Lush Young Researchers Prize 2013

Background Paper

1 Executive Summary

The Lush Prize, now in its second year, aims to encourage young scientists to develop a career in toxicology without harming animals by offering £10,000 bursaries to allow them to advance in this area. As last year, in 2013 it is seeking nominations from keen young scientists with a desire to fund the next stage of a career focused on an animal-test free future.

1.1 Methodology

This paper is based on the following:

1. An examination of UK GCSE and A Level syllabus positions on dissection
2. A survey of dissection in UK university life sciences curricula
3. Selected information on dissection and the academic curricula in other parts of the world
4. Interviews with two individuals who left the life sciences in part due to animal testing concerns
5. Interviews with last year's Young Researcher winners
6. Feedback from last year's winners on the merits of the Lush Prize
7. Selected information on groups working to help people overcome ethical barriers to involvement the life sciences (Appendix I).

1.2 Key findings

The status of dissection on the curriculum varies greatly from country to country - from India, where dissection has actually been banned from both school and university curricula, to the UK where a more 'personal choice' stance seems to apply, to other European countries where conscientious objection to dissection can involve a legal battle. It appears that globally, real progress towards humane education is being made.

Information on dissection at UK universities was not easily obtainable, which could be a major barrier to those wanting information on animal use before even considering whether to apply for a course in the life sciences.

The experience of young researchers choosing to avoid animal experiments varies greatly depending on the situation they find themselves in. Interviews pointed to the importance of centres or research groups dedicated to animal alternatives. It is clear that those students lucky enough to find themselves at

one of these institutions have a much easier time in pursuing this career route. That said, there are still obstacles and challenges, including funding issues and resistance from those working outside these institutions.

Those who choose this often difficult path outside specialist institutions may face a very tough time - the two we interviewed ended up changing career, in large part due to issues around animal use.

The Lush Prize can make a meaningful contribution to encouraging young researchers working in the field of animal-free toxicology to pursue their chosen path. It is clear that last year's Lush Prize was instrumental in allowing one researcher to go back to her chosen path in animal-free toxicology work. Last year there were concerns raised in the Background Paper that the amount per student was not sufficient to be considered meaningful, however feedback from last year's winners indicate that this is not the case. Responses highlight the importance of its focus on replacement and indicate that the Prize has served as a big motivational boost and raised the profile of non-animal work.

There are a number of organisations working at the school curriculum level either by lobbying for change or by providing resources to help educators teach without using animals, and there is overlap with the Training category here. The reach of the Young Researcher category could potentially be re-considered to include these initiatives; perhaps this is an area that warrants a category of its own, or it could be the particular focus of the training prize in one year.

Rewarding organisations which target school curricula with the aim of encouraging more young scientists to come into the academic arena with an ethical stance on animal use could be a way of reaching more young people. However, without the structural support for these students post school or first degree level, they may simply end up exiting the life sciences without realising their potential for achieving change in this area. The young researcher award as it is provides meaningful encouragement to those already on this often difficult path and has already proved itself effective at driving change in this area.

Looking ahead the biggest challenge for the Young Researcher award is making more potential recipients aware of its existence. Developing a communications strategy with this in mind should be a key task for the 2014 Lush Prize. Although the award is designed to reward a maximum of five researchers each year, raising awareness of its existence will provide motivation and encouragement to many more.

2 The educational curriculum

The Lush Prize seeks to support young researchers internationally. Given those co-ordinating the project are based in the UK, we start by examining dissection in the school and university curricula here in the UK. Some information on dissection in the school and university curricula in other countries is looked at later.

2.1 The UK situation at school level

2.1.1 GCSE Level (secondary/high school level)

In terms of the UK school curriculum at GCSE level, dissection appears to be something that would only be considered if suggested by individual teachers, rather than something that is proposed in the national curriculum. The national curriculum programmes of study for science at key stages 3 and 4 (age 11-16) have recently been disapplied and so are no longer statutory. Schools are free to develop their own science curricula that best meet the needs of their pupils, in preparation for the introduction of the new national curriculum from September 2014. It is interesting to note that the discovery and development of new medicines, including their pre-clinical and clinical testing is on the draft new curriculum – a potential opportunity for organisations to create curriculum-based educational materials on alternatives to animal testing.[1]

2.1.2 A Level (college/further education level)

When it comes to A level it seems there are no compulsory dissections in the UK but dissection does become a suggested activity. We had a look at the various exam boards which offer biology A Level in the UK.

- Assessment and Qualifications Alliance (AQA) – includes dissection as one of many suggested activities in its 'Scheme of Work', which states there are far more activities than it would be possible to teach. Links to video clips are given as well as a note to 'consider all members of the class before carrying out dissection'.[2]

- EdExcel – the scheme of work is not prescriptive and offers video clips as an alternative to dissection.[3]

- University of Cambridge International Examinations (CIE) – although no dissection of materials of animal origin will be set in Advanced Practical Skills papers, dissection, interactive videos or similar will

[1] http://www.education.gov.uk/schools/teachingandlearning/curriculum/secondary
[2] Assessment and Qualifications Alliance (AQA) Scheme of Work
[3] EdExel Biology Scheme of Work

continue to be a useful aid to teaching, e.g. when the heart is being studied.[4]

- Oxford, Cambridge and RSA Examinations Board (OCR) – if a dissection is not possible or desirable a short video showing the structure of the lungs could be shown.[5]

- The Welsh Joint Education Committee (WJEC) – guidance on dissection says that there are also many interactive white board models available to assist in the dissection and for use as an alternative.[6]

- The Council for the Curriculum, Examinations & Assessment (CCEA) – includes dissection in its scheme of work but again says this not should not be considered prescriptive or exhaustive, and includes an illustration of heart dissection using a web resource as a suggested activity in the same section as actual dissection.[7]

It would seem therefore, that at school level in the UK, dissection is not seen as a requirement and that alternatives to dissection are clearly prescribed as something teachers should be thinking about if they do choose to teach dissection. Of course, how all of this plays out in the class room will depend on the attitude of individual teachers. As one of our young researchers explained, 'my husband currently teaches A Level Sciences and it's interesting/worrying to note that he still has struggles with the exam board trying to find acceptable alternatives, not just to dissection but for vegan students who don't wish to experiment on horse blood and milk.' This conflicts somewhat with what web-based research found but is perhaps a more realistic gauge of how things are 'on the ground'.

