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An independent academic psychologist, based in England, who has written extensively on different areas of psychology with an emphasis on the critical stance towards traditional ideas.

A complete listing of his writings at <http://psychologywritings.synthasite.com/>.

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1. BROOD PARASITISM AND CO-EVOLUTION

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1.1. INTRODUCTION

Thorogood et al (2019) began: "Parental care is a key aspect of the life history of many animals, including our own species. It is perhaps not surprising then that we find it hard to forget the sight of a small bird devoting its parental attention to a noisy and monstrously large parasitic cuckoo chick that is so clearly, to our eyes, an imposter in the nest. This reproductive strategy of having one's offspring reared by another species – brood parasitism [BP]¹ – has fascinated naturalists and other curious minds for centuries" (p1).

Obligate interspecific BP is found in approximately 1% of all birds (ie: all parental care left to the other species (host)) (Thorogood et al 2019). The avian brood parasite usually lays her egg in the nest of the host species. The key adaptive behaviours of the parasites include:

- The ability to observe the host over time and know when to deposit the egg in the nest.
- Parasite eggshells that mimic the colour and pattern of the host eggs.
- The parasite chicks are "adapt at winning the preferential care of host parents, sometimes with specialised adaptations to kill foster siblings outright" (Thorogood et al 2019 p2).

¹ Also called cleptoparasitism or kleptoparasitism.

Among fish, BP has only been observed in the cuckoo catfish (*Synodontis multipunctatus*), where cichlid hosts provide care by mouthbrooding (Thorogood et al 2019).

BP is also seen in various insects (eg: some beetles, butterflies, and ants). For example, the invading queen of the obligate slave-making ant *Polyergus breviceps* kills the resident host queen and gets the host workers to care for her brood via chemical manipulation (Thorogood et al 2019).

The brood parasites manipulate their hosts, then, chemically as just mentioned, or visually (as in the mimicking eggs), or acoustically (eg: parasite begging chick's calls mimic host's) (Thorogood et al 2019).

Hosts, however, are not passive, and they evolve defence strategies against BP, which leads to the parasites evolving counter-strategies. This is parasite-host co-evolution. This means that co-evolution can occur between different orders (eg: cuculiform cuckoos vs passeriform hosts), different families (eg: icterid cowbirds vs parulid warbler hosts), or different genera within the same family (eg: *Vidua* finches vs estrildid finch hosts) (Thorogood et al 2019)². Yet BP is unknown in amphibians and reptiles (Thorogood et al 2019).

Host exploitation depends on parasites encountering hosts. "For example, hosts can only be encountered if their geographical distribution is included in the dispersal range of the parasite, and, all else being equal, more abundant hosts are more likely to be encountered than rare hosts" (Tartally et al 2019 p2).

BP may occur with a single host species or multiple host species, and there can be geographical variations "across a parasite's range, such that a host species is heavily parasitised in one locale, but little or never targeted in another" (Thorogood et al 2019 p4).

Tinbergen's (1963) "four questions" for understanding behaviour can be applied (Thorogood et al 2019):

i) Mechanism - how does the trait/behaviour work?

Example question related to BP: what are the cognitive rules that hosts use to distinguish kin from parasite?

² Genera is plural of genus. The biological hierarchy of living organisms has "eight levels"(taxonomic ranks) beginning with species, which are part of a genus, which are part of a family, and families make up an order (then class, phylum, kingdom, and domain). For example, the brown antechinus (*Antechinus stuartii*) (species), antechinus (genus), dasyuridae (family), dasyuromorphia (order), mammalia (class), chordata (phylum), animalia (kingdom).

ii) Development - how does the trait/behaviour develop?

Example: when in their development do parasites learn to recognise suitable hosts?

iii) Function - what are the fitness consequences of the trait/behaviour?

Example: what characteristics are necessary for parasites to succeed?

iv) Evolution - how did the trait/behaviour evolve?

Example: what are the evolutionary origins of BP?

1.2. MECHANISM

1.2.1. Birds

In birds, Stoddard et al (2019) pointed out that "visual discrimination by hosts has sometimes resulted in sophisticated colour and pattern mimicry by parasites at the egg, chick, fledgling and even adult stages of the life cycle. In response to parasite mimicry, some hosts have evolved more distinctive eggs and chicks, and sometimes better discrimination abilities" (pp1-2).

The key moment for detection is when the parasite puts their egg in with the host's ³. Differences in egg colour and pattern (spots, markings, speckles) varying between species are used to recognise the parasitic egg.

Stoddard et al (2019) studied this process in the tawny-flanked prinia (*Prinia subflava*) (host) and the cuckoo finch (*Anomalospiza inberbis*) (parasite) in Zambia. Previous work by Spottiswoode and Stevens (2010) had "found that egg rejection was predicted by disparity between host and foreign eggs in colour and three low-level pattern parameters (dominant marking size, variability in marking size, dispersion of markings on the egg)" (Stoddard et al 2019 p2). These characteristics of the markings are classed as "low-level" pattern features (occurring in the early stages of visual processing). "Higher-level" pattern features include the shape and orientation of markings (Stoddard et al 2019).

Using photographs taken by Spottiswoode and Stevens (2010) when a foreign egg (of varying appearance) was

³ "A host's ability to discriminate between its own and the parasite's egg, and appropriately respond to it, is an important evolved host defence against brood parasitism. Hosts may respond to the presence of a brood parasite's egg in their nest by deserting the clutch, by burying the parasitic egg, or by ejecting it from the nest. When making these decisions, hosts must balance the risk of accepting a parasitic egg (acceptance error) or mistakenly rejecting one of their own (rejection error)" (Hanley et al 2019 p2).

added to a host's nest ⁴, Stoddard et al (2019) analysed the differences between eggs accepted and rejected with a pattern recognition algorithm.

This study confirmed the importance of "low-level" features of the egg, but also the role of colour and "higher-level" features in the host rejecting parasite eggs. However, it was not clear how the different features were used. Stoddard et al (2019) speculated: "One possibility is that colour and low-level pattern features are evaluated first, consistent with the idea that initial colour and low-level pattern processing occurs in the very early stages of vision. If these two channels do not provide large visual differences, higher-level pattern features – processed slightly downstream – might be assessed and sometimes (but not always) tip the balance in favour of egg rejection. In other words, when the forgery is very good, higher-level pattern assessment might be necessary to spot the fake" (p9).

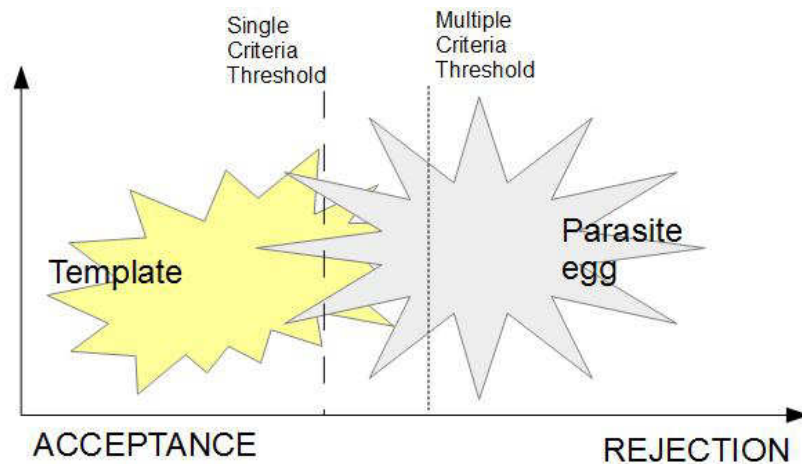
The "optimal acceptance threshold hypothesis" (Reeve 1989) can be applied to egg rejection. The host will have a template of their egg's appearance, and when a parasite egg differs beyond a certain degree to that template, it will be rejected, but eggs that do not differ beyond the threshold will be accepted.

The assessment of an egg, however, involves multiple criteria. "The optimal acceptance threshold hypothesis predicts that when multiple components of the recognition cue are similar between stimuli (eg: sharing colour and spotting rather than sharing either colour or spotting), their dissimilarity is decreased, and the likelihood of acceptance is greater. For example, for a host with a spotted egg, the presence of spots on a foreign egg may be sufficient to shift it from the rejection side of the acceptance threshold to the acceptance side of the acceptance threshold, irrespective of that eggshell's coloration" (Hanley et al 2019 p3) (figure 1.1).

Hanley et al (2019) studied the chalk-browed mockingbird (*Mimus saturninus*) (host) and the shiny cowbird (*Molothrus bonariensis*) (parasite) in South America. The host lays blue-green speckled eggs, while the parasite has eggs that vary in appearance (blue-green, white or brown, and heavily spotted). The researchers experimentally added egg models that varied in colour, but were spotted or unspotted, to 85 mockingbird nests in Argentina. The presence of the egg model in the nest after five days was classed as acceptance, and data on seventy nests were included in the analysis.

The overall rejection rate was 46%, but unspotted

⁴ N = 122 nests.



(After figure 1a Hanley et al 2019)

Figure 1.1 - Representation of optimal acceptance threshold hypothesis.

eggs were rejected significantly more than spotted ones (58 vs 32%). Brown eggs generally were more often rejected, and this fitted the simple comparison of template to egg model. But "when the discrimination task was made more challenging by experimentally increasing the similarity between foreign eggs (through the addition of spotting), rejection responses became less likely. Specifically, eggshell spots made these foreign eggs more similar to the hosts' own phenotype..., the addition of spots shifted eggs to the 'acceptance' side of the acceptance threshold" (Hanley et al 2019 p7).

To sum up, the "findings demonstrate that mockingbirds preferentially rejected brown eggs (both spotted and unspotted), and were more permissive of spotted eggs and more restrictive of unspotted eggs... [So] this host has not yet adapted the ability to discriminate fine-grained differences in eggshell patterns, but instead uses eggshell features as an all-or-nothing cue" (Hanley et al 2019 pp6-7).

Egg recognition is probably linked to egg retrieval behaviour. "Before complex nests evolved, birds laid eggs on the ground, and egg retrieval evolved as an adaptation against accidental displacement of eggs outside the nest" (Yang et al 2019 p1).

However, there are cavity-nest birds where egg retrieval is still important if not so for those species with complex nest structures above the ground.

Yang et al (2019) performed their experiments with the cavity-nesting green-backed tit (*Parus monticolus*) (figure 1.2) in south-west China. Nest-boxes were set up in the breeding seasons 2014 and 2015, and allocated to one of four experimental conditions. Green-backed tits

lay white eggs with brown markings. The nests received either:

- i) A model egg (blue);
- ii) A conspecific egg (white with brown spots);
- iii) Pale blue egg with brown spots of red-billed leiothrix;
- iv) White egg with brown spots of red-billed leiothrix.

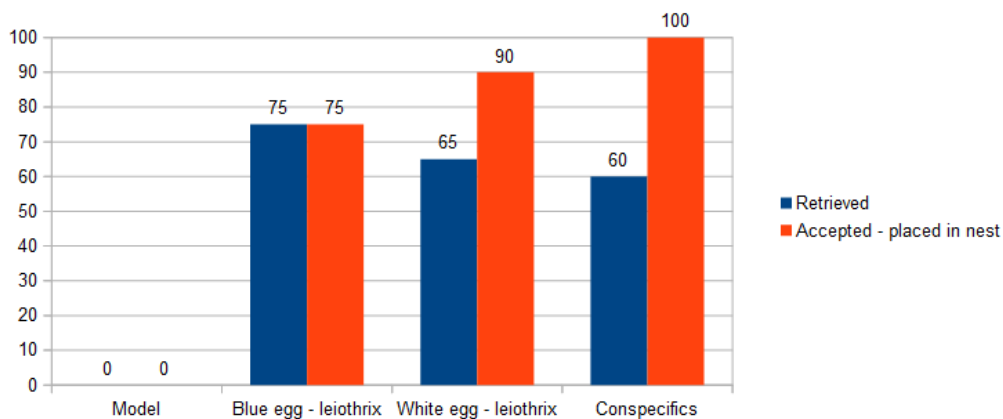


(Source: J.M.Garg; <https://commons.wikimedia.org/wiki/User:J.M.Garg>)

Figure 1.2 - Green-backed tit.

The experimental egg was either placed in the nest (parasitism condition) or 2 cm from the rim of the nest cup (retrieval condition).

Green-backed tits never retrieved the model egg and always rejected it, but accepted and retrieved the other eggs in varying degrees (figure 1.3). Yang et al (2019) summed up: "We found that host decisions about whether to retrieve or reject an egg both depended on the degree of mimicry. However, hosts sometimes first retrieved poorly mimetic foreign eggs and then rejected them. Alternatively, hosts sometimes failed to retrieve highly mimetic conspecific eggs. We suggest that egg retrieval in hosts is likely to be a result of the interaction between ancient retrieval behaviour and subsequent adaptation against brood parasitism" (p1).



(Data taken from Yang et al 2019 table 1)

Figure 1.3 - Responses (%) of green-backed tits to different eggs.

Interspecific obligate brood parasitism in birds has "evolved independently seven times" (McClelland et al 2019). McClelland et al (2019) continued: "Despite the large phylogenetic diversity of parasitic species, there are commonalities in the approaches that they adopt to ensure the hosts will incubate their eggs, and successfully rear their offspring. Since brood parasitism has arisen independently in each of these lineages, this is suggestive of convergent selection pressures acting on these traits" (p1).

Commonalities between parasite species include thicker eggshells than those of their hosts, which combats host's attempts to puncture the egg, and thicker eggshells "may also function to protect the parasitic egg from fracture during the rapid laying process that is characteristic of many brood parasites" (McClelland et al 2019 p2). Many brood parasites have shorter incubation periods than their hosts, and thus the first hatched gain a competitive advantage in terms of being fed by the host, and in ejecting the host eggs or killing the chicks. "Various mechanisms have been proposed to explain the shorter developmental period seen in brood parasites, including internal incubation by the female (in some species where eggs are laid at 48 h intervals) and a higher concentration of growth-promoting steroids in the yolk, but the precise mechanism behind early hatching is not fully understood" (McClelland et al 2019 p2).

Another commonality is that parasite nestlings have stronger neck or back muscles. This aids in hatching from thicker eggshells, and in killing the host chicks (McClelland et al 2019).

McClelland et al (2019) studied another commonality

in the form of gas exchange across the eggshell, and in particular, water vapour conductance (G_{H_2O}). Too much or too little water will effect the embryo's development.

Eggshells were analysed from seven species of brood parasite (from four unique evolutionary lineages) and their hosts. Previously, Portugal et al (2014) had found that the G_{H_2O} of common cuckoo eggs was lower than host eggs, and lower than expected for egg size.

McClelland et al (2019) found that the parasites had significantly lower G_{H_2O} than their hosts. "This commonality among brood parasites is striking given their geographical spread, distant relatedness and the diversity of nesting environments of the hosts they exploit" (McClelland et al 2019 p8).

McClelland et al (2019) speculated that an evolutionary explanation could be that low G_{H_2O} helps the development of the cardiovascular system in the egg (ie: "greater aerobic fitness"), which aids in breaking out of the thicker eggshells.

Low G_{H_2O} is also risky, depending on the nest environment. But parasite eggs "may be under potentially competing selective demands to develop quickly and successfully in a wide range of nesting habitats, temperatures and humidity, while also retaining structural strength, and producing highly competitive chicks able to kill or outcompete their nest-mates" (McClelland et al 2019 p10). An interesting example of the "co-evolutionary arms-race between hosts and parasites" (McClelland et al 2019).

1.2.2. Not Birds

The geographical mosaic theory of co-evolution (Thompson 1999) predicts that host-parasite interactions vary. "Depending on gene flow and differences in selection pressures between sites, hosts or parasites might locally adapt to the opponent or develop more general resistance or offensive traits" (Kaur et al 2019 p1).

