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One-health approach as counter-measure against “autoimmune” responses in biosecurity



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ABSTRACT

This Swine flu pandemic of 2009 and the potential Avian flu threat of 2011–2012 have revived a most challenging debate on protection against infectious diseases. The response to the Swine flu pandemic has been ambivalent, both on the societal (political) and the scientific level. While some scientists warned against potential massive loss of human lives and urged for immediate and large-scale vaccination, others accused them of unnecessary scaremongering, arguing that the pandemic would not be that severe. The lab-created virulent Avian flu virus – which has been created in order to ‘fight’ a potential Avian flu pandemic – sparked a fierce debate on the dual-use risks of such a pre-emptive strategy. This article involves an analysis of the medical-political response to these recent viral threats using Peter Sloterdijk’s immunological framework as diagnostic tool. In his trilogy *Spheres* Sloterdijk uses immunological concepts to analyse and assess the contemporary biopolitical situation. It shows how drawing a parallel between the functioning of the biological immune system and “immune responses” on socio-political level enables to assess and reconceptualise biosecurity.

It demonstrates that ideas such as “nature is the biggest terrorist” – as advanced by many virologists – sometimes result in exaggerated “immunisation responses”. This strong *defensive* attitude sometimes brings about collateral damage. In other words, fierce biosecurity measures sometimes risk developing into “autoimmune” responses that actually destruct the body politic they are meant to protect. By drawing on recent insights in the functioning of the biological immune system it is shown how a One-Health approach that incorporates a broader and nuanced “immunological” repertoire could act as counter-measure against “autoimmune” responses in biosecurity.

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1. Introduction

Throughout history, humankind has repeatedly fallen victim to dreadful epidemics or pandemics that have claimed the lives of millions over the centuries; from the ‘plague of Justinian’ dating back to the Roman empire, via ‘the Black death’ in the Middle Ages, to the ‘Spanish flu’ in 1918, the ‘Asian flu’ of 1957 and the ‘Hong Kong flu’ of 1968 (Zanetti and Zappa, 2010). By the 1970s it had become common to believe that infectious diseases were declining and would be soon eliminated through medical progress. This optimistic view appears to have been naïve. In recent decades the

world has been confronted with an ever-increasing number of novel or re-emerging infectious diseases, some of them causing true pandemics. Striking examples were the emergence of Acquired ImmunoDeficiency Syndrome (AIDS) in the early 1980s and the more recent Severe Acute Respiratory Syndrome (SARS) in 2003 (Zanetti and Zappa, 2010). It has been widely accepted in modern science that new viral strains will emerge and continue to pose challenges to public health and the scientific communities of future societies (Cohen, 2000; Medina and Garcia-Sastre, 2011; Sasseti and Rubin, 2007).

In April 2009, a new influenza virus emerged in the United States and Mexico. In the weeks that followed, the ‘Mexican flu’ (later called the ‘H1N1 Swine flu virus’, named after the subtype numbers of its hemagglutinin (H) and neuraminidase (N) surface antigens) spread rapidly around the world. On 11 June 2009, the World Health Organization (WHO) officially declared the first flu pandemic of the 21st century (Butler, 2010b; Chan, 2009). This

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outbreak and its rapid spread across the world revived the debate on protection against infectious diseases.

The response to the Swine flu pandemic is characterised by substantial ambiguity, on the socio-political as well as the scientific level. In various publications, in mass media, and in scientific journals the severity of the threat, and of the accompanying protection measures considered necessary have been stressed by referring to the dreadfulness of the 1918 Spanish flu pandemic (Barry, 2009). At the same time, other people (including scientists) were much more reluctant and argued that the pandemic would not be that severe (Editorial Nature, 2009; Reporter BBC News, 2009). This article analyses and problematises the biosecurity measures taken in response to viral threats (see also, Collier and Lakoff, 2008, p.27).

The second event that will be assessed is the disturbance caused by the fabrication of a mutant Avian influenza virus (Butler, 2011). In view of a potential future Avian flu pandemic, virologists have succeeded in fabricating a mutant version of the Avian flu that is capable of transmission between humans, in order to get more insight in flu evolution, and to prepare the production of future vaccines and antiviral medicines. This preventive approach has the downside that such lab-bred viruses could escape from the lab or be abused by terrorists.

To come to terms with the biosecurity measures in response to these recent viral threats Sloterdijk's trilogy *Spheres* (1998, 1999, 2004) may serve as an instrument to analyse and assess the "immunisation responses" to both the Swine flu pandemic and the Avian flu threat. In his 'Immunology of Spheres', Sloterdijk uses immunological concepts to analyse and assess the current biopolitical situation. He draws a parallel between the immune system on the biological level and immune systems on socio-political and cultural level. By building on this analogy between the biological immune system and "immune responses" on socio-political level, this article shows how an immunological framework can be fruitful for grasping (assessing and reconceptualising) biosecurity. This mode of inquiry into problematisations of biosecurity is that of a second-order observer (Rabinow) (Collier and Lakoff, 2008, p.12). The analysis will be illustrated with quotations from *Nature* and *Science* articles (News and Opinion articles & Editorials) that deal with these two threats. The 'Sloterdijkean' analysis will be supplemented with the views of the American cultural critic Susan Sontag (1933–2004), notably her notion of apocalyptic discourse as reflected in her commentary on the AIDS pandemic in the late 1980s (notably in *AIDS and its Metaphors*, 1988).

