100% Pure Pigs: New Zealand and the Cultivation of Pure Auckland Island Pigs for Xenotransplantation

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Abstract: *In 2008, the New Zealand based company Living Cell Technologies (LCT) was granted approval for human clinical trials of animal-to-human transplantation (xenotransplantation) in New Zealand. This was one of the first human clinical trials to go ahead globally following regulatory tightening in the 1990s due to concerns over disease transmission. In response to these disease concerns LCT is using special pigs, isolated on Auckland Island for 200 years and deemed to be the cleanest in the world. This article explores the way that LCT leverages off New Zealand national narratives of purity to market the Auckland Island pigs as safe xenotransplantation products. LCT's marketing strategy relies on the Auckland Island pigs' origin story, which aligns with a broader 100% Pure New Zealand narrative, locates them geographically within an established mapping of purity and cleanliness, and links them to a problematic myth of 'pure nature.' Biological and social concerns about contagion in xenotansplantation are routed through a well-rehearsed national imaginary of purity, which helps both to figure the pigs as disease free, and to position them socially and ethically in relation to humans as pure, other, and a natural resource.*

Keywords: *xenotransplantation, contagion, feminism, animal studies, purity*

Visit New Zealand's national parks if you want to discover the natural soul of the land. The real gems of this country, the national parks preserve the natural heritage, forests, wildlife and landscapes, close to – and in some cases, exactly – as it was before man was here.
(Tourism New Zealand. 'National Parks in New Zealand.')

Legend says this land was hauled from the ocean like a giant fish. And then it waited. In fact, these islands waited until every other country had been discovered before any human ever set foot here. Welcome, to the youngest country on earth.
(Tourism New Zealand, 'Welcome to the Youngest Country on Earth - Forever Young.')

LCT has the sustainable competitive advantage of having a pig herd free of common viruses, bacteria and parasites. LCT's pig herd originates from the sub-Antarctic Auckland Islands, between New Zealand and Antarctica. The pigs have effectively been quarantined and untouched by humans since being left there by Captain Bowen over 200 years ago.
(Living Cell Technologies)

In 2008, the company Living Cell Therapies (LCT) gained regulatory approval in Aotearoa New Zealand for a human clinical trial of xenotransplantation (animal-to-human transplantation) using a unique breed of pigs, the Auckland Island pigs (fig.1). Since then, LCT has continued to lead the field globally in xenotransplantation clinical trials, with two products now in late stage clinical trials. In response to global controversies over possible disease transmission from animals to humans (zoonosis) in xenotransplantation, LCT is using a special breed of pigs found in the remote Auckland Islands, whom it claims to be the 'cleanest' in the world (PharmaVentures), free from infections, because of their unique birthplace and history.

This article explores the interconnections between New Zealand's national narratives of purity and LCT's construction of the Auckland Island pigs as safe xenotransplantation resources. By continually rehearsing the Auckland Island pigs' origin story, which aligns with a broader 100% Pure New Zealand narrative, LCT locates them geographically within an already well-established mapping of purity and cleanliness. This carefully crafted script links them to a problematic myth of 'pure nature,' and their (biological/categorical) isolation with the imagery of isolated Auckland Island. The pig population is marked out as clean and distinct from humans, a separate and contained category of animals which are non-threatening to the category of the human. Already steeped in the troubling processes by which the self and other are produced in a post-colonial context, these narratives help to make these pig bodies available for use within an emerging xenotransplantation industry, replicating a familiar dynamic of instrumentalising non-humans for human benefit. Biological and social concerns about contagion in xenotransplantation are deflected via a well-rehearsed national imaginary of purity which positions the pigs as pure, other, and a natural resource.

Fig. 1. Auckland Island Pig.
Image from David White and Paul Wedel, The Cleanest Pig. Focus Forward Films, 2012.
By kind permission of David White and Nelly Petit.