This process is evident in the social parasites of ants and wasps which parasitise entire societies, probably more so than in brood parasites (eg: cuckoos), which "do not exploit the body of their hosts, but their social or care behaviours" (Kaur et al 2019 p2). The social parasites of ants, for instance, are "often closely related to their hosts..., so that the population size, generation time and evolutionary potential of both opponents are largely similar..." (Kaur et al 2019 p2) (known as "Emery's rule" ⁵).

⁵ Original article by Emery in 1909 in German (Kaur et al 2019).

Kaur et al (2019) used the example of the acorn ant (*Temnothorax longispinosus*) (host) and the slave-making ant (*Temnothorax americanus*) (parasite). In low parasite pressure populations, the hosts respond with aggression towards the parasite, but in high parasite pressure populations the response of the host is flight. Parasites react to the former by mimicking the chemical signals of their hosts.

Kaur et al (2019) studied eight sites in eastern North America. Analysis of data on behaviour and gene sequencing concluded that "the outcome of the parasite-host interaction depends much more on the expression of traits in the parasite than in the host" (Kaur et al 2019 p7).

1.3. DEVELOPMENT

The cuckoo catfish (figure 1.4) parasites mouthbrooding cichlids in Lake Tanganyika in Africa. Cohen et al (2019) described the process: "Cuckoo catfish disrupt the spawning activities of cichlids and breed concurrently with them. The catfish lay their eggs and the female mouthbrooder picks them up to be incubated along with her own eggs. Even though host and parasite eggs are fertilised at the same time, the catfish develop faster and devour the host young (often completely eliminating the host brood) while still in the mouth of the cichlid mother" (p2).



(Source: Transactions of the Zoological Society of London 1835; <https://archive.org/details/transactionsofzool1518981901zool/page/n6>; in public domain)

Figure 1.4 - Drawing of cuckoo catfish.

Cohen et al (2019) compared the cuckoo catfish to the dwarf petricola catfish (*Synodontis lucipinnis*) (same genus but non-parasitic). Along with cichlid host species, the fishes were studied in aquariums.

The cuckoo catfish eggs were twice as large as the non-parasitic congener (and closer to the larger egg size of hosts). "This larger egg size might increase the frequency with which mouthbrooding hosts take up parasite eggs. Another possibility is that the larger egg size is necessary to produce predatory young big enough to eat cichlid young" (Cohen et al 2019 pp5-6).

The young of the cuckoo catfish were also larger than other catfish, particularly in head width, which allows the eating of the host hatchlings.

But earlier hatching of cuckoo catfish eggs (than the host) was present in the dwarf petricola catfish.

1.4. FUNCTION

1.4.1. Fish

In the evolutionary arms race, Blazek et al (2018) have shown that one host cichlid (*Simochromis diagramma*) can successfully eject cuckoo catfish eggs from its mouth (with up to 90% rejection; Polacik et al 2019).

But what happens to the rejected cuckoo catfish eggs or offspring? Polacik et al (2019) performed three experiments with fishes in aquariums to answer this question.

Experiment 1 tested survival of host and parasite eggs outside the host parent's mouth (buccal cavity) (ie: placed on sand to hatch). There was no difference in survival between the two species.

Experiment 2 investigated the behaviour of rejected parasite offspring. A juvenile cuckoo catfish was offered a choice of a recently spawned cichlid or a control catfish in compartments at different ends of tank. There was no difference in choice.

Experiment 3 offered rejected parasites the opportunity to return to the host's mouth ("re-infection"). There was a strong parental instinct by the host to collect stray offspring which allowed re-infection.

These experiments showed that cuckoo catfish can survive outside the host's mouth, and, "uniquely among all known brood parasites, cuckoo catfish have the capacity to infect hosts at two qualitatively different ontogenetic stages; as an egg and later as an actively swimming juvenile. Hence, even after rejection at the egg stage, juvenile cuckoo catfish could complete development to the free-swimming stage and return to the buccal cavity of a host..." (Polacik et al 2019 p5).

1.4.2. Solitary Bee

Solitary bee species (eg: grey-backed mining bee; *Andrena vaga*) build nests in sand or hollow plant stems, for example, in which food is provided for the young to development. Within the nest are brood cells containing pollen and nectar, and a single egg is deposited into a cell which is then closed up. The egg develops through larval stages in the cell, and after metamorphosis (appendix 1A), the adult bee emerges (Litman 2019).

Cuckoo bee species deposit a single egg into a brood cell of a host's nest. The lineages of these brood parasites have "entirely lost the ability to gather provisions [eg: loss of scopa - specialised brush of hair for pollen collection] or even build their own nests. As a consequence, their reproductive success is inextricably tied to their ability to locate an appropriate host nest and successfully deposit their eggs inside" (Litman 2019 p2).

Cuckoo bees have three main strategies to avoid the host rejecting their eggs (Litman 2019):

i) The female parasite opens a closed nest, destroys the offspring of the host inside, and deposits her egg before re-sealing the nest (eg: *Euaspidis basalis*).

ii) As above, but the parasitic larva kill the host offspring. These "hospicidal" (host-killing) larvae have evolved to be aggressive with sickle-shaped mandibles (eg: *Melecta separata callura*).

iii) A variation of (ii), but the adult parasite attacks an open nest (eg: *Protepeolus singularis*). The parasite enters the nest while the adult host is away foraging.

Brood parasites lurk around nesting sites, and can face attack from hosts, and so have evolved "armour" (thickened cuticle) (Litman 2019). There is, thus, a balance between parasitising closed and open nests (table 1.1).

Open nest-parasites have evolved disguises, like chemical mimicry. Torchio (1989), for example, reported that the parasitic leaf-cutting bee (*Stelis montana*) ate the same plants as their host.

Another strategy by the parasites is egg-hiding. The egg is deposited in the nest cell wall, for example, rather than openly in the cell. It has been observed that parasites that use egg-hiding also have smaller eggs than their hosts (Litman 2019).

OPEN NESTS	CLOSED NESTS
<p>Advantages:</p> <ul style="list-style-type: none"> • Full access to resources. • No digging required to access nest. <p>Disadvantages:</p> <ul style="list-style-type: none"> • Risk of attack or detection. • Need to evolve strategies to avoid detection. 	<p>Advantages:</p> <ul style="list-style-type: none"> • Less risk of attack or detection from host adult. • No need for strategies to avoid detection. <p>Disadvantages:</p> <ul style="list-style-type: none"> • Resources in brood cell may be eaten by host offspring. • Digging effort to access nest required.

Table 1.1 - Key advantages and disadvantages of parasitising open and closed bee nests.

1.4.3. Birds

Spottiswoode and Busch (2019) considered the rejection of avian parasitic eggs as a parallel with the recognition of pathogens by the immune system of vertebrates. A key mechanism in both cases is self/non-self discrimination. The "defensive action on the part of the host has to minimise the risks of mistaken attack against self (a false hit, analogous to a 'Type I' error in statistics) and of failure to respond effectively to dangerous non-self (a miss, or 'Type II' error), by failing to detect a parasite or by detecting it but misidentifying it as self" (Spottiswoode and Busch 2019 p2) (table 1.2).

Learning has an important role to play. For example, "birds appear to be initially naive to their own egg appearance, and then to learn a template of their phenotype. They then compare potentially foreign eggs to this template to recognise parasitic eggs, and use this information, supplemented by additional cues of parasitism risk, to decide whether to reject an egg from the nest" (Spottiswoode and Busch 2019 p3).

	Avian Hosts	Vertebrate Immune System
Type I error - "false hit"	Reject own egg as parasitic.	Autoimmune response - own cell misidentified as pathogen.
Type II error - "a miss"	Fail to recognise parasitic egg and keep as own.	Fail to recognise pathogens, and infection spreads in body.

(After Spottiswoode and Busch 2019 table 1)

Table 1.2 - "Type I" and "Type II" errors in self/non-self discrimination.

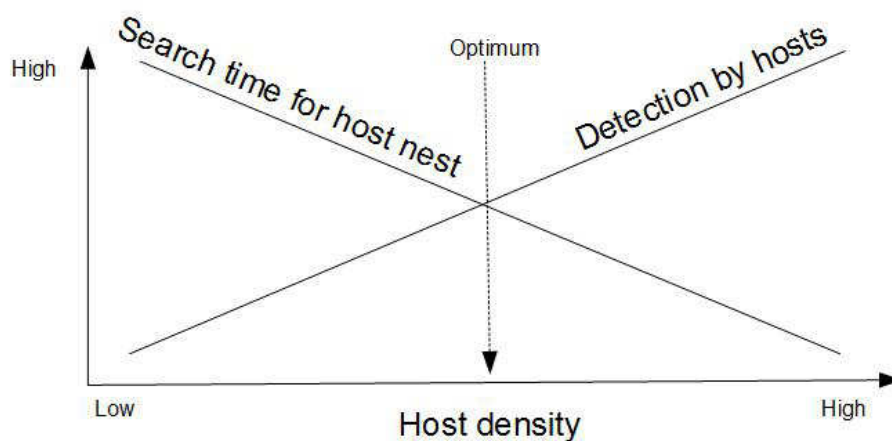
Medina and Langmore (2019) explored the role of host density and reproductive success in a comparison of 242 bird species (116 of which were hosts and the remainder non-parasitised) from published data, and a field study in Australia of superb fairy-wrens (*Malurus cyaneus*) (host) and Horsfield's bronze-cuckoo (*Chalcites basalis*) (brood parasite).

Across the different species, hosts have smaller colony sizes than non-host species, while birds that nest in cavities are less likely to be hosts.

From the fieldwork, it was found that parasitism was higher in moderately densely clustered nests (ie: two or three nests within 200 m) (33.5% parasitism rate). This compared to 6.8% for sparsely distributed nests (ie: one nest within 200 m), 10.3% for densely clustered nests (ie: four nests within 200 m), and no parasitism in nests of five or more in 200 metres.

Brood parasites, then, do not choose hosts in very low or very high density nesting. But "the directionality of this association is unclear; brood parasites may avoid exploiting species that are sparsely distributed or nest in large colonies, or, conversely, host species may have evolved to breed in higher densities as a defence against brood parasitism, or both" (Medina and Langmore 2019 p6).

Intermediate host density is a trade-off for parasites between search time for host nest and detection by hosts (figure 1.5).



(After figure 1 Medina and Langmore 2019)

Figure 1.5 - Trade-off for brood parasites and host nest density.

Host reproductive success was higher in high-density nesting, but only in years of high parasitism. "However, in years with lower parasitism rates the effect of host density was reversed, and nests in lower densities had higher reproductive success" (Medina and Langmore 2019)

p6). Hosts, then trade-off nesting density and risk of BP (table 1.3).

Advantages	Disadvantages
1. Safety from predators. 2. Communal care. 3. Social transmission of information (eg: detection of brood parasites). 4. Other benefits like thermoregulation.	1. Increased competition. 2. Increased risk of infection. 3. More obvious to predators. 4. Risk to young; eg: misdirected parental care.

Table 1.3 - Key advantages and disadvantages of large dense nesting colonies.

1.4.4. Butterflies

Maculinea butterflies (genus) are brood parasites of Myrmica ant colonies (genus), and Tartally et al (2019) examined the relationship using a database of European fieldwork.

Initially the caterpillars of Maculinea butterflies feed on host plants, and then are taken in by Myrmica colonies, where the larvae feed on the resources of the ant colonies (a process known as "adoption"). Commonly, cuticular hydrocarbons of the caterpillars mimic those of the ants (ie: chemical mimicry) (Tartally et al 2019).

There are variations between species of Maculinea butterflies, including dependence on one host species (eg: dusky large blue (Maculinea nausithous) and Myrmica tulinae) or many species (eg: large blue butterfly; Maculinea arion) (Tartally et al 2019).

Specialisation by a parasite for one host leaves them vulnerable if the host evolves a new defence (eg: changes cuticular hydrocarbons, so use of multiple hosts is safer, though, mimicry is less exact (and the risk of attack and rejection).

Tartally et al (2019) concluded: "It is clear that the idea of 'one Myrmica for one Maculinea' does not hold across Europe as a whole but is often true in smaller regions within the continent. It is equally clear that different Maculinea have different propensities for using multiple Myrmica hosts or shifting host. Such alternation in the use of a network of hosts by parasites is expected to be a common outcome of antagonistic co-evolution" (p12).

1.5. EVOLUTION

1.5.1. Birds

What about the mating systems of avian brood parasites? Feeney and Riehl (2019) reviewed the literature on 75 species⁶. Around half of them showed "some degree of pair-bonding", and "territoriality is clearly the rule in brood parasitic birds rather than the exception" (Feeney and Riehl 2019).

It is assumed that brood parasites provide no parental care, but some species do show a limited amount in the form of "mafia" behaviours. Female brown-headed cowbirds, for example, monitor the host's nest after depositing the egg, and punish the host if egg rejection occurs. Around 10% of parasites feed their fledged juveniles, and "this behaviour has been observed in both male and females alone or together and in some case across multiple days" (Feeney and Riehl 2019 p4). These species tend to be territorial - whether defending resources (eg: food sources) or "laying territories" (ie: hosts' nests) (Feeney and Riehl 2019).

Co-operative host nest searching has been reported - both parents searching for hosts, males finding the nests for their pair-bond partner, or males defending territories containing hosts and females mate with the territory-holder in exchange for access to the nests. The male may also distract the host to allow the female to lay (eg: great spotted cuckoos) (Feeney and Riehl 2019).

Feeney and Riehl (2019) summed up that "social and genetic monogamy may result from very different selective pressures, and that male-female co-operative behaviours, population density and territoriality may all interact to favour the evolution of monogamous mating in brood parasites" (p1).

Hamilton (1964) proposed the ideas of "inclusive fitness" and "kin selection" to explain why an individual may act in a way that benefits others at their own cost. This makes sense if the individuals are related (ie: from the "gene's eye view").

What is the relevance of this idea to BP? In some species of birds, laying in relatives' nests occur (eg: goldeneye ducks often parasitise the nest of their mothers or sisters; Gloag and Beekman 2019). "From the host female's perspective, there is an indirect benefit to accepting donor eggs from closely related offspring (say, a grand-daughter), which could partially counteract the costs of incubating the additional egg. This indirect benefit to egg-receivers is particularly likely if they

⁶ The researchers could not find any information on twenty-six other brood parasite species.

possess some ability to preferentially accept the eggs of kin, their own fecundity is low, or the parasitic relative has no nest of its own. Under some conditions, egg-dumping in relative's nests might be better considered a form of intergenerational breeding cooperation, rather than true parasitism" (Gloag and Beekman 2019 p3).

A similar concept is "social immunity" where a whole group defends against a parasite (ie: both affected and unaffected individuals) (eg: alarm calls and physical mobbing of cuckoos and cowbirds by host species). Usually the members of the group are related (Cotter et al 2019).

1.5.2. Others

Among insects, social parasitism is varied - "the host-parasite association can be temporary or permanent, it can be facultative or obligate; there can even be variation in the life stage (larva or adult) of the parasite that exploits the host, or the caste (workers are the exploiters in slave-making ants)" (Cini et al 2019 p2).

Cini et al (2019) observed: "Across these guises, natural selection has equipped social parasites in diverse ways with sophisticated toolkits that enable them to invade and exploit host societies; for example, parasites need to decode their host's communication system and break the rules governing the functioning of the host society. To produce this toolkit, evolution has tinkered with the ancestral traits of the parasites' free-living (social) ancestors: a social parasite may lose, gain, retain or modify traits to enable it to better exploit the host society. Trait gains are likely to represent traits used by the parasite to manipulate the host, while losses are likely those traits that were essential to a free-living social host (such as brood care) but no longer required (and costly to otherwise maintain) by the parasite; modified traits are examples of how evolution can co-opt existing mechanisms and use them to achieve a different function, and/or exaggerate or reduce them adaptively" (p2) (table 1.4).

Change	Example
Loss	No worker caste
Gain	Chemicals pacify host brood
Increase	Physical weapons to kill host adults

(After Cini et al 2019 table 1)

Table 1.5 - Examples of trait changes in social parasites.