It seems young people studying biology shouldn't find resistance to refusing dissection, at least on paper, and therefore should find it easier to challenge if ever pressure was put on them. The fact that consideration of all students and alternatives to dissection are included in some curricula is very welcome and shows structural progress for humane science.

2.2 The UK situation at university level

We contacted the biology admissions offices or similar of 24 of the 25 'Russell Group Universities' asking for information on dissection. The questions asked can be found in appendix II.

Not a single university responded to this request, although they were not chased by telephone due to time constraints. Perhaps as the request was made in August, a busy time for admissions offers, it was not seen as a priority and thus ignored. It would be interesting to see how such a request

[4] Cambridge International A & AS Level Biology syllabus
[5] OCR Scheme of Work: Science and Society
[6] Pathways in Applied Science (QCF)) Unit Specific Teacher Guidance
[7] Revised GCE & AS & A Level Scheme of Work, Biology

would be responded to if it came from a potential applicant and that is something to consider looking at in future years.

2.3 Groups working on animal use in the curriculum globally

We have identified a number of organisations working on the issue of dissection at school and university level around the world and highlight some of them, and their achievements, below. This list is by no means exhaustive.

2.3.1 Pro Anima

Pro Anima, a French animal rights organisation, told us that "Since 2010, Pro Anima has supported the young student Axelle in her fight against her own university, concerning the obligation to run dissections according to a curriculum, and participated in legal costs, calling for the right to conscientious objection. We are just launching the campaign "Dissection… Objection!" and have sent a press release to colleges, universities, student associations, members of the French government (Education Minister), the European Committee, UNESCO, and the European Parliament in early 2013. We have launched a petition and cards that anyone can fill in and send to the government." They also told us that "Recently, we have succeeded in ending a school's visits to laboratories conducting experiments on dogs and monkeys, by writing letters to the college's headmaster and the Children's Rights' Defence Minister."

2.3.2 PETA US

PETA claimed a victory in March of this year for convincing Baltimore,Maryland, and Washington, D.C., school districts to adopt policies allowing students to opt out of classroom dissection. It said that Baltimore City Public Schools was joining every other district in Maryland and neighbouring Delaware, Pennsylvania and Virginia, which have such guidelines already in place. PETA also donated computers and software to the district through the group's national educational grants programme so that teachers have access to virtual dissection equipment, which has been shown to teach anatomy better than animal dissection. PETA and virtual-dissection software leader Digital Frog International were also offering training sessions for teachers.[8] The organisation also claimed a victory in June when it announced that Connecticut had overwhelmingly passed a dissection-choice bill allowing students to opt out of participating in or watching classroom animal dissections and instead to be provided with humane non-animal learning methods, such as realistic models and interactive computer programs.[9]

2.3.3 PETA India

Another significant victory claimed by PETA has been achieved in India where dissection in the education curriculum has been banned by the government altogether. In 2012, the Ministry of Environment and Forests (MoEF) issued a

[8] http://www.peta.org/about/victories/baltimore-adopts-dissection-choice-policy.aspx

[9] http://www.peta.org/b/thepetafiles/archive/2013/06/06/victory-connecticut-passes-dissection-choice-law.aspx

directive instructing "all the institutes/establishments associated with teaching of medical, pharmacy and other graduate/postgraduate courses in life sciences to follow the University Grants Commission guidelines for discontinuation of dissection and animal experimentation in the universities/colleges and introduce use of alternatives to animal experimentation." PETA is now pursuing through the courts those institutions who have not yet complied.[10]

2.4 Conclusion

It is very encouraging to see groups working to achieve change structurally at this level.

Many organisations working at school and university level were identified in the training paper doing work which clearly overlaps with the issues we are trying to identify and address through the young researcher award and this associated research process. We list some of them in appendix I. More detail can be found in the 2013 Training paper.

3 Interviews with young researchers

Last year, interviews were conducted with individuals from a number of organisations involved in promoting alternatives to animal experiments and/or animal rights.

What clearly came out of the interviews is that young researchers wishing to go into a career without ever using animals need to be determined, resourceful and tenacious. As Dr Capaldo of the New England Anti-Vivisection Society told us, “Really do an assessment of your personality because you do have to have a bit of a fighter in you. I don’t mean that in a belligerent way, but you have to be someone who understands that even in 2012, you’re going to be going against the grain a bit. You’ve got to get used to the fact that it may not always be an easy route.” Alistair Currie, who was with PETA at the time, echoed these sentiments, “Forging an entire career in toxicology where you’re never involved in animal testing is much more challenging.”

It was also identified that many might be put off entering in the first place: “Some budding scientists may well be put off entering science, particularly toxicology, because of the issue of animal welfare.”

Dr Capaldo told us “certainly in the US, not all states have laws which guarantee students the right to choose alternatives to traditional animal dissection, so even at high school level, students may be put off. Our message to budding scientists is that if you aren’t willing to hurt or harm animals, then you may go into another field. What this means”, says Dr

[10] http://articles.timesofindia.indiatimes.com/2013-06-14/india/39975740_1_animal-experimentation-ugc-moef Legal notice to government to enforce ban on animal dissections, June 14th 2013

Capaldo, “is that for students who don’t want to be harming animals, by the time they’re getting to PhD programmes, they’re going to be more surrounded by people willing to use and harm animals because these are the type of people who won’t have been put off at the high school level. We had an epidemiologist who was told point blank that she would have to do rat research as part of her post-doc epidemiology programme or to not even bother applying, even though she had chosen epidemiology specifically because she didn’t want to do animal research.”