The analysis will show how rather defensive "immunisation responses" against viral threats sometimes bring about considerable collateral damage. Biosecurity measures sometimes risk evolving into "autoimmune" responses. Autoimmunity is a biological concept that refers to an immune response directed against a body's own cells and tissues. In its metaphorical use as diagnostic tool, autoimmunity refers to a situation in which the protective measurements are more destructive than the original threats themselves and immunisation becomes a major threat to social (political) life itself. In the final part, it is shown how a One-Health approach could mitigate and act as counter-measure against the tendency towards "autoimmune" responses (whether caused by virological research, industrial animal agriculture or other institution). It will be shown how on the biological level the immune system does not simply operate as 'defence army' against all possible intruders of the body. Whether a virus or a microbe is 'seen' as something that must be attacked and destroyed is very dependent upon the context in which the immune reaction takes place. Immunological processes like tolerance ('silence' of the immune system upon encounter of a pathogen) and autoimmunity have proven that the immune system is far more complicate than a

protective army against destructive invaders (Tauber, 2008, p.272). In this article, it is defended that such biomedical insights on the functioning of the immune system enable to assess and reconceptualise biosecurity.

2. Peter Sloterdijk's immunological framework

In his trilogy *Spheres* [*Sphären*] (1998, 1999, 2004), Sloterdijk argues that humans are essentially sphere-building and sphere-dependent beings. Human life has always been lived within what he calls protective 'immunising spheres' (Sloterdijk, 1998). For Sloterdijk, culture as such revolves around a process of immunisation (Sloterdijk, 1998, 2001, p.346). Spheres are spatial environments that function as protective immune systems. They defend us from looming threats coming from outside and create an ambiance, a place that humans can inhabit and that allows them to live their life in the immensity of the world. Humans are beings that have built and build caves, houses, villages, cities, nation-states, cultures, world-views etc., which act as *immune systems* or *immune responses* against possible threats from the outside world. This capacity to build protective spheres is not restricted to material environments such as villages, cities and, eventually, the metropolises of today, but it also involves protective ideological and symbolical structures such as metaphysical and religious views.

Sloterdijk argues that with the development of science and technology, formerly implicit aspects of the world (such as viruses) have become increasingly explicit. Sloterdijk's notion of 'explication' is akin to Heidegger's notions of 'unveiling' [*Entbergung*], which for both of them constitutes the core of science and technology. Sloterdijk refers to the 20th century as the "age of explication" [*Explicationszeitalter*] (Sloterdijk, 2004, p.228). In this century, science and technology have developed rapidly. From the time of Pasteur and Koch onwards, for example, human beings suddenly had to take explicit measures to protect themselves against the thus far unknown microbes. Sloterdijk shows how new knowledge also results in the corollary explication (and thus perception) of new risks and threats. Indeed, in Sloterdijk's view, 'immunisation' (as cultural phenomenon, including its biomedical forms) has nowadays become a focus of concern, due to forces of globalisation. This is illustrated by a profound desire for protection by means of insurances, security measures, vaccines, and so on. However, these 'immunisation' measures simultaneously (and paradoxically) entail a growing sense of more and deeper insecurity, which, in its turn, entails more and more emphasis on immunisation and so on. In the following, Sloterdijk's immunological framework will be operationalised. The Sloterdijkean concepts of 'immunisation' and 'explication' of Sloterdijk will be applied as *diagnostic tool* to analyse and problematise the biosecurity measures taken in response to successively the Swine flu pandemic and the Avian flu threat. However, this article extends Sloterdijk's immunological framework. It also employs other immunological concepts, such as the notion of autoimmunity. By drawing a more complete and precise parallel between the functioning of the biological immune system and "immune responses" on socio-political level some contemporary biosecurity measures are further assessed and problematised. In the third part, it is shown how a One-Health approach could 'cure' some of the 'pains' (i.e. "autoimmune" responses) of contemporary biosecurity.