Cini et al (2019) noted two characteristics of the inquiline social parasites ⁷ ⁸ of bees, wasps, and ants:

a) Social parasite species are closely related to their host species (eg: same genus). This means that there will be shared ancestral traits between the parasites and hosts.

b) Selection pressure on the parasites is strong because their survival depends on integration into the host colony. The parasite must "first infiltrate a well-established host colony, deceiving and/or overcoming the host workers and queen in order to be accepted; the parasite must then become integrated (remain undetected) into the society and functionally replace the former host breeder. Failure at any of these stages exerts strong selection on the parasite" (Cini et al 2019 p2). Co-evolution exerts pressure on hosts.

If the host evolves stronger defences, one strategy for parasites is to switch to a new host species. The success of this behaviour in insects is "more probable if the new host species is closely related to the current host(s), as close relatives tend to share ecological traits and probably have similar chemical signatures" (Suhonen et al 2019 p2). A large population size and geographical range size of the host are also relevant (Suhonen et al 2019).

Suhonen et al (2019) analysed data on 230 bumblebee species, 63 ant species, and 37 wasp species. Most species are parasite-free, but a few species are attacked by multiple parasite species (up to four different inquiline species). Suhonen et al (2019) suggested that "the main co-evolutionary processes in multi-species host-parasite systems involve interspecific competition between parasite species rather than escalating defences and counter-defences of hosts and parasites" (p9).

1.6. APPENDIX 1A - METAMORPHOSIS

Holometaboly (or "complete metamorphosis"; CM) is where an insect's body is "almost entirely rebuilt", such that "the larval body is always markedly different in form from that of the adult" (Rolff et al 2019 p1). It is estimated that over three-quarters of insect species

⁷ Inquilines are "specialised and committed to a parasitic life and are dependent on being fully integrated into their host's colony throughout their lives" (Cini et al 2019 p2).

⁸ Inquilines appear in "hosts that have transitioned from the ancestral condition of colonies with just one, monogamous queen to one of multiple queens in the same nest (polygyny)" (Gloag and Beekman 2019 p3). Thus, polygyny is the "predictable niche space" (Boomsma and Nash 2014) for the evolution of insect social parasites.

undergo some form of metamorphosis (Rolff et al 2019).

But what are the evolutionary benefits of CM? One answer, which Darwin favoured, was that different life stages allow the insect to occupy different niches (eg: different food resources) (Rolff et al 2019).

This could suggest a decoupling between the larval and adult stage (ie: no carry-over of traits between them). Studying the wood tiger moth, for instance, Galarza et al (2019) found that some characteristics are carried over and others not.

Hinton (1948) argued that CM allowed winged insects to hide in the soil, say, in their larval stage. But Rolff et al (2019) questioned the complexity of CM just for one characteristic (ie: wings).

Rolff et al (2019) preferred "a special case of the decoupling hypothesis" where growth is confined to the larval stage, and differentiation or development occurs later. A period of accelerated growth is "clearly adaptive where food is plentiful in the short term, but the window of opportunity in which to eat it may be limited. In the case of food plants, these resources may be transient because of a short growing season or the development of plant defences, or in the case of an animal carcass because of competition from other carnivores or saprophytes" (Rolff et al 2019 p5). The development of a complex adult body form then occurs in the pupal stage. However, pupae face the cost of predators, pathogens and parasites, though some defence mechanisms have evolved (Rolff et al 2019).

1.7. REFERENCES

Blazek, R et al (2018) Success of cuckoo catfish brood parasitism reflects co-evolutionary history and individual experience of their cichlid hosts Science Advances 4, eaar4380

Boomsma, J.J & Nash, D.R (2014) Evolution: Sympatric speciation the eusocial way Current Biology 24, R798-R800

Cini, A et al (2019) Inquiline social parasites as tools to unlock the secrets of insect sociability Philosophical Transactions of the Royal Society B 374, 20180193

Cohen, M.S et al (2019) Early life-history features associated with brood parasitism in the cuckoo catfish, *Synodontis multipunctatus* (Siluriformes: Mochokidae) Philosophical Transactions of the Royal Society B 374, 20180205

Cotter, S.C et al (2019) Defences against brood parasites from a social immunity perspective Philosophical Transactions of the Royal Society B 374, 20180207

Feeney, W.E & Riehl, C (2019) Monogamy without parental care? Social and genetic mating systems of avian brood parasites Philosophical Transactions of the Royal Society B 374, 20180201

Galarza, J.A et al (2019) Evaluating responses to temperature during

pre-metamorphosis and carry-over effects at post-metamorphosis in the wood tiger moth (*Arctia plantaginis*) Philosophical Transactions of the Royal Society B 374, 20190295

Gloag, R & Beekman, M (2019) The brood parasite's guide to inclusive fitness theory Philosophical Transactions of the Royal Society B 374, 20180198

Hamilton, W.D (1964) The genetical evolution of social behaviour I Journal of Theoretical Biology 7, 1-16

Hanley, D et al (2019) Variation in multi-component recognition cues alters egg rejection decisions: A test of the optimal acceptance threshold hypothesis Philosophical Transactions of the Royal Society B 374, 20180195

Hinton, H.E (1948) On the origin and formation of the pupal stage Transactions of the Royal Entomological Society of London 99, 12, 395-409

Kaur, R et al (2019) Ant behaviour and brain gene expression of defending hosts depend on the ecological success of the intruding social parasite Philosophical Transactions of the Royal Society B 374, 20180192

Litman, J.R (2019) Under the radar: Detection avoidance in brood parasitic bees Philosophical Transactions of the Royal Society B 374, 20180196

McClelland, S.C et al (2019) Convergent evolution of reduced eggshell conductance in avian brood parasites Philosophical Transactions of the Royal Society B 374, 20180194

Medina, I & Langmore, N.E (2019) Host density predicts the probability of parasitism by avian brood parasites Philosophical Transactions of the Royal Society B 374, 20180204

Polacik, M et al (2019) Parasitic cuckoo catfish exploit parental responses to stray offspring Philosophical Transactions of the Royal Society B 374, 20180412

Portugal, S.J et al (2014) Rapid development of brood-parasitic cuckoo embryos cannot be explained by increased gas exchange through the eggshell Journal of Zoology 293, 219-226

Reeve, H.K (1989) The evolution of conspecific acceptance thresholds American Naturalist 133, 3, 407-435

Rolff, J et al (2019) Complete metamorphosis of insects Philosophical Transactions of the Royal Society B 374, 20190063

Spottiswoode, C.N & Busch, R (2019) Vive la difference! Self/non-self recognition and the evolution of signatures of identity in arms races with parasites Philosophical Transactions of the Royal Society B 374, 20180206

Spottiswoode, C.N & Stevens, M (2010) Visual modelling shows that avian host parents use multiple visual cues in rejecting parasite eggs Proceedings of the National Academy of Sciences, USA 107, 8672-8676

Stoddard, M.C et al (2019) Higher-level pattern features provide additional information to birds when recognising and rejecting parasitic eggs Philosophical Transactions of the Royal Society B 374, 20180197

Suhonen, J et al (2019) Brood parasitism in eusocial insects (Hymenoptera): Role of host geographical range size and phylogeny Philosophical Transactions of the Royal Society B 374, 20180203

Tartally, A et al (2019) Patterns of host use by brood parasitic *Maculinea* butterflies across Europe Philosophical Transactions of the Royal Society B 374, 20180202

Thompson, J (1999) Specific hypotheses on the geographic mosaic of co-evolution American Naturalist 153, S1-S14

Thorogood, R et al (2019) The co-evolutionary biology of brood

parasitism: A call for integration Philosophical Transactions of the Royal Society B 374, 20180190

Tinbergen, N (1963) On aims and methods of ethology Zeitschrift Tierpsychologie 20, 4, 410-433

Torchio, P.F (1989) Biology, immature development and adaptive behaviour of *Stelis montana*, a cleptoparasite of *Osmia* (Hymenoptera: Megachilidae) Annals of the Entomological Society of America 82, 5, 616-632

Yang, C et al (2019) Egg retrieval versus egg rejection in cuckoo hosts Philosophical Transactions of the Royal Society B 374, 20180200

2. WHAT REALLY HAPPENED: FELDMAN AND THEISS (1982)

Background - "Behavioural scientists have long suggested that merely expecting an event to occur can sometimes lead to an increased likelihood that the event will in fact happen. Expectations have been shown to affect not only one's own behaviour, but also the behaviour of others" (Feldman and Theiss 1982 p217).

Rosenthal and Jacobson (1968) showed the influence of the teacher's expectations on performance of the student/pupil. Feldman and Theiss (1982) investigated the effect of teacher's expectations on student performance and vice versa in a laboratory experiment ⁹.

Method - 120 female psychology undergraduates ^{10 11} were paired together for a mock lesson ¹². One of each pair was randomly chosen ¹³ as the "teacher" for the lesson, and one as the "student".

The teacher was told that their student would be high ability (positive teacher-expectation condition) or low ability (negative teacher-expectation condition), and the student was given the same information about the teacher (positive student-expectation or negative student-expectation conditions).

There were two independent variables - the expectation of the teacher about the student, and the expectation of the student about the teacher - and four independent conditions (table 2.1) ¹⁴.

After the lesson, each participant was asked to rate the performance of their partner on a seven-point scale ¹⁵. Student performance was also measured by a test about

⁹ A laboratory experiment gives the researchers greater control over the variables than a field experiment, but it is an artificial situation (ie: teaching takes place in a class with other students).

¹⁰ 144 women recruited originally, but twelve pairs not included in analysis because of suspicion by the participants about the experiment's purpose (ie: not naive).

¹¹ A convenience sample - easy to find, but not necessarily representative of the population, which limits generalisability of the findings. Generalisability is also limited because the sample were psychology undergraduates and all female. They were naive to researcher's aims as not taken psychology course before. They were volunteers, though the offer of extra course credit for participation alters that slightly.

¹² The lesson was a short-term (20 minutes), one-time interaction. Also a "loss of experimental control and precision that exists when both partners in a dyadic setting are naive subjects" (Feldman and Theiss 1982 p223). The use of a confederate would have given greater control to the experimenters, but it would not have been possible to assess both teacher and student expectations at the same time. However, analysis of the results was done separately (ie: teacher-only and student-only).

¹³ This removes bias, and could be achieved by the toss of a coin.

¹⁴ Experiments with independent designs need more participants than those with repeated measures, but they remove "order effects" (where, here, participants would have become aware of the purpose of the research by doing more than one condition).

¹⁵ This is a Likert scale which varied from competent to incompetent, for example. A seven-point scale is common, but why not less points (eg: five) or more (eg: nine)?

<p>Condition A:</p> <p>Teacher - positive expectation about student</p> <p>Student - positive expectation about teacher</p>	<p>Condition B:</p> <p>Teacher - negative expectation about student</p> <p>Student - positive expectation about teacher</p>
<p>Condition C:</p> <p>Teacher - positive expectation about student</p> <p>Student - negative expectation about teacher</p>	<p>Condition D:</p> <p>Teacher - negative expectation about student</p> <p>Student - negative expectation about teacher</p>

Table 2.1 - Four independent conditions in the experiment.

the lesson content, and the mother's performance was scored by independent judges from a video-recording of the lesson. These are the measures of the dependent variable ¹⁶. The participants were then debriefed ¹⁷.

Findings - Student performance on the test was better (non-significantly) in the positive than negative teacher-expectation condition (67% vs 55% correct of six questions). Teacher performance was rated significantly higher in the positive student-expectation condition than the negative one (mean 4.40 vs 3.61 out of 7). "Thus, simply being told that a student is likely to perform well or poorly is sufficient to result in differential teacher behaviour" (Feldman and Theiss 1982 p221).

The ratings by the students and teachers varied depending on the expectations.

Discussion - "Support was found for the notion that both the expectations of the teacher and student do have an effect on the outcome and feelings of success of both partners in the dyad" (Feldman and Theiss 1982 p222).

The expectations of the teacher had a stronger influence on student performance than the other way around. In fact, "the results do not indicate that student expectations about the teacher were transmitted to the teacher" (Feldman and Theiss 1982 pp222-223).

¹⁶ Multiple ways of measuring the outcome allows the researchers to see the effects from subjective and objective measures, and removes the risk of dependence of one type of measure (eg: self-reports).

¹⁷ The participants were informed about the deception involved in the experiment, which the researchers justified as necessary. There was little risk of harm to participants, in terms of other ethical issues, but did the participants freely consent when offered the reward of extra course credits, and did they have the right to non-participate?

REFERENCES

Feldman, R.S & Theiss, A.J (1982) The teacher and student as pygmaliions: Joint effects of teacher and student expectations Journal of Educational Psychology 74, 2, 217-223

Rosenthal, R & Jacobson, L (1968) Pygmalion in the Classroom: Teacher Expectation and Pupils' Intellectual Development New York: Holt, Rinehart & Winston

3. SOME BIOETHICS

- 3.1. Chimera and moral status
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3.1. CHIMERA AND MORAL STATUS

The technique of interspecies blastocyst complementation is "on the cusp of feasibility" (Koplin and Wilkinson 2019a), and it will allow the growing of human organs inside human-pig chimeras (HPCs). The technique knocks out genes in the pig embryo responsible for growing certain organs, and adds human pluripotent stem cells. The animal will be a chimera (combination of two species) with the targeted organs being wholly human (Koplin and Wilkinson 2019a).

HPCs could overcome the shortage of organs for transplantation, and use of the recipient's stem cells will circumvent organ rejection by the immune system (Koplin and Wilkinson 2019a).

But what about "arguably the central ethical concern raised by the prospect of generating human organs in human-pig chimeras: that human-pig chimeras would develop morally relevant cognitive capacities" (Koplin and Wilkinson 2019a p440)?

Marino (2017), for example, argued against the creation of HPCs - "These organisms may be capable of self-awareness to the extent that they understand their identity and circumstances, which would produce unbearable suffering... If we cannot say with certainty that this will never happen, then we need to stop this kind of research right now before we find ourselves in a world where there is no line" (quoted in Koplin and Wilkinson 2019a). While Knoepfler (2016) talked of HPCs occupying "an ethical 'grey zone' between the moral status of animals and humans" (Koplin and Wilkinson 2019a p440).

The concern is greatest where the HPCs have

"humanised brains" ¹⁸, and in the USA, for instance, a moratorium on funding has been issued by the National Institutes of Health (Koplin and Wilkinson 2019a).

Koplin and Wilkinson (2019a) clarified the concept of moral status: "To say that a being has moral status is to say that a being has moral importance in their own right; beings with moral status have interests that ought to be taken into account when we consider how we should treat them. We assume that moral status can be ascribed in degrees. To say that one being has more moral status than another is to say that our moral obligations towards the first being are weightier than our moral obligation towards the second" (p441). The issue is that the HPCs have characteristics that increase their moral status "beyond that of a regular pig" (Koplin and Wilkinson 2019a). This is because moral obligations towards non-humans is usually linked to their perceived cognitive abilities ¹⁹.

Koplin and Wilkinson (2019a) pointed out that assessing perceived cognitive abilities is difficult in practice, and so there is a problem with establishing the moral status of the regular pig this way ²⁰.

One approach to the HPC is the "moral status precautionary principle" (MSPP) - "A course of action should not be pursued if there is a reasonable fear that the course of action will cause serious harm to beings of full moral status, even if there is no conclusive evidence that the beings will actually have full moral status" (Koplin and Wilkinson 2019a p443) ²¹. In other words, do not create HPCs because of the ethical risks associated with it. Alternatively, there is the "moral status no alternative principle" (MSNAP) - "A course of action may be pursued if there is a reasonable fear that the course of action will cause serious harm to beings of full moral status, *only* if there is no alternative course of action that would achieve the same benefit without any risk of serious harm to beings of full moral status" (Koplin and Wilkinson 2019a p443).

