Biosocial Worlds

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Published by University College London

Seeberg, Jens, et al.
Biosocial Worlds: Anthropology of health environments beyond determinism.

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Chapter 3

Pig–Human Relations in Neonatology: Knowing and Unknowing in a Multi-Species Collaborative

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Translating pigs into human health

‘Okay, so we are your piglets?’ some of the researchers in a pig facility at the University of Copenhagen teasingly asked my graduate student Mie S. Dam and me in 2014. Since 2009, I had followed them in their experimental practices of making piglets into models of human infants to advance nutrition and health for prematurely born infants in the neonatal intensive care unit (NICU). I conducted fieldwork in their pig laboratory, at scientific seminars and conferences, and in the human NICU at the University Hospital. The comments about the researchers being ‘our pigs’ put on equal footings the researchers as resources in our knowledge production and the piglets as resources in theirs. To me, it raised questions about how something or someone becomes a resource and it brought into view the ways in which resource-imagining and resource-making were at the heart of both social science and natural science. In this chapter, I critically assess the conditions that facilitate the appropriation of the pig as a resource for human health and the foregrounding and backgrounding of what is acknowledged about this appropriation when the bench and the bedside are brought together within the same research framework. I end with a short discussion of the cultural knowledge made possible in the multi-species and multi-disciplinary collaborative in which the researchers could jokingly figure as ‘our pigs’.

In the introduction to their edited volume, Timely Assets, Elizabeth E. Ferry and Mandana E. Limbert state that although we may see stone, forest or livestock as obvious resources, nothing is intrinsically or self-evidently
a resource (Ferry and Limbert 2008a). Rather, the concept of resource entails ‘ideas of the world as available for human use, and of that use as the basis of proper human society’ (Ferry and Limbert 2008b, 8). This also implies that the Euro-American notion of resource presupposes a separation between human exploiters and the ‘nature’ exploited (Ferry 2008, 52). Anthropological scholarship from different parts of the world illuminates that resources are not conceived in the same way everywhere. In hunter-gatherer societies in different parts of the world, relationships between humans and hunted animals are lived as long-term social relationships and forms of kinship (Conklin 2001; Nadasdy 2008; Willerslev 2007).

In the following text, I am particularly interested in how resource-making is practised in the administration of life and death in Danish translational medicine and what notions of the ‘proper’ human society come to the fore. How does resource-making, which in the laboratory is closely linked to making (pig) life and death, carry moral reasoning and future orientations? How is the pig as a proxy for the human presented when bringing the animal resource out of the laboratory? How is the value of life negotiated in managing limited resources in the neonatal intensive care unit?

To answer these questions I draw on my fieldwork in three sites that are part of the infrastructure of translating pigs into human health: The pig laboratory in which premature piglets are put in incubators, taken care of and eventually killed to become valuable samples in paediatric gastroenterology research; the semi-public spaces of scientific conferences in which pig-based research is presented to various actors in the field of translational medicine; and the human NICU where preterm infants or seriously ill term infants are treated and where resource scarcity and resource imagination also enter into life-and-death decisions. I investigate the various forms of unknowing that, for good reasons, the researchers and clinicians engage in, and argue that such unknowing is part of a complex boundary work that upholds existential inequalities between human and pig, and existential equalities between human infants. I begin with a short introduction to the broader landscape of appropriating the pig in Denmark.

**Imagining and claiming pigs as resources for health**

For centuries, the welfare of the Danish population has largely relied on claiming the pig and other livestock as a resource for humans and breeding it for food. Breeding practices have been based on systematic selection
and have resulted in the ‘local biology’ (Lock 2001) of the famous Danish pig with leaner meat, an extra rib and large litters. While the Danish population is less than 6 million people, the number of pigs produced per year amounts to approximately 26 million. This number is the result of a huge scaling-up of pig production in the mid-twentieth century and illuminates the pig as a ‘world-defining creature’ (Blanchette 2015, 648) shaping the Danish landscape and its economy as agribusiness, providing a sizeable portion of the state’s income, and thereby contributing considerably to the welfare of the general population. Put differently, a shaping of pig lives and bodies on the one hand and the creation of welfare and health of Danes on the other has continuously taken place. While many Danes are ambivalent about the precarious pig lives in pig production and the pollution of Danish waters due to discharge of slurry from pig farms, pork is still a staple diet of most Danes and pigs are considered mundane production animals that contribute to a familiar fabric of living. In many ways, the pig occupies the same role in the Danish cultural and political economy as the sheep in the UK (Franklin 2007), salmon in Norway (Lien 2015) and cows in the Netherlands (Taussig 2004).