Alistair Currie pointed out “it’s unlikely that anyone gets into toxicology because they’ve got a burning desire to test on animals. However, the issue is more likely to be whether or not they can avoid doing animal tests at some point in their career, and that may well be putting off potential researchers. There’s also the possibility that you might find that in some circumstances, even someone who is validating new methods may, on occasion, still find themselves in a situation where they have to be involved in animal tests for comparison. That’s likely to put a lot of people off… Forging an entire career in toxicology where you’re never involved in animal testing is much more challenging... what’s needed is enough options so that the people who are highly committed against animal tests feel that toxicology is something that’s open to them.”

For this year's paper we have decided to explore this area in more depth by focusing on talking to the young researchers themselves, and so have conducted in-depth interviews with all of last year's young researcher winners as well as two other individuals who entered the life sciences but who chose to change path at least in part due to issues around animal use. We include all six of them as separate case studies. Although lengthy, each of their stories is unique and gives a real insight into the actual experiences of the people we are trying to support with the young researcher award, so they are presented almost in their entirety. The questions which elicited these responses can be found in appendices I & II.

3.1 Case studies

3.1.1 Sofia – the early-exiter – Portugal

I applied and was accepted on a Biology BSc but ended up by dropping out in the first year. When I decided to leave I had not yet been asked to dissect or vivisect but I knew that before the end of the year, I would be asked to do it. I of course didn't want to. I was already expecting a normative, non-critical type of thought from the institution itself. Still, I must admit I was shocked professors weren’t discussing these matters with students. Maybe later on they did, I really don’t know; as I said, I left before I was asked to do it. Even more shocking, and to me that was the most saddening part of it and definitely one of the most worrying aspects, was the students’ apparent indifference to the subject and the powerless way they perceived themselves. The general opinion of the student body was that dissection and vivisection were scientifically mandatory and even if they didn’t want to do it, there was nothing they could do to prevent it. Conscientious objection was something the great

majority of students would not consider. I felt excluded from the course. I knew that if I wanted to pursue Biology I would have to go to court (in order to avoid dissection) eventually and honestly I didn't feel like going through that long process and could not afford it anyway. That was not the only thing that made me decide to leave, but it definitely had a strong influence. I ended up quitting the course and started my studies on the so-called "human sciences". Animal use was not the only factor, but it played an important part in my decision. I now hold a B.A. (180 ECTS) in "Artistic Studies - Comparative Arts and Cultures", a course based on the European and North-American tradition of Comparative Literature and Comparative Studies and am now pursuing a Master in Critical Animal Studies/Animal Human Relationships, which seems to be extremely difficult due to the very recent emergence of this field of study.

3.1.2 Joe – the committed conscientious objector – UK

I was good at Biology & Chemistry at school and so there was a natural progression to studying a life science degree, then a related PhD and finally taking up a post-doctoral position. With hindsight I should probably have jumped off this 'conveyer-belt' of life science progression before the post-doc or even PhD stage! I had the option whilst studying for my university degree to take modules that would have involved dissection, I avoided these, I'm not sure what would have happened though if I had chosen one of the 'dissection' modules. During my PhD studies, again although I avoided it, there was an increasing pressure on me to become involved with carrying out studies involving rodents. I chose my degree modules so as to avoid carrying out dissection and stated at the start of my PhD that I would only do it if I didn't have to carry out experimentation involving animals. I expected when choosing to do a life science degree that dissection would be something that, although I wanted to avoid it, would be happening and would be carried out by people I was studying with. I had no contact with dissection during my undergraduate degree, but exposure to vivisection during my PhD studies hardened my stance against it and made me feel angry and isolated. I never did animal work, but as time went on during my career in the life sciences there was more and more pressure to get involved with vivisection. The pressure and slowly building encouragement to get me carrying out animal experiments made me feel awkward and angry. I also felt very upset knowing what was going on in the same building I was working in. During my PhD I was able to guide my own research in a way that avoided animal testing, using non-animal methods. This did however get harder and harder as the research progressed and I was encouraged more and more to use non-human models to look at some of the key areas I was investigating. The position I ended up in essentially had me boxed into a corner from which changing career or carrying out animal experimentation (either directly or indirectly) were the only options. As my career progressed I would say that the alternatives were pushed to one side, or not seen as being able to give the whole picture, by the people leading my research group. I didn't feel excluded but I guess I had that feeling that most people have when they think they are the only person that has an opposing world view or moral stand point to those

around them. This made me feel isolated, uncertain, saddened, more convinced of my moral stand point.

Eventually I changed path, I'm still using some of my scientific and life science skills, but I'm now working in the field of conservation.

I did try and find myself a PhD position that would have enabled me to use my scientific skills and my desire to help in the fight against human diseases, which only used non-animal methods. I found it hard though getting advice on this from my tutors at university and also felt awkward about talking about it too much as I felt I was going against the grain. I contacted the Doctor Hadwen Trust and the Lord Dowding Fund, as well as FRAME and even companies including Lush, but wasn't able to get any useful advice on what options were available. It would have been useful at this stage to have been able to get a bit more support and encouragement. I do feel my desire to not test on animals did make things harder and the career path I was on would (and in fact did) eventually become impossible to pursue without animal testing being involved. The reliance on animals and the belief that their use is essential and necessary for scientific progression is deeply ingrained in the majority of the life sciences and so anyone with an opposing opinion will automatically come up against barriers and obstacles if they become involved in this field and stay true to their beliefs.

3.1.3 Chiara – the well supported enthusiast – Italy

During my scientific education and experimental work I have always invested my moral and ethical strengths in the cultures and in the development of innovative methods, supporting the validity of the alternative to animal testing *in vitro* models, in order to keep pace with improvements in science to benefit human health.