¹⁸ Resnick (2019) questioned whether having human neurons in the brain of a pig is the same as a human brain - "A pig with human neurons in its brain is not likely to develop a human brain unless... factors combine to produce an organ that is structurally and functionally similar to a human brain" (p449). Therefore, a pig with a human brain is "very unlikely" to "have the cognitive abilities that we think are linked to moral status" (Resnick 2019).

¹⁹ Humans are seen as having the full moral status because of our superior cognitive abilities ("anthropocentrism; Sandin 2019).

²⁰ Streiffler (2019) emphasised the practical problem of establishing what aspect of HPC research enhances the participant's moral status.

²¹ Munthe (2019) asked about the price of precaution - ie: how much evidence is needed before continuing with the technique - particularly "as it is far from certain that any transplantation practice based on this technology will ever see the light of day" (p447).

Koplin and Wilkinson (2019a) made the suggestion that a solution may be "to apply the MSPP/MSNAP to both human-pig chimeras and non-chimeric pigs. If we think it is appropriate to take precautions against harming human-pig chimeras on the chance they have full moral status, then perhaps we should also be prepared to take precautions against harming regular pigs on the chance they possess full moral status. This would require us to renounce the farming of pigs for food unless and until we can be confident that pigs lack more than minimal moral status" (p444).

Resnick (2019) challenged the position that "it would be inconsistent to have moral qualms about creating pigs with humanised brains for organ transplantation but to no such misgivings about raising pigs for food" (p449).

King (2019) argued that if we applied the same moral status to the HPC and the regular pig, it would raise uncertainty about the moral status of all entities - "sentient and non-sentient animals, insects, plants, bacteria and artificially intelligent machines. Moreover, if we should be uncertain about these, we should be uncertain about whatever they develop from: fertilised eggs, seeds, the gametes of these and perhaps even the parts of machines, or machine learning algorithms" (p451).

Responding from comments from these other authors, Koplin and Wilkinson (2019b) pointed out that the HPC is one of a growing range of morally uncertain situations, like transgenic monkeys with human genes associated with intelligence ²², and the ultimate question is how to deal with them ethically ²³.

3.2. MEDICAL CROWDFUNDING

"Crowdfunding" is "the practice of soliciting a

²² Barbara. J. King described rhesus monkeys with a human brain gene linked to intelligence (as "created" at the Kunming Institute of Zoology in China) as "an ethical nightmare" (Rigby 2019). Julian Savulescu explained: "Is it unethical to make an animal more intelligent? Not in itself... Already mice have been genetically modified to have better memories. It's a question of what those modifications do to the animal's well-being and how that animal is treated... As you start to improve or enhance the intelligence or empathy or capacity for social relationships, or any property, then there's a corresponding obligation to treat the animal in a way that those capacities are developed and also that they are associated with suffering for the animal" (quoted in Rigby 2019).

²³ Technological developments provide challenges as Kofler (2019) described with the gene editing technique, Crispr: "Most of us support a future where Crispr is used to treat over 10 000 monogenic diseases that impact 75 million people every year. But should Crispr also be used to 'correct' deafness, for example, and by extension, eradicate a rich and vibrant deaf community? Should it be used to increase intelligence or muscle strength? What about changing children's eye colour? Or their sexuality? The future becomes blurry when Crispr applications move beyond treating disease to instead perpetuate subjective perceptions of normalcy or supremacy" (p1).

large number of small donations via internet platforms" (Jin 2019 p538). "Medical crowdfunding" (MC) is the funding of individual health-related expenses (eg: medical care or innovative treatment) this way.

"Medical crowdfunding has the benefits of improving the recipient's access to medical treatment and promoting social engagement in charity. However, this fundraising practice raises economic risks and ethical concerns. Due to the asymmetrical information structure, fabrication threatens the authenticity of medical crowdfunding. Furthermore, crowdfunding may exacerbate health inequities by favouring those with broader social networks and better narratives of deservingness instead of greater health needs" (Jin 2019 p538).

Jin (2019) concentrated on MC in China, where specialist Internet platforms like Tencent Gong Yi raise vast amounts of money. Jin (2019) analysed 100 MC campaigns on this platform in 2016-17, of which less than one-tenth achieved their stated financial goal. Campaigns for children were most common.

Because of concerns over fake or fraudulent claims, most campaigns provided formal medical proofs (eg: photographs of scan results). Jin (2019) raised the ethical concern of privacy breach. "All the sampled campaigns used real names and disclosed a significant amount of personal information. In addition, a large proportion of the recipients were children under 18; it might be difficult for them to refuse if their parent consented to medical crowdfunding that threatened their privacy. Moreover, some of the medical proof provided in the campaigns showed the name and department of the doctor in charge, which might constitute a breach of privacy if the doctor had not consented to such disclosure" (Jin 2019 p543).

The campaigns were framed around financial distress, and the role of the family. "For example, one daughter appealed for her father who was hospitalised after a traffic accident: 'As long as my father is alive, our family stays together... I don't want to lose my father. Even if he wakes up vegetative or paralysed, I will still be by his side'" (Jin 2019 p539). A small number of campaigns blamed fate or god for the unfairness. "No campaigns attributed their difficult situation to social arrangements or insufficient governmental support" (Jin 2019 p541).

3.3. SMOKING IN HOSPITAL

Sue and Applewhite (2019) considered the situation of patients in hospital who leave the ward to go outside for a smoke because of the no-smoking ban indoors. These

authors began with this fictional scenario: "Mr Jones ripped his IV out of his arm. While blood was spurting on the bed, the nurse and the intern physician tried to talk him down from signing himself out of the hospital against medical advice. He was upset because he had not been allowed to leave the floor for a smoke break. Our medical team had been treating Mr Jones for endocarditis, which required at least 6 weeks of intravenous anti-biotics to treat. The team was concerned given blizzard-like conditions outside. Moreover, it had been noted in Mr Jones' chart during a previous admission that he was suspected of using drugs while out on a smoke break" (Sue and Applewhite 2019 p483).

The authors had no doubts about the benefits of smoking cessation ²⁴, but "banning smoking on hospital campuses or among hospitalised patients creates new challenges. Patients who smoke often find smoking bans to be an infringement on their rights or needs, and policies and regulations about smoke breaks are inconsistently enforced. Meanwhile, medical teams, particularly nurses on the frontlines of patient care, spend an inordinate amount of time and energy worrying about allowing patients on smoke-breaks and monitoring their absences" (Sue and Applewhite 2019 p483).

Some hospitals also include bans on outdoor spaces ("campus-wide smoking bans"). The health benefits of this are less convincing. "One of the strongest arguments for outdoor smoking bans that remains, then, is to minimise public nuisance such as decreasing litter and fires and avoiding exposure to 'offensive' activities" (Sue and Applewhite 2019 p483). Chapman (2008) was critical - "public health research is debased when it lends bogus credibility to what are essentially matters of community preference" (quoted in Sue and Applewhite 2019).

Sue and Applewhite (2019) considered hospital smoking bans using Beauchamp and Childress's (2013) four principles of bioethics:

i) Autonomy - As long as an individual's actions are not harming others, then they are free to behave as they wish. Sue and Applewhite (2019) suggested a larger issue here - "What is at stake is often more than just a cigarette, but rather autonomy – and with that, pride and dignity – during a hospitalisation in which patients are routinely needled, tested and treated in often painful and undignified means to a clinical endpoint in which the patient may or may not feel subjectively better" (p484).

ii) Beneficence - Healthcare policies should benefit

²⁴ Tan and Glantz's (2012) meta-analysis of forty-five studies of thirty-three smoking bans/smoke-free policies found less hospitalisations for heart and respiratory conditions, for example.

the patients. Sue and Applewhite (2019) argued for a concerted effort to help smokers quit (eg: nicotine replacement therapy) both while in hospital and afterwards.

iii) Non-maleficence - Policies should not harm individuals. Sue and Applewhite (2019) stated: "We know that patients feel unsafe going outside to smoke, particularly those in wheelchairs or when the weather is at extremes. We therefore disagree with moves to create strict, hospital wide smoking bans and instead encourage smoke-free campuses to include designated smoking areas where patients can smoke, equipped with medical alert bells, shelter and heat lamps during winter" (p484).

iv) Justice - "Smoking is an addictive practice that has increasingly become a habit of the poor that carries with it a high amount of stigma and shame regarding deeply engrained bodily practices and habits as a myriad of historical, corporate, medical and cultural forces have converged" (Sue and Applewhite 2019 p485).

Sue and Applewhite (2019) continued: "We push ourselves and colleagues to engage in physician advocacy on behalf of our patients and remind ourselves to target the economic, corporate, and healthcare environments that ultimately place our patients at increased risk for tobacco related harm. This includes, but is certainly not limited to, demanding improved access to healthcare (and therefore access to evidence-based tobacco cessation interventions), integration of social services into smoking cessation efforts, and increased accountability from – and limits on – the tobacco industry" (p485).

When the principles conflict, as in the paternalism of the smoking ban and smoker's autonomy, Sue and Applewhite (2019) argued that "harm reduction demands that we involve people with ongoing tobacco use in informing the policies that most affect them, and hospitals should extend special efforts to involving these populations in the creation of these policies intended to benefit all patients" (p485).

3.4. PRESSURE FOR EUTHANASIA

In the Netherlands, the Termination of Life on Request and Assisted Suicide Act was introduced in 2002. This allowed for euthanasia or physician-assisted suicide (EAS) based on certain criteria - the patient's request is voluntary and well-informed, their suffering is unbearable with no prospect of improvement or a reasonable alternative (de Boer et al 2019).

Physicians are not legally obliged to perform EAS even if all the criteria are met (de Boer et al 2019).

But do physicians feel pressurised by EAS requests? A 2014 survey found that nearly three-quarters of doctors did feel pressure to grant a request for EAS (de Boer et al 2019).

de Boer et al (2019) explored this further in interviews with fifteen general practitioners (GPs), who described 36 cases of EAS with pressure. Fourteen of the GPs had performed euthanasia, eleven more than once.

Six themes emerged from the interviews:

a) Emotional blackmail - EAS was seen as a right, which led to threats of suicide from the patient or murder by a relative if EAS not granted, as well as personal attacks (eg: "You are scared to do it", said one patient reported a doctor).

b) Control and direction by others over the GP - "For example, in the case where the GP was still in the process of willingness to discuss euthanasia in due time and the patient suddenly said: 'I have made up my mind, I want it [euthanasia] after my birthday, because I still want to celebrate my birthday'. At this point, this GP started 'feeling pressure, because she [the patient] very much took over control'" (de Boer et al 2019 p427).

c) GP's doubts about fulfilling the legal criteria - "One GP provided the example of a patient who was suffering from increasing dependency and loss of control: 'I needed multiple meetings and time for myself to feel this [type of suffering] was enough for euthanasia'. Looking back she felt forced to make a decision in a situation which to her felt as 'too soon'" (de Boer et al 2019 p427).

d) Counter-pressure from relatives who opposed the EAS.

e) Referral patients, where there was a lack of time to develop a trusting relationship.

f) "Organisational hassle" of arranging EAS, as well as the daily workload as a GP.

de Boer et al (2019) concluded that "the pressure experienced by GPs in dealing with EAS requests can be attributable to factors associated with the patient-physician relationship and/or the relationship between the physician and the patient's relative(s), the inherent complexity of the decision itself and the circumstances under which they have to make the decision to (not) grant EAS requests or perform EAS" (p428).

3.5. BRAIN DEATH

Vrselja et al (2019) reported the ability to receive some cellular activity in the brains of pigs decapitated four hours previously. There was no evidence of global electrical activity associated with consciousness or ability to perceive the environment. The researchers developed a surgical procedure (known as "BrainEx") that circulated a solution (containing haemoglobin-based oxygen and pharmacological agents) through the brain cells.

But a number of ethical issues are raised, of which Farahany et al (2019) saw the most important as "what makes an animal - or human - alive". Until this point, it was assumed that neural activity and consciousness are lost within a short time of interrupting blood flow to the brain, and this is an irrecoverable process (Farahany et al 2019).

Farahany et al (2019) asked five questions:

a) How should researchers try to detect signs of consciousness?

b) Are pigs appropriate models for human brain research?

c) Could the capacity to feel pain emerge in such experiments?

d) Should anaesthetics be used or not (just in case pain is experienced)?

e) How long should brains be kept "alive" in such experiments?

Youngner and Hyun (2019) noted the implications of the research in relation to removal of human organs for transplantation. Two main protocols are used:

i) "Controlled donation after circulatory determination of death" (controlled DCDD) - After severe brain injuries, but not brain death, consent is obtained to turn off life support equipment. Death is declared 2-5 minutes after the heart stops.

ii) "Uncontrolled donation after circulatory determination of death" (uncontrolled DCDD) - With a fatal heart attack, say, in a non-medical setting, 5-20 minutes after resuscitative efforts have failed, steps are taken to preserve the organs.

But how long to wait after death ²⁵ is declared? "Questions about the term 'irreversible' haunt both protocols. Does this mean that the care team is unable to reverse a situation, or that they have reasonably decided not to attempt to? Unsurprisingly, most advocates for transplantation favour the latter view. Some have even argued that further efforts to restore people's brains at the expense of organ procurement would divert much-needed medical resources and potentially increase the number of people with severe disabilities" (Youngner and Hyun 2019).

These authors continued: "These debates and decisions could become much more fraught if advances in research challenge assumptions about the brain's inability to recover from an absence of oxygen, or even just hint at the possibility that consciousness can be restored after a person's heart has stopped beating. Ultimately, more people could become candidates for brain resuscitation rather than for organ donation" (Youngner and Hyun 2019).

3.6. LIVING-RELATED CORNEAL TRANSPLANT

Human cornea transplants have a long history (eg: first performed in 1905; Behaegel et al 2019), usually from deceased donors. But because of the shortage of donor cornea (eg: 1 per 70 needed; Behaegel et al 2019), living-related donors could be considered (though the donor will have a blind eye) (Behaegel et al 2019).

Thus, ethically, living donors contravene the basic principle of medicine - "first do no harm". But related donors get "indirect" benefits in the sense of helping family members, as well as their autonomous decision being respected (Behaegel et al 2019).

It is, therefore, important to have a robust consent process, where both donor and recipient must agree. The key issues are (Behaegel et al 2019):

- Donor's capacity to make a complex decision.
- Provision of detailed information.
- Voluntariness (eg: implicit family pressures to donate reduces autonomy). One way to deal with this risk, used with living kidney donation, is the passing of the final decision to an independent team at the hospital. say.
- The decision - allowing time, and the possibility of

²⁵ Known as the "prolonged post-mortem interval"; Vrselja et al 2019).

refusal.

- Conflict - a donor may express reluctance privately to a doctor while publicly consenting to the family. If the donor is unwilling to tell the family of their real feelings, the doctor may maintain privacy by declaring the donor "unsuitable".
- Unanticipated risks - eg: discovering the donor has a previously unknown serious illness during screening, like HIV.

3.6.1. Opt-In and Opt-Out Donation

"Opt-in" organ donation schemes require individuals who want to donate to register, while "opt-out" schemes assume consent is deemed and refusal to donate has to be registered. The four countries of the UK are in the process of moving to the latter (eg: Wales changed in 2016 and England will do so in 2020) (Shaw 2019).

Shaw (2019) outlined the "default" changes in this process:

a) Opt-in to opt-out - Critics argue that it is a violation of autonomy. Shaw (2019) pointed out that "before, it was necessary to consent; now, it is necessary to refuse, but choice can still be exercised. This change might seem rather presumptuous on the part of the state, but the evidence illustrates that most people want to donate their organs, so changing the default is in line with that. The change in legislation does not remove the right to choose whether to donate; it simply changes the mechanism of consent and refusal" (pp436-437).

b) No change for those opting-in - Individuals can still register their consent to donate and thereby emphasise their desires, particularly if families are considering prevention.

c) No change for children - Deemed consent will not be the case for children.

d) Removal of family consent, but expansion of family overrule - Deemed consent "disempowers families to some extent", but families "will be able to 'overrule', 'override', or 'veto' donation from a patient for whom consent has been deemed in addition to recorded consent" (Shaw 2019 p438). This overrule comes in the form of "new evidence of refusal". In the first year of opt-out in Wales, the rate of family overrule of deemed consent was 33% compared to 8% overrule of consent under the opt-in system. However, overrule was 44% where there was no

consent under opt-in (Shaw 2019).