100% Pure New Zealand

In 1999, Tourism New Zealand launched the *100% Pure New Zealand* campaign which has since developed beyond tourism into a core part of the New Zealand national brand, entwined with a number of industries (Lewis).[1] The campaign centres on the environment, consistent with a long history of tourism and agricultural product marketing,[2] and extends the clean-green image that the government cultivated in the 1980s and 1990s (Morgan, Pritchard, and Piggott).[3] The campaign advertisements feature images of stunning *unpopulated* landscapes: crisp ice-capped mountains, wild rivers and forests, and lengths of empty beach, headed with the tagline '100% Pure New Zealand'. Humans appear only sparsely, as a couple or small group, often engaging in sporting or outdoor activities, suggestive of nature tourism and adventure tourism. The images depict New Zealand as a place to experience untouched, untainted or pristine nature. As sociologist Evelyn Dürr notes, '[i]n combination with the "100% Pure"-slogan, a state of "pure nature" is suggested, meaning devoid of human presence, culture or civilisation' (61).

Nature is imagined to have been protected from humans and culture, retaining an Edenic purity that has been lost elsewhere in the world. The logic rests on New Zealand being geographically isolated. It is also called 'the youngest country on earth,' thought to be one of the last to become inhabited by humans. Areas of protected national parks are presented as exemplifying untainted nature, also implying a protective attitude toward the environment in New Zealand (Tourism New Zealand. 'National Parks in New Zealand').

The campaign concept of '100% Pure' has now extended beyond the original domain of tourism into other New Zealand industries. Building on the success of the slogan, many New Zealand export companies deliberately incorporate elements of the *100% Pure New Zealand* campaign to make links between the purity of New Zealand environment and the purity of their products, particularly food, drink or health products.[4] Companies have employed the campaign slogan, font, colour scheme or imagery; for example, *100% Pure New Zealand Honey*, 'gathered from New Zealand's vast wilderness' (Pure New Zealand Honey). Agricultural plants and animals, although mostly non-native, are often figured as imbibing the natural purity of NZ, such as New Zealand AngusPure® cows: 'The Purest taste from the purest place. On a pair of islands at the bottom of the Pacific Ocean, New Zealand's natural beauty is distilled into a beef so pure, so tender, and so tasty' (New Zealand AngusPure). Purity, a slippery term, is invoked to suggest a range of meanings including organic, disease-free, natural, and undiluted.[5] The campaign has also intertwined itself with the film industry, particularly *Lord of the Rings*, for example in the '*100% Middle-earth*, *100% Pure New Zealand*' advertisements which foster a sense of New Zealand *as* Middle-earth, as mythical and outside of modern life (*100% Pure New Zealand*). The tourism industry has also sponsored sporting and other international events for greater global exposure (Morgan and Pritchard), linking the 100% Pure concept more tightly to the nation as a whole.

The idea of New Zealand as a pure space is problematic on a number of levels. The concept employs a familiar construction of pure nature or wilderness, imagined to exist *before* (non-indigenous) human contamination (see Cronon). This reifies nature as something stably existing at a particular point in time, neglecting 'the changing and dynamic nature of ecologies' (van Dooren 289), and frames most human interaction with the environment as unnatural, within a nature/culture binary.[6] Ironically, although nature is romanticized, the campaign and the export industry involve further intervention in and exploitation of the environment for the

purposes of human capital accumulation and consumption.[7] The narrative also problematically presents an image of nature that is 'innocent of history' and politics (Haraway 156), suppressing the fact that, as Gurevitch argues, 'antipodean space was biologically, ecologically and pathogenically (and often violently) reengineered for European settlement' (60). More than Māori, European (Pākehā) settlers and their companion plants and animals are implicated in the extinction of native species, as well as the destruction, erasure and commodification of Te Ao Māori (see Gurevitch; Potts, Armstrong and Brown). Given these histories, the 100% Pure concept might be read as both an economic strategy and also, as it intersects with and (re)produces national imaginaries,[8] part of the construction of Pākehā identity and belonging in New Zealand, shaped by tensions between Māori and Pākehā (Holm) and settler relationships with the environment.[9] The 100% pure imaginary, alongside conservation efforts such as culling 'invasive' possums (and pigs), may reflect uneasy Pākehā belonging and an ongoing drive to construct a pure/cohesive national community in New Zealand (see Holm; Ginn; Potts, Armstrong and Brown).[10]

