

Anticipating Immunity

Vaccine-induced Immunity and Vaccine Safety in the Finnish News Coverage of COVID-19 Vaccines

Venla Oikkonen

Received: 26 June 2022; Accepted: 24 November 2023; Published: 15 March 2024

Abstract

In this article I draw on the concept of anticipation to examine Finnish news discourse on the development, licensing and administration of COVID-19 vaccines. I explore the interplay of anticipation of vaccine-induced immunity and vaccine safety concerns, and trace how ideas of protection and risk were invoked in relation to specific vaccine technologies as well as different accounts of biomedical pasts, including cases of narcolepsy associated with one of the 2009 H1N1 influenza vaccines. I demonstrate that anticipation around vaccine development during a public health emergency operates through a series of small shifts and twists that magnify affects around novel vaccines in news media discourse. I argue that even a slight shift in the biomedical knowledge about immunity or in the historical framing of specific vaccine technologies may significantly reshape vaccine-induced immunity as an object of anticipation.

Keywords

Anticipation, COVID-19 vaccines, Immunity, Vaccine safety, News media.

Introduction

Concerns over vaccine hesitancy have made the introduction of new vaccines a precarious task. Researchers have documented how claims challenging vaccines are articulated through social media and online sites (Lindén 2020; Smith and Graham 2019) and how vaccine hesitancy draws on distrust in public institutions and local histories of health concerns (Feldman-Savelsberg, Ndonko, and Schmidt-Ehry 2000; Stöckl and Smajdor 2017). Researchers have also shown how personal perceptions of immunity shape vaccine hesitancy, including ideas of how a particular vaccine will affect a particular body (Gottlieb 2018; Reich 2016). These findings suggest that when a new vaccine enters public discussion, expectations around it take shape in relation to past and existing vaccines as well as local health debates.

This article explores the shifts in anticipation around vaccine-induced immunity and vaccine safety in the Finnish news coverage of the development and roll-out of COVID-19 vaccines during 2020 and early 2021. I start with the premise that questions of immunity and vaccine safety are mutually entangled in public discourse. Vaccine-induced immunity and vaccine safety are conceptualised in relation to the perceived seriousness of illness. The possibility of a rare vaccine injury may be more likely to be accepted if infection comes with considerable risks (Gottlieb 2018; Reich 2016). If the vaccine is perceived as providing only partial or short-lasting immunity, vaccine safety concerns are often heightened in public debate (e.g., Dehner 2012, 174–92). What is considered a sufficient level of vaccine safety in public discourse, then, is entangled with both the strength of vaccine-induced immunity and the risks posed by infection. The exact nature of the vaccine-induced immunity being pursued, in turn, constitutes an evolving object during vaccine development. The necessarily limited knowledge available during clinical trials highlights the blurriness of safety and immunity as objects of anticipation. Known histories of vaccine trials gone awry and circulating rumours of hasty clinical trials further shape the degree of cultural acceptance of novel vaccines (Conis 2015). Likewise, local concerns about the exploitation of historically vulnerable populations in biomedical research inform communal responses to safety and efficacy concerns raised during vaccine trials (James and Lees 2022; Thiongane 2021).

Drawing on cultural studies, science and technology studies (STS), and medical anthropology scholarship, I trace how ideas of vaccine-induced immunity and vaccine safety were conceptualised in relation to one another in the Finnish news media in the months leading to the launch of the first COVID-19 vaccination campaigns. This focus on anticipation of vaccine-induced immunity contributes to the growing social science literature on immunity, which has highlighted our

interconnectedness and embeddedness in environments and the complex ways in which people conceptualise immunity (e.g., Brown 2019; Diehl 2013; Lorimer 2019; Martin 1994). I examine how affects such as hopes and concerns around immunity in news discourse arise from particular constructions of biotechnological pasts and how they change in relation to evolving ideas of risk.

The analysis centres on two COVID vaccines: the mRNA vaccine developed by Pfizer and BioNTech (henceforth 'Pfizer vaccine') and the adenovirus vector vaccine developed by AstraZeneca and Oxford University (henceforth 'AstraZeneca vaccine'). The Pfizer vaccine is the first mRNA COVID vaccine and AstraZeneca vaccine the first adenovirus COVID vaccine approved in Europe. The analysis shows that their distinct technologies became embedded in affectively charged discourses that attached hopes and fears to different levels of protection and safety. Crucially, the anticipated successes and failures of these vaccines cannot be understood simply through a biomedical model of risk and efficacy but require a cultural analysis of each vaccine as an affectively charged object.