Shaw (2019) ended: "Changing the law to enable deemed consent might seem like it is an ethical way of boosting organ donation rates, but the reality is more complicated. The evidence from Wales is still weak, but it appears that many people are unaware of the change in consent system, and while deemed consent is resulting in more donations compared with the old family consent system (where the donor had not consented), it still lags substantially behind the consent rate for patients who have registered consent. Although the formal defaults regarding individual and family consent have changed, the retention of the informal family overrule means that families still have the power to prevent donation. Many families will understandably want to opt out their relatives out of deemed consent, so the success of the new system in England or Scotland should not be presumed" (p438).

3.7. TRANSGENDERISM

Ashley (2019) outlined a situation: "We generally trust what other people say about their own mental states. If someone says, 'my arm hurts', we typically grant credence to their claim. We have this trust in people's self-reports of their mental states because we hold mental states to be within the purview of people's epistemic authority – authority over knowledge. This authority is defeasible: I do not need to demonstrate the authoritativeness of my assertion and probing questions would typically be unjustified, but if a serious reason to doubt it is present, it would be legitimate to doubt the claim and ask further questions... If someone says that their arm hurts but are laughing at the same time, we may have a good reason to doubt, yet in the absence of such conflicting indication, it would be illegitimate to doubt them. Defeasibility addresses the epistemic tension between our privileged access to our own mental states and the fallibility of that self-knowledge. If I were to doubt that person's claim without serious reasons to believe otherwise, I would be committing an injustice because I would unjustly fail to recognise their authoritative knowledge of their own experience of the world" (p480).

But there is a mistrusting of self-reports for gender dysphoria, argued Ashley (2019) ²⁶. Such a response treats "self-reports of gender dysphoria not as one would

²⁶ Gender dysphoria is defined as "discomfort or distress that is caused by a discrepancy between a person's gender identity and that person's sex assigned at birth (and the associated gender role and/or primary and secondary sex characteristics)" (Coleman et al 2012 quoted in Ashley 2019).

treat reports of normal mental experiences, but as one would treat reports of mental illnesses" (Ashley 2019 p481).

Ashley (2019) preferred to talk about "gender euphoria" and "creative transfiguration". The former describes medically transitioning as "a distinct enjoyment or satisfaction caused by the correspondence between the person's gender identity and gendered features associated with a gender other than the one assigned at birth" (Ashley and Ellis 2018 quoted in Ashley 2019). Creative transfiguration "sees the body as a gendered art piece that can be made ours through transition-related interventions" (Ashley 2019 p481).

Ashley (2019) completed the argument that not respecting the request for hormone replacement therapy (HRT) as dehumanising as transgender individuals. Because medical authorities "don't see self-reported desire for medical transitiona [sic] as sufficient a justification to obtain a HRT prescription, mental health referral requirements fail to recognise the value of trans self-actualisation and, based on my experience with trans communities, will frequently be experience as dehumanising by those who do not fall under a pathologising gender dysphoria model" (p481).

3.7.1. Transgender Health

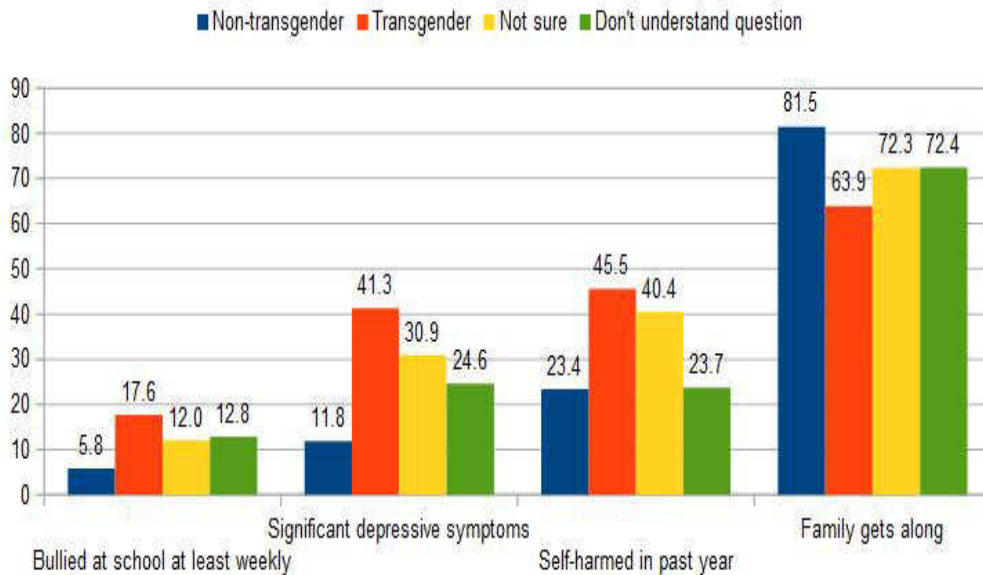
Clark et al (2014) suggested that "most transgender youth 'remain invisible' [Dean et al 2000] in Western cultures and they must work strategically to appear indistinguishable from their non-transgender peers to avoid abuse. People are expected to assume the gender typically associated with their assigned sex category, and to adopt the gender roles and expectations associated with this. Those who challenge these expectations experience 'antagonistic, unwelcoming, and unsafe' [Goldblum et al 2012] environments" (p94).

Clark et al (2014) considered the well-being of such adolescents in an analysis of data from "Youth'12". This involved a survey of adolescents in New Zealand from randomly selected secondary schools (n = 8166), who completed a 608-item online questionnaire in 2012.

The key question was: "Do you think you are transgender? This is a girl who feels like she should have been a boy, or a boy who feels like he should have been a girl (eg: Trans, Queen, Fa'faffine, Whakawahine, Tangata ira Tane, Genderqueer)?" (p94). The answers were divided into four categories - non-transgender (94.7%), transgender (1.2%), unsure (2.5%), and did not understand the question (1.7%).

Compared to the non-transgender group, the three

other groups reported increased risk of violence, increased health and well-being needs, and less "protective factors" (figure 3.1).



(Data from Clark et al 2014 tables 2 and 3 p97, table 4 p98)

Figure 3.1 - Selective significant differences between non-transgender and other categories (%).

The findings confirmed the diversity in experience of transgender adolescents: "Most of the transgender students surveyed reported that they had at least one parent who cared for them, that school was okay, that they felt safe in their neighbourhood, and that they were not suicidal and did not have significant depressive symptoms. However, transgender students and those who were not sure or did not understand the question were at increased risk of being bullied, having physical fights, depressive symptoms, and suicide attempts, and being unable to access health care compared with their non-transgender peers" (Clark et al 2014 p96).

Key methodological issues of the study:

- The wording of the question about transgender, particularly as 1.7% of respondents did not understand it.
- Another question on the survey asked, "what sex are you?", and offered only two response options (male/female). Clark et al (2014) admitted that "it is hard to know how transgender students interpreted the question on sex (ie: did they respond based on their

natal sex or based on their gender identity at the time of the survey?). Therefore, we do not know which transgender students were girls assigned male at birth or boys assigned female at birth. However, many transgender young people identify with a gender that is outside the conventional binary of male/female" (pp97-98).

- All data self-reported.
- The survey was performed on one day at school, and "evidence suggests that adolescents who attend school are healthier than those who do not" (Clark et al 2014 p98).

3.8. MISCELLANEOUS

3.8.1. Marine Genes

"Blue growth" is the idea that economic benefits can be elicited from the oceans. One aspect of that is "marine genetic resources" (MGR), which covers the patenting of genes found in marine organisms. Blasiak et al (2018) voiced concerns that a small number of transnational corporations are coming to dominate this area.

These authors investigated what genes were being patented by creating a database of 38 million records of sequences of genetic material associated with patents (since the first patent related to a marine species in 1988).

There were 862 marine species and 13 000 genetic sequences identified. The majority of patents (over 80%) were registered by 221 companies, with BASF (chemical manufacturer) being the leading individual company.

Basiak et al (2018) concluded that "it is clear that the potential for commercialisation of the genetic diversity in the ocean currently rests in the hands of a few corporations and universities, primarily located or headquartered in the world's most highly industrialised countries" (p5).

Blasiak et al (2019) developed their concern by arguing for transparency about the origin of marine gene patents. With the growth in interest in MGR, biodiversity in the oceans could be threatened, as well as the ethics of sharing the benefits from marine biotechnology developments.

3.8.2 Scientists' Warning

Ripple et al (2019) represented over 11 000

scientists who felt a moral obligation to warn that "planet Earth is facing a climate emergency". They stated: "The climate crisis is closely linked to excessive consumption of the wealthy lifestyle. The most affluent countries are mainly responsible for the historical GHG [greenhouse gas] emissions and generally have the greatest per capita emissions" (Ripple et al 2019 p1).

Ripple et al (2017) stated: "By failing to adequately limit population growth, reassess the role of an economy rooted in growth, reduce greenhouse gases, incentivise renewable energy, protect habitat, restore ecosystems, curb pollution, halt defaunation, and constrain invasive alien species, humanity is not taking the urgent steps to safeguard our imperilled biosphere" (p1026).

In the 21st century, there are both positive and negative signs of a response to warnings, including (Ripple et al 2019):

Negative - eg: increasing human population; increasing livestock population and meat consumption; increased global tree cover loss; increasing air passengers.

Positive - eg: reducing birth rates; decelerated Amazon deforestation; increasing use of wind and solar power.

Ripple et al (2019) recommended six inter-related steps:

i) Energy - cleaner sources and greater efficiency, and wealthier countries supporting poorer countries to move away from fossil fuels.

ii) Short-lived pollutants - eg: reduce methane emissions.

iii) Nature - protect and restore ecosystems.

iv) Food - increase consumption of plant-based foods.

v) Economy - a shift away from economic growth and "the pursuit of affluence".

vi) Population - continue reducing fertility rates.

Heat

Climate change will increase heat exposure, and this will have consequences for humans in different ways, like

for pregnant women. One possibility is acceleration of childbirth.

"Extreme heat has been hypothesised to cause an immediate increase in delivery risk, both in animals and in humans. One possible channel for these effects is that heat increases levels of oxytocin, which is a key hormone regulating the onset of delivery. Alternatively, extreme heat might cause earlier deliveries via cardiovascular stress" (Barreca and Schaller 2019 p1). Shorter gestational period can have both short- and long-term effects. For example, one study found that exposure to extreme hot days in the womb led to lower birth weight, while another study calculated a lower income in adulthood (Barreca and Schaller 2019).

Barreca and Schaller (2019) attempted to calculate the loss of gestational days due to hot weather in the USA between 1969 and 1988. The overall daily birth rate was 19.1 per 100 000 women aged 15-44 years. Seven different groups were distinguished based on temperature, and it was found that birth rates increased by 0.97 births on days with maximum temperature over 32 °C (>90 °F) compared to 15-20 °C (60-70 °F).

It was calculated that one hot day (>32 °C) resulted in 9.9 lost gestational days per 100 000 women, and a total of 151 000 lost days annually.

3.8.3. Superpowered Supercrip

A number of films and television series feature individuals with "extraordinary skills that result from or are related to a character's specified mental illness" (Beirne 2019 p235). Schalk (2016) has talked of the "superpowered supercrip" trope in relation to disabilities generally.

"The more common definition of 'supercrip' speaks of an 'inspirational' individual overcoming obstacles, and achieving either ordinary ('regular supercrip') or extraordinary ('glorified supercrip') things despite having a disability. The 'superpowered supercrip narrative' in contrast 'is primarily a fiction, television or film representation of a character who has abilities or "powers" that operate in direct relationship with or contrast to their disability' [Schalk 2016]" (Beirne 2019 p236). For example, "Matt Murdock" in "Daredevil" whose partial blindness leads to enhanced other senses and an advantage in combat, or "Daniel Pierce" in "Perception" who receives special messages from his hallucinations that help in solving crimes (Beirne 2019).

Talking in reference to "Monk" (a detective with obsessive-compulsive disorder; OCD), Johnson (2008) pointed out: "Historically, madness has typically been

described as a discourse of exclusion... madness has become, at least in part, a means of managing individuals and directing them into productive circuits... difference is not excluded but cultivated as a useful social and economic resource" (quoted in Beirne 2019).

Beirne (2019) felt that the portrayal of medication (and treatment), which can dampen the special skill, "led to a certain framing of mental illness as a choice" (p238). Many episodes of the series present the characters with a binary choice of enhanced abilities/no medication versus medication and reduced negative symptoms and enhanced abilities.

"These representations rely on the incorrect assumptions that psychiatric medication is always quickly and completely effective, and that it is more likely to remove the ability to function at a high professional level than psychiatric symptoms are. Although this trope avoids characterising mental health conditions in the violent or anti-social ways common to previous depictions,... it heightens the stigma of taking psychiatric medication. These problematic representations of medication also set up a discursive framework that places the ethical burden of mental illness, and its attendant stigma, firmly on the shoulders of the individual experiencing symptoms. It suggests that these characters' choose to experience personal symptoms in order to achieve professional success, thus, they are responsible for their symptoms. Or, they choose to eliminate their symptoms at the expense of helping people/society, and their loss of symptoms risks the lives and well-being of others" (Beirne 2019 p238).