Since I was a thesis-stage student, I have always carried out my research with *in vitro* models, because I refuse to both inflict needless suffering on animals and conduct experimental research of low quality. I had the good fortune to meet in my experimental training Dr Anna Maria Bassi, head of a research team which works only with *in vitro* models. So, I had the opportunity to grow professionally within the laboratory, the Analysis and Research Laboratory in Pathophysiology (LARF) of the Department of Experimental Medicine (Genoa – Italy), previously known as a "cell cultures laboratory" and developed in 1970. As a researcher with Dr Bassi's team, I contribute with my work to perform scientifically good research in Pathology fields.

My decision to work without animals came both from my strong rejection of the use of animals and through the careful and patient leadership of my mentor Dr Anna Maria Bassi. I chose the institution for its non-animal research stance.

My major difficulty has been fundraising and finding partners to develop new and competitive projects. In the Italian scientific environment there are few research groups that promote *in vitro* models as alternatives to animal testing. In addition, the Italian Parliament has only very recently banned animal tests

and endorsed funds for research on *in vitro* models with particular attention to the policy of the 3Rs and the European legislation.

In Italian academic institutions there are very few courses on alternative methods and research groups devoted exclusively to *in vitro* models. I've not got this problem because I worked on my thesis at LARF. For this reason we offer updated training courses and workshops on *in vitro* models.

3.1.4 Felix – The motivated human research-focused scientist – USA

I have always aspired to perform research that can provide information that can more rapidly be translated into understanding the factors that contribute human diseases. In my scientific career, since my days as a graduate student, I have found it useful to focus my research in a human-based rather than animal-based approach. I strongly consider that the human-based approach can provide information that the public can associate more with the real world. I could say that there was, and still is, some type of resistance by those that argue that much more information can be gathered from animal-based research. The motivation to perform research in non-animal models has come from myself, and still is to this day. I selected my current institution (CAAT USA) based on its known tradition as an excellent training place for us scientists that soon will transition into more independent positions in our careers. There have been some challenges, mainly by arguments that some of the proposed questions in my research can be better answered in an animal model. However, I still maintain the great utility of using human-based models to better understand the human physiological reactions tox or y stimuli.

I think that the most difficult steps are in the very early stages, such as undergraduate and post-graduate, where our scientific freedom is limited. However, for me it has been the post-doctoral stage because our non-animal system has been received with some level of resistance by some of our colleagues.

3.1.5 Line – the animal-free testing convert – Denmark

I always aspired to do research on human health, but the specific field I am in is a result of networking more than me seeking it out. I actually started with the intent of working with animals because I thought that I could help the animals "from the inside". So the animals used would be as few and as well taken care of as possible. I am glad that I changed my course, because it is stressful to be around animal suffering every day. I was never put in a position where I was forced to use animals, but I have colleagues that use animals and I am forced to evaluate their results. For me the encouragement to pursue this path came from the group that I am in now (Lisbeth E. Knudsen). I didn't choose the institution particularly because of the focus on non-animal research, but the ability to work on entirely human tissue is very interesting from a scientist's point of view, especially when researching human health, the use of animal models will always be less accurate than using humans.

I haven't encountered challenges in furthering my career without the use of animals, so far I have had only triumphs and support in avoiding the use of animals

I think the undergraduate level is the hardest when it comes to avoiding animals. Often you are not able to choose, as the institutions are streamlined and every student has to do the same courses.

3.1.6 Liz – The slow burner – UK

I was generally interested in the Sciences and did A' levels in Biology, Chemistry and Physics. In Biology we had to do one rat dissection. At this time I was a vegetarian at home but still eating fish etc. when visiting other people's houses as I didn't have the confidence yet to exert my vegetarian status fully. The same went for the dissection really, I was concerned about animal welfare and didn't want to do the dissection but I wanted to pass the course and go to University. It was said we could apply to dissect a plant but that we wouldn't get as good a mark. I don't know how much of this was rumour and I should have stood my ground more and insisted but I was young and lacked confidence. I regret this and have been trying to make up for it since!

When I went to University I became a strict vegetarian and I didn't study Biology in part due to advice at College that it would involve a lot of dissection and I was still going for avoidance rather than fighting for change. But also I'd done a work placement in the chemical industry and enjoyed it. However, during the course of my degree I was more and more drawn to the options that involved a Biological element. So for my MSc I chose to do Toxicology, with the long term aim of working in a hospital and thus with humans, not animals. I spoke with a friend who had completed the course and ascertained there was no practical animal work involved though of course the lectures largely dealt with animal testing which was tough to hear at times. In practice there was no animal work bar one experiment where we were given urine from 2 rats to compare, one that had been given aspirin and one that hadn't. The University bought these samples commercially, to my knowledge no animal work was going on under our noses. I still wasn't happy about it but it was such a tough year, I was exhausted and I'm afraid I let it go.

Probably for me, undergraduate level was the most difficult step in my career path, as I chose a degree away from Biology to avoid animal use. At school I didn't really realise yet I was pursuing a career without the use of animals. Though for more aware youngsters it could be at this early stage they are put off. By post-graduate level I had decided I specifically wanted to pursue a career in alternatives and this was the basis of the research so there was no conflict. As a post-doc the problem may be lack of funding and as an adult you normally have more responsibilities, house, family etc. and working for free to follow your beliefs is not always a practical option. Additionally, as a researcher you have to be prepared to justify and prove the value of your work to the scientific community on a regular basis which can be tough.