Social science research on COVID vaccines

A growing social science literature has emerged on the cultural reception of COVID vaccines in different national contexts. In an interview-based study conducted in Germany before the launch of the vaccination programme, Fiske and colleagues (2022) document considerable nuances in how people evaluated the pros and cons of a novel vaccine in relation to an evolving horizon of publicly discussed safety and efficacy concerns. Other analyses drawing on interviews and qualitative research methods have shown how expectations about COVID vaccines are articulated in relation to local histories and political situations. Such studies include, for example, Azak and Wigen's (2022) exploration of COVID vaccine refusal as a means of protesting the authoritarian state in Turkey, Gabay and Tarabieh's (2022) account of vaccination intentions among a religious group in Israel, and Lockyer and colleagues' (2021) analysis of vaccine expectations in an urban context in the United Kingdom.

Two recent articles are particularly relevant for my analysis. Through a close analysis of a small set of news texts, Harrison, Lancaster and Rhodes (2022) identify two ways in which specific configurations of time are turned into evidence of COVID vaccine safety. First, the beginnings of mRNA vaccine technologies are located several decades prior to the COVID vaccine development in some news articles, which extends the timescale of vaccine development and testing from months to decades (Ibid.). Second, a distinction is enacted between the perceived slowness of the administrative timescale of traditional vaccine development and what is presented as the actual time needed for vaccine development, a framing that suggests that, with their massive influx of funding and expedited

bureaucracy, COVID vaccines reflect the real time required for vaccine development (Ibid.). While I share Harrison, Lancaster and Rhodes' interest in the connection between safety arguments and time, I trace shifts through a larger dataset, explore the connection between vaccine safety and vaccine-induced immunity, and highlight the ambiguous effects of different enactments of time on ideas of safety.

My analysis also resonates with Lasco's (2022) exploration of COVID antibody testing in the Philippines, which shows how antibody testing became a personal means of evaluating whether one would benefit from a COVID vaccine or whether the vaccine worked. The boundary between antibodies as quantified through tests and antibodies as embodied and felt becomes blurry when Lasco's interlocutors evaluate their personal protection. While I focus on news discourses, a similar blurriness across antibodies and immunity is invoked in my data.

In what follows, I turn the attention to the connections between ideas of vaccine-induced immunity and vaccine safety in news discourse. Several scholars have argued that media stories can shape people's ideas of vaccine safety. Writing about the unsubstantiated connection between the measles, mumps and rubella (MMR) vaccine and autism, Conis suggests that an important reason for the persistence of the claim was 'that the media didn't let go of the story' and notes that 'scholars have shown that public concern about a risk increases as news coverage of the risk increases – no matter how small, or unproven, that risk may be' (2015, 213). Likewise, Boyce (2007) demonstrates that the British media played a significant role in keeping the autism-MMR story alive, with a subsequent decline in vaccination rates. Furthermore, Harrison, Lancaster and Rhodes (2022) note that the COVID-19 pandemic has placed the media in an important position in interpreting and communicating uncertainties around health risks. Thus, while the broader cultural discourses that engender anticipation are beyond the scope of my analysis, the news discourses I analyse are an important part of the larger societal reception of a novel vaccine.

I approach the news discourses through a specific national context: Finland. Finland makes an interesting case study as it has a traditionally high vaccine coverage and relatively strong trust in public health institutions (Nurmi and Harman 2022). Cultural attitudes toward vaccines before the COVID-19 pandemic were generally favourable and anti-vaccine movements have been less prominent than in many European countries (European Union 2019). At the same time, Finland was one of the countries affected by cases of narcolepsy among children and adolescents associated with the vaccine Pandemrix, developed in response to the 2009 H1N1 swine flu pandemic outbreak (Nurmi and Harman 2022; Oikkonen 2022). Altogether, over 200 people in Finland have received compensation in

connection to the Pandemrix vaccine through a national medical injury compensation system. The launch of COVID vaccination programmes took place against this recent history of vaccine safety concerns.