3. The immunisation paradox in recent viral threats

In April 2009, the emergence of a new strain of H1N1 influenza virus took the world by surprise. It first emerged in Mexico and the United States, but in the weeks that followed, it spread rapidly to countries worldwide. As it turned out, the surface proteins of the

virus were strikingly similar to those of the 1918 Spanish flu virus that had caused a pandemic 90 years earlier. It then killed up to 50 million people worldwide (Nabel et al., 2011). Accordingly, in several scientific articles the severity of the threat (and the ‘immunisation measures’ considered necessary) was stressed by referring to the dreadfulness of this 1918 pandemic of the Spanish flu (Barry, 2009). Following the threat and these premonitions, an “immunisation response” erupted, not only on the biomedical scene (development and distribution of vaccines and antiviral medicines) but also at the societal level (public health measures; surveillance, quarantine, hygiene, etc.).

On the one hand, virology in general enables the emergence of an effective biological immunisation response, such as in the H1N1 case. Virological research has revealed the genetic characteristics of H1N1, its transmissibility, etc. in order to make informed decisions on how to control and counteract the virus’s spread (Hayden, 2009). On the other hand, virological research obviously increases our knowledge about viruses, about their genes, their virulence, their interaction with hosts, and their spread. This progressive understanding has also made us more aware of the potential new risks we are exposed to. This ambivalent effect of virological research is captured nicely by the following quote from *Nature*: “The boost in research spending on epidemiological modelling and laboratory studies has enabled scientists to understand the H1N1 virus in record time, prepare to manufacture vaccine faster, make more informed decisions on how to intervene in the virus’s spread, and understand and share information on its genetic characteristics” (Hayden, 2009, p.756). In this phrase, it is suggested that our increased knowledge will boost our immunisation response. In the following quote, however, the basic ambivalence already becomes more apparent: “If researchers know the key genetic regions that facilitate reassortment, surveillance efforts could watch out for H5N1 of H1N1 viruses with changes in those regions, ones that might be on the verge of dangerous reassortments” (Maher and Butler, 2009, p.157). In other words, increased knowledge about the Swine flu genes might result in the discovery of an even more dangerous and virulent ‘reassortment’ of the virus. Reassortment, or gene mixing, refers to the exchange of segments of the viral genome of two distinct virus strains as a result of simultaneous infection of a single cell by two distinct influenza viruses. This can result in the generation of a novel influenza virus strain, and it is believed that most human pandemic viruses actually arose in this way (Medina and Garcia-Sastre, 2011).

These quotes already indicate that new knowledge not only resulted in the idea that we are protected from Swine flu once and for all. On the contrary, increased knowledge about Swine flu has resulted in the emergence of new and previously unknown threats, the threat of an even more virulent virus. This new disconcerting knowledge involves what Sloterdijk refers to as ‘collateral damage’ (Sloterdijk, 2004, p.200). If new diseases or new viral strains are discovered, the feelings of security or comfort (among both experts and the public) will not increase. The opposite is actually more true, there is an increase of uneasiness or distrust because of the increased awareness of new potential risks in society (Sloterdijk, 2004, p.198–201). This is a paradigmatic example of what could be termed the ‘immunisation paradox’, the idea that “immunisation measures” result in the concomitant ‘explication’ of previously unknown risks and threats and feelings of insecurity, which entail more and more emphasis on immunisation.

Moreover, the collateral damage is two-fold. First of all, increase in our knowledge about the Swine flu unravels potential new risks, for example the risk of dangerous reassortments or mutants of the virus that makes it more virulent, transmissible or resistant to drugs (Maher and Butler, 2009). Secondly, new knowledge about viruses and new techniques, for example the technique of

‘resurrecting’ former (now extinct) viruses such as the 1918 flu virus, actually creates new forms of risk associated with the technology itself. Although a fully reconstructed virus might gain a better understanding of the virus and thus be instrumental in fighting the next pandemic, there is nonetheless a risk of accidental or intentional release (bioterrorism) of the virus from the lab (Beck, 2002; Bubnoff, 2005; Interlandi, 2010). The paradoxical implications of this so-called ‘pre-emptive’ strategy will be further discussed later in the manuscript.

4. “Autoimmune” responses in biosecurity

In hindsight, the Swine flu pandemic has turned out to be very mild. The dramatic pestilence that many (experts as well as ordinary people) had expected did not occur. There have definitively been casualties: the most seriously affected involved relatively young people, and one quarter of the seriously afflicted patients had no pre-existing underlying disease (Butler, 2009; Osterhaus, 2010). Yet, the downside of the lack of virulence of H1N1 and the relative mildness of the pandemic is that many countries were left with a stockpile of unused H1N1 vaccines. As a result, in hindsight, many governments have been criticised for squandering taxpayers’ money on supplies that were not needed. Several critics have been prompting accusations that the WHO has been guilty of scare-mongering and exaggerating the Swine flu threat and accordingly have accused scientists and the WHO of ‘over-reacting’. Moreover, these critics point to partnerships between the virologists involved and drugs companies providing the vaccines (Butler, 2010a; Cohen and Carter, 2010; Editorial *Nature*, “Lessons from a pandemic”, 2010).