3.9. REFERENCES

Ashley, F (2019) Gatekeeping hormone replacement therapy for transgender patients is dehumanising Journal of Medical Ethics 45, 480-482

Ashley, F & Ellis, C (2018) In favour of covering ethically important cosmetic surgeries: Facial feminisation surgery for transgender people American Journal of Bioethics 18, 23-25

Barreca, A & Schaller, J (2019) The impact of high ambient temperatures on delivery timing and gestational lengths Nature Climate Change (<https://www.nature.com/articles/s41558-019-0632-4>)

Beauchamp, T.L & Childress, J.F (2013) Principles of Biomedical Ethics Oxford: Oxford University Press

Behaegel, J et al (2019) Ethical issues in living-related corneal tissue transplantation Journal of Medical Ethics 45, 430-434

Beirne, R.C (2019) Extraordinary minds, impossible choices: Mental health, special skills and television Medical Humanities 45, 235-239

Blasiak, R et al (2018) Corporate control and global governance of marine genetic resources Science Advances 4, eaar5237

Blasiak, R et al (2019) Scientist should disclose origin in marine gene patents Trends in Ecology and Evolution 34, 5, 392-395

Chapman, S (2008) Should smoking in outside public places be banned? No BMJ 337, a2804

Clark, T.C et al (2014) The health and well-being of transgender high school students: Results from the New Zealand Adolescent Health Survey (Youth'12) Journal of Adolescent Health 55, 93-99

Coleman, E et al (2012) Standards of care for the health of transsexual, transgender, and gender-non-conforming people, version 7 International Journal of Transgenderism 13, 4, 165-232

Dean, I et al (2000) Lesbian, gay, bisexual and transgender health: Findings and concerns Journal of the Gay and Lesbian Medical Association 4, 3, 101-151

de Boer, M.E et al (2019) Pressure in dealing with requests for euthanasia or assisted suicide: Experiences of general practitioners Journal of Medical Ethics 45, 425-429

Farahany, N.A et al (2019) Part-revived pig brains raise slew of ethical quandaries Nature 568, 229-302

Goldblum, P et al (2012) The relationship between gender-based victimisation and suicide attempts in transgender people Professional Psychology: Research and Practice 43, 468-475

Jin, P (2019) Medical crowdfunding in China: Empirics and ethics Journal of Medical Ethics 45, 538-544

Johnson, D.A (2008) Managing Mr Monk: Control and the politics of madness Critical Studies in Media Communication 25, 1, 28-47

King, M (2019) Implications of moral uncertainty: Implausible or just unpalatable? Journal of Medical Ethics 45, 451-452

Knoepfler, P (2016) Human chimera research's huge (and thorny) potential Wired (<https://www.wired.com/2016/09/human-chimera-research-huge-thorny-potential/>)

Kofler, N (2019) Gene editing is too important to be left to scientist alone Guardian 22nd October, J1-2

Koplin, J & Wilkinson, D (2019a) Moral uncertainty and the framing of human-pig chimera Journal of Medical Ethics 45, 440-446

Koplin, J & Wilkinson, S (2019b) How we should treat human-pig chimeras, non-chimera pigs and other beings of uncertain moral status? Journal of Medical Ethics 45, 457-458

Marino, L (2017) We've created human-pig chimeras - but we haven't weighed the ethics STAT (<https://www.statnews.com/2017/01/26/chimera-humans-animals-ethics/>)

Munthe, C (2019) Price of precaution of human-pig chimeras for transplantation purposes Journal of Medical Ethics 45, 447-448

Resnick, D (2019) Commentary on Koplin and Wilkinson Journal of Medical Ethics 45, 449-450

Ripple, W.J et al (2017) World scientists' warning to humanity: A second notice BioScience 67, 12, 1026-1028

Ripple, W.J et al (2019) World scientists' warning of a climate emergency BioScience (<https://tinyurl.com/sl4okqr>)

Rigby, S (2019) Primate research: Has it crossed an ethical line? Science Focus June, 30-32

Sandin, P (2019) Commentary of Koplin and Wilkinson Journal of Medical Ethics 45, 455-456

Schalk, S (2016) Re-evaluating the supercrip Journal of Literacy and

Cultural Disability Studies 10, 1, 71-86

Shaw, D.M (2019) The side effects of deemed consent: Changing defaults in organ donation Journal of Medical Ethics 45, 7, 435-439

Streiffler, R (2019) Harming animals for research and for food in conditions of moral uncertainty Journal of Medical Ethics 45, 7, 453-454

Sue, K & Applewhite, D (2019) Smoking and hospitalisation: Harnessing medical ethics and harm reduction Journal of Medical Ethics 45, 483-486

Tan, C.E & Glantz, S.A (2012) Association between smoke-free legislation and hospitalisations for cardiac, cerebrovascular, and respiratory diseases: A meta-analysis Circulation 126, 2172-2183

Vrselja, Z et al (2019) Restoration of brain circulation and cellular functions hours post-mortem Nature 568, 336-343

Youngner, S & Hyun, I (2019) Pig experiment challenges assumptions around brain damage in people Nature 568, 302-304

4. MEAT, FOOD, SUSTAINABILITY, AND HEALTH

- 4.1. Meat consumption and health
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- 4.2. High protein foods
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4.1. MEAT CONSUMPTION AND HEALTH

Carroll and Doherty (2019) began: "For some time, medical and science organisations have been beating the drum that red and processed meat are bad for you. For almost as long, they have lamented that their efforts to inform the public have not convinced enough people to change their consumption" (p767)²⁷. "Nutritional Fethics epidemiology" is the name of the field that has studied this issue.

This field has been "plagued by observational studies that have conducted inappropriate analyses, accompanied by likely erroneous conclusions. Many studies selectively report results, and many lack an a priori hypothesis. Many use notoriously unreliable self-reports of food consumption while failing to collect or appropriately control for data on numerous potential confounders" (Carroll and Doherty 2019 p767).

The controversies were summarised by Carroll and Doherty (2019):

- Does meat consumption lead to poor health outcomes?
- What outcomes (eg: cancer)?
- What kind of meat (eg: processed or unprocessed red

²⁷ Vernooij et al (2019) commented: "Foods and nutrients are not consumed in isolation, and their effects may differ depending on the totality of one's diet and how dietary habits change over time. Moreover, interventions focusing on modification of intake of particular foods or nutrients require compensatory changes in other dietary components" (p732).

meat ²⁸)?

Studies vary in the answers to these questions, even when examining the same data sets (Carroll and Doherty 2019).

In terms of recent studies (Carroll and Doherty 2019):

a) Vernooij et al (2019) (appendix 4A) - A meta-analysis of over 100 cohort studies of dieting patterns and all-cause mortality found that "differences in meat consumption, may result in only small differences in risk outcomes over long periods" (Carroll and Doherty 2019 p767).

b) Han et al (2019) - A meta-analysis of 118 articles reporting 56 cohort studies of at least 1000 adults of reductions in red and processed meat, and cancer incidence and mortality found that "the possible impact of reduced meat intake was very small" (Carroll and Doherty 2019 p767). A reduction of three servings per week of meat was associated with seven fewer deaths from cancer per 1000 persons, for example.

Han et al (2019) summed up: "Our systematic review and meta-analysis of cohort studies supports the association between red and processed meat intake and increased risk for cancer. The magnitude of red meat's effect on cancer over a lifetime of exposure was, however, very small, and the overall certainty of evidence was low or very low. Persons making recommendations about consumption of red and processed meat should be mindful of the remaining uncertainty regarding causation and, if indeed causal mechanisms are at play, the very small absolute effects" (p718).

c) Zeraatkar et al (2019a) (appendix 4B) - Only a "very small" link found between meat consumption and all-cause mortality in a meta-analysis of cohort studies.

All these studies included observational studies only, and had great heterogeneity. "Over and over again, they stressed that even if the results were statistically significant, their certainty was low and the absolute differences seen were small and potentially confounded" (Carroll and Doherty 2019 p767).

d) Zeraatkar et al (2019b) - A meta-analysis of twelve randomised controlled trials (reported in 24

²⁸ Red meat is mammalian meat, while processed meat is defined as "white or red meat preserved by smoking, curing, salting, or adding preservatives" (Vernooij et al 2019 p733). Zeraatkar et al (2019a) included "adding chemical compounds (for example, hot dogs, charcuterie, sausage, ham, and deli meats)" (p704) after salting in their definition.

articles) of differing consumption of red meat over at least six months. The trials varied from 32 to 48 835 participants, and from twenty-two to seventy years old.

The overall conclusion was that "red meat may have little or no effect on major cardio-metabolic outcomes and cancer mortality and incidence" (quoted in Carroll and Doherty 2019). For example, the equivalent to two fewer deaths per 1000 persons with lower red meat intake.

e) Johnston et al (2019) - A set of guidelines based on previous reviews suggesting that "adults continue to eat their current levels of red and processed meat, unless they felt inclined to change them themselves" (Carroll and Doherty 2019 p767). This is contrary to other guidelines (eg: US Department of Health and Human Services in 2015) (appendix 4C).

f) Valli et al (2019) - Covering 41 quantitative and 13 qualitative studies of the motivations to eat meat and to reduce it. An unwillingness to reduce meat consumption, even when aware of health risks, because of the enjoyment, belief in its importance in a healthy diet, and the place in one's culture. There was also mistrust of scientific information. On the positive side, ethical concerns about animal welfare, and the environmental consequences of meat consumption were strong motivators to reduce intake (table 4.1).

i) Reasons for meat consumption:

- 19 studies explored reasons generally (eg: enjoyment), and barriers to reduction (eg: lack of alternatives; poor cooking skills).
- 10 studies compared gender - eg: women more concerned about health, and ethics of meat-eating.
- 5 studies investigated older adults - eg: health important in food choices.
- 23 studies on motivations of vegetarians or low-meat consumers - eg: health reasons; animal welfare or environmental concerns.

ii) Willingness to reduce meat consumption:

- 9 studies - barriers include belief that meat is part of a healthy diet.

"The overall certainty of the evidence was rated as low because 20 of 38 (53%) studies proved to be at high risk of bias due to lack of validation of the measurement instruments and likely selectivity of study populations" (Valli et al 2019 p750).

Table 4.1 - Two main themes found by Valli et al (2019).

Carroll and Doherty (2019) ended: "We have saturated the market with warnings about the dangers of red meat. It would be hard to find someone who doesn't 'know' that experts think we should all eat less. Continuing to

broadcast that fact, with more and more shaky studies touting potential small relative risks, is not changing anyone's mind" (p768).

4.1.1. Methodological Issues

The key methodological issues with the studies included in the reviews and meta-analyses included:

i) How overall diet is measured (eg: diet indices or scores), and usually by recall-based methods.

ii) Samples - eg: variations in age, and gender make-up.

iii) Comparison groups or not - eg: vegetarian.

iv) Measurement of meat intake (eg: serving size; frequency of intake), and length of time of measurement. Data on red and processed meat were often combined (Vernooij et al 2019).

v) Control of potential confounders (eg: smoking; exercise).

4.2. HIGH PROTEIN FOODS

"High protein" (HP) foods have grown in popularity recently (eg: number of food and drink products launched in UK with HP claims rose fivefold between 2010 and 2015; Fleming 2019). The desire to build muscles, and lose weight as proteins are believed to keep the individual fuller for longer are driving the demand. But what is the evidence for protein consumption beyond that required by the body as per recommended guidelines?

Protein deficiency, without HP foods, is generally not an issue in the UK. The average adult male consumes 87 g of protein per day, and 67 g for women, which is 50% above official guidelines (Fleming 2019). The only individuals who risk deficiency are high endurance, speed or strength athletes, and bedridden older adults who eat very little (Fleming 2019).

Individuals lifting weights to build muscle mass may gain some benefits from HP foods, for example. A meta-analysis found that maximum weight lifted increased with HP foods and exercise, but only slightly more than exercise only (Morton et al 2018) (table 4.2). "For elite athletes, [supplemental protein] might give you an extra 3 to 4 per cent... For most people, it won't have a noticeable effect" (Stuart Gray quoted in Fleming 2019).

- Morton et al (2018) reviewed data from 49 studies on dietary protein supplementation and resistance exercise training (RET)-induced gains in muscle mass and strength ²⁹. For inclusion, the studies had to last at least six weeks, and involved RET at least twice per week.
- Protein supplementation up to 1.62 g/kg/day was beneficial. Supplementation was associated with an increase in strength on average of 2.5 kg, but the RET-induced gain was over 25 kg, "which strongly suggests that the practice of RET is a far more potent stimulus for increasing muscle strength than the addition of dietary protein supplementation" (Morton et al 2018 p382).

Table 4.2 - Morton et al (2018).

In terms of HP foods aiding weight loss, the evidence is not clear-cut (Fleming 2019). For example, Lepe et al's (2011) review found no evidence that HP diets were better than high-fat or high-carbohydrate diets for weight loss ³⁰. "Unfortunately, comparing high-protein diets with other weight-loss strategies over the long term is hard because people can neither be imprisoned in laboratories, nor relied on to accurately report what they eat" (Fleming 2019).

In the short term, however, individuals eating HP meals report feeling fuller than those consuming lower-protein meals (eg: Dhillon et al 2016).

HP foods are often filled with extra sugar, and so do help with weight loss (Fleming 2019).

There is also a health risk to HP consumption. For example, Virtanen et al (2018) found a greater risk of heart problems with HP intake (eg: >100 g per day) than average intake (eg: 75 g) in a Finnish study (appendix 4D).

4.3. UNIVERSAL HEALTHY REFERENCE DIET

Insufficient food, and low-quality diet are two challenges for the global population, including in the face of climate change (appendix 4E). In fact, Willett et al (2019) asserted: "Unhealthy diets pose a greater risk

²⁹ RET is mostly weight training, but covers any exercise where muscles are developed by resistance (eg: pulling a weight).

³⁰ For their review, Lepe et al (2011) found eight randomised clinical trials of high protein diets lasting at least 24 weeks. The trials had to include a control group with either a conventional restricted diet or a high fat/high carbohydrate diet. The outcome measure was weight loss. The authors summed up: "In this systematic review it was observed that the long-term effect of high-protein diets is neither consistent nor conclusive. Although more than half of the studies showed a higher weight loss with a high-protein diet, three out of four studies with the longest intervention show no statistical difference in weight loss" (Lepe et al 2011 p1258). A non-statistical difference was more common in longer studies, which "suggested a diminished trend of weight loss with the length of intervention" (Lepe et al 2011 p1258).

to morbidity and mortality than does unsafe sex, and alcohol, drug, and tobacco use combined. Because much of the world's population is inadequately nourished and many environmental systems and processes are pushed beyond safe boundaries by food production, a global transformation of the food system is urgently needed" (p447).

The Lancet Commission (Willett et al 2019) considered these issues. One recommendation was a "universal healthy reference (UHR) diet", which included fruit and vegetables, whole grains and nuts, and limited seafood, poultry, meat, and added sugar. The provision of such a diet can be linked to sustainable food systems. For example, "[R]e-orient agricultural priorities from producing high quantities of food to producing healthy food. Production should focus on a diverse range of nutritious foods from biodiversity-enhancing food production systems rather than increased volume of a few crops, most of which are used for animal production" (Willett et al 2019 p449). Reduction of food losses and waste is also important.

The UHR diet needs to provide an adult with an average of 2000-2500 kcal per day, of which 10% of energy intake is protein (Willett et al 2019).

Replacing protein from animal sources with protein from plant sources will reduce overall mortality. For example, in Song et al's (2016) cohort of over 130 000 adults over up to 30 years, mortality among plant-sourced protein eaters was two-thirds that of meat-sourced protein individuals.

Willett et al (2019) summed up the research on "good" dietary patterns: "(1) protein sources primarily from plants, including soy foods, other legumes, and nuts, fish or alternative sources of omega-3 fatty acids several times per week with optional modest consumption of poultry and eggs, and low intakes of red meat, if any, especially processed meat; (2) fat mostly from unsaturated plant sources, with low intakes of saturated fats, and no partly hydrogenated oils; (3) carbohydrates primarily from whole grains with low intake of refined grains and less than 5% of energy from sugar; (4) at least five servings of fruits and vegetables per day, not including potatoes; and (5) moderate dairy consumption as an option" (pp459-460).

It was estimated that from USA data primarily that a move to the UHR diet would reduce premature mortality by one-fifth (Willett et al 2019).

The second aspect of the Lancet Commission's was sustainable food production as "food production is the largest cause of global environmental change" (Willett et al 2019 p461). An estimate of 8.5 to 13.7 Gt of carbon dioxide equivalent per year from total food production

has been made (Willett et al 2019).

Reducing this level of emission could be achieved by changing to the UHR diet (eg: less meat consumption and the carbon dioxide equivalent cost of its production), improved food production practices (eg: changes in cropping and fertiliser use; improved water management), and reduced food losses and waste (Willett et al 2019).

The Lancet Commission called their proposals a "Great Food Transformation", and offered five strategies to achieve it:

i) "Seek international and national commitment to shift towards healthy diets".

ii) "Reorient agricultural priorities from producing large quantities of food to producing healthy food".

iii) "Sustainably intensify food production, generating high-quality output".

iv) "Strong and co-ordinated governance of land and oceans".

v) At least halve food loss and waste.

Nuffield Council on Bioethics (2002) proposed different levels of intervention by governments and health authorities to change behaviour. Table 4.3 gives some examples in relation to the UHR diet and sustainable food production (Willett et al 2019).

Level of Intervention	Examples
Do nothing	Leave to individual to change
Provide information	Mass public information campaigns
Enable choice	Encourage marketing of healthy foods
Guide changes	Information on menus; consumer reward schemes; taxes on unhealthy foods
Limit choice	Change law; withdraw certain products

(Source: Table 6 p 480 Willett et al 2019)

Table 4.3 - Nuffield Ladder of Intervention and the Lancet Commission proposals.

Clark et al (2019) showed that foods that are positive for health are also good in terms of environmental impact. These researchers concentrated on fifteen food groups, five health outcomes (type II diabetes, stroke, coronary heart disease, colorectal cancer, and mortality), and five environmental outcomes (greenhouse gas emissions, land use, water use, ocean

acidification, and eutrophication (excess algae growth in water)).