Analytical framework

The article focuses on how news discourses engender a sense of anticipation, working from the premise that anticipation is historically layered and situated. As cultural objects, new vaccines are imagined in relation to how past debates about vaccine safety or efficacy are remembered (Conis 2015; Dehner 2012). At the same time, when a new vaccine is debated in public, there is often initially considerable flux in how it is framed and received (Conis 2015). My analysis traces how the news discourses around COVID vaccines produced a sense of anticipation by invoking the perceived past successes and failures of vaccine science as well as by foregrounding perceived sudden shifts of direction and changes of speed around the new technologies.

One key feature in the development of COVID vaccines has been the presence of multiple vaccine candidates. I approach these vaccine projects as distinct technologies. This allows me to highlight how ideas of safety and immunity were associated differently with specific technological choices and how clinical trial results affected where safety and immunity were expected to be pinned. This focus makes visible a *comparative* aspect that, I argue, is central to how anticipation of COVID vaccines operated in the Finnish news media. I examine how the vaccines were conceptualised in relation to one another, and how this relationality made safety and immunity appear as matters of degree, establishing a hierarchy between the vaccines.

A rich research literature across sociology, anthropology and STS exists on the dynamics of anticipation and expectation around biomedicine and biotechnologies. Scholars working in these fields have shown, for example, that expectations are performative, in that they shape biomedical innovation and legitimise research practices (Borup et al. 2006; Flear 2021; Tarkkala, Helén, and Snell 2019), and that expectations both persist and change over time (Borup et al. 2006; Brown and Michael 2003; Tarkkala, Helén, and Snell 2019). Likewise, scholars have traced the intensification of anticipation around developments in biomedicine and biotechnology (Adams, Murphy, and Clarke 2009; Blue, Davidson, and Myles 2022; Dolez, Granjou, and Louvel 2019; Montgomery 2017). Expectation and anticipation are overlapping concepts, and they have multiple definitions in the literature, described in some contexts as parallel but differently invested orientations towards the future (e.g., Bryant and Knight 2019) and in other contexts as mutually entangled (e.g., Blue, Davidson, and Myles 2022).

In a considerable part of the literature, anticipation is understood to foreground the affective dimensions of future orientation. For this reason, I use 'anticipation' as my central analytical concept. Focusing on anticipation allows me to highlight how the news discourses around COVID vaccines invoke affects such as hopes, fears and doubts about what vaccines can do that extend beyond the logic of expecting a particular (desired or undesired) sociotechnical outcome. I suggest that tracing this interplay of affects is crucial for understanding the context-specific circumstances in which a novel vaccine becomes accepted or doubted. Identifying underlying affects such as excitement or resentment in media discourses on COVID vaccines makes visible tensions that may be felt rather than articulated. Yet, whether experienced on a collective or personal level—often on both—anticipation is characterised by a sense of direction, of temporal movement about to happen.

My approach to anticipation draws especially on two sources, which both theorise the entanglement of affect and future orientation. First, Bryant and Knight's *The Anthropology of the Future* (2019), based on ethnographic work on conflict and displacement in the Eastern Mediterranean, provides a theorisation of anticipation that is also useful in the analysis of an unfolding biomedical emergency such as the COVID-19 pandemic. They describe anticipation as an orientation that engenders a palpable sense of the future pushing into the present. The future is 'viscerally present in the act of anticipation' while the present emerges as liminal, as if we were at a 'threshold' (Bryant and Knight 2019, 35). The perceived distance between the present and the future shrinks and expands depending on the sensed presence or absence of an impending crisis. Within this framework, anticipation 'works to relieve the anxiety of uncertainty' as it provides 'a collective way of stepping into the future, of trying to transform one's own future or the future of the collective before it occurs' (Idem, 43). At the same time, as has been noted by several scholars, that the future does not constitute a pre-existing endpoint (Ringel 2016), nor is future-oriented time monolithic, but rather, it is produced through tensions between situated arrangements of time (Bear 2014).