Retrospectively, one could argue that the “immunisation response” to the threat and the accompanying scares and fears may have been more socially and economically disruptive than the harm caused by the disease itself. On these grounds, the response to the threat could be labelled as an instance of what cultural critics like Sloterdijk, but also Jacques Derrida and Roberto Esposito have referred to as ‘excessive immunisation’ or an ‘autoimmune pathology’ (Sloterdijk, 2004; Borradori, 2003; Esposito, 2008). The concept of autoimmunity has its origins in the biomedical sphere and indicates - in simplified terms - a situation in which the immune system operates so powerfully, that it produces detrimental effects for the body it is supposed to safeguard. When used as a metaphor for socio-political responses, autoimmunity refers to a situation when the striving for immunisation or self-protection becomes more damaging to the life - the veins and tissues - of society than the original threat. In that case, the protection of life, the effort to exclude any intrusion from the outside may become obsessive to such an extent that it risks destroying not only the alleged enemy outside, but first and foremost the social ‘body’ it is meant to protect, i.e., society.

Governments were faced with predictions concerning a new influenza virus from which a large proportion of the world’s population was not protected (many had no or little immunity). Taken into account the uncertainty of the predictive epidemiological models, governments have chosen to base their policies on the principle of prudence: “preparing for the worst while hoping for the best,” as advocated by Dr Keji Fukuda of WHO (Osterhaus, 2010, p.142). Referring to the fact that it is impossible to predict the course of an influenza pandemic at an early stage because of the unpredictability of the virus, virologists such as Osterhaus justify their caution by arguing that the policy of “better safe than sorry” is warranted (Osterhaus, 2010, p.142).

There is a clear logic behind this way of reasoning. The problem, however, is that there is a price to pay for this prudence, as these warnings and premonitions do evoke anxieties and fear

(sometimes causing public reluctance concerning vaccination). These carry financial as well as political consequences (Editorial Nature, 2009; see also Wildavsky, 1988). This prudent “immune reaction” thus risks evolving into an “autoimmune” response.

4.1. “Autoimmune” responses: looming viral threats

Furthermore, the delay of vaccine delivery has resulted not only in an estimated of 1 million extra infections, but also burdened health care systems with tens of millions of unused vaccine doses (Jack, 2010; Stöhr, 2010). On a political level, the Council of Europe has written an evaluation report on the handling of the H1N1 pandemic entitled “The Handling of the H1N1 Pandemic: More Transparency Needed” (Flynn, 2010). The immediate cause for this evaluation report was a motion tabled under the title “Faked Pandemics – a Threat for Health,” by Dr Wolfgang Wodarg (2009). Although the intention was to write a clear-cut evaluation of the topic, the document abounds in ambiguities. On the one hand, virologists are accused of inciting “unjustified scares and fears about health risks” and of “sensationalism and scaremongering in the public health domain” (Flynn, 2010, p.1). On the other hand, this document itself warns for “the next disease of pandemic scope – which may turn out to be much more severe than the H1N1 pandemic” (Flynn, 2010, p.1). Although the response to the Swine flu pandemic is diagnosed as excessive, at the same time the document refers to the looming threat of a potentially more severe “next disease of pandemic scope”, thereby evoking a new catastrophic foresight with all the accompanying concerns and fears.

Thus, the viral threat still remains and it is only a matter of time before we are hit by a deadlier influenza pandemic. Virologists and other public health officials and experts keep on warning for the possibility that the threat still exists: “We’re worried the virus could increase its disease-causing ability” (Ledford, 2009, p.1). They even warn for a false sense of security: “The danger now is that last year’s relatively mild pandemic will create a false sense of security and complacency. The reality is that the next time we might not be so lucky (...)” (Editorial Nature, 2010, p.136).

The apocalypse of a pandemic is present in a more threatening way than ever, at least according to prominent virologists such as Osterhaus. He warns for an imminent pandemic of a viral (flu) strain. The exact moment it will strike is yet uncertain but the fact that a pandemic will strike sooner or later is something to be expected (Osterhaus, 2010). Many virologists such as Osterhaus justify their warnings against a pandemic by saying that we always should ‘expect the unexpected’ (Butler, 2009, p.21; Weiss and McMichael, 2004, p.S75; Howard and Fletcher, 2012, p.10). This rhetoric is comparable to the rhetoric on AIDS described by Susan Sontag in *AIDS and its Metaphors* (1988), which seems to be aimed at accustoming us with “the intermittent awareness of a monstrous, unthinkable – but we are told quite probable – pandemic catastrophe” (Sontag, 1988 p.88). Such taste for worst-case scenarios seems to reflect the constant need to master fear of what is felt to be out of control (1988, p.87). The warning ‘expect the unexpected’ entails a situation in which constant fear is provoked, rather than fear of a specific disease at a specific moment; as such, it produces a kind of sustained state of fear. Sontag (1988) has argued how it seems that in modern society, the end is believed to be near, but this is a “long-running serial”, a protracted condition rather than a terminal event. It is a state that always looms but never happens (Sontag, 1988, p.88; see also Fitzpatrick, 2003, p.1310). As she puts it, it is not “Apocalypse Now,” but rather “Apocalypse from now on” (Sontag, 1988 p.88). It seems that virologists who warn for the looming threat of viruses and pandemics try to make the pandemic catastrophe a key element of our “ordinary horizon of expectations”. In contemporary society, the state of

concern has become interminable (Cooper, 2008a,b; Fitzpatrick, 2003), which can be regarded “an autoimmune pathology”, or as Sontag puts it: “an unparalleled violence that is being done to our sense of reality, to our humanity” (Sontag, 1988 p.88).