I got a graduate job in a hospital tox-lab but due to NHS redundancies found myself looking for a job 12 months later. I got a job with a cancer prevention unit. First of all I was examining human samples, breast tissue etc. gained during biopsies and surgery, for biomarkers of cancer, but then was required to test organs from experimental animals. I was still training and learning but felt that the experiments were not always well planned and the animal data derived was not always very informative. At this point I started reading more about replacement toxicology which was an emerging field and realised I had to take more proactive action as opposed to just going for jobs that happened to not involve animal work and hope for the best. I contacted my now boss literally by googling *in vitro* toxicology, etc. and luckily found he had funding for a PhD student to study Neurotoxicology *in vitro*, by developing a brain model using human cells. This was a double bonus as a lot of *in vitro* work then and now involves using animal cells and although that greatly reduces the numbers of animals involved in experimentation, may not provide the data most relevant to the human situation. I moved to Birmingham and did my PhD followed by a post-doc funded by the Humane Research Trust. University funding for replacement alternatives research seems to come mostly from these brilliant but small organisations rather than the big companies who seem to focus more on reduction and refinement, although this may just be a perception and may be changing in light of recent legislation. I felt very lucky, my supervisor is hugely dedicated to replacement, the work was interesting, I was learning a lot and the model we developed was very promising. I also got to attend In Vitro Tox conferences and meet other people with the same aims and new ideas. We came up against some resistance from traditional toxicologists, as obviously, as consumers and patients, we want to be healed and helped but also safe guarded and this currently involves testing substances on animals. Also occasionally from those in our own field of *in vitro* toxicology as models using animals cells were frequently seen as the gold standard. Our driving aim then as now is not just the animal welfare issue but the development of models and methods that better reflect the human condition, human based models which hopefully in the future will provide data on chemical toxicity that is simply more relevant to humans than that derived from animals. It a huge undertaking, especially for small University groups with limited man power and resources, compared with the larger devoted organisations in Europe and the USA. But the more people working to the same aim the better, though it would be good to have greater collaboration and more funding opportunities.

After my first post-doc, despite the promising nature of the brain cell model, my supervisor was unable to secure further funding. By this time I was married, had a mortgage and a baby and was more limited in where I could apply as I needed a job locally but obviously would not consider working with animals. I was lucky enough to get a technician post which involved using tissue from Alzheimer's patients. I was hopefully helping patients and not involved in animal work but it was a step away from the long term aim of demonstrating whether a) our human brain cell model could provide the most relevant data regarding the response of humans to drugs, b) it is flexible enough for use with other chemicals, ingredients and cosmetics etc. and c) it

is robust enough for examining repeat-dose and not just acute effects as this is very difficult to do *in vitro*. We kept applying for funding as I really felt I had to get back to my original work for myself but also the sake those who'd supported me thus far. Thankfully due to the Lush prize to examine the response of the brain model to repeat/long-term exposure to cosmetic ingredients and post-doc fellowship funding to develop the model to examine the effect anticholinergic drugs may have on brain cell function (interestingly from the British Brain Research Fund, not a humane research organisation, simply one interested in using the best tools for the job and who had faith in our concept) I was able to get back to my research aims, though come March 2014 I'll be job-hunting again.

Because I have now chosen a career that specifically deals with developing replacement models, with a supervisor specifically involved in this field, avoiding animal use is not an issue until I find myself unemployed. But due to still being an emerging field, employment opportunities and funding are an issue,as is convincing our traditionalist colleagues of the worthiness of our research. Though as it an emerging field we hope opportunities will increase. In fact a PhD colleague of mine got a job with the Cosmetics and Perfumeries Association that was specifically created due to the ban on animal testing, though she had to move to London. And my colleague has been awarded a newly created lectureship in stem cell Biology due to his track record on developing human cellular models for investigating neurodevelopmental toxins and diseases of ageing.

So yes, animal use in the Life Sciences is probably a barrier to those who wish to avoid animal testing but it's hugely complicated. There are jobs that simply don't involve testing but you need to be flexible about where you live and work. I don't know much about the current animal testing requirements of the various degrees and whether alternatives have to be available. You can direct yourself specifically towards being trained in alternatives to animal testing but will come up against resistance from traditionalists in your field and there is huge competition for funding but at least it's an expanding/emerging field so hopefully things will improve. And it's not simply a case of saying, well let's just do away with animal testing because the alternatives are not advanced enough to replace animals yet, we need funding to progress them and after that need to validate them in order to prove they can provide the best safety information which takes time and collaboration with the right organisations which isn't easy to achieve. It's not a simple career path to follow, can be frustrating but very rewarding. I wouldn't have got this far without luck and the support and faith of a lot of different people and I'm sure getting involved with developing alternatives to animal testing rather than just avoiding animal testing is the way forward. Though I am only involved in this at a post-doctoral research level, I am not involved with any campaigning to change the way degrees are taught etc. Though many Biology degrees, including those at my current institution are expanding to include modules on stem-cell biology and how cellular models may be used in life sciences research and particularly how (animal welfare aside) the use of human models may prove more relevant to human health and safety that using

animals. To get the majority of people onside it really has to be a combination of animal welfare concerns and using the best tool for the job, which ultimately we aim to show is using human material to examine human responses.

3.2 Summary

The testimonies of these individuals largely speak for themselves. The responses point to the importance of dedicated centres or research groups, and these should be supported. Those who find themselves outside such institutions or teams are more likely to feel stranded and isolated and perhaps it is those students therefore, towards whom support should be targeted. Then again, Liz did have the support of a research group dedicated to replacements but still struggled to find funding and it is very clear that being awarded the Lush Prize has been instrumental in allowing her to go back and pursue her chosen path.

4 Last year's Young Researcher winners on the Lush Prize

4.1 Line

The Lush Prize is a great encouragement and has helped me to recruit the next generation of students and spread the good word! It allows independence and thinking freely without having to rely on the rules from funding agencies. I think the amount is fine for a real project, as long as you don't have to pay your own salary. The awareness the Prize creates is a big issue! The forum of Peers thinking the same way as you from all over the world is awe inspiring.

I think the undergraduates and post graduates should be supported by information sharing, and the post-doctoral level by funding.

I think the ecological aspect should gain some focus. For example, the use of alternative methods could sometimes be more environmentally costly (cell cultures require a lot of plastic and energy, production of robots and elaborate machines use more energy than an animal), I was missing some information and focus on this.