Second, I draw on Adams, Murphy and Clarke's (2009) theorisation of how anticipation around biomedicine invokes ideas of time as well as a range of affects from hope to worry. They note that potential infectious disease emergencies constitute one site at which anticipation intensifies (Idem, 252). Working at the intersection of STS and medical anthropology, they propose five modes of anticipation. *Injunction* refers to how anticipation of a future becomes 'a moral imperative' that requires us to demonstrate 'a will to anticipate' in order to be responsible actors (Idem, 254). *Abduction* refers to how the future is perceived to extend to the past and the present while drawing on simulations and modelling as tools of anticipation (Idem, 255). *Optimisation* refers to the mobilisation of 'the

innermost regions of the body, the outermost regions of the globe, the earliest or latest moments of life, the largest and smallest of measurable things' to their full potential while simultaneously curtailed by its own perfectionism, as crucial acts may be 'delayed in the name of optimization' (Idem, 256–57). *Preparation* refers to the sense that we need to prepare for (rather than seek to prevent) a future, treating 'the event and the trauma as if it were already here' (Idem, 257). Finally, *possibility* refers to how things that seemed previously impossible emerge as sites for 'ratcheting up' technological innovation or new economic dynamics (Idem, 258).

While anticipation around COVID vaccines takes place amidst a public health crisis rather than in preparation for a future pandemic, it feels familiar because it fits so well within the anticipatory logic that Bryant and Knight (2019) and Adams, Murphy and Clarke (2009) describe. The sense of already living in a crisis highlights the feeling that we are on what Bryant and Knight describe as the 'threshold' that pushes us inevitably to a potentially unknowable future (Bryant and Knight 2019; see also Oikkonen 2021). My data also includes recurring instances that resonate with the modes of anticipation identified by Adams, Murphy and Clarke (2009). Many news texts invoke the sense that there is a collective responsibility to develop vaccines and that a responsible citizen is willing to trust public vaccination programmes. Likewise, past vaccine development successes and failures as well as simulations and scenarios of vaccine-induced immunity are invoked to imagine certain courses of action as best ways of securing a future. Discussions of what counts as a satisfactory or ideal vaccine reflect debates about mobilising the potential of human bodies for new biotechnological, societal and economic goals. The fact that the pandemic is already happening reinforces the sense of urgency around vaccine development and vaccination campaigns.

Tracing anticipation across the news discourse in the Finnish media, I argue that anticipation around vaccine development during a public health emergency operates through a series of small shifts and twists that magnify affects such as hopes, fears, excitement and disappointment around the novel vaccines. I show that even a slight shift in the evolving biomedical knowledge about the length or strength of vaccine-induced immunity or the risk of adverse effects may significantly reshape the sense of anticipation produced in news discourse. Likewise, a small shift in the framing of a vaccine candidate as part of a history of vaccine research can make the distance between the present and the future shrink and expand abruptly.

Materials

The article analyses widely read news sites in Finland, including both major daily newspapers and the main tabloids. While different types of journalistic texts utilise different discursive strategies, news stories in widely read news media tend to

employ ways of framing that are familiar and easily recognisable to most readers (Wald 2000; Wilcox 2003). The data consists of two sets of texts. The first set covers the pre-vaccine period from the beginning of the pandemic up until mid-September 2020, before concrete plans for vaccination programmes were announced. The data represents the stage when anticipation was not yet closely tied to specific vaccines. The second dataset covers the period from October 2020, when the first vaccines entered a review process at the European Medicines Agency (EMA), until mid-March 2021. In order to focus on ideas of immunity connected to vaccine development, licensing and rollout, texts published after mid-March 2021 have not been included in this article. While I trace shifts and turns in the framing of COVID vaccines, my intention is not to constitute a linear trajectory of progress. Instead, I highlight how different present moments, characterised by different conjoiners of material circumstances and knowledges of immunity and risk, enable different ways of mobilising a sense of anticipation and different ways of imagining connections between pasts, presents and futures.

The first dataset includes a broad range of news media and magazines available online: *Helsingin Sanomat*, *Ilta-Sanomat*, *Ilta-lehti*, *Kaupparehti*, *Suomen Kuvalehti*, *Uusi Suomi*, *Turun Sanomat*, *Keskisuomalainen*, *Kaleva*, *Lapin Kansa*, *Savon Sanomat*, MTV news site, and the website of the national public broadcasting company YLE. Many of these sources published only a handful of texts on the prospect of developing COVID vaccines. After eliminating duplicates and texts mentioning vaccines in passing, the remaining dataset consists of 305 news articles. While these include several detailed feature articles on vaccine development, there are also many short reports on the latest announcements by vaccine developers or governmental or regulatory bodies, or on news published in English language media.