These concerns for a looming viral threat are closely connected with key characteristics of viruses, such as their invisibility to the naked eye, their capacity to mutate and evolve very quickly. Viral infections are particularly difficult to eradicate because viruses adapt continuously to their environment by mutation, recombination or gene reassortment (Morens et al., 2004). Furthermore, globalisation promotes the emergence and spread of new infections and pandemics (Zanetti and Zappa, 2010). Accordingly, virologists state that “yet at the end of the day, making predictions about this new H1N1’s next move is a mug’s game. There’s nothing more predictable about flu than its unpredictability” (Cohen, 2009a, p.997). When, where and how the next catastrophe will strike remains uncertain, disaster is always incubating and one can only speculate (Ewald, 2001). Accordingly, the inescapable elusive and uncertain characteristics of viral threats call for drastic and immediate “immunisation measures”. Some virologists argue that H2N2 looms and could re-emerge in a similar way as H1N1 did. Accordingly, they urge for a “pre-emptive” vaccination strategy against this potential threat (Nabel et al., 2011; Stöhr, 2010). Yet, such pre-emptive strategies are likely to generate their own incalculable dangers and incorporate autoimmunity aspects, as will be shown in the next section.

4.2. “Autoimmune” responses: pre-emption

Pre-emption is a concept originating from international law, it authorised a state to counter-strike when it had a warning or visible evidence of an imminent attack. However, in the course of time the doctrine of pre-emption has changed, mainly in response to the World Trade Center (WTC) attacks of 9/11/2001 (National Security Strategy, 2002). In *Life as Surplus* (2008), Cooper points out that what is radically new about this doctrine is that the US authorised itself to use *pre-emptive* action against a threat that is not so much *imminent* as *emergent*; “a threat whose actual occurrence remains irreducibly speculative, impossible to locate or predict” (Cooper, 2008b, p.124). In recent decades, newly emerging infectious diseases, but also bioterrorist threats, such as the anthrax attacks of 2002, induced a shift in the approach to disease from classic public health (managing known diseases) to preparedness practices (developing the capacity to respond to yet unknown potentially catastrophic biological events (Lakoff, 2008; pp.14, 33–60)).

The strategy of pre-emption has also been taken up and employed by the field of infectious diseases. In view of a potential future Avian flu pandemic, two groups of scientists (one led by Yoshihiro Kawaoka at the University of Tokyo and the University of Wisconsin–Madison, and one led by Ron Fouchier of the Erasmus Medical Center in Rotterdam, the Netherlands), have created mutant H5N1 Avian influenza variants that can be transmitted between ferrets, which are a good proxy for how flu behaves in other mammals, including humans (Herfst et al., 2012; Imai et al., 2012). To date, however, H5N1 viruses have very scarcely been transmitted between humans. Nevertheless, as H5N1 viruses continue to evolve and infect humans, the viral experts concerned warn for the fact that variants of H5N1 viruses with pandemic potential, including Avian–human reassortant viruses, might emerge (Kawaoka, 2012). In this specific case, the doctrine of pre-emption implies that we need not only to mobilise against currently circulating viruses, but against a potential emergence of a possible disease, in this case a transmissible mutant version of the Avian flu, which (as far as one knows) does not exist yet. This could

be regarded as a form of ‘anticipatory evolution’ (Bacher et al., 2002).

The transmissibility studies of H5N1 Avian influenza sparked a fierce debate within the life science community and – although instigated by the media – among the general public, about the ‘dual-use’ risks involved in publishing the results of this research. The results of such studies can be used for beneficial purposes (i.e. understanding and counter-acting a future viral threat), but can also be misused for malevolent purposes with potentially severe effects on public health (for instance: bio-terrorism) (Butler, 2012; Brumfiel, 2012).