4.2 Chiara

First of all, I am very honoured to win the Lush Prize award in 2012 and to have been part of this movement, focused on anima-free research and testing. The Lush Prize 2012 has allowed me to fund my research. The experimental design, for the Lush Prize 2012, was presented to support the research and development of innovative *in vitro* methods for the assessment of the potential of sensitisation and inflammatory processes induced by

chemical mixtures, respecting and improving the quality of animal and human life. I am driven to work in this field, because I believe it is possible to consolidate, standardise and generate innovative analytical procedures, that employ the use of alternative models to animals, through the definition of new protocols for monitoring the risk associated with exposure to chemical mixtures analysed in the project with identification of new biomarkers for the identification of new scenarios of exposure and the risk for human health and the ecosystem. Thanks to Lush Prize and the dissemination by many web sites (dedicated to *in vitro* models or to the safety of animals) the visibility of our research group has increased. Indeed we have an increase in training participants in our theoretical and practical courses on *in vitro* models; moreover several industries have just contacted us for a collaboration. The amount of the prize is meaningful, being equivalent to a one year Italian fellowship. I think initiatives like the Lush Prize are very important to encourage experimental research by *in vitro* models.

4.3 Felix

The Lush Prize has come as a motivational piece into my scientific career. It not only contributes financially, but also by acknowledging that non-animal research does has significance in the scientific community. It has also helped in promoting our scientific human-based approach within the scientific and non-scientific community. In addition, the Lush Prize has helped make other colleagues give credit to our non-animal approach. Initiatives like this one are great ways to motivate others to follow their approaches and go outside animal-based research. It can also benefit those in the early stages by contributing to expand their scientific network and get access to materials necessary to perform their research. I do consider that the amount of the award is enough to be meaningful. However, I also consider that the door could be open for future considerations regarding the amount of the price based on the increased cost of research and scientific training these days.

4.4 Liz

Whilst the LUSH prize wasn't enough to fund a post-doc salary and consumables it was certainly meaningful and gave me the encouragement I needed to leave a reasonably interesting and permanent job as a technician and get back into replacement research. The nomination process etc. reconfirmed my belief that our brain cell model has the potential for use in repeat-dose toxicity testing. However, I am only able to work on the project part-time as my main fellowship funding and salary comes from a different organisation, though the projects are complementary and involve development of the same brain cell model.

Whilst the prize isn't enough to fund a whole project it is enough to obtain meaningful pilot data and this proof of concept is often what is needed to secure full grant funding and so this sort of start-up grant almost could be vital in the early stages of a young researchers career to enable progression.

Though for grants the period between application to award time can be a long and uncertain.

That the funding was aimed at replacement only was encouraging also as often 3Rs funding seems to go to reduction and refinement projects, though this may just be my perception. Similarly that everyone at the Lush prize awards day/dinner were celebrating and working towards the same aim was really encouraging.

Also, it enabled me to pursue an area I have previously been unable to due to lack of funds, namely the removal of animal products from the *in vitro* process. The culture of cells *in vitro* frequently employs the use of Foetal Calf Serum (FCS) as a growth factor supplement. This is taken from foetuses of the pregnant cow following slaughter in commercial slaughter houses. Other factors such as antibody production and use of bovine serum albumin in assay processes were also a consideration. Ideally I would like to remove animal products from my model for ethical reasons but also to more fully humanise the model and make it more relevant. Replacement chemically-defined cell culture products are becoming available but at a cost of up to 10 times that of the animal equivalents. Grants are often not able/willing to factor in these extra costs and also it takes a large number of man-hours to adapt a cell model to growth under new conditions and prove it is functioning as it should. The Lush prize has enabled me to overcome these cost barriers.

Additionally, it has enabled me to begin examining the response of the cell-model towards potentially neurotoxic cosmetics and ingredients. This was an area I had wanted to examine as we hope to eventually demonstrate the model to be flexible and useful for drug, chemical and cosmetics testing. This would potentially increase funding opportunities and also help further the advancement of replacement research more broadly.

As for how the Lush Prize could be expanded, I wonder if maybe a Lush conference or workshops… prize funding could fund travel and accommodation and presentations could involve alternatives research, training etc. and get to meet others in the field, share ideas and practical advice on how to proceed/validate etc. Indeed it was great to meet people at the Lush awards involved in training etc. and not just research. Advice on how to progress research to the validation stage would be invaluable. Whilst the IVTS and ESTIV run excellent annual conferences, PhD and post-doctoral funding doesn't always stretch to conference attendance, though I was lucky enough to get a bursary to attend a couple based on my research record. Perhaps attendance could include those at college or school to encourage them but I'm not sure if this would be feasible. Also as I am snowed under and want to do the best by all my funders I am considering using some of the Lush Prize to fund a short-term undergraduate placement student who wishes to avoid animal use, to help with the workload but also train them in cell culture and perhaps encourage them to pursue this route. The prize of £10,000 may be enough to fund a year-out student and so could the Lush prize consider this as an award? Academic and Industrial institutions could apply with projects they would like funding and then seek a suitable candidate to support

in alternatives research? I think it has to be specific in this aim, not just people jumping on band-wagon to obtain funding, with no proven track-record of an overall aim in replacing animal testing as this diminishes meaning.

5 Identifying worthy candidates

Last year there were 6 nominations for the young researcher category, of which 4 won. This year we have received ten nominations of which 8 were worthy of consideration and 6 have been short listed. This year four of the nominations came from colleagues in more senior roles. This points to the fact that the young researchers we want to target are less aware of the award than more senior colleagues, indicating that somehow we aren't reaching them. This demonstrates a need to develop our communication strategy for this award. It also seems that contacting key scientists in the field and specifically inviting them to nominate their students might also generate nominations. However, we should also be aware that it is students outside existing networks, specialist centres and research groups who are likely to be in most need of our support. The animal rights/welfare community could be a good place to target communications around this award as those struggling at the first stages could be tapped in these networks. It is important to note that the two young people who exited the life sciences over animal use were both (and still are) involved in animal rights campaigning.