For the October 2020–March 2021 dataset, I focused on three news sites: YLE (Finnish public broadcasting company) website, *Helsingin Sanomat* (the biggest daily newspaper) and *Ilta-Sanomat* (the biggest tabloid). Amidst rapidly growing news coverage on COVID vaccines, this narrower focus allowed identifying patterns and gaps over time. This second dataset includes 92 articles. These articles are generally longer and more detailed than many of the texts in the first dataset. Altogether, the two datasets include 397 news articles or news commentaries.

The analysis is divided roughly chronologically into four sections, as this helps trace how anticipation around ideas of immunity and vaccine safety are invoked at different moments. The first two sections explore the ways in which anticipation was managed between the beginning of the pandemic and the first Phase 3 clinical trials in the early autumn 2020. The last two analysis sections trace shifts and turns

in the sense of anticipation produced in news discourse as vaccination programmes were launched at the end of 2020 and immunity and safety became pinned to concrete material processes in soon-to-be vaccinated bodies.

Anchoring the future in a biomedical past

Public discussion on the prospect of COVID vaccines was characterised by an ambivalent sense of anticipation in the news stories between January and September 2020: waiting for something that could end the pandemic but that might never happen. This interplay of possibility and impossibility was addressed by positing the future as anchored in the past and present (Adams, Murphy, and Clarke 2009). News texts addressed uncertainties by situating COVID vaccines within a history of vaccine research as well as biomedicine more generally. Multiple temporal trajectories were enacted in the texts, showing that what version of the past is invoked shapes how the future is envisioned. Many news stories highlighted past successes (or near successes) in vaccine research with the implication that COVID vaccines carried that same potentiality. For example, the development of Ebola, SARS and Zika virus vaccine candidates is cited in several texts as evidence that it is possible to develop a vaccine with considerable speed (Palonen 2020; Puttonen 2020b; Vanhalakka 2020). Hopes were also engendered through repeated mentions of how COVID vaccine projects relied on years of non-vaccine-related biomedical research. For example, an article discussing a Finnish virus vector laboratory describes how ‘the carefully monitored, standardised and confined production lines have been developed for the production of a cancer medicine, but the same method can be also used to produce Covid vaccine’ (Juonala 2020c). As in Harrison, Lancaster and Rhodes’ (2022) study, this framing extends the perceived timescale of COVID vaccine development, reinforcing a sense of safety.

While these invocations of past biomedical achievements encouraged seeing the prospective development of COVID vaccines as an area where the potentialities of the human body could be harnessed for biotechnological innovation (Adams, Murphy, and Clarke 2009), there was little public discussion of what success would mean in practice: what level or duration of immunity could be achieved through a vaccine. Instead, the news stories focused on anticipation of immunity as a means that might abridge the perceived gap between the seemingly all-encompassing pandemic present and an uncertain and unknowable post-pandemic future.

Hopes were juxtaposed by more pessimistic invocations of different biomedical pasts. Many news stories highlighted problems with previous vaccines, especially unexpected or suspected vaccine adverse effects, such as SARS, RSV and dengue vaccine candidates increasing rather than decreasing the severity of a

subsequent infection (Mattila 2020; Terävä 2020). For example, one article brings up the affective intensities involving excitement and disappointment around the dengue vaccine: ‘a lot of hope was placed on the dengue vaccine, but the adverse effects noticed in 2018 have limited the use of the vaccine meant for the serious fever illness’ (Mattila 2020). This framing challenges the assumption that immunity is an obvious outcome of vaccine development. Ambivalences around connections between past vaccine failures and future vaccines were particularly prominent when both optimistic and pessimistic visions were invoked simultaneously, as when AstraZeneca was reported to have promised the US government millions of vaccines as early as September 2020 while also promising to return swiftly to clinical research if the vaccine did not work (Heino 2020). That the past is invoked to engender both hopes and concerns about COVID vaccine development attests to the precariousness of when and how biological processes can be harnessed to promise a future grounded in biotechnological success.

In the Finnish media discourse, one particular past event generated a sense of danger: cases of narcolepsy among children and adolescents after vaccination with the Pandemrix vaccine, rolled out in relation to the 2009 H1N1 swine flu pandemic. While in some other countries the connection between Pandemrix and narcolepsy is still debated or not considered of great importance, in Finland it has been generally accepted by health officials, and those affected have been eligible for compensations, as noted in a number of news articles (e.g., Hannula 2020; Mattila 2020). When starting this research, one of my goals was to understand whether the cultural memory of vaccine-associated narcolepsy structured the sense of anticipation around COVID vaccines in news discourse.