Within the Danish agricultural field, the Danish pig breeding programme is seen as a national achievement and a treasure to be protected, yet the large litters of the Danish sows have also resulted in rearing problems. Often the sow does not have enough teats to accommodate the entire litter and piglets are born less mature, a circumstance that might be related to the lean tissue growth and the large litter size (Sangild et al. 2013). The litter hierarchy, which is established within the first day after birth, leaves the weaker piglets either without access to colostrum, the highly nutrient-rich first milk after birth, or with access to only the low-quality colostrum of the back teats (Bollen et al. 2010, 9). Due to their weak condition, hypothermia and poor access to milk, 25,000 newborn piglets die every day in Denmark (9 million every year). The high mortality in the farrow stables, which is a general problem of intensified pig production, has been frequently discussed in both the agricultural field and the daily press in Denmark, and research has been initiated and solutions developed such as better feed products and heating for the newborn piglets. One of the feeding solutions comes from a small company in Southwest Denmark that has developed a milk product consisting of whole bovine colostrum. The bovine colostrum is collected from dairy farms in Denmark and subsequently homogenised, pasteurised, spray-dried and turned into a powder easily dissolvable in water, and administered at the pig farms.
At the other end of Denmark, at the University of Copenhagen, the immature piglets of the large litters and the bovine colostrum product have become central in imagining and claiming Danish pigs as resources for infant health globally. At the University of Copenhagen, the researchers I collaborate with have studied paediatric gastroenterology for the last 20 years using the Danish pig as a model. They find the local biology of the immature piglets from Danish food-production to be excellent models of weak infants at risk of the devastating and life-threatening inflammation of the gut, necrotising enterocolitis (NEC), which is said to occur in 7 per cent of infants with a birth weight between 500 and 1500 g (Neu and Walker 2011). During their studies of the etiology and prevention of NEC, the group has developed a laboratory procedure in which piglets are removed prematurely by surgery (C-section), put in incubators, and provided with different forms of nutrition (for example, infant formula, bovine colostrum, human donor milk). The piglets come to develop NEC during the first 5 days, after which they are killed and their organs, especially the intestines, sampled and analysed. Some of the group’s most promising experiments show that the bovine colostrum product from the Danish company is as effective as human donor milk in protecting against NEC and is superior to both human donor milk and infant formula in stimulating growth, gut immunity and digestive functions in premature piglets (Jensen et al. 2013; Rasmussen et al. 2016).

To the researchers, their studies also indicate that the bovine colostrum product will have a positive effect on infants deprived of mother’s milk, a situation common in NICUs where premature birth makes it difficult to stimulate milk production and where breast-feeding often becomes challenging, leading to premature infants depending on formula or human donor milk. Thus, their hypothesis is that in premature infant feeding, bovine colostrum may be superior to infant formula, and maybe also to human donor milk. Based on similarities between preterm piglets and preterm infants with respect to size and the impaired respiratory, nutritional, immunological and metabolic responses after preterm birth, they envision a translational process in which the piglet literally stands in for the infant. The group in Copenhagen does not stand alone in their preference for pigs. Within the global scientific community, the recognition of important phenotypic and genotypic traits between humans and pigs has been central to the increasing use of pigs in biomedical research and the great interest in pig-to-human transplantation (Gutierrez et al. 2015). While such cross-species transplantations still prove difficult, the pig continues to provide a highly useful model of the human organism in a broad range of biomedical research (Groenen et al. 2012; Kuzmuk and Schook 2011; Swindle et al. 2012).
To realise the translational potential of using preterm pigs in gastroenterology research, the professor in charge of the pig laboratory received a prestigious grant from the Danish state in 2012 to establish a research platform, NEOMUNE, in which studies in piglets and mice are to be coupled with observational and clinical studies in NICUs in a number of countries. The vision of NEOMUNE is to develop new diet and microbiota treatments for normal and compromised newborn infants; and to establish adequate universally accepted clinical care procedures for infants with limited maternal care – an objective that embodies the idea of a universal infant biology to be administered by universal clinical care procedures. By collaborating with scientific and clinical partners from different countries as well as dairy companies, NEOMUNE incorporates the whole process from laboratory studies through clinical studies to marketable nutrition products commercially sold to NICUs/parents globally. NEOMUNE also includes a small social science study which examines the ethical, social and cultural aspects of translating across bench (the experimental pig studies) and bedside (clinical practices in the NICU). Heading this study, I – together with graduate student Mie S. Dam – have become part of the NEOMUNE team following and collaborating with the researchers and clinicians involved in taking care of piglets, data and infants.

In the clinical studies which are being initiated, clinicians in NICUs in China and in Denmark will ask parents to consent to feeding their preterm infants a refined bovine colostrum product approved for humans from the Danish company as part of investigating and documenting the efficacy of this nutrition in infants devoid of breast-feeding. Thereby the Danish piglets are seen as a central actor in paving the way for bovine colostrum to reach the stomachs of infants worldwide, and in bringing together scientists, industrial partners and clinicians from around the world. A powerful vision of optimising infant health globally through crossing geographical, cultural, disciplinary and species-related boundaries is at the core of articulating the pig as a resource for human infant health.