Healthwise, the food groups of nuts, minimally processed whole grains, fruits, vegetables, legumes, olive oil ³¹, and fish were significantly associated with the best outcomes, while sugar-sweetened beverages, and processed and unprocessed red meat were associated with the worst outcomes.

A similar pattern was seen for environmental outcomes, both independently, and combined with health outcomes, such that Clark et al (2019) concluded that the "same dietary changes that could help reduce the risk of diet-related non-communicable diseases could also help meet international sustainability goals. Focusing diets on foods consistently associated with decreased disease risk would likely also reduce diet-related environmental impacts. Foods with intermediate environmental impacts or that are not significantly associated with health outcomes, such as refined grain cereals, dairy, eggs, and chicken, could also contribute to meeting international health-focused or environmental-focused sustainability targets if they are used to replace foods that are less healthy or have higher environmental impacts such as unprocessed red meat and processed red meat" (pp23360-23361) (table 4.4).

<p>GOOD HEALTH/GOOD ENVIRONMENT</p> <p>Nuts Legumes Whole grains Potatoes Fruits Vegetables Olive oil</p>	<p>POOR HEALTH/POOR ENVIRONMENT</p> <p>Unprocessed red meat Processed red meat</p>
<p>GOOD HEALTH/POOR ENVIRONMENT</p> <p>Chicken Fish Dairy</p>	<p>POOR HEALTH/GOOD ENVIRONMENT</p> <p>Refined grains Sugar-sweetened beverages Eggs</p>

(Health outcomes - good = relative risk of mortality <1; poor = risk >1)

(Environmental outcomes - average relative environmental impact (AREI) (average of food's impact across five environmental outcomes); good = <10; bad = >10)

(Based on Clark et al 2019 figure 3 p23361)

Table 4.4 - Fifteen food groups and health and environmental outcomes.

³¹ The Mediterranean diet, which is viewed as good for health, includes extra-virgin olive oil, and chemically this is similar to anti-inflammatory drugs. So, an individual eating this type of diet throughout their lives would consume "a daily anti-inflammatory dose roughly equivalent to that of a baby aspirin, which might account for some of the diet's health benefits" (Beauchamp 2019 p174).

4.4. NOVEL FOODS

Why do some novel foods become popular and others do not? Here is a possible sociological answer to this question using "practice theories".

"Practice theories" (eg: Schatzki 2002) argue that "'the social' is not situated in the mental activities of the individual, or in the determining influence of social structure, but rather at the level of social practice" (House 2019 p452). A "practice" here is "a routinised way in which bodies are moved, objects are handled, subjects are treated, things are described, and the world is understood" (Reckwitz 2002 quoted in House 2019).

Practices are:

- Related - "For example, the practice of eating breakfast could be shaped by shopping practices, work practices, childcare practices and so on, which may affect its content, location, timing and affective valence. These related practices themselves shape, and are shaped by, other practices. Social life may be understood as a web or 'mesh' (Schatzki 2002) of interrelated, interdependent practices" (House 2019 p452).
- Recursive - Practices constitute "the social", but "the social" also makes up the performance of practices.
- Recurrent - Practices are repeated enough to give social stability, but allow modification and change.

Food consumption is key to many practices, and "successful dietary change (whether in orientation, 'healthiness' or vis-a-vis the uptake of new foods or technologies) involves all related areas of food practice, and indeed a web of non-alimentary practices as well" (House 2019 p453).

House (2019) applied these ideas to the introduction of "sustainable" foods into the diet of Westerners, and in particular, the use of insects as human food ("entomorphagy") (appendix 4F). Insects are "relatively low in fat and high in nutrients, and that their production is significantly less harmful to the environment than that of conventional western meat animals" (House 2019 p454).

In the Netherlands, for example, insect-based convenience foods (eg: "Insecta") are processed or powdered versions of mealworms, buffalo worms, crickets, and grasshoppers, mostly, that can be made into familiar foods like bread, cakes, pasta, or meat-alternatives (House 2019).

Forty individuals in the Netherlands who had used Insecta products were involved in House's (2019)

research. All were interviewed, and half kept a two-week food diary. The focus was upon the change to eating insect-based products regularly.

House (2019) referred to the example of a middle-aged man, "Gijs", who was seeking to change his diet after a diagnosis of high cholesterol. Three "modes of eating" were distinguished:

a) "Mundane" - eating alone: "functionality, ease and convenience" (House 2019).

b) "Elaborate" - eating with girlfriend: involved negotiation of "menu", and shared experience (eg: eating out).

c) "Deviations" - eg: unplanned.

How would insect-based products be integrated into Gijs's modes? "For Gijs, Insecta products were a candidate for incorporation within his prevailing, mundane mode of eating, and were situated within the configuration of practices which constituted it. Indeed, this applied to almost all participants (exceptions being occasional consumption of Insecta at barbecues or other domestic social events). Yet Gijs had not eaten Insecta more than once, as he did not like the taste or the 'sponge-like' texture. Participants who, like Gijs, consumed Insecta as one-among-many meat replacers - which is to say, almost all of them - required Insecta to be superior in terms of the key selection criteria for inclusion in relevant food practices (price, taste, availability) that in practice they seldom met. At around €3.95 per pack, Insecta products were more expensive than most alternatives. Typically they were only intermittently available, and their taste was in general not highly regarded... A comparably priced plant-based range was often preferred" (House 2019 p460).

House (2019) offered two other cases - "Margot" and "Willemijn". Margot ate Insecta relatively often in 2015 when a student, but stopped the next year. "A primary reason was her change in employment. Previously she had little time to prepare food between finishing university and starting work, necessitating quick and easy meals in which meat replacers (often cooked in around five minutes) featured prominently. Her new job left her evenings free, enabling her to spend much more time cooking (she estimated 1.5 hours per evening meal, on average), and thus able to make dishes from basic ingredients. She still ate meat replacers occasionally, but much less often than before. Margot's cessation of Insecta consumption was also prompted by other considerations. By 2016 the novelty of eating insect-based products had worn off, and she reported finding the

price rather high relative to alternative products" (House 2019 p462). This is an example of how changes in other practices influence food consumption ³².

Willemijn experienced a similar change in her life, but continued to eat Insecta products (though less often). The key was the enjoyment of the taste.

For novel foods, like Insecta, to become popular, they must "fit" with the changing lifestyles of individuals (phases and practices), and factors like taste, cost, and convenience are important. A new food that fits with a particular "mode of eating" is more likely to be taken up.

4.5. SHAME AND EATING DISORDERS

"Diagnostic crossover" is where an individual receives a change in diagnostic category for their symptoms. Mortimer (2019) studied this in relation to eating disorders (EDs) (appendix 4G).

There are many similarities and overlaps between the different categories of EDs, as outlined in DSM-5 (APA 2013). For example, binge eating is a symptom of bulimia nervosa (BN), binge eating disorder (BED), and anorexia nervosa (binge-purge type) (AN-BP) (Mortimer 2019). It is "the distinct combination of symptoms or behaviours that determines the diagnosis, and acquiring or losing one symptom can result in transition to a new diagnostic category, a process known as diagnostic crossover" (Mortimer 2019 p366).

Diagnostic crossover is "relatively common" in EDs (Mortimer 2019). For instance, around one-third of individuals with an initial diagnosis of AN later receive one of BN (Eddy et al 2008). "An individual's experiences or behaviours need not change dramatically to warrant a different diagnostic label; for example, a patient with AN-BP who gains sufficient weight will transition to BN, and vice versa. Given that weight and symptoms tend to fluctuate regularly, and that diagnosis is made on the basis of positive symptoms over just three months, some individuals may experience recurrent diagnostic crossover over time" (Mortimer 2019 p366).

Receiving a different diagnosis is not just a technical issue, EDs are "closely intertwined with moral values, both in the minds of those diagnosed and within society" (Mortimer 2019 p366) (appendix 4H). BED is viewed as moral weakness, say (because of its association with obesity), while AN is seen more positively (almost

³² The dominate "mode of eating" in each phase of life, House (2019) called "phased routinisation".

with "admiration for the thin body"; Giodano 2005). Such views will influence the self-identity of individuals given such diagnoses, and when there is diagnostic crossover.

Mortimer (2019) investigated these moral values in diagnostic crossover in interviews with five female "mostly recovered ex-patients". "A key finding from participant interviews was the experience of shame (appendix 4I) as a consequence of diagnostic crossover. Participants described the existence of a diagnostic hierarchy whereby certain EDs, and the individuals diagnosed with them, were perceived as 'better' than others. Exploring what 'better' means in this context led to a careful analysis of how character, self-image, and moral identity are experienced by individuals who undergo diagnostic crossover" (Mortimer 2019 p368).

Three themes were elicited in relation to this:

i) "Better diagnosis, better person" - AN was viewed as top of the "moral hierarchy", as described by "Hollie" (22 year-old; diagnosis BN, but self-diagnosis AN): "Anorexia is like the top one, you're an exemplar of resilience and determination and you work hard, you don't indulge, it's incredibly puritanical [...] I'm not really sure that I would ever have referred to myself as having anorexia as I didn't feel [pause] I wasn't good enough for that" (p369).

"Natalie" (21 year-old; diagnosis BN and AN-restrictive type, but self-diagnosis BED) confirmed this view: "There is the perception that AN is this extreme manifestation of will power, [and] will power is a positive quality, and hence you are from the outset imbuing that diagnosis with this strength, and therefore bingeing and bulimia are chaos, that's negative, so from the very start that these labels are tied up with value judgments, [...] I attach value to the different labels, like I think I was worth more as a person when I was anorexic than when I'm bulimic, I sort of think of it as a very hierarchical thing" (p369).

ii) "Reading moral character through the body" - The distinction between EDs that make the individual skinny or fat was evident, as described by "Marianne" (21 year-old; diagnosis AN-restricting type, but self-diagnosis BED): "Anorexia - they're the sad skinny girls, but internally they're... well you feel really quite strong, you're able to despite everything, despite people shouting and crying, you continue to do this one thing. Bulimics are less in trouble and that's the sad thing because if you have an ED that makes you thin, oh tragedy but oh interest. But if you have an ED that makes you fat, then you're no different to the fifty-year-old women who use Weight Watchers and can't do anything about their proclivity for cheese. You know? It's just conflated with

general laziness or being unaware or not caring" (p370).

iii) "Diagnostic crossover: identity in flux" - Diagnostic crossover produced an "identity crisis", as, for example, "Natalie" explained: "I think the transition to binge eating was terrifying [...] because of the extent to which I felt like I didn't recognise myself; it was like, 'I don't know what I'm doing'; I felt like I became a different person" (p370).

While "Ruth" (22 year-old; diagnosis AN-restricting type, but self-diagnosed BN) said something similar: "And I was so ashamed of what I'd become. Being anorexic was always a badge of honour when I was young, whereas being bulimic is a source of total shame and humiliation, especially after having been anorexic. I didn't know you could be bulimic after anorexia, and I didn't know what I had was bulimia, so I felt like I was the only person in the world this had happened to, like the worst anorexic ever. I didn't know what to call myself. Just a fat girl with no will power" (pp370-371).

Mortimer (2019) noted that "whilst participants described the imagined judgment of others, none relayed stories of such judgment ever being explicitly expressed towards them. This could perhaps be understood in terms of what Scambler and Hopkins (1990) call 'felt stigma'. Felt stigma occurs when an individual feels shame as a result of their condition and fears discrimination and enacted stigma, even when such negative social repercussions never actually occur" (p372).

To sum up: "For the participants in this study, crossover from AN to BN or BED was experienced as shameful, due to the bad moral character traits that the new diagnosis and behaviours were felt to represent" (Mortimer 2019 p373).

4.6. APPENDIX 4A - VERNOOIJ ET AL (2019)

The review involved 105 cohort studies with 1000 or more participants that "reported an association between dietary patterns and 1 or more of our outcomes of interest in adults with or without cardio-metabolic conditions but without cancer or any infectious or chronic non-cardio-metabolic conditions" (Vernooij et al 2019 p733). The articles were published between 1994 and 2018.

The certainty of evidence was rated as high, moderate, low or very low using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria (Guyatt et al 2008).

Lower red or processed meat intake was associated

with a small decrease in risk for all-cause mortality, cardiovascular mortality (but not other cardiovascular outcomes like fatal and non-fatal myocardial infarction), non-fatal stroke, type 2 diabetes, and overall cancer incidence and mortality.

Vernooij et al (2019) warned: "However, this evidence was considered to have very low certainty for overall cancer incidence (due to imprecision) and overall cancer mortality (due to inconsistency). No statistically significant risk was found for dietary patterns lower in red and processed meat intake for incidence of breast, colorectal, endometrial, liver, ovarian, pancreatic, prostate, stomach, and uterine cancer. Similarly, we found no differences among dietary patterns in risk estimates for mortality associated with breast, colorectal, oesophageal, liver, ovarian, prostate, and stomach cancer. We found low-certainty evidence that dietary patterns lower in red or processed meat consumption were associated with a very small reduction in risk for incidence of extrahepatic and gallbladder cancer. Low-certainty evidence also suggested that risk for death due to pancreatic cancer was lower for the dietary patterns with low intake of red or processed meat" (p735).

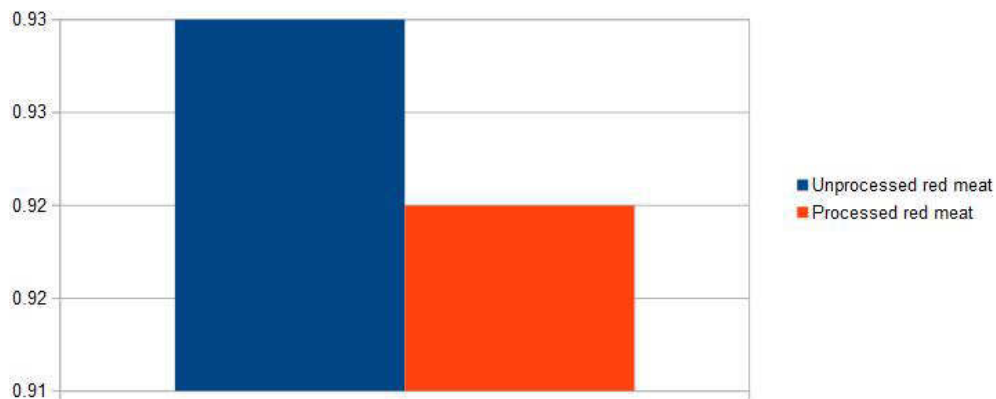
4.7. APPENDIX 4B - ZERAATKAR ET AL (2019a)

Sixty-two articles covering 56 cohorts of at least 1000 adults.

A reduction in three servings³³ per week of unprocessed red meat showed a "small apparent effect" on cardiovascular mortality, for example, but not all-cause mortality, while a reduction of three servings per week of processed meat did show "a very small apparent effect" on all-cause mortality. The same was found for a reduction of three servings per week of mixed unprocessed red and processed meat (figure 4.1).

However, most of the studies were rated as low-certainty evidence, according to the GRADE criteria.

³³ A serving was defined as 120 g unprocessed red meat, 50 g processed red meat, or 100 g mixed unprocessed red and processed meat.



(Data from Zeraatkar et al 2019a tables 1 and 2)

Figure 4.1 - Relative risk of all-cause mortality with reduction of three servings per week (where 1.00 = no reduction).

4.8. APPENDIX 4C - JOHNSTON ET AL (2019)

A panel of fourteen was set up to consider the evidence, which included eleven health experts and three lay members from seven high-income countries.

Eleven members voted for recommending that individuals continue current unprocessed red and processed meat consumption, and three members wanted a weak recommendation to reduce consumption.

Johnston et al (2019) explained the decision based on the low to very low-certainty of the evidence, and the "often trivial absolute risk reduction" in eating less meat.