In the news data, Pandemrix is mentioned repeatedly throughout 2020. Although the comment sections of online news articles were not included in my analysis, it is important to mention that Pandemrix was often evoked by commentators even when the article itself discussed adverse vaccine effects only generally. Most importantly, however, Pandemrix was mentioned by officials and experts interviewed in the news articles. These include public health officials from the Finnish Institute for Health and Welfare, which coordinates and monitors the national vaccination programme, the Ministry of Social Affairs and Health, which purchases vaccines, as well as key clinician-researchers. These experts and officials are quoted explaining that the narcolepsy cases were so rare that they could be detected only after vaccinating a large population (Parviola 2020a; Paananen K. 2020). Likewise, experts and officials also highlight the importance of learning from Pandemrix in the news stories. A representative of the Ministry of Social Affairs and Health is quoted: “We have had also bad experiences of vaccinating healthy people causing an unexpected adverse effect. We don’t want to see it again” (Parviola 2020a). Such invocations of past vaccine safety problems

by public experts or state actors constitutes an interesting contrast to many other countries, in which vaccine injury discourse is primarily invoked by anti-vaccine activists, vaccine-hesitant groups, and occasionally individual doctors not affiliated with public health institutions (e.g., Gottlieb 2018; Reich 2016).

Invocations of Pandemrix served to pre-empt accusations that the state is not concerned with its citizens' health by demonstrating that public health authorities have learned from past vaccine safety problems. This framing merges an invocation of past biomedical developments with the sense that it is the moral responsibility of a future-oriented society to develop vaccines (and, implicitly, the duty of its citizens to support this project by participating in vaccinations) (Adams, Murphy, and Clarke 2009). Yet, invocations of Pandemrix also engendered a sense of unease: what happened in 2009 could also happen with a COVID-19 vaccine. This uncertainty is evident in an article that reports that some of the COVID vaccine candidates might utilise the adjuvant AS03 used in Pandemrix; it has been suggested that the adjuvant may have contributed to the onset of narcolepsy, alongside a person's genetic predisposition and structural features of the vaccine's viral material (Mikkonen 2020). The article includes comments from a Finnish sleep disorder specialist, who states that COVID vaccines are unlikely to lead to narcolepsy but other neurological conditions need to be considered when evaluating the safety of the adjuvant: 'there are many other adverse effects that may occur. For example, chronic fatigue syndrome or other injuries to the central nervous system' (Mikkonen 2020). This creates an ambivalent anticipatory dynamic in which the promise of a post-pandemic future is juxtaposed with a sense that the present may push us to a re-enacted past instead of providing a 'threshold' for a future (Bryant and Knight 2019).

Invocations of possible vaccine adverse effects intensified the sense of uncertainty in news discourse around vaccine-induced immunity. As noted above, in the early months of COVID vaccine development, the ability of the prospective COVID vaccines to produce immunity was simply assumed, as when an article in one of the tabloids stated that 'a vaccine would solve' the impact of the pandemic on the economy and employment (Palomäki 2020). However, during the summer of 2020, the idea of vaccine-induced immunity emerged as increasingly complicated, making it, as a desired object of anticipation, unstable and possibly unknowable (e.g., Heikkilä 2020). For example, while the initial results of the first clinical trials are reported in terms of antibodies, it is mentioned that it is still unclear to what extent the level of antibodies correlates with immunity (Ahtela 2020; Joukanen 2020; Tuomisto 2020). In contrast to Lasco's (2022) analysis of how antibodies can become a personal means of claiming agency even without knowledge of the protection they provide, in the Finnish news discourse uncertainties about vaccine- or infection-related antibodies engendered concerns rather than hopes.