The realisation of this vision is highly dependent on connecting the locally produced colostrum product to the Danish piglets in the laboratory, and to clinicians, parents and infants in NICUs in China and Denmark. As the research director explained in an interview with my graduate student Mie S. Dam and myself in 2013: ‘If one day the Danish company is not here, the colostrum project will end, because I need to have someone to make the irradiation [of the colostrum] and do the testing and so on [...] and to know how to pack the substance and to secure a sterile
product [for the clinical studies].’ In other words, a long local tradition of appropriating Danish pigs and cows and turning their substances and lives into human welfare is inseparable from claiming pigs as resources for infant health globally. The history of the local biology of the Danish pigs (large litters, lean tissue growth) and the locally developed solutions to prevent the high death-toll in the farrowing stables (the administering of bovine colostrum), are hardly visible in the research objectives of ‘identifying milk and microbiota treatments through infant and animal studies’. However, Danish pig history and local solutions to piglet deaths are pivotal to imagining the piglet as a resource for infant health, and transmuting it into something completely other than a production animal – namely into a platform for developing scientific breakthroughs that will put NEOMUNE on the map of prestigious science, optimise infant health, and create promising business for dairy companies. To follow how the local is woven into promises of global connections and universal knowledge, I now turn to the first step of the research process: enrolling Danish piglets into the laboratory.

Making resources in the laboratory

It is early Monday morning and the sow, from a farm outside Copenhagen, lies anaesthetised on the table in the operating theatre surrounded by professors, graduate students, animal technicians and master’s students who each have specific tasks to do in relation to the C-section that is about to take place.1 The atmosphere is relaxed. Some of the students talk about the parties from the weekend just passed, and a graduate student asks everyone to take part in a guessing game about the number of piglets to be delivered. The quantity of the resource is of interest to everyone. For the master’s students, the C-section is part of their surgical training and hence the sow an educational resource. Standing next to them I follow how one piglet after the other is carefully lifted out of the large body and handed over to the graduate students who start ventilating the piglets and then moving them to a separate room where they are placed in heated, ventilated, humidified and oxygenated individual incubators. Twenty piglets in total are taken out of the womb. A group of both senior and junior researchers begin the work of providing each piglet with an identifying letter, determining their sex, weighing them, taking their temperatures, and putting all the data into the computer. They also insert catheters into the piglets and connect them to individual nutrition machines by which they will be fed during the study. The researchers’
determined and routinised work on connecting the nutrition machines to the anaesthetised piglets’ limp bodies underlines the piglets as unspecified ‘gut units’ to be turned into scientific tools for creating viable lives in the NICU. In other words, biological (and killable) pig bodies are projected onto biographical and (liveable) infant futures. The first step of this process is accomplished by enclosing the piglets in the laboratory, carefully following the protocol that is patterned after procedures in the NICU; and on the last day of the experiment by turning them into samples to be processed and analysed with the aim of gaining new insights into the critical neonatal period.

Daily laboratory practices in the following days, however, illuminate a much greater complexity. When the piglets wake up from the anaesthesia, they gradually gain individuality and in the days following the C-section, some of them become sick and suffer (for example, from respiratory distress). A team of four or five graduate students attend to the piglets with meticulous care day and night. Such care work in animal laboratories plays a constitutive role in the organisation of the experimental practice and shapes the animal bodies and the findings that result from them (Friese 2013). In the Danish laboratory, the piglets are not only enacted as unspecified guts that react to microbiota, but as sentient lives placed in relationships to the researchers who feed them individually, change their nappy-like cloths, and demonstrate great efforts to reduce their sufferings (Svendsen and Koch 2013). These exchanges between human researcher and research animal take place in small and ordinary interactions, as when the animal technician attends to a piglet that is not thriving and unwittingly pats her own stomach, saying, ‘Its stomach-ache sure must be painful.’ In such situations a kind of existential affinity – even kinship (see Dam et al. 2017) – between human and animal appears, thus contesting a strict separation between ‘human exploiters’ and ‘exploited resources’. Similarity and difference cannot be neatly determined, but go together (see Mol and Law 1994).

In the autumn of 2013, the group initiated a set of new studies that investigated how nutrition affects brain development. The cognitive development of the pigs was tested through 26 days. While the standard preterm model runs 5 days, it was a huge expansion to let the sometimes severely compromised piglets live for more than 20 days in the laboratory. In these experiments, the individual monitoring of the piglets had become essential to ensure the survival of as many as possible until day 26. While euthanasia sometimes, perhaps, seemed the most benevolent act towards the individual suffering piglet, the researchers
were painfully aware of the dilemmas of this act as they opted for statistically significant results and hence needed a certain number of piglets to survive to day 26. As I have heard numerous times in conversations in the lab, ‘a euthanised piglet costs a piglet at the other end’ (det koster en gris i den anden ende). ‘The other end’ refers to the monetary costs of enrolling one more litter into the laboratory, the laborious and time-consuming work of running the study, and the suffering of these future piglets that substitute the euthanised ones. Thereby ‘the other end’ points to the landscape of knowledge production of which the researchers are part, and the pressure on them to reach scientific results, to stick to the project plan and to complete graduate studies within timeframes settled by the grant proposals. Here the issue of scarcity, so integral to conceptualising something as a resource (Ferry and Limbert 2008b, 7), was not imagined as a possible depletion of pigs in Denmark, but experienced as a limit in terms of money, work and suffering.