The protagonists of publication of the mutant flu studies assure that their research sheds light on influenza transmission. They argue that their research will deepen our understanding of what allows a virus to cross the species barrier and jump from other animals to humans. The benefits for monitoring wild viruses for potentially dangerous mutations and for vaccine development outweigh the risks, the protagonists claim (Hunter, 2012; Maher, 2012). “Don’t censor life-saving science”, argues virologist Peter Palese (2012, p.115). Palese argues that the transmissibility experiments actually allow virologists to understand what makes a virus dangerous and how it can be disabled (Palese, 2012, p. 115). Fouchier, author of one of the mutant flu papers, argues similarly that publication of his study could help stop a future pandemic, whether natural or as a result of an act of terrorism (Hunter, 2012). Accordingly, imposing censorship on publication would be counterproductive, to the extent that it constrains the development of suitable countermeasures such as vaccines (Hunter, 2012).

However, it is important to keep in mind that the actual occurrence of an Avian flu pandemic remains irreducibly speculative – impossible to locate or predict. Moreover, the pre-emptive strategy also involves “autoimmunitary” aspects: although the studies were aimed at finding ways to prevent a devastating Avian influenza pandemic (to engineer a cure), they involved the creation of a novel, more transmissible Avian flu virus. Thus, this simple act seemed to enhance the chances of a pandemic, owing to either a lab accident or intentional release by terrorists. *Nature* also warns against the dangers (the “autoimmunitary” aspects) of this development by arguing that one should keep in mind that public health services are currently not equipped to mitigate a H5N1 pandemic, either accidental or intentional, due to the (worldwide) limited abilities to manufacture and distribute vaccines (Editorial *Nature*, 2012; Cohen, 2009b).

4.3. “Autoimmune” responses: nature as bioterrorist

It seems that, carried by fear and anxiety, the doctrine of pre-emption is of growing importance and popularity for managing not only a proliferating range of political problems, but also for coping with viral threats. There is an increased demand for public health preparedness to focus not only on interventions against known recorded viral strains but on generic measures that would be effective against yet unknown, not recorded but theoretically possible viral strains (Collier and Lakoff, 2008, p.12–16). The idea behind pre-emption is to intervene in the conditions of emergence of the future, before one may be besieged by nature’s own act of emergence (Cooper, 2008a, p.91). In the case of the mutant Avian flu, virologists make use of exactly that argument. Professor John Oxford from Barts and the London School of Medicine says, “The biggest risk with bird flu is from the virus itself. We should forget about bio terrorism and concentrate on Mother Nature” (Walsh, 2011, p.1). In similar vein, Osterhaus argues that the bigger danger is that “nature will do the first job” (quoted from Check, 2005, p.406). Similarly, Fouchier and De Jong (virologists) claim that “nature is the biggest terrorist” (Carvajal, 2011, p.A28; Visser,

2012, p.1). Their argument clearly states that virologists should be allowed to pre-emptively ‘attack’ nature, before nature itself will ‘attack’ us.

In these quotes, the virologists concerned literally align nature and bioterrorism, a natural viral threat and a threat from bioterrorism, and as such this example represents the surreptitious militarisation of infectious diseases (Cooper, 2008a). From the perspective of these virologists, the only viable protection strategy against evolving infectious diseases, against an uncertain biological future, is one of aggressive counter-proliferation. Whether the threat is unintentional or intentional, i.e., whether it comes from human terrorists or from nature does not really make a difference.

However, one must realise that the potential of biological resistance is inexhaustible because of the co-evolution between viruses and their hosts, including humans. As a result, the pre-emptive war will be indefinite in time and scale (Dubos, 1987 [1959]). In other words, the ‘war’, however smart it will be, will become interminable. Lederberg labelled this scenario, ‘our wits versus their genes’ (Lederberg, 1998, p.463).

This specific development within the field of virology is not surprising, since it seems to fit within a wider development, which some philosophers have designated a reinforcement of the “biologisation of politics” (Esposito, 2008; Rose, 2001). This means that the rapid technological and scientific developments within the life sciences, and our deepened understanding of biological life at the molecular level, have resulted in the fact that human existence (at the biological level) has increasingly become the dominant concern of government attention. The idea of ‘pre-emptive war’ against all possible offenders, including terrorists as well as viruses, seems to be the quintessential result of this development. Esposito regards this to be the “autoimmune illness” of contemporary political culture, by pointing to the paradoxical results of this strategy and by indicating that this ‘excessive defense’ actually ruins the body politic it is meant to protect (Esposito, 2008, p.147–148).

The practice of pre-emptive immunisation as applied to infectious diseases thus appears to convey a militaristic approach. This pre-emptive approach expresses a reductionist and defensive, rather than a One-Health (ecological approach) to biosecurity. Cooper (2008a) also noted how this growing entanglement between the protection of biological life (immunisation) and the imposition of a permanent state of war is something that needs to be contested (p.99; Thacker, 2005). Yet, as long as we (virologists, but also politicians and the public at large) regard “nature as the biggest terrorist”, this entanglement is rather furthered than contested.

5. One-health as counter-measure against autoimmunity

Thus far, it has been shown that contemporary immunisation practices within the field of infectious diseases, including the controversial practice of pre-emption, reproduce a rather reductionist defensive perspective on biosecurity. The discontents of such reductionist defensive biosecurity measures have been outlined by building on the notion of autoimmunity. It appears that the perception of the virus as the invading ‘other’ (or enemy) has consequences for the way biosecurity is conceptualised and infectious diseases are dealt with.