The panel did not consider animal welfare or environmental impact of meat consumption, only health issues. The focus was also on the individual rather than at a societal level.

Johnston et al (2019) summed up: "In terms of how to interpret our weak recommendation, it indicates that the panel believed that for the majority of individuals, the desirable effects (a potential lowered risk for cancer and cardio-metabolic outcomes) associated with reducing meat consumption probably do not outweigh the undesirable effects (impact on quality of life, burden of modifying cultural and personal meal preparation and eating habits). The weak recommendation reflects the panel's awareness that values and preferences differ widely, and that as a result, a minority of fully informed individuals will choose to reduce meat consumption" (p762).

4.9. APPENDIX 4D - VIRTANEN ET AL (2018)

Protein intake was recorded over four days for 2441 men aged 42 to 60 years old randomly selected from eastern Finland. A picture book of common foods and dishes was used to help the participants estimate portion size, and this was converted into proportion of diet for different foods. These data were collected between 1984 and 1989.

Subsequent heart failure (HF) for an individual (up to 2015) was ascertained from hospital records (n = 334 cases). Higher protein intake was "marginally associated" with increased risk of HF.

Other findings about diet included an increased HF risk associated with higher dairy intake, and higher calcium intake, but no relationship with protein from fish, nor egg protein.

4.10. APPENDIX 4E - FOOD INSECURITY

Between 8-10% of households in the UK are "food insecure", defined as "a household-level economic and social condition of limited or uncertain access to adequate food" (USDA 2019 quoted in Sosenko et al 2019)³⁴. Food insecurity was higher among lower income households, individuals who are unemployed, lone-parent households, and people with ill health, for example.

Sosenko et al (2019) surveyed 1100 individuals referred to "food banks" in October-November 2018, and found that four-fifths were food insecure.

4.11. APPENDIX 4F - INSECT-BASED FOODS

In terms of the acceptance of insect-based foods, studies have found that the individuals willing to adopt them as meat substitutes are, for example, low in disgust sensitivity and food neophobia, while high in "sensation-seeking", and more likely to be male, and have high convenience orientation (House 2016).

This is the focus on the individual consumer, but Shelomi (2015), for example, argued that the "supply side" is crucial. "This approach does not emphasise reducing or changing negative attitudes in the general population, but increasing the positive and distinctive attributes of insect-based foods, such as their taste..., so that a relatively small but established number of repeat consumers can be attained" (House 2016 p50).

³⁴ Another common definition of food insecurity is by Anderson (1990): "whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain" (quoted in Sosenko et al 2019).

House (2016) continued: "While it is crucial to acknowledge that supply-side changes in food distribution cannot alone account for a new food's popularity e the '[c]onsumption and production' of food, Murcott (2001...) argues, 'are mutually constitutive' - historical evidence suggests that demand for new foodstuffs is nevertheless substantially affected by increases in supply... A particular food must be widely available if it is to become an accepted and integrated part of people's diets" (p50).

House (2016) recruited 33 interviewees in the Netherlands via cards added to the packs of insect-based convenience foods. "A basic interview schedule asked direct questions about the product, such as why it was chosen, how it was eaten, whether it was enjoyed, and whether it would be bought again, plus some broader questions about meals typically eaten, dietary preferences, and how food was provisioned" (House 2016 p51).

The details of the semi-structured interviews were summarised under a number of headings:

a) Who were the consumers? - concern to eat healthily, a preference for organic products, and an interest in the environment.

b) Initial motivation for consumption of insect-based foods - curiosity (42% of interviewees), a sustainable alternative to meat (33%), and good for one's health (24%).

c) Repeated consumption - only a quarter of interviewees were regular consumers, and the factors involved were practical ones "that one would expect to be associated with the consumption of more conventional food products: price, taste, availability, and degree to fit with current eating habits" (House 2016 p52) (table 4.5).

- Price - "For me it's more of a e I wouldn't say luxury item, because it's not at a restaurant or something e but even though it's just 4 euros I always think ok, I will not buy it as much as if it was 2.50 or 3 euros" ("Rolf"; p52).
- Availability - "I found a few times that I thought: 'I think I'll buy an insect burger, it's not available, well there goes that plan'" ("Pieter"; p53).
- Choice - "I would prefer if the Jumbo [supermarket] had more types of the Insecta [brand name] things, because they really had one choice, so it's not really something I would buy every week because well, it becomes boring" ("Jasmijn"; p53).

Table 4.5 - Examples of quotes by interviewees about regular consumption of insect-based foods.

4.12. APPENDIX 4G - GENETICS OF ANOREXIA

The prevalence of AN is up to 4% of women, but less than 1 in 200 men (Watson et al 2019). Interestingly, twin studies have found a heritability estimate of 50-60%, which has encouraged genetic studies of the condition (Watson et al 2019).

Two such large-scale studies are the Anorexia Nervosa Genetics Initiative (ANGI) (Thornton et al 2018), and the Eating Disorders Working Group of the Psychiatric Genomics Consortium (PGC-ED) (Duncan et al 2017). Watson et al (2019) combined these data with those from the Genetic Consortium for Anorexia Nervosa (GCAN)/Wellcome Trust Case Control Consortium-3 (WTCCC-3) (Boraska et al 2014), and the UK Biobank (Sudlow et al 2015) in their study. This gave a total of 16 992 cases of AN, and 55 525 healthy controls. It was a genome-wide association study (GWAS).

The study identified eight genes (or loci, technically), particularly related to metabolism (eg: insulin-related). In other words, versions of the genes common to AN sufferers and different to controls.

It is possible that AN is a metabolic condition, and that low body weight, for instance, is a result of metabolism genes rather than as "traditionally been viewed as a consequence of the psychological features of anorexia nervosa (that is, drive for thinness and body dissatisfaction)" (Watson et al 2019 p1210).

4.13. APPENDIX 4H - DIAGNOSIS

Fulford et al (2005) argued that "diagnosis in psychiatry, although no less firmly based on science than diagnosis in any other area of medicine, is also based on values" (p78). The value-laden nature of psychiatric diagnosis is shown in "the shifting boundary between psychiatric-diagnostic and moral concepts; and in the persistent and increasingly overt use of value terms in psychiatric diagnostic classifications" (Fulford et al 2005 p78).

The former is seen, for example, in forensic psychiatry with the boundaries between "mad or bad", and "guilt, responsibility and freedom of the will" (Fulford et al 2005).

Fulford et al's (2005) answer is to "approach psychiatric diagnosis with both fact-eye and value-eye fully open" (p79). They summed up: "psychiatry should: (a) recognise the more value-laden nature of mental disorder, (b) embrace this as a reflection not of scientific deficiency but of values complexity, and thus (c) take it seriously by developing the resources to work as effectively with complex values as, in the twentieth century, we developed the resources to work with complex

facts" (Fulford et al 2005 p84).

4.1.4. APPENDIX 4I - SHAME

Cook (1994) designed the Internalised Shame Scale (ISS)³⁵, and found that eating disorder-sufferers scored significantly higher than individuals with other psychiatric disorders.

Skarderud (2007) reported two main categories of shame from qualitative research with thirteen women with AN in own psychotherapeutic practice in Norway:

i) "Globalised internal shame" - feeling ashamed; "a general sense of being unworthy: to the shame of being the person one is" (Skarderud 2007 p86).

As summed up by "Else": "I am a hopeless person, not worth loving. Everything I do is stupid. I should not have been born, and very often I do think that I do not deserve to live. I cannot stand myself" (p86).

ii) "Focuses of shame" - different focuses of shame based around, for instance:

- Feelings and cognitions - eg: greed: "Sometimes there is so much I want to do. I daydream both about things and about success. But then I rebuke myself, thinking that this is not for me. I have not done anything to deserve it. And then I think that I am terribly greedy. It's the same also with food. Since I am thinking about food all the time, it must be because I am really greedy - that's what I think" ("Elisabeth"; p87).
- Achievement failures - eg: "First of all I felt very shameful about having to start in therapy. It hurt my pride. I like to manage on my own. And I don't like to ask for help" ("Helena"; p88).
- Body shame - eg: "I don't like taking a bus or a tram in town either. Because the windows there often function as mirrors. I don't like seeing myself; I think it's so revolting" ("Martha"; p89).
- Self-control and self-destructive behaviour - eg: "I am really a weak person. I make plans that today I shall try to eat almost nothing. But then I may start thinking about something sad, or I get a phone call from my father, and then I completely lose control. So I go shopping and buy food. I do that because when I

³⁵ Eg: "I feel like I am never good enough" (Wood et al 2017).

eat, I forget. It is even more effective than being knocked out by hunger. But it is so awful afterwards. The self-contempt is huge, I can tell you" ("Sol"; p89).

- Shame related to sexual abuse - eg: "I often think that it is my fault. It should have been possible for me to say no at the time... I have always had difficulties setting limits, and I still do. It causes many problems. It is actually tragic to think what I have put up with where men are concerned, especially married men" ("Rachel"; p91).
- Shame of having an eating disorder - eg: "There are 5 billion people on this earth, maybe even 6 now? Many of them don't have enough food, so they have their own eating problem. But for the others, for those who have enough food, eating is rarely a problem. And very many eat with great pleasure. Just eating should be very simple. Everyone manages it, except for me and some others. I don't cope with something as elementary as eating every day" ("Emily"; p91).

The opposite of shame was pride, which related to AN for many of the women. For example, "Hanna" said: "I am often told that I am so thin, mostly it is said as a compliment. And sometimes I can see envy in their eyes. That makes me feel proud. But it also confuses me. Surely, I am ill and I actually want to get well. But when I am given such encouragements, it makes me doubt whether I am really ill. Because the others want to be like me" (Skarderud 2007 p93).

Skarderud (2007) distinguished the shame-shame cycle (shame as a risk factor for and a consequence of AN), and the shame-pride cycle (shame as risk factor, and pride as a consequence).

4.15. REFERENCES

Anderson, S (1990) Core indicators of nutritional status for difficult to sample populations Journal of Nutrition 11, 1557-1600

APA (2013) Diagnostic and Statistical Manual of Mental Disorders, 5th ed (DSM 5) Washington DC: American Psychiatric Association

Beauchamp, G.K (2019) The flavour of serendipity American Scientist 107, May-June, 170-177

Boraska, V et al (2014) A genome-wide association study of anorexia nervosa Medical Psychiatry 19, 1085-1094

Carroll, A.E & Doherty, T.S (2019) Editorial: Meat consumption and health: Food for thought Annals of Internal Medicine 171, 10, 767-768

Clark, M.A et al (2019) Multiple health and environmental impacts of foods Proceedings of the National Academy of Sciences, USA 116, 46, 23357-

Cook, D.R (1994) Internalised Shame Scale Professional Manual
Wisconsin: Channel Press

Dhillon, J et al (2016) The effects of increased protein intake on fullness: A meta-analysis and its limitations Journal of the Academy of Nutrition and Dietetics 116, 6, 968-983

Duncan, L et al (2017) Significant locus and metabolic genetic correlations revealed in genome-wide association study of anorexia nervosa American Journal of Psychiatry 174, 850-858

Eddy, K.T et al (2008) Diagnostic crossover in anorexia nervosa and bulimia nervosa: Implications for DSM-V American Journal of Psychiatry 165, 2, 245-250

Fleming, N (2019) Protein mania? New Scientist 20th April, 38-41

Fulford, K.W.M et al (2005) Looking with both eyes open: Fact and value in psychiatric diagnosis? World Psychiatry 4, 2, 78-86

Giodano, S (2005) Anorexia and its moral foundations International Journal of Children's Rights 13, 149-160

Guyatt, G.H et al (2008) GRADE: An emerging consensus on rating quality of evidence and strength of recommendations BMJ 336, 924-926

Han, M.A et al (2019) Reduction of red and processed meat intake and cancer mortality and incidence: A systematic review and meta-analysis of cohort studies Annals of Internal Medicine 171, 10, 711-720

House, J (2016) Consumer acceptance of insect-based foods in the Netherlands: Academic and commercial implications Appetite 107, 47-58

House, J (2019) Modes of eating and phased routinisation: Insect-based food practices in the Netherlands Sociology 53, 3, 451-467

Johnston, B.C et al (2019) Unprocessed red meat and process red meat consumption: Dieting guideline recommendations from the Nutritional Recommendations (NutriRECS) consortium Annals of Internal Medicine 171, 10, 756-764

Lepe, M et al (2011) Long-term efficacy of high-protein diets: A systematic review Nutricion Hospitalaria 26, 6, 1256-1259

Mortimer, R (2019) Pride before a fall: Shame, diagnostic crossover, and eating disorders Bioethical Inquiry 16, 365-374

Morton, R.W et al (2018) A systematic review, meta-analysis and meta-regression of the effect of protein supplementation on resistance training-induced gains in muscle mass and strength in healthy adults British Journal of Sports Medicine 52, 6, 376-384

Murcott, A (2001) Public beliefs about GM foods: More on the makings of a considered sociology Medical Anthropology Quarterly 15, 1, 9-19

Nuffield Council on Bioethics (2002) Public Health: Ethical Issues
Cambridge: Nuffield Council on Bioethics

Reckwitz, T.R (2002) Toward a theory of social practices: A development in culturalist theorising European Journal of Social Theory 5, 2, 243-263

Scambler, G & Hopkins, A (1990) Generating a model of epileptic stigma: The role of qualitative analysis Social Science and Medicine 30, 1187-1194

Schatzki, T.R (2002) The Site of the Social: A Philosophical Account of the Cast of Social Life and Change
Pennsylvania: Pennsylvania State University Press

Shelomi, M (2015) Why we still don't eat insects: Assessing entomophagy promotion through a diffusion of innovations framework Trends in Food Science and Technology 45, 311-318

Skarderud, F (2007) Shame and pride in anorexia nervosa: A qualitative descriptive study European Eating Disorders Review 15, 81-97

Song, M et al (2016) Association of animal and plant protein intake with all-cause and cause-specific mortality JAMA Internal Medicine 176, 1453-1463

Sosenko, F et al (2019) State of Hunger: A Study of Poverty and Food Insecurity in the UK London: Trussell Trust

Sudlow, C et al (2015) UK Biobank: An open access resource for identifying the causes of a wide range of complex diseases of middle and old age PLoS Medicine 12, e1001779 (Freely available at <https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001779>)

Thornton, L.M et al (2018) The Anorexia Nervosa Genetics Initiative (ANGI): Overview and methods Contemporary Clinical Trials 74, 61-69

Valli, C et al (2019) Health-related values and preferences regarding meat consumption: A mixed-methods systematic review Annals of Internal Medicine 171, 10, 742-755

Vernooij, R.W.M et al (2019) Patterns of red and processed meat consumption and risk for cardiometabolic and cancer outcomes: A systematic review and meta-analysis of cohort studies Annals of Internal Medicine 171, 10, 732-741

Virtanen, H.E.K et al (2018) Intake of different dietary proteins and risk of heart failure in men: The Kuopio ischaemic heart disease risk factor study Circulation: Heart Failure 11, 6, e004531

Watson, H.J et al (2019) Genome-wide association study identified eight risk loci and implicates metabo-psychiatric origins for anorexia nervosa Nature Genetics 51, 8, 1207-1218

Willett, W et al (2019) Food in the Anthropocene: The EAT-Lancet Commission on healthy diets from sustainable food systems Lancet 393, 447-492

Wood, L et al (2017) The impact of stigma on emotional distress and recovery from psychosis: The mediating role of internalised shame scale Psychiatry Research 255, 94-100

Zeraatkar, D et al (2019a) Red and processed meat consumption and risk for all-cause mortality and cardiometabolic outcomes Annals of Internal Medicine 171, 10, 703-710

Zeraatkar, D et al (2019b) Effect of lower versus higher red meat intake on cardiometabolic and cancer outcomes: A systematic review of randomised trials Annals of Internal Medicine 171, 10, 721-731