Despite the problematic aspects of the 100% Pure narrative, these tropes have been widely disseminated, and the campaign has been a relative success (Tourism New Zealand. *Pure As: Celebrating 10 Years of 100% Pure New Zealand*). These well-developed imaginaries of geographical and natural purity have been artfully leveraged by LCT in its efforts to construct pigs found in remote New Zealand as ideal source animals for xenotransplantation. In the next section I will discuss xenotransplantation in more detail, before exploring the interaction between imaginaries of national purity and the biopolitics of xenotransplantation.

Xenotransplantation controversies

Xenotransplantation involves the transplantation of live tissues, organs or cells from animals to humans for therapeutic reasons. Using cells from pigs, cellular therapies are being developed by several biotechnology companies for the treatment of long term health or medical conditions such as diabetes and Parkinson's disease.[11] These therapies have the potential to progress into a new large-scale industry revolving around the commercialisation of live animal tissues (cells) for human transplants, and this would have important implications for the lives of those animals

used. Pigs are the main animal currently used for transplants because they are biologically similar to humans, and, compared with non-human primates, they are thought to be less ethically controversial (given that we farm them for food) and less likely to carry diseases infectious to humans.[12]

Xenotransplantation using pigs has been controversial, however, and some of the central concerns have been around the potential for *contagion*. In the mid-1990s, scientists raised alarms over possible animal-to-human disease transfer (zoonosis) via animal transplants, amid increasing anxiety about new and re-emerging human viruses that are often traced back to animal sources, for example HIV, 'bird-flu', Ebola, and H1N1 or 'swine flu' (Wolfe, Dunavan, and Diamond). In 1997, researchers demonstrated that porcine endogenous retroviruses (PERVs), endemic to pigs, could sometimes infect human cells (Patience, Takeuchi, and Weiss), resulting in tightened regulation globally, including in the UK, USA, Australia and New Zealand (McLean and Williamson). The concern was that these viruses (or other microbes) might infect the transplant recipient and spread into the human population, at worst producing a pandemic like HIV (Collignon and Purdy). These concerns have lessened somewhat over time, particularly as studies revealed that only some strains of PERV are likely to infect human cells (Wood). Regulatory frameworks have been put in place in many countries aiming to protect the human population, in part by limiting xenotransplantation to instances where the source animals are proven to be free from certain infections. The regulatory requirements are extremely difficult to meet and only a few clinical trials have progressed since this period, primarily those of Living Cell Technologies (LCT).

The concern over zoonosis reflects a more general anxiety about the human collective body being infected by non-human animal viruses. Feminist scholarship on identity and difference, drawing on psychoanalytic theory, has highlighted that anxieties over medical and social contagion are often intertwined; for example, 'threats to social order from undesirable groups have historically been represented as infectious threats' (Waldby 91). Perceived infectiousness may indicate a perceived threat to the distinction between self and other, where a constitutive other becomes 'too close, too recognizable (threatening merging and indifference)' (Shildrick 75). The self at stake might be an individual, a group, or a 'normative category as a whole' (Shildrick 71).[13] Accordingly, concerns over disease transmission in xenotransplantation might simultaneously be read as symbolic anxieties about human identity or social cohesion

(Murray; Rosengarten). Xenotransplantation threatens species boundaries as humans incorporate live animal tissues into their bodies, and as scientists emphasise the similarity of pigs and humans (Sharp), in some cases furthering this resemblance by genetically modifying pigs with human genes. Ironically, while this confusion is intrinsic to the very act of xenotransplantation, the industry simultaneously relies on the production and safeguarding of difference, on the acceptability of doing to other animals what would be forbidden in humans: raising them for spare parts.