In view of the collateral damage involved in fierce “immunisation measures”, in what follows some recent developments in virology and immunology will be sketched out. In immunology a few important developments can be discerned, which are very relevant for reconceptualising biosecurity. Building on these biological insights, it will be shown how the One-Health approach could mitigate the autoimmunitary tendencies in biosecurity measures against viral threats. The biological immune system will again function as analogy for immune responses on the socio-

political level, not because biology is the model per se (that would come down to biologism), but because the conceptual ‘surplus’ in biological immunology could enrich the socio-political repertoire of “immune responses”, including the “immunisation response” against infectious disease threats.

In virology it is recognised that the emergence and re-emergence of infectious diseases reflects various changes in human ecology: increases in population size and density; increase in the number and movement of refugees; changes in personal behaviour and life style; and human-induced global changes, including climate change. Medical technology can also pose a risk and unintentionally introduce and spread infectious diseases. Drug-resistant microbes, contaminated equipment or biological medicines produced from animal-cell substrates can also present an inherent potential for introducing new infections (Weiss and McMichael, 2004). All these factors cause patterns of infectious diseases to change globally and on a massive scale. This illustrates how human health obviously cannot be separated from planetary conditions in general, i.e. from our total planetary ‘health’, including the health status of its animate and inanimate environment (see also, Canguilhem, 1989). We live in interdependent existence with the totality of the living and non-living world. Accordingly, today we understand that the concept of the microbe as the single cause of infection (as Koch has postulated) is inadequate and incomplete, because it ignores the influence of the host, the milieu, and the social and physical environment (Budd et al., 2009; Weiss and McMichael, 2004; Wilson, 1995). Next to all fundamental viral research, we should pay at least as much attention to the ecological and climatological factors such as increased global population, increased travel, intensive animal farming and food production, global climate change, prophylactic doses of antibiotics and other drugs, and so on (Rappuoli, 2004).

In immunology, a similar development towards more attention for the context (of immune responses) can be traced. In the 19th century, immunology began as a study on how a host organism reacts to pathogenic injury and how it defends itself against microbial incursion (Tauber, 1999, p.459). In that pathological context, immunology came to be defined as the science that discriminates between self and non-self (other) (Tauber, 1994). In recent decades, processes such as immunological tolerance (‘silence’ of the immune system upon the encounter of a pathogen) and autoimmunity have pointed immunologists to the fact that the immune system is far more complex than simply a ‘defence army’ against destructive invaders (Tauber, 2008, p.272). It appeared that the immune system does not attack and destroy all invading pathogens, but includes a more nuanced and diverse repertoire. Immunologists increasingly recognise the importance of the ‘context’ of immune reactivity (Tauber, 2008, 2012). Whether a virus or microbe is ‘seen’ as ‘enemy’ is dependent upon the context in which the immune reaction takes place. It appears that an antigen (that which elicits an immune response) is not a priori ‘non-self’ or the ‘enemy’, but only attains its ‘meaning’ within a particular context. In other words, immune responses are not based on intrinsic foreignness, but rather on how the immune system perceives an antigen (of the virus) in the larger context of the body’s economy (Tauber, 2000, p.241). The immune system is thus in constant ‘dialogue’ with surrounding tissues and the exterior. In that way, the immune system determines what is to be protected and healed and what is foreign, and thus must be attacked and destroyed (Tauber, 2000, 2008).

Although the immune reaction is often pictured as a hostile encounter between self and non-self - including its associated military metaphors of combat, invasion, aggression or counter-attack - (Tauber, 1999, p.526), this is not because the hostile encounter is axiomatic, but because its associated events are the

most salient and consequential (Tauber, 1999, p.526). Yet, on the biological level, the norm in such encounters is “truce rather than war, tolerance instead of destruction” (Tauber, 1999, p.526; Burnet, 1962, p.39). As such, the biological body is not a battlefield, moreover, nor is the political body.

For this reason, it is of utmost importance to also get rid of military metaphors in the debates on protection against infectious diseases. Besides, the account of all the factors involved in the transmission, evolution and emergence of infectious diseases described above underlines the nonsensicalness of utterances such as “nature is the biggest bioterrorist”, or “Mother Nature as biggest threat” (Walsh, 2011; Carvajal, 2011; Visser, 2012). As humans, we are an integral part of nature and our role is of crucial importance in the current upsurge of infectious disease incidence. As Sontag – so eloquently remarked – paraphrasing Lucretius –, “about that military metaphor (...) “give it back to the war-makers” (Sontag, 1988, p. 95).