In a group conversation about this issue that graduate student Mie S. Dam and I set up in June 2013, one postdoctoral researcher said: ‘The pig is a valuable resource. We don’t want it to die [before the scheduled time]. But [on the other hand] our individual treatment may also prolong suffering. So what is ethics here?’ It is important to note that ‘ethics here’ does not refer to animal ethics as understood within a bioethical framework of institutionalised rules and guidelines of professional conduct. In all their practices, the researchers carefully follow bioethical codes of conduct. By asking the question ‘what is ethics here?’ the postdoctoral researcher alluded to the ‘ethics’ that in spite of numerous guidelines will always have to be lived through one’s own body and sensations and is situated ‘here’ in specific spaces and interactions that are unique. In other words, she hinted at the moral peril (Mattingly 2014, 15) that each experiment holds.

Her question also highlights that claims about resources are not only acts that engage morality, but also time (Ferry and Limbert 2008a; Sharp 2014). As Ferry and Limbert state, ‘to define something as a resource is to suspend it between a past “source” and a future “product”’ (Ferry and Limbert 2008b, 6). In handling highly compromised piglets and in the end killing them to create samples for their research, the researchers invested their working lives in transforming the source of production pigs in Denmark into the future product of ‘optimal care and diet for newborn infants’. To the researchers in the laboratory, this work continuously raised questions about what is ‘good’. The same postdoctoral researcher explained in the group conversation.
This morning I saw a poster that said: ‘Most mice die because of wrinkles’. It was an ad against using mice in the cosmetics industry. Thinking about this ad I realised that to me it makes a huge difference that I work with animals for the sake of the clinic. I can’t say that I will never work for the cosmetics industry, but I would definitely have great difficulties working with animals for cosmetics.

While her story hinted at the presence of moral questions and vulnerabilities in the laboratory, her statement about doing it ‘for the sake of the clinic’ placed the hard work of appropriating the piglets’ lives and death in a temporal horizon and imbued it with the value of human becoming and notions of generativity. In the context of the NEOMUNE research platform, this future-making of optimising infant health was inextricably linked to creating knowledge in collaboration with NICUs in the global field, generating continuous funding for research, and promoting economic growth to the nation through collaborating with small as well as giant players in agribusiness. In bioscience, such scale-up through industry collaboration and clinical trials has proved increasingly challenging, illustrating that moving an invention into therapeutic use is much harder than making the discovery (Fischer 2010). In the following text, I trace the work it takes to bring the pig studies out of the lab, connect them to numerous actors in the field of translational neonatology research and thereby have the Danish pigs tie together science, health and capital.

**Bringing the pig-based resources out of the laboratory**

At the end of every experiment, the researchers began the work of analysing samples and turning them into written papers. Simultaneously with writing up papers, they presented their results at research seminars in which the various partners of the research platform were brought together. Here laboratory researchers, clinicians from NICUs in the Netherlands, England, New Zealand, Australia, China and Denmark, and researchers and representatives from the industry, discussed how to connect and align experimental animal studies and clinical studies and how the various studies may be of interest to the industrial partners. In participating in these meetings, I noticed that the presenters of the pig studies sometimes started out with a statement like: ‘We can do things on animals that we cannot do on human beings.’ Such introductory comments situated the experiments in the moral economy of animal-based science according to which the management of the animal’s life and death (‘do
things on animals’) was legitimised by the moral difference between human and animal (‘that we cannot do on humans’). Apart from such comments, the presentations were usually silent about the hard work of caring for individual animals on a day-to-day basis, which shaped in profound ways the experimental practice. The piglets appeared in the form of precious graphs and numbers, and were discussed in the language of medical categories such as ‘gut microbiota’, ‘neuro-endocrine signalling’, or simply ‘metabolism’. The overall framework of these presentations was the enthusiasm of creating path-breaking knowledge and new infant diets and microbiota treatments for the NICU. The piglets constituted ‘evidence’, and the caregiving and death through which this evidence was produced was not considered relevant to be included in the limited time of scientific presentations, and thus remained untold and unknown.