In order to make this new live tissue industry viable, it is crucial for stakeholders to cultivate (both materially and socially) a clean source of animals, ideally figured as medically non-infectious and/or non-threatening to the category of the human: as pure but firmly other. Scientific discourses have played a role in figuring human-pig closeness (see Sharp; Cook) and in defining and managing infectious disease risks; however, my interest is in the work of national narratives. As Franklin; Potts, Armstrong and Brown and others have shown, animals (and plants) and human relationships with them are in many different ways connected with projects of nation-making. In the case of LCT, the already well-articulated New Zealand national imaginary of purity is brought to bear on biological and social anxieties around contagion, which accordingly facilitates the harvesting of these particular animal bodies for xenotransplantation. LCT uses the origin story of the Auckland Island pigs to position them *within* the purity of New Zealand, aiding the construction of the pigs as clean, non-infectious and fundamentally different from humans.

Auckland Island pigs

The Auckland Islands, part of New Zealand, are an archipelago of small islands lying in the Pacific Ocean, 465 kilometres south of the South Island of New Zealand. The largest of them is also called Auckland Island. Auckland Island is reputedly barren, cold and windy; one visitor observed that 'the land here was clothed in wind-moulded, sombre scrub' (Turbott 6). The island has largely been unoccupied by humans; however, it is home to many non-human species including several rare native birds, such as Auckland-Islands Teals, Yellow Eyed Penguins, sea lions, and, unexpectedly, a flourishing herd of pigs. The Auckland Island pigs look rather

different to domestic pigs: they have long white, brown and black hair, narrow faces, lean bodies, and long straight tails (fig. 2).

Fig. 2. Auckland Island Pig.
Image from David White and Paul Wedel, The Cleanest Pig. Focus Forward Films, 2012.
By kind permission of David White and Nelly Petit.

These pigs are the result of the interbreeding of several groups released there from 1807 onwards. It has been suggested that some pigs were left by explorers, whalers, and sealers, who released them as a resource for shipwrecked sailors, others by whalers who camped on the island, and more by a group of Māori who lived there briefly (Robins, Matisoo-Smith, and Ross). Human attempts to settle on the islands were brief and unsuccessful: there were few whales, the seal population was quickly diminished, and the weather made the island barely habitable.[14] The pigs remained on the island and over time a unique breed emerged as they adapted to the cold environment as an isolated population (RBCSNZ).

Once valued as companions and food sources for sailors, the pigs' status changed to invasive pest as the island later became a site for conservation. The area of the New Zealand sub-Antarctic Islands was declared a national reserve in 1977 and the zone was made a world heritage site in 1998 (UNESCO). In the 1980s, the Department of Conservation (DOC) set out to restore the entire archipelago by eradicating many introduced animals from the islands, including goats, cats and pigs. 'By the 1980s the presence of alien animals was accepted as inconsistent with the national nature reserve status of the islands and moves were made remove the invaders and restore the islands to what they once were' (DOC. 'Introduced Species: New Zealand's Subantarctic Islands'). This was in keeping with a re-branding of New Zealand from the 1970s onwards as 'clean and green,' and later as '100% pure,' and with the uneasy construction of nationalism based on environmental purity.[15] Ironically then, in contrast to LCT's characterization of the pigs as clean, DOC frames them as invaders, highlighting their destruction of native flora and fauna. The pigs are understood as contaminating the heritage status of the Island. Plans have been made for their eradication since the 1990s, although the $22 million project has not yet been funded (DOC. 'Eradicating Pigs and Cats on the Auckland Islands').