The biological insight that immune responses include much more than simply a form of defence against an invading non-self (an a priori enemy) can (and should) be used to reconceptualise biosecurity. The contextual scheme of immunology should be transposed to the level of “immunisation measures” involved in biosecurity. Parallel to the immune system, which appears to be far more complex and nuanced than a destructive army, the “immune responses” involved in biosecurity should be more nuanced and complex and take into account the context in which they take place. “Immunisation measures” that do *not* take into account the context in which they are applied do not only risk developing into “auto-immune” responses but they are also less effective (Bingham and Hinchliff, 2008, p.174–193). This context thus not only involves the climatological and ecological factors involved in the emergence of viral threats (as emphasised by “ecological virologists” or “evolutionary virologists” (Cf. Suttle, 2007; Galama, 2010; Varela et al., 2009; Wilson, 1995), but also the political context and socioeconomic conditions (Bingham and Hinchliff, 2008, p.174–193). Thus, a One-Health approach will not only prevent “immunisation responses” evolving into “autoimmune” responses but also increases the effectiveness of biosecurity measures. A One-Health approach that incorporates a broader and more nuanced “immunological repertoire” than aggressive counter-proliferation not only acts as counter-measure against autoimmunity tendencies but might also vitalise – in the words of Sloterdijk – the “mental immune status of our enlightened society” (Sloterdijk, 2004, p.196).

6. Conclusion

The Sloterdijkian immunological framework has shown how “immunisation” attempts often concomitantly also *explicate* new viral threats. It has been argued how viral research potentially brings about ‘collateral damage’, through the explication of formerly unknown risks, for example the emergence of a more virulent reassortment of the virus. Given important characteristics of viruses such as their invisibility, their unpredictability, and their capacity to mutate quickly, virologists are bound to caution that despite immunisation measures, viral threats are always looming. This further promotes the shift to preparedness in public health, including a practice of pre-emption. The lab-bred mutant Avian flu is a paradigmatic example thereof. However, such strong defensive (and preventive) “immunisation measures” risk evolving into “autoimmune” responses. In the context of this article, “autoimmune” responses involve a situation in which protective measures (against a viral threat) are more destructive for society than the original viral threat itself.

The subsequent fierce global debate on the dual-use risks involved overlooks the fact that this strategy of pre-emption will be

indefinite. If pre-emption develops into a standard doctrine, one needs to take into account the evolution rate and reassortment possibilities of this most abundant type of biological entity and the accordingly endless range of potential viral threats. The “autoimmune” aspects of the lab-bred Avian flu involve not only the creation of new viruses, but also psychological damage by creating a permanent state of fear. More importantly, as long as virologists regard ‘nature as the biggest bioterrorist’, the worrisome entanglement between the protection of biological life (immunisation) and war including its “autoimmunity” effects will be furthered rather than contested.

A One-Health approach, however, could act as counter-measure against such autoimmunity developments. From the perspective of One-Health, the ‘other’ whether a virus or anything else is not a priori the enemy that has to be ‘fought’ and ‘defeated’. The biological immune system does not simply operate as ‘defence army’ but mediates aggressive as well as cooperative (tolerant) interactions (Tauber, 2008). More importantly, whether a virus or microbe is ‘seen’ as ‘enemy’ is dependent upon the context in which the immune reaction takes place. It appears that an antigen (that which elicits an immune response) is not a priori ‘other’ or the ‘enemy’, but only attains its ‘meaning’ within a particular context. In other words, immune responses are not based on intrinsic foreignness, but rather on how the immune system perceives an antigen (of the virus) in the larger context of the body’s economy (Tauber, 2000, p.241). Analogously, the “immune systems” on socio-political level involved in biosecurity should also include a broader and more nuanced “immunological repertoire”. On the socio-political level not all viruses need to be (pre-emptively) ‘fought’. A One-Health approach that involves such attention for the context in which (socio-political) immune reactions take place is needed.

In that way, the One-Health approach involves a perspective that not only conveys how easily life is threatened, but also stresses our dependence upon others, of co-existence as a basis for our existence, biologically as well as politically. It articulates the radical dependency of humans on interrelationships with others (including viruses), as well as the vulnerability to all others. No biosecurity or immunisation measure can foreclose this dependency (Butler, 2004, p.19–50). This necessitates more nuanced than current attempts to achieve ‘absolute’ security or immunity.

To conclude, the Sloterdijkian immunological framework illuminated the discontents of our (fierce) immunisation strategies and the risk of “autoimmunity” in biosecurity. A One-Health approach acknowledges the fact that the fundamental dependency on anonymous others is not a condition we can get away from, neither on the political nor on the biological level. A One-Health approach that incorporates a broader “immunological repertoire” than only ‘fight and defeat’ (i.e. pre-emption) would further our commitment to living with a certain kind of ‘vulnerability to others’ that actually gives our individual lives meaning (Butler, 2004, p.19–50).

Ethics approval

For this paper ethical approval was **not** required because the paper does not include human subjects data.

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