In her book on moral thinking in the experimental worlds of xenotransplantation and mechanical hearts, L. Sharp argues that erasing subjective properties of individual animal or human bodies silences moral questions related to experimentation (Sharp 2014, 44–6). Similarly, S. Lochlann Jain’s study of the mortality effect in randomised control trials (RCTs) in oncology powerfully illuminates that the RCTs’ future thinking, hope, and strong notion of progress result in the obfuscation of suffering and death, to which she refers as the ‘ghosting of lives’ (Jain 2010, 90). Among social scientists, such ignorance or unknowing of, for instance, suffering and death does not represent a lack of knowledge, but rather constitutes a form of knowledge that is out of place and therefore may pollute organisational principles and make it difficult for organisations to function and pursue their goals (Geissler 2013; Marris et al. 2014; Rayner 2012; Mathews 2011). For example, in his study of the production of medical knowledge in transnational clinical trials in an African city, Wenzel Geissler (2013) illuminates how research staff’s knowledge of research subjects’ hunger and lack of healthcare was central to making the clinical trial function on a daily basis (sharing food with research subjects, convincing them to join and stay in a trial), yet all this knowledge did not constitute ‘data’ and was excluded from scientific reports. This exclusion also contributed to upholding research participation as based on voluntary participation and equal relations between research staff and trial subjects and adhering to scientific conventions according to which hunger belonged to a background factor outside the focus of research (Geissler 2013, 18–20). In drawing attention to the dynamics of constructing knowledge and ignorance differently over time and across various arenas, Geissler’s study points to the ways in which professionals’ oscillation between knowing and unknowing
productively links bodies, lives and institutions in scientific knowledge production, thereby creating the much-valued biomedical knowledge that may improve health.

While the unknowing that Geissler identifies pertains to material inequalities between research subjects and researchers, and between institutions involved in transnational clinical trials, the unknowing present in experimental animal-based science pertains to the animals as sentient and qualified lives, what we may think of as existential equalities between human and animal. Consequently, what the researchers in the animal facility seem to engage in when moving between different spaces in translational medicine is a sophisticated switching between knowing the piglet as a sentient being in the experimental practice and excluding this dimension at scientific meetings, in scientific papers and in reports to the media. This differentiation between places may be approached as not simply an exclusion of particular aspects of practice so as to maintain boundaries of legitimate knowledge, but also as an inclusion of important aspects of practice (see Geissler 2013, 15) as part of scaling up. The inclusion of treating piglets as unspecific biology in scientific presentations makes the researchers adhere to ideals of standardisation, detachment and reproducibility in the biological and biomedical sciences, thereby paving the way for the clinical studies by creating easily exchangeable and recognisable knowledge within the scientific community. The simultaneous exclusion or erasure of the specificity of the local pig biology and the local practices in the laboratory facilitated the piglets’ attachment to new (complex) phenomena such as clinical studies and future clinical trials. We might see the research presentations as a way by which the interdisciplinary research group made their work accountable to each other and grounded it in a promise of future translation (see Brosnan and Michael 2014, 695). They took responsibility for realising the aim of translation by making their studies understandable within collective discussions of identifying the optimal time, amount and composition of nutrition to neonatal infants at risk of NEC. In these discussions, the scientists simply did not see their interactions with the piglets and all the care work as crucial for the scientific quality of their research. As much as they depended on this non-scalable care practice to create good data, they also relied on ignoring it as part of scaling up their studies and pursuing the next step of clinical studies and the future step of clinical trials.

On several occasions I discussed with the director of NEOMUNE the question of what can be known publicly. In an interview with myself and graduate student Mie S. Dam, he reflected upon the possibility of using photographs when informing non-scientific audiences of their research.
NEOMUNE director: Photos are part of the reality, yes, but only a small part. It is a bit like, I don’t know if this comparison will work, but it is a bit like exposing [human] bodies, naked bodies. This is a way of exposing a human being, but we don’t think that this [exposure] is the human being […]. In the same way, if we expose the newborn piglets too much … there are many feelings connected to the newborn and especially there are many feelings connected to suffering and illness. I think it is a little similar to the photos of hungry children from the developing world. We usually sense that there is something almost damaging in exposing [such photos] too much, because you flatten what you want to show. Also because you become immune to it. There are some things in life which are important, which are central, we should be careful not to expose them too much in pictures and films because then they will lose their …

Mette: Almost their dignity?

Director: Yes. Their dignity, and this is why I’m a little worried about giving the public a wrong and twisted impression of what we are working with, but there is no part of our research which is secret […]. The way I may best explain it is to say that it is very sensitive and dignified and you shouldn’t expose it too much.

This conversation about respecting the dignity and worth of the piglet and the research practice it is part of, provides a glimpse into the world of many publics that the research director and his team navigate. His considerations are not necessarily different from those of clinical scientists who are also careful about how they talk about research subjects who may also be terminally ill patients. In both cases, scientists balance the multiple identities of their research resources. In front of a scientific audience, it makes perfect sense to state the moral difference between human and animal with statements like, ‘We do things on animals that we cannot do on human beings.’ In talking about a more general public in the interview situation, the animal turns into a sentient being and enters the category of precarious life together with starving children from another part of the world. Why is it the piglet in the situation of the conference is stressed as an animal less worthy than the human, and in the situation of the interview with the social scientists is stressed as morally equal to a human life?