In the face of eradication, two groups saw greater value in the Auckland Island pigs. The Rare Breeds Conservation Society of New Zealand championed them as a unique breed that ought to be conserved, perhaps holding valuable genes for cold resistance. In 1999, some members of the society travelled to the island to 'rescue' the pigs from eradication, and brought seventeen back to the South Island, including some pregnant females (RBCSNZ). Within months, this population had grown to more than fifty (RBCSNZ). At this point, Living Cell Technologies came into the picture. The company had been searching for the 'cleanest' pig population, microbiologically-speaking, to gain regulatory approval for human clinical trials of xenotransplantation.[16] When LCT heard about the pigs recently retrieved from Auckland Island, the company tested them and found that 'they were extremely rare, as in they're *very, very clean* with none of the modern pig viruses' ('Cells from a Unique Breed of Pigs'). LCT acquired the pigs and began breeding them in biosecure facilities on the mainland to maintain their 'pristine' state (Elliott 45), heralding them as the 'cleanest pigs in the world' by virtue of their time on the island (PharmaVentures). Human clinical trials in xenotransplantation using cells from the Auckland Island pigs were approved by the New Zealand government in 2008 and

continue to progress. LCT is now positioned at the forefront of clinical trials in xenotransplantation globally, with one product designed to treat diabetes and another for Parkinson's disease.

100% Pure pigs?

> 'And there they were… the purest mammals alive.' Tim Shadbolt, Mayor of Invercargill (David White and Paul Wedel)
>
> 'From a clinical perspective they are one hundred percent natural. Clean.' Professor Bob Elliott, co-founder of LCT ('Guinea Pigs')
>
> 'LCT considers its herd to be the purest source of cells and tissue for human Therapeutics.' (Living Cell Technologies)
>
> LCT has the sustainable competitive advantage of having a pig herd free of common viruses, bacteria and parasites. LCT's pig herd originates from the sub-Antarctic Auckland Islands, between New Zealand and Antarctica. The pigs have effectively been quarantined and untouched by humans since being left there by Captain Bowen over 200 years ago. (Living Cell Technologies)

Auckland Island is a more extreme version of New Zealand: it is even further away, more isolated, and 'uninhabited' by humans. These factors are highlighted by LCT (above). LCT describes the Island as a 'natural pathogen-free facility', implying that it is both isolated and clean/sterile ('Cells from a Unique Breed of Pigs').[17] The company emphasises that the pigs, like the island, are isolated and have had little contact with humans, pigs or other 'land-based mammals' (Elliott 45) that would transmit diseases to them: 'The pigs have effectively been quarantined and *untouched by humans* since being left there by Captain Bowen over 200 years ago' (LCT, my emphasis). This is said to have protected them from modern diseases and furthermore purified them of their old diseases: '[in] two centuries of isolation from other land-based mammals in this fierce climate, these pigs have lost all microorganisms capable of infecting

people' (Elliott 45). Through isolation from other mammals and especially humans, the pigs are imagined to have returned to a more original clean state.

Using similar terms to the *100% Pure New Zealand* campaign, LCT repeatedly describes the pigs as pristine, clean, natural, and pure, for example stating that 'Auckland Island is a remote, uninhabited island in the South Pacific where LCT's *pure* and disease-free pigs have been sourced.' (my emphasis) and '[t]he herd is regularly monitored to make sure its *pristine* state is preserved' (Elliot 45, my emphasis). The use of the same language and logic allows LCT to connect with and leverage off the national imaginary produced by the *100% Pure New Zealand* campaign. In particular, the word pristine, meaning 'unspoilt by human interference, untouched' ('Pristine, Adj. (and n.)'), resonates with the broader national imaginary of an original natural purity existing prior to human contact or cultural contamination. The logic suggests that originally clean pigs become dirty and diseased through contact with humans and domesticated (human-contaminated) pigs. Likewise, protection from humans can ostensibly prevent contamination, and maintain or even restore a more original purity. The nature/culture binary – and separation – underlies this conception of cleanliness, just as in the 100% Pure narrative. The pigs fall definitively on the side of nature, claimed by cofounder Bob Elliot to be 'microbiologically speaking … one hundred percent natural. Clean' ('Guinea Pigs'). In the same way that other products from New Zealand tap into this imaginary, then, the Auckland Island pig origin story mobilises the now familiar understanding of purity to emphasise that the pigs are microbiologically clean. At the same time, this sense of purity is ambiguous and can extend beyond microbiological cleanliness, as LCT states that they are 'pure *and* disease-free pigs' (Living Cell Technologies).

