox"/>
EPSRC responsive mode	<input type="checkbox"/>	Healthcare charity*	<input type="checkbox"/>
EPSRC EQUAL initiative	<input type="checkbox"/>	Industry*	<input type="checkbox"/>
Department of Health/NHS	<input type="checkbox"/>	Other*	<input type="checkbox"/>

* please give details

2. Was this your first grant in ageing research? (please tick)

Yes	<input type="checkbox"/>	If Yes - please give details of previous research area			
No	<input type="checkbox"/>	If No - please indicate how long you had been working in ageing research	<5 years	5-10 years	>10 years

3. Did you need to alter the direction of your research to fit into the remit of the SAGE initiative? (please tick one box)

4 (substantially)	3	2	1 (not at all)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please give details.

4. Did the fact that this was an initiative encourage you to apply? (please tick)

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

Please give details.

5. Please indicate your current research interests and summarise in up to five keywords (please tick and insert keywords)

	✓	Keywords
My current research interests are entirely focused on ageing	<input type="checkbox"/>	
Ageing research is a significant component of my current research	<input type="checkbox"/>	
Ageing research is a minor component of my	<input type="checkbox"/>	

current research		
My current research projects do not include research on ageing		

Outputs and outcomes

Please provide details of all research outputs arising as a direct result of this SAGE grant.

6. **Publications:** list all further publications arising from the grant since the final report was published, including those that were 'in press' in the final report that have been published subsequently. Only include those publications that are directly related to the work carried out on the grant, i.e. that have the RA(s) employed on the grant as authors.

Please list publications in the following categories, and ensure that the full reference is included - Author(s), Year, Title, Journal, Volume, Page:

- a. original work reported in refereed journals
- b. others: review articles, edited conference papers, book chapters and articles in popular magazines.

7. **Other outputs/outcomes:** please give details of any other outputs or outcomes from the grant.

	Please give details here
Contribution to the 3Rs: the replacement, reduction or refinement of animals in experiments	
Participation in activities to enhance public engagement with the biosciences. These could include open days, schools' events, media interactions, public meetings and lectures, etc , but not presentations at scientific conferences or articles in scientific journals.	
New techniques and technologies	
Other (please specify)	

8. **Staff:** please provide details of all staff employed on the grant.

Name	Grade/ position	Period of appointment	First destination after SAGE grant	Training received and/or qualifications gained on grant

9. **Training:** did any other training in ageing research arise from your grant, e.g. studentship projects supervised by yourself or your collaborators?

Name	Grade/ position	Period of appointment	First destination on completion of studentship	Training received and/or qualifications gained on grant

Networking and collaboration

One of the aims of the programme was to encourage networking and collaboration within the ageing research community.

10. **Workshops: did you or a member of your group attend any of the workshops associated with the initiative?** Please give details.

Date	Location	PI	Others

11. **If you attended any workshops, how useful were they?** Please tick one box and comment on aspects that you found more/less useful.

4 (very useful)	3	2	1 (not at all useful)

Comments:

12. **Do you have any suggestions for how the workshops could have been improved?**

13. **Did you find the advice/feedback received at the workshops helpful in your research?**

4 (very helpful)	3	2	1 (not at all helpful)

Comments:

14. **Contacts and collaborations:** please give details of any new or improved contacts or collaborations, and comment on the impact that they had on the progress of your research.

New or improved academic contacts - <i>if cross-disciplinary, please specify which discipline</i>	UK	
	Overseas	
New or improved industrial contacts - <i>please specify type of industry</i>	UK	
	Overseas	
New formal academic research collaboration (e.g. joint publication, joint funding application) - <i>if cross-disciplinary, please specify which discipline</i>	UK	
	Overseas	
New formal industrial research collaboration (e.g. joint publication, joint funding application) - <i>please specify type of industry, nature of collaboration</i>	UK	
	Overseas	

Comments:

Funding

15. Please give details of any further funding that you have received to continue or develop the work funded by the SAGE grant.

Source		Grant reference no/title	Value (£)	Period of grant	
				From	To
BBSRC	Responsive mode				
	Studentship				
	ERA: Experimental Research on Ageing initiative				
	NDA: New Dynamics of Ageing initiative				
MRC					
EPSRC					
Department of Health/NHS					
EU					
Wellcome Trust					
Healthcare charity*					
Industry*					
Other*					

*please specify

16. If you have not yet applied for further funding, are you planning to do so?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

Please give details.

