

## NON-TECHNICAL SUMMARY (NTS)

NOTE: The Secretary of State considers the provision of a non-technical summary (NTS)

<b>Project Title</b> (max. 50 characters)	<b>In vivo study of sound transmission to the third trimester fetus</b>		
<b>Key Words</b> (max. 5 words)	Fetus, ear, sound, in-utero, pregnancy		
<b>Expected duration of the project</b> (yrs)	5 years		
<b>Purpose of the project</b> (as in section 5C(3) <sup>1</sup>	Basic research	Yes	
	Translational and applied research	Yes	
	Regulatory use and routine production		No
	Protection of the natural environment in the interests of the health or welfare of humans or animals		No
	Preservation of species		No
	Higher education or training		No
	Forensic enquiries		No
	Maintenance of colonies of genetically altered animals <sup>2</sup>		No
<b>Describe the objectives of the project</b> (e.g. the scientific unknowns or scientific/clinical needs being addressed)	<p>Preterm born babies are cared for in the Neonatal Intensive Care Unit where they are exposed to high volumes of sound emanating from the equipment such as ventilators, monitoring alarms and pumps that are used to care for them. The noise results in a stressful environment in which these fragile immature babies have to grow. The intense, sustained noises or impulse sounds associated with the use of this equipment are known to have a direct detrimental effect on newborn heart rate and oxygen levels. This may contribute to the general stress of the baby and could therefore delay and/or impair development of the immature baby brain. We aim to develop a physiological sound barrier to be incorporated in incubators used to care for preterm born babies to reduce the risk of immediate and long term side effects associated with the exposure of artificial environment sounds on the immature human brain.</p>		
<b>What are the potential benefits likely to derive from this project</b> (how science could be advanced or humans or animals could benefit from the project)?	<p>This project will improve our knowledge of the acoustic environment of the baby in the womb in-utero during the last third of pregnancy, which is the period when the development of hearing and corresponding auditory cortex takes place in most mammals. This will provide us with the physiological background to better</p>		

<sup>1</sup> Delete Yes or No as appropriate.

<sup>2</sup> At least one additional purpose must be selected with this option.

	<p>understand how this development is protected in utero from outside sounds. There is mounting evidence that preterm born babies are particularly sensitive to the intense, sustained noises or impulse sounds associated with the used of intensive care equipment and that this non-physiological sound environment may impact their immediate and long-term outcome. The data obtained by the proposed experiments will contribute to the development of neonatal incubators to provide the premature neonate with better protection from artificial sounds and to reduce/prevent some of the long-term side effects associated with prematurity and long-stay in intensive care.</p>
<p>What species and approximate numbers of animals do you expect to use over what period of time?</p>	<p>We plan to use a maximum of 12 pregnant sheep, 6 at 100-120 days of gestation and 6 near term (140 days). Each experiment will involve 2 animals (experimental and companion). We will allow the experimental animal to recover in the pen from the general anaesthesia and the surgical procedure for 3-4 days to minimize the possible effect of the post-operative stress on both the mother and fetal responses to sound.</p>
<p>In the context of what you propose to do to the animals, what are the expected adverse effects and the likely/expected level of severity? What will happen to the animals at the end?</p>	<p>We do not anticipate more than a 5% complication rate and we will inform and take advice from The Named Veterinary Surgeon in case of any major adverse events. Minor complications could include a wound infection, haematoma or even a hernia. Before parturition, terminal general anaesthesia will be induced in the ewe using a suitable injectable agent and maintained with inhaled volatile agents. We will perform a laparotomy to identify the position of and remove the monitoring equipment. Ewe and fetus will then be killed by a schedule 1 method while under terminal anaesthesia without recovering consciousness.</p>
<p><b>Application of the 3Rs</b></p>	
<p><b>1. Replacement</b> State why you need to use animals and why you cannot use non-animal alternatives</p>	<p>It is not possible to insert hydrophones or any other recording equipment into the amniotic cavity of a third-trimester human pregnancy due to the inevitable associated surgical risk to the mother and likely pre-mature delivery of the fetus.</p>
<p><b>2. Reduction</b> Explain how you will assure the use of minimum numbers of animals</p>	<p>We are currently developing a computer model in collaboration with the department of medical physics &amp; bioengineering at UCL using historical data from the literature and in-vitro laboratory acoustic experiments. If the first series of experiments validates the model we will only need to evaluate the effect of gestational age by comparing data obtained at 100-120 days and 140 days in a series of 6 pregnant sheep.</p>

<p><b>3. Refinement</b> Explain the choice of species and why the animal model(s) you will use are the most refined, having regard to the objectives. Explain the general measures you will take to minimise welfare costs (harms) to the animals.</p>	<p>The development and anatomy of the hearing system is similar in all mammals including marine mammals. The general anatomy and size of the ewe uterus is similar to the human. The lambs from medium to small breeds are similar in size to human babies, usually between 5 and 12 pounds, with an average of 8 to 10 pounds. The animals will be recovered after the surgical procedure for a few days to ensure that they are healthy before we perform the experiments. We will minimise the animal suffering by using telemetric monitoring without needing to confine the animal's movement.</p>
--	---