I only slowly began to understand what was at stake in conference presentations and in the research director’s appeal to life ethics when I was less strictly focused on what was being said, but more on the
distinctions made. In the conference presentations and in our interview with the research director, the moral question about worth and dignity operated as a kind of boundary work (Gieryn 1983) that set up boundaries between what can be known by the scientists who take part in the experimental work and what can be known by scientific and non-scientific publics. In the conference situation this happened by highlighting the animal as simply data (excluding its sentience). In the interview situation, this happened by highlighting its moral worth (including its sentience). That is, when moving the animal resource out of the laboratory, its moral worth was continually redrawn to facilitate its appearance as a legitimate resource upon its arrival in the spaces of translational medicine (conferences) and public communication (reports to the media).

To simply interpret these practices as a deliberate way of avoiding critique and resistance would miss what was at stake for the researchers in performing this boundary work. To understand the research director’s urge to place his research in relation to life ethics, I will turn to Didier Fassin’s analysis of the deployment of moral sentiments in contemporary governmental and non-governmental initiatives directed towards the most unfortunate, suffering and vulnerable individuals, such as helping AIDS orphans or disaster victims (Fassin 2012). Fassin argues that these initiatives, what he calls ‘humanitarian government’, are characterised by a paradox. On the one hand, humanitarian government is based on the universal recognition of other individuals as fellow human beings (a relation of assistance and solidarity) and on the other hand humanitarian government does not change the inequality that causes the disasters of war or illness (a relation of domination and inequality) (Fassin 2012, 3).

Although the research piglets are not humans and the practices in the laboratory far from the humanitarian interventions of assisting AIDS orphans, the research director himself compares research piglets to disaster victims (‘I think it is a little similar to the photos of hungry children from the developing world’), and present in our conversation is both the articulated compassion towards the piglets (solidarity) and the silenced killing of them at the end of the experiment (domination). He mentions the moral sentiments towards precarious lives (‘there are many feelings connected to the newborn and especially there are many feelings connected to suffering and illness’), and in the course of the conversation I myself provide him with the keyword ‘dignity’. That is, humanitarian government designates positions in the conversation and unwittingly I come to represent these moral sentiments along with public concerns about responsible conduct and public engagement. In facing these sentiments
and concerns in the interview situation, we may see his boundary work as a way of caring for the ‘bigger picture’ (Law 2010, 64–6), that is, not losing track of the explicitly articulated promissory statements of infant health which the researchers strive to realise, yet do not know how and when will happen. He fears that the public may forget about this aim if the precarious piglet bodies are rendered visible. Moreover, in his statement about ‘not becoming immune’ we sense that establishing the boundary between what can be known by the public and what can be known by the researchers also serves to maintain his own sensitivity towards precarious lives so essential to running the experiments.

The double identity of the piglets as resources for human health and in themselves sentient beings came to the fore in a full-page article about NEOMUNE in the national Danish newspaper Politiken. Under the heading ‘Incubator pigs are to support preterm infants’ (Bach Madsen 2015), the article printed short interviews with several researchers from the NEOMUNE research platform and included a close-up photograph of a preterm piglet wrapped in a cloth in the hands of the researchers wearing laboratory gloves. In showing the newborn piglet, not the newly killed piglet at the end of the experiment, the article echoes the paradox of humanitarian reasoning described by Fassin: The photograph communicates the piglet as sentient life (morally like the human), yet the whole framework of the article pictures the piglet as a resource for human becoming (morally unlike the human) indirectly made known through the laboratory gloves, but not through showing its suffering and death. Taken together, the various ways of configuring the piglets in scientific presentations, in interviews with the social scientists and in reports to the media, illuminate how actors within translational research continuously strive to keep the right balance between knowing and unknowing to let the animal resource arrive safely in the Research and Development departments of industrial players and in clinics located in a global field.

Managing resources in the NICU

I wish to end this chapter by providing a short excursion into life-and-death decision-making practices in the NICU in Copenhagen; the site inhabited by the infants whose health is seen as the ultimate goal of the life, suffering and death of the research piglets. My aim with this excursion is not to describe how feeding bovine colostrum to piglets has been translated into new dietary regimes in NICUs as this is still in the process
of being realised. Rather, my short description aims at exploring how also in this site unknowing is at work in managing resources and turning infants into viable lives.

The NICU in Copenhagen is the most advanced in Denmark and treats infants born as early as gestation week 23. In Denmark, healthcare services (i.e. treatment in the NICU) and social services (i.e. special education and rehabilitation of disabled children) are tax-financed and thus fully paid for by the Danish welfare state. The NICU has an explicitly family-based approach to the treatment of preterm infants. From the very moment a newborn child is rushed to the clinic, the parents will be offered a bed next to the incubator. They will be taught to take part in the daily care of their infant and be involved in all the difficult decisions about continuing or withdrawing treatment. In this setting, coming to belong in the Danish welfare state is closely related to becoming part of a family (see Navne and Svendsen 2019).