Aims and objectives

17. Was your SAGE project successful in meeting its original objectives? (please tick)

4 (very successful)	3	2	1 (not successful)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If you ticked 1 or 2, were the reasons for this related to:

Staff, e.g. difficulties in recruiting and retaining staff	<input type="checkbox"/>
Experimental/methodological/technical reasons	<input type="checkbox"/>
Lack of resources, e.g. funding, equipment, facilities	<input type="checkbox"/>
Insufficient time to complete experiments	<input type="checkbox"/>
Other, please specify	<input type="checkbox"/>

Comments:

18. Did the grant support your wider research aims?
(please tick one or more boxes and comment if you wish)

Enabled extension of your research into new areas	<input type="checkbox"/>
Provided funding for activities that other bodies would not fund	<input type="checkbox"/>
Strengthened the skill base of the group, e.g. techniques, cross-disciplinary skills	<input type="checkbox"/>
Helped to publicise the importance of your field of research	<input type="checkbox"/>

Strengthened the standing of your research group in the field	
Contributed to maintenance/development/purchase of equipment/facilities	
Contributed to the development of tools, technologies, or reagents	
Enhanced the progress of your career	
Other, please specify	

Comments:

19. To what extent do you think your project contributed towards:

(a) an increased understanding of ageing (please tick)

4 (considerably)	3	2	1 (not at all)

(b) improved quality of life for the ageing population (please tick)

4 (considerably)	3	2	1 (not at all)

20. The original aim of the SAGE initiative was “to understand the fundamental biology of the ageing process”. Do you think the initiative was successful in meeting this aim? (please tick)

4 (very successful)	3	2	1 (not successful)

Comments:

Other

21. Was there any added value to you in being part of an initiative, or do you think you would have made similar progress in your research by receiving a grant via normal responsive mode?

22. Do you have any comments on the management of the SAGE initiative by BBSRC?

23. Did you receive sufficient support from BBSRC during the progress of your grant?

24. Please feel free to express your views on any other aspects of the SAGE initiative.

Evaluation of the Experimental Research in Ageing (ERA) initiative

Questionnaire

Name of Principal Investigator:

Institution:

Grant No:

Title:

1. **Please indicate which funding bodies you had funding from at the time of applying for an ERA grant.**

(please tick)

BBSRC	<input type="checkbox"/>	EU	<input type="checkbox"/>
BBSRC SAGE initiative	<input type="checkbox"/>	Wellcome Trust	<input type="checkbox"/>
MRC	<input type="checkbox"/>	Healthcare charity*	<input type="checkbox"/>
EPSRC responsive mode	<input type="checkbox"/>	Industry*	<input type="checkbox"/>
EPSRC EQUAL initiative	<input type="checkbox"/>	Other*	<input type="checkbox"/>
Department of Health/NHS	<input type="checkbox"/>		<input type="checkbox"/>

* please give details

2. **Was this your first grant in ageing research?** (please tick)

Yes	<input type="checkbox"/>	If Yes - please give details of previous research area			
No	<input type="checkbox"/>	If No - please indicate how long you had been working in ageing research	<5 years	5-10 years	>10 years
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. **Did you need to alter the direction of your research to fit into the remit of the ERA initiative?** (please tick one box)

4 (substantially)	3	2	1 (not at all)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please give details.

4. **Did the fact that this was an initiative encourage you to apply?** (please tick)

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

Please give details.

5. **Please indicate your current research interests and summarise in up to five keywords** (please tick and insert keywords)

	✓	Keywords
My current research interests are entirely focused on ageing	<input type="checkbox"/>	
Ageing research is a significant component of my current research	<input type="checkbox"/>	
Ageing research is a minor component of my current research	<input type="checkbox"/>	
My current research projects do not include research on ageing	<input type="checkbox"/>	

Outputs and outcomes

Please provide details of all research outputs arising as a direct result of this ERA grant.

6. **Publications:** list all further publications arising from the grant since the final report was published, including those that were 'in press' in the final report that have been published subsequently. Only include those publications that are directly related to the work carried out on the grant, i.e. that have the RA(s) employed on the grant as authors.

Please list publications in the following categories, and ensure that the full reference is included - Author(s), Year, Title, Journal, Volume, Page.

- a. original work reported in refereed journals
- b. others: review articles, edited conference papers, book chapters and articles in popular magazines.