I suggested above that the concern over pigs transmitting diseases reflects an anxiety over the stability of the boundary of the human in xenotransplantation. The pig origin story highlights the separation and potential contagion of pigs and humans; in doing so, it underlines that humans are different in kind from these (natural) pigs.[18] Their separation, or purification, is exemplified in the image of remote and isolated Auckland Island which defines the boundaries of the population of pigs spatially, and also stands as a clear image of their *categorical* isolation: marking out the population as a self-contained entity, physically and ontologically separate from humans.[19] Yet, in concert with the New Zealand imaginary, their isolation also renders them clean, a pure community (Bashford).[20] The stories and images of isolation, purity, and

cleanliness at work reaffirm both pig-human difference and, as I outlined above, a nature/culture binary. Their historical segregation ironically enables subsequent mixing together of these pigs and humans: the narrative of isolation (re)affirms the naturalness of species boundaries at the very moment they are about to be crossed. Transgression of boundaries calls for a simultaneous reassertion of absolute difference.

Moreover, like the 100% Pure New Zealand narrative, the clean pig story also involves the erasure of certain perspectives, including their status as invasive pests, and the realities of their biological interconnections with others. The existence of the pigs on Auckland Island is connected with European colonialism, and, as DOC highlights, their presence, along with other species, has changed the island flora and fauna. For example, the pigs living on Auckland Island are destructive to rare species of native birds including the iconic White-capped Mollymawk or Albatross (DOC).[21] Also, rather than being completely isolated from all land mammals, there have been cats, rats, rabbits and sheep on the island, and humans have had an intermittent presence.[22] Indeed, the pigs were carrying Trichinella parasites, most likely from eating dead seals (Stone), which highlights the pigs' infectious relations with other species. They are also severely inbred and will need careful interbreeding with other pig populations to maintain their health.[23] Thus, the image of the pigs as clean and biologically disconnected involves the elision of interspecies connections and interrelations to create a myth of purity (Duschinsky).

Conclusion

In this paper I have taken the company LCT and its unique Auckland Island pigs as a telling example of the politics of purity at work in attempts to market xenotransplantation. Analysing this example within the context of New Zealand nationalism, it becomes clearer that by incorporating the pigs within a narrative of New Zealand purity, LCT is able to respond to anxieties around disease transfer and simultaneously reaffirm the difference between pigs and humans, nature and culture, and alleviate subtle social concerns over contagion of the human category. What this demonstrates is the delicate balance of purity and otherness that needs to be cultivated for xenotransplantation to be socially and ethically acceptable. The trope of pure nature, central to both the broader New Zealand national imaginary of purity and LCT's efforts

to sell its services, is familiar and has cultural purchase even as it also elides (sometimes violent) interconnections between humans, animals, and nature, in particular obscuring colonisation histories. The problematic tropes and narratives at work re-stabilize the human/animal hierarchy which xenotransplantation both troubles and yet fundamentally relies upon in order to instrumentalise pig bodies, revealing the boundary policing necessary to make these technologies viable. Xenotransplantation already raises a number of serious ethical issues and controversies, including the welfare and treatment of animals that are utilised for human benefit. The narratives of national imaginaries that circulate around the use of Auckland Island pigs further complicate these ethical dilemmas.

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Notes

[1] Coyle and Fairweather argue that although Pākehā people may critique this reputation, the image often informs identity and attitudes toward the nation, and mobilises political action.

[2] On the longer connection between Pākehā identity and the environment see Bell or Belich

[3] The clean-green image was originally based partly on policies around resource management and nuclear energy in 90s, however the reputation as environmentally friendly has been critiqued (see Coyle and Fairweather; Motavalli).

[4] Underwriting these links are discourses of organic farming, free range farming, and in wine commerce, the concept of Terroir (Lewis). These also draw on New Zealand's strict biosecurity practices.