Likewise, news reports increasingly mentioned that different population groups—especially the elderly and the young—were likely to have different immunological responses to different vaccine compounds, and different types of COVID vaccines might be needed for different groups (Autti and Myllykoski 2020; Manninen 2020; Vaittinen 2020). Meanwhile, concerns about the efficacy of each vaccine candidate were already being mentioned occasionally in the spring of 2020, as when the head of the Vaccine Research Centre at Tampere University is quoted as saying that a vaccine ‘comes with a wide range of shades of grey’ in terms of the level of protection it provides (Seppä 2020). Towards the end of the summer of 2020, this framing was increasingly common, as many texts highlighted that vaccine-induced immunity may be short-lasting and require boosters, or it may be partial, protecting some but not others, or protecting against serious illness but not infection (e.g., Kokkonen and Kosola 2020; Myllyniemi 2020). This changed the underlying tone of anticipation, as immunity emerged as temporally and spatially situated rather than all-encompassing. This imperfection of the vaccine candidates contributed to a sense of hesitation, as it appeared increasingly likely that none of the new vaccines were close to an optimal one. With this challenge to the idea of vaccine-induced immunity as a gateway to a post-pandemic future, the safety of the presumably less-than-perfect future vaccine emerged as increasingly important.

Enacting safety and efficacy

Although hopes about COVID vaccines’ capability to provide full and long-lasting immunity were more hesitant at the end of the summer of 2020 than earlier in the year, vaccine development continued to embody optimism. The sense of hopeful anticipation was partly engendered by the abundance of technical detail that even tabloids provided. Several news stories published as early as mid-March 2020 describe how the novel mRNA technology works within the body to produce an immune reaction (e.g., Juonala 2020a; Kantola 2020). There was also increasing coverage of alternative vaccine technologies. For example, the biggest Finnish tabloid published an infographic about COVID vaccine technologies that was included in several news articles throughout the summer of 2020 (e.g., Kauppinen 2020a).

Descriptions of vaccines as *technologies* tapped into a long history of cultural excitement around biotechnological innovation, engendering a sense of possibility (Adams, Murphy, and Clarke 2009). Reports that multiple vaccine technologies were being developed highlighted the prospect that biotechnology might shape our futures in ways that had seemed previously impossible. At the same time, biotechnological development is also an object of longstanding cultural anxiety, especially in the case of technologies that are perceived to permeate our bodies. Many of the news stories domesticated the novelty of COVID vaccine technologies

by emphasising that they did not include coronavirus, but instead tricked our bodies into producing antibodies to the viral spike protein—a framing used in the infographic mentioned above. This invoked expanding scales of possibility by envisioning ways in which vaccines could harness the inherent potentialities of bodies.

Anxieties about new technologies going awry were also addressed through repeated descriptions of clinical trials. Throughout the spring and summer of 2020, news stories outlined what happens in Phase 1, 2 and 3 trials and where in this process each vaccine candidate was (e.g., Laine 2020; Kukko-Liedes 2020). Furthermore, a sense of trust was invoked through a juxtaposition of the vaccines considered by the EU and those developed outside the European framework of pharmaceutical governance. Particular attention was paid to Russian and Chinese vaccines. Initially reported on in a matter-of-fact manner (e.g., Paananen A. 2020), there was increasing talk about safety concerns especially in connection to the experimental use of a COVID vaccine in China and the use of the Sputnik vaccine in Russia before completing Phase 3 trials (Kauppinen 2020b; Nykänen 2020). For example, one news article reports that researchers are concerned about the authenticity of the clinical data from Russia and quotes an Italian professor: “it looks as if the data has been photoshopped” (Nykänen 2020). These juxtapositions between what was implied to be reliable and unreliable safety measures, and too-much versus right-amount-of speed, strengthened the impression that vaccines eventually licensed by the EU should be trusted. In line with this, when the AstraZeneca trials were briefly halted in September 2020 while a case of a possible adverse effect was investigated, this temporary glitch was quickly portrayed as a sign that the EU safety control measures worked (Hanhinen 2020; Laine 2020). The juxtaposition of the EU against China and Russia also established an idea of responsible mobilisation of possibility that knows its limits and irresponsible mobilisation that goes too far.

The limits of biotechnological ambition and expansion were further addressed through a juxtaposition between vaccine projects led by international pharmaceutical companies and the possibility of developing a Finnish COVID vaccine. Throughout the spring and summer of 2020, Finnish news outlets reported especially on two Finnish vaccine projects: a collaboration between researchers from the University of Eastern Finland and University of Helsinki to develop an adenovirus vector vaccine administered as a nose spray, and the plans to develop a COVID vaccine that uses virus-like particles at Tampere University. The non-profit Finnish vaccine projects were repeatedly framed as different from the international vaccines. For example, one of the lead researchers is quoted saying that a Finnish vaccine would be developed ‘purely from the viewpoint of science’ (Tanner 2020). While the texts do not directly challenge the quality of