In the same way as it is important for the researchers in the pig laboratory to maintain the hope that the pain and death of the piglets in the here-and-now experimental practices contribute to creating life and health for infants in the future, it is also important for the clinicians in the NICU to be convinced that the treatments which the infants undergo and the suffering involved may in the end turn into a life worth living for these infants. To the clinicians, intubation and complicated and painful heart or gut operations are meaningful as long as there is a hope that these interventions in the end will result in a viable infant. By far the majority of the admitted infants are successfully treated and safely taken home by parents. However, when it happens that infants are so seriously ill that a graduation towards death within the near future can be predicted, the clinicians tend to see continued treatment as futile and argue in favour of withdrawing treatment.

In most of these cases, the parents share the clinicians’ experience of futility and are ready to withdraw treatment, which means extubating the infant and letting him or her lie body-to-body with the parents until death occurs. Although rare, once in a while it happens that the parents insist on continued treatment and maintain the hope that a miracle might happen and that death is not the only possible future. In following such contested situations of decision making, my graduate student Laura E. Navne and I noticed how issues of limited resources found their way into discussions among clinicians. As the head of clinic expressed in an interview with us about one such specific situation, ‘Overall, resources are not unlimited. Shall we continue with a very care-intensive treatment, which is futile and painful for the patient?’ He and his staff did not think so
as such an infant would take up a space in the NICU from other infants who with care and technology may become viable babies. Also, a futile infant would exhaust his staff who were already working at full stretch doing their utmost to make infants viable, and for whom the experience of creating worthy lives was essential for them to maintain faith in their work so as not to resign from their job. Hence, the doctors did not blindly aim for continued treatment and prolonged life. Rather, they engaged in a difficult task when they balanced the expected life’s worth of the infant with the situation of the family and the resources of the clinic and the welfare society (see Navne and Svendsen 2018 for a detailed analysis of such a case). Thereby the clinicians were not only treating the infant as an end in itself to be saved no matter the costs, but also saw the infant as part of a family and a welfare state and hence, we might say, as a resource for these collectivities. Consequently, the rare cases where clinicians and parents did not reach agreement on withdrawing treatment from infants who could not recover spelled out the central role in the clinic of managing resources (ensuring that some infants did not take up resources from other infants with greater needs; keeping staff by ensuring work conditions in which they were able to see their work as meaningful) and thereby facilitating the future human resources for society (investing work efforts and technology in infants who may become lives worth living).

At the same time as economics and prioritisations of resources are inevitable in the daily life of treating infants – every treatment is priced, the clinic has a budget to comply with, there are prices on items in the medicine room of the clinic, only the most premature infants are allowed to be fed the costly human donor milk – the clinicians did not consider it right to bring up the issue of resource management when talking to the parents. Also when parents were not willing to withdraw treatment in spite of the clinicians’ advice to do so, the clinicians did not introduce to the parents the question of resources so pivotal in this situation. As the head of the clinic said to Laura E. Navne and me, ‘I think that it is unethical [to mention money to the parents] … they are in the deepest imaginable crisis in their lives … money is of no relevance in comparison to life and death. How can the two of them [money and life/death] come together?’ While these two cannot be separated in the daily management of the clinic and prioritisations between lives as the contested case spells out, the clinicians put efforts into separating money and life when talking to the parents as part of caring for them in their grief. Thereby the inescapable question of which lives to treat with societal resources and which lives not to treat constituted a specific geography – a ‘careography’ (Navne and Svendsen 2018) we might say – that separated the spaces in
which resource questions could be known and discussed (daily rounds, interviews with anthropologists) from the spaces in which resource questions were actively unknown (conversations with parents). This separation echoes the common view that the value of the human body should be kept separate from monetary transactions (Felt et al. 2009; Hoeyer 2005; Svendsen 2007) and illuminates a shift in ‘money talk’ between the laboratory and the NICU. In the laboratory, the researchers’ articulations of a connection between economic value and pig life (‘it costs another pig at the other end’) constitutes the pig as a valuable resource; in the NICU, the clinicians’ absence of such articulations of the calculability of life in front of the parents underlines the human infant as non-calculable, that is, as holding intrinsic worth. Hence, by unknowing and not exposing the inescapable prioritisations present in daily clinical practice, the clinicians separated money from human life and in so doing cared for the parents and maintained a high degree of understanding and empathy in their interactions with them, thereby upholding trusting relationships between healthcare institutions and citizens. Like the researchers when presenting their studies, the clinicians cared for the ‘bigger picture’ (see Law 2010; Navne and Svendsen 2018). They strived for the right balance between resource prioritisations and ways of helping parents through the grieving process and back to an everyday life outside the NICU.