[5] Purity is understood broadly as that which is unmixed, clean, or uncontaminated, especially from outside sources. Mary Douglas argues in her seminal work on purity that cleanliness and pollution (purity and impurity), and attendant pollution rituals, are connected with the maintenance of the social order. Julia Kristeva similarly links impurity with identity construction and maintenance of the social order especially in processes of abjection. For a more contemporary performative account of purity, see Duschinsky.

[6] Additionally, it often ignores the work of indigenous peoples in producing ecologies (van Dooren 289). Māori people and culture also feature in these advertisements as part of the experience of purity, problematically used to affirm the authenticity of New Zealand purity (Gurevitch).

[7] Plumwood argues this is typical of the nature/culture binary even in romanticism.

[8] Broadly, following Anderson and others, I understand national imaginaries to be a set of collectively held or circulating stories and administrative processes that enrol the population into a sense of a nation based community, which outline boundaries and identity of the nation (Anderson; Bashford).

[9] The prelapsarian mythical purity is specifically a Pākehā, not Māori, conception of nature (Ginn).

[10] Despite contemporary representations of New Zealand as bicultural, racial purity was an issue for the emerging nation during the 19th and 20th Centuries, with a 'colonial demand for racial homogeneity' (Belich 18). Seuffert argues that a foundational myth of mutual Aryanism – figuring Māori as earlier explorers of the same Aryan descent – relieved anxieties over racial mixing, but nonetheless enabled Pākehā domination of Māori people who were figured as less civilised or pre-modern versions of the same stock (Seuffert 61).

[11] Research directed toward using whole organs is distinctly experimental.

[12] Epidemiologists and virologists consider animals that are evolutionarily closer to humans, especially primates, to be more infectious to humans (See Cook).

[13] This is particularly so in a biopolitical era where the social body corresponds to the population, made up of biological bodies (Waldby), and an individual body can stand in a synecdochical relation to the social body/population.

[14] During World War II there were coast watchers positioned on the Island, but this was usually a lone soldier (see Turbott 2002).

[15] In part achieved precisely through processes of Othering and killing non-native species, as I suggested above.

[16] In response to disease concerns the New Zealand government put a hold on xenotransplantation trials in 1997, while they developed a regulatory standpoint. In 2007, following expert and public consultation, New Zealand produced guidelines similar to the USFDA guidelines, allowing xenotransplantation to go ahead, with the approval of the Health Minister (HRC Gene Technology Advisory Committee).

[17] A pathogen free facility is a bio-isolated and sterile area used in breeding clean animals for research, and for xenotransplantation. Unlike a pathogen free facility, which supposed to be completely sterile, there are lots of plants and animals and other critters on Auckland Island. LCT also link the proximity of Antarctica, and the temperature, to a lack of diseases: 'It's so

cold, not many viruses survive anyway, and no one really wants to go there' ('Cells from a Unique Breed of Pigs').

[18] Humans are contaminating to pigs, and therefore different in essence (see Duschinsky).

[19] As opposed to processes of abjection which render the threatening other different and polluting/dirty (Kristeva).

[20] As historian Alison Bashford argues, isolation can work both in marking out contagious/dirty populations but also defining a pure community, as in the 100% Pure New Zealand imaginary discussed above.

[21] The Mollymawks are now limited to breeding on the cliffs of Auckland Island, and pigs are said to push them off the cliffs and eat their eggs, however Mollymawks also breed elsewhere and aren't threatened by extinction. LCT plays down this aspect, saying that the pigs eat 'rare native herbs' ('Cells from a Unique Breed of Pigs.').

[22] The Auckland Island pig genes do contain the porcine retrovirus (PERV) that caused concern in the 1990s, although possibly at lower rates than other pigs, and LCT claim they are ''null' or noninfectious pigs' (Garkavenko).

[23] Genetic diseases are sometimes enhanced in isolated populations rather than purified.

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