7. **Other outputs/outcomes:** please give details of any other outputs or outcomes from the grant.

	Please give details here
Contribution to the 3Rs: the replacement, reduction or refinement of animals in experiments	
Participation in activities to enhance public engagement with the biosciences. These could include open days, schools' events, media interactions, public meetings and lectures, etc, but not presentations at scientific conferences or articles in scientific journals.	
New techniques and technologies	
Other (please specify)	

8. **Staff:** please provide details of all staff employed on the grant.

Name	Grade/position	Period of appointment	First destination after ERA grant	Training received and/or qualifications gained on grant

9. **Training:** did any other training in ageing research arise from your grant, e.g. studentship projects supervised by yourself or your collaborators?

Name	Grade/position	Period of appointment	First destination on completion of studentship	Training received and/or qualifications gained on grant

Networking and collaboration

One of the aims of the programme was to encourage networking and collaboration within the ageing research community.

10. **Workshops: did you or a member of your group attend any of the workshops associated with the initiative?** Please give details.

Date	Location	PI	Others

11. **If you attended any workshops, how useful were they?**

Please tick one box and comment on aspects that you found more/less useful.

4 (very useful)	3	2	1 (not at all useful)

Comments:

12. **Do you have any suggestions for how the workshops could have been improved?**

13. **Did you find the advice/feedback received at the workshops helpful in your research?**

4 (very helpful)	3	2	1 (not at all helpful)

Comments:

14. **Contacts and collaborations:** please give details of any new or improved contacts or collaborations, and comment on the impact that they had on the progress of your research:

New or improved academic contacts - <i>if cross-disciplinary, please specify which discipline</i>	UK	
	Overseas	
New or improved industrial contacts - <i>please specify type of industry</i>	UK	
	Overseas	
New formal academic research collaboration (e.g. joint publication, joint funding application) - <i>if cross-disciplinary, please specify which discipline</i>	UK	
	Overseas	
New formal industrial research collaboration (e.g. joint publication, joint funding application) - <i>please specify type of industry, nature of collaboration</i>	UK	
	Overseas	

Comments:

Funding

15. **Please give details of any further funding that you have received to continue or develop the work funded by the ERA grant.**

Source	Grant reference no/title	Value (£)	Period of grant	
			From	To

BBSRC	Responsive mode				
	Studentship				
	NDA: New Dynamics of Ageing initiative				
MRC					
EPSRC					
Department of Health/NHS					
EU					
Wellcome Trust					
Healthcare charity*					
Industry*					
Other*					

*please specify

16. If you have not yet applied for further funding, are you planning to do so?

Yes	
No	

Please give details.

Aims and objectives

17. Was your ERA project successful in meeting its original objectives? (please tick)

4 (very successful)	3	2	1 (not successful)

If you ticked 1 or 2, were the reasons for this related to:

Staff, e.g. difficulties in recruiting and retaining staff	
Experimental/methodological/technical reasons	
Lack of resources, e.g. funding, equipment, facilities	
Insufficient time to complete experiments	
Other, please specify	

Comments:

18. Did the grant support your wider research aims?

(please tick one or more boxes and comment if you wish)

Enabled extension of your research into new areas	
Provided funding for activities that other bodies would not fund	
Strengthened the skill base of the group, e.g. techniques, cross-disciplinary skills	
Helped to publicise the importance of your field of research	
Strengthened the standing of your research group in the field	
Contributed to maintenance/development/purchase of equipment/facilities	
Contributed to the development of tools, technologies, or reagents	
Enhanced the progress of your career	
Other, please specify	

Comments:

19. To what extent do you think your project contributed towards:

(a) an increased understanding of ageing (please tick)

4 (considerably)	3	2	1 (not at all)

(b) improved quality of life for the ageing population (please tick)

4 (considerably)	3	2	1 (not at all)

20. The original aim of the ERA initiative was “to understand the basic biology of healthy ageing”. Do you think the initiative was successful in meeting this aim?
(please tick)

4 (very successful)	3	2	1 (not successful)

Comments:

Other

21. Was there any added value to you in being part of an initiative, or do you think you would have made similar progress in your research by receiving a grant via normal responsive mode?
22. Do you have any comments on the management of the ERA initiative by BBSRC?
23. Did you receive sufficient support from BBSRC during the progress of your grant?
24. Please feel free to express your views on any other aspects of the ERA initiative.