**Knowing and unknowing in translational medicine**

My movement across central sites in the infrastructure of translational medicine illustrates how aspects of the work of imagining, claiming, making and administering resources in the field of neonatology are open to experience yet actively unknown or silenced in specific contexts. In facilitating translation between bench and bedside, the possible existential equality between piglet and human researcher is unknown; in decision making in the NICU what is unknown concerns the inevitable selection of the worthy and the less worthy lives, what we may think of as the inescapable existential inequality between infants.

My study of this foregrounding and backgrounding of what is acknowledged points to the ways in which administering the boundary and moral tension between knowing and unknowing is part and parcel of making and managing resources for human health. Reflected in these activities is a notion of the ‘proper human society’ (see Ferry and Limbert 2008b) as one that frames the animal as a valuable tool for human health, sees the infant as an icon of life and potentiality, and
upholds the imaginary of infinite resources to treat every newborn life within the Danish welfare collectivity. In other words, the practices of claiming, making and managing resources are suffused with a notion of a ‘we’, which is closely linked to the welfare state society that regulates and subsidises pig farming, finances the NEOMUNE research platform, and finances and runs the public healthcare system. The researchers’ and clinicians’ sophisticated boundary work demonstrates a deep commitment to this ‘we’ in their striving for good science, in their commitment to collaborate in ways outlined by national research policies, in their engagement in securing a fair use of public funds, and in their care for infants and parents in the clinic.

While it may be that human exceptionalism and the boundaries between the species have been increasingly contested in both natural science (for example, De Waal 2001; Kohler et al. 2002; Oswath and Martin-Ordas 2014) and in social science (for example, Despret 2008; Haraway 2008; Buller 2014), my ethnography of the daily practices in translational medicine muddles this picture. These practices demonstrate that within a scientific framework in which the pig has moved closer to the human, asymmetries and disconnections between species and spaces are essential when bringing the pig into the clinic and managing resources in the clinic. At the same time as daily biosocial dynamics of animal-based translational science momentarily dissolve a clear distinction between the killable biological life of the animal and the liveable biographical life of the human, articulating and upholding this distinction is crucial to practices of translation. The pig and the human, sentient life and generalised knowledge, money and life worthiness, local dairy farms and global nutrition products are deeply entangled, yet actively separated or silenced in reaching the promise of human health, capital and science in translational medicine and in managing human health in the NICU.

Coda

In jokingly describing themselves as ‘our pigs’, the researchers hinted at the ways in which they were both colleagues (of equal standing) of Mie S. Dam and me and our resources (of unequal standing) in the multi-species collaborative we all participated in. If it is so that the notion of resource presupposes ‘a particular relation between humans as exploiters of resources and “nature” as the ground from which resources are exploited’ (Ferry 2008, 52), this insight raises questions to the anthropologist about the right relationship between the anthropological
endeavour of producing knowledge about the boundary between knowing and unknowing (making resources in the form of ethnography) and the lives of the people who take care of this boundary on a daily basis (the ground from which data and analyses are made).

While including a social science study in a basic science/biomedical research platform surely holds the potential for engaging more ethical discussion without disengaging from the advancement of biological knowledge, this collaborative endeavour also cracks open conceptions of resource-making easily taken for granted in different epistemic practices. Hence, the question ‘What is ethics here?’ raised by the postdoctoral researcher applies equally to the anthropologist continuously trying to figure out the ethically right relationship between her informants and the anthropological knowledge production to which these informants contributed. In the same way as entanglements and separations are pivotal in making piglets into resources and managing resources in the clinic, entanglement and separations penetrate the anthropological scholarship. I know the worlds of experimental animal science and clinical neonatology from the inside through engaged solidary relationships with the professionals who with meticulous care and commitment handle piglets and infants. And I examine these fields by separating myself from their logics, thereby making it possible to question the common sense of the human–animal divide and explore the worlds that this common-sense divide produces. This is not without tensions. In literally moving between animal and human, laboratory and clinic, my ethnography is grounded in the daily interactions of people who think, feel, act, doubt, negotiate, at the same as it seeks to explore these worlds by examining the logics that not only belong to them, but encompass all of us. From this puzzled position we may begin to understand how human and animal lives are conditions of possibility for one another and how the strong notion of human potential and human uniqueness is woven into the practices of appropriating the pigs as resources for human health.

**Acknowledgements**

Thank you to the researchers and clinicians in NEOMUNE for sharing their work practices with me and engaging in productive discussions. Thank you to Mie S. Dam, Laura E. Navne, Iben M. Gjødsbøl and Lene Koch for great companionship in exploring life and its value across the human–animal divide. I am grateful to the reviewers for valuable input and to the editors for calling this chapter into existence and organising
the stimulating seminar on ‘The End of Biodeterminism’. This chapter is based on empirical work made possible through grants from the Danish Research Council – Life at the Margins (grant number 0602–00854B) and A Life Worth Living (grant number 12–133657) – and from my participation in the research platform NEOMUNE.

Notes

1. Similar descriptions of the laboratory practice can be found in Svendsen and Koch 2013 and Svendsen 2016.

References

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