As one of the unsuccessful young researcher candidates indicated last year - 'Just the idea of the Lush Prize has given me more motivation to move forward with my research!' (on computer modelling). So even knowledge of the prize could encourage people to keep going.

6 Conclusion and recommendations

The status of dissection on the curriculum varies greatly from country to country – from India where dissection has actually been banned from both school and university curricula, to the UK where a more 'personal choice' stance seems to apply, to other European countries where conscientious objection to dissection can involve a legal battle. It appears that globally, real progress towards humane education is being made.

Information on dissection at UK universities was not easily obtainable, which could be a major barrier to those wanting information on animal use before even considering whether to apply for a course in the life sciences.

The experience of young researchers choosing to avoid animal experiments varies greatly depending on the situation they find themselves in. Interviews pointed to the importance of centres or research groups dedicated to animal alternatives. It is clear that those students lucky enough to find themselves at

one of these institutions have a much easier time in pursuing this career route. That said, there are still obstacles and challenges, including funding issues and resistance from those working outside these institutions. One young researcher did have the support of a research group dedicated to replacements but still struggled to find funding and it is very clear that being awarded the Lush Prize has been instrumental in allowing her to go back and pursue her chosen path.

Those who choose this often difficult path outside specialist institutions may face a very tough time – the two we interviewed ended up changing career, in large part due to issues around animal use – so perhaps it is those who the Lush Prize should aim to support.

The Lush Prize can make a meaningful contribution to encouraging young researchers working in the field of animal-free toxicology to pursue their chosen path. It is clear that last year's Lush Prize was instrumental in allowing one researcher to go back to her chosen path in animal-free toxicology work. Last year there were concerns raised in the Background Paper that the amount per student was not sufficient to be considered meaningful, however feedback from last year's winners indicate that this is not the case. Responses highlight the importance of its focus on replacement and indicate that the Prize has served as a big motivational boost and raised the profile of non-animal work.

There are a number of organisations working at the school curriculum level either by lobbying for change or by providing resources to help educators teach without using animals, and there is overlap with the Training category here. The reach of the Young Researcher category could potentially be re-considered to include these initiatives; perhaps this is an area that warrants a category of its own, or it could be the particular focus of the training prize in one year.

Rewarding organisations which target school curricula with the aim of encouraging more young scientists to come into the academic arena with an ethical stance on animal use could be a way of reaching more young people. However, without the structural support for these students post school or first degree level, they may simply end up exiting the life sciences without realising their potential for achieving change in this area. The young researcher award as it is provides meaningful encouragement to those already on this often difficult path and has already proved itself to be effective at driving change in this area.

6.1 Identifying worthy candidates

We received more nominations this year than last, but still only 8 worthy of consideration with four of these coming from colleagues in more senior roles. This points to the fact that the young researchers we want to target are less aware of the award than more senior colleagues indicating that somehow we aren't reaching them and highlighting the need to develop our communication

strategy for this award. It also seems that contacting key scientists in the field and specifically inviting them to nominate their students might also generate nominations. However, it is students outside existing networks, specialist centres and research groups who are likely to be in most need of our support.

Looking ahead it seems the biggest challenge for the Young Researcher award is making more potential recipients aware of its existence. Developing a communications strategy with this in mind should be a key task for the 2014 Lush Prize. Although the award is designed to reward a maximum of five researchers each year, raising awareness of its existence will provide motivation and encouragement to many more.

Appendix I

Organisations identified in the 2013 Training Prize paper which are working at school or university level on non-animal teaching method.

The New England Anti-Vivisection Society (NEAVS)

In 2013, NEAVS offered 13 places to the 1st International Conference of Alternatives to Animal Experimentation, in Almada, Portugal for students wishing to pursue a career in alternatives to animal experimentation. NEAVS also operates an alternatives loan library, through its Ethical Science Education Campaign (ESEC). ESEC works to ensure all students can enter the field of science and be a part of the breakthroughs of today and tomorrow regardless of their ethics.[11]

Alexandra Association, Monaco (Alternatives to Experiments on Animals Designed to Research Applications)

As well as educating existing scientists and laboratories the Alexander Association operates in schools and has organised sessions for students on animal testing and currently available, alternative methods in various schools in Monaco where they are based.[12]

InterNICHE, UK

InternNICHE has worked tirelessly around the world in encouraging the adoption of replacements to animal use on academic curricula.[13]

CAAT and CAAT-Europe (USA/Europe)

Both centres aim to promote humane science by “supporting the creation, development, validation and use of alternatives to animals in research, product safety testing, and education”. These centres would be safe havens for budding young researchers wishing to avoid animal use, although they promote the 3Rs, rather than replacement only, they don't use animals.[14]

Doctors Against Animal Experiments, Germany[15]

The organisation has recently published a “trilingual website in Russian, Ukrainian, and German” to inform and educate students and teachers of the organisation’s Eastern European project which has so far mainly worked in

[11] http://www.neavs.org/resources/esecs-inventory-of-alternatives-to-dissection
[12] http://alexandra-project.org/en/
[13] http://www.interniche.org/
[14] http://caat.jhsph.edu/about/, http://caat.jhsph.edu/ http://cms.uni-konstanz.de/leist/caat-europe/
[15] www.aerzte-gegen-tierversuche.de/en/

the Ukraine, providing alternative teaching aids in return for agreeing not to use animals.[16] It has also financed the production of educational films in Russian. It maintains the website “Harry Helps Animals” aimed at children and young people of 10 to 13 years,[17], has created teaching materials related to animal testing, and offers animal welfare education in three regions of Germany where trained animal welfare teachers work in schools focusing on animal testing. [18]

LARF: The Analysis and Research Laboratory of Pathophysiology, Department of Experimental Medicine, University of Genoa, Italy

LARF has been involved in *in vitro* experiments using the twenty years’ of experience of its staff in various fields of experimental pathology and is another 'safe haven' for those wishing to avoid animal use. [19]

Animalearn

Animalearn, a US initiative, involves a website dedicated to fostering “awareness of and a respect for animals used in education”.[20] .It has created The Science Bank, a “lending program of new and innovative life science software and educational products that enable educators and students to learn anatomy, physiology, and psychology lessons without harming animals.” It also provides humane education curricula and materials free of charge for educators and students.” It conducts workshops – for free – for educators wishing to implement the animal-free programmes and products and delivers presentations to students and student organisations. It also delivers presentations to classrooms. All levels of education are covered, from elementary school and even pre-school, through to university levels, graduate level, veterinary school, and medical school.

National Anti-Vivisection Society (US)

The US-based National Anti-Vivisection Society (NAVS),[21] (not be to be confused with the UK organisation of the same name, created an information resource known as the Biology Education Advancement Program (BioLEAP) in 1993 which is now the most “comprehensive free lending library of alternatives to classroom dissection” and offers a “growing archive of state-of-the-art dissection alternatives to students, teachers, school boards and others”, [22] aimed at all levels of education – from high school, right up until post-graduate work, and which represent a selection of animals. BioLEAP enables students and educators who object to, and wish to avoid, dissection to do so while still fulfilling their academic requirements.

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16 http://www.altex.ch/News.17.html?ncat=1&eid=304
17 http://www.harry-hilft-tieren.de/
18 http://www.aerzte-gegen-tierversuche.de/en/projects/eastern-europe/277-further-successes-in-ukraine
19 http://www.larf.unige.it/
20 http://www.animalearn.org/
21 www.navs.org
22 http://www.navs.org/page.aspx?pid=416

Animal Aid

UK based organisation Animal Aid's Education Department produces educational materials around the issue of animal testing and has a free school speakers service. Its network of trained, volunteer school speakers is available to give talks or run workshops on a range of topics, including animal experiments.

Royal Society for the Prevention of Cruelty to Animals (RSPCA), UK

The RSPCA has a dedicated website with a range of resources for use in schools to stimulate debate around animal cruelty – and including animal testing. A lesson plan is included and a number of factsheets are available to download: Ethics, Animal Experiments and the lLaw;, Fundamental rResearch, ; hHarm/bBenefit aAssessment, ; hHumans and oOther aAnimals, ; mMedical rResearch, ; rRight or wWrong, wWho dDecides, ?; sSafety tTesting of nNon-mMedical Pproducts, ; andvVeterinary rResearch.[23]

[23] http://www.science-ethics-animals.org.uk/page/index.cfm

Appendix II

Questions put to university life sciences admissions offices:

1. Is dissection part of the curriculum for any courses at your institution?
2. If so, are there alternatives available for those students who do not wish to take part?
3. Are these alternatives offered automatically or only on request?
4. Do students encounter resistance to conscientiously objecting to animal use?
5. Are students penalised in terms of their grades for refusing to participate in dissection?
6. Is this information freely available to students in advance of enrolment?

List of universities contacted:

University of Birmingham
University of Bristol
University of Cambridge
Cardiff University
Durham University
University of Edinburgh
University of Exeter
University of Glasgow
Imperial College London
King's College London
University of Leeds
University of Liverpool
University of Manchester
Newcastle University
University of Nottingham
University of Oxford
Queen Mary, University of London
Queen's University Belfast
University of Sheffield
University of Southampton
University College London
University of Warwick
University of York

Appendix III

General young researcher questions:

- Have you ever considered a career in the life/biological sciences?
- Did you pursue this?
- If not, why not?
- If so, were you asked to do dissection?
- Did you want to do it?
- How did you feel?
- Did you agree to do it?
- How did this make you feel?
- If not, were you offered an alternative?
- Was the alternative freely offered?
- Was there resistance?
- Did you feel excluded from the course?
- How did this make you feel?
- Did your grades suffer as a result?
- Did you continue with your studies in the life sciences?
- If not, was animal use a factor in stopping?
- What are you doing now?

Please expand discursively below if you have anything more you wish to share regarding your experiences regarding with animal use and the life sciences. We are particularly interesting interested in ascertaining whether the widespread use of animals in the life sciences is a barrier to those people entering the area who would be driven to find alternatives to animal use in research and testing due to the use of animals in the field. Your thoughts on this would be very valuable.

Appendix IV

Interview questions for young researcher winners:

- Did you always aspire to do the kind of research you are involved with?
- Did you always aspire to work without the use of animals?
- Was this ever difficult (i.e. were you ever put in a position werewhere you were expected to use animals)
- Did the decision to work without animals come from encouragement/ the opportunity to do so from an institution (the one you're at now or another one) or was it motivated entirely by yourself?
- Did you choose that institution particularly because of the focus on non-animal research?
- Have you encountered challenges in furthering your career without the use of animals?
- Has the non-animal aspect of this been a particular issue?
- How has the Lush Prize helped you overcome these challenges?
- How else has it helped you further your research?
- Do you think the amount young researchers are awarded by the prize is enough to be meaningful?
- How important do you think initiatives such as the Lush Prize are in helping those who are at the early stages of a research career without the use of animals?
- Where do you think the most difficult step is in the career path of those wishing to pursue a career without the use of animals, i.e. at school, undergraduate, post-graduate or post-doctoral level? Which of these stages has been most difficult for you?
- Please let us know any other ideas of how the impact of the Lush Prize could be expanded, e.g. how and where it could be targettedtargeted? (both age groups and particular institutions) and whether you think the resources could be used differently to maximise the impact of replacing animal testing through on young researchers.
- Please share any other experiences you've had as a young researcher working without animals that could be interesting or useful for us to know for this the background paper we are compiling for the young researcher element of the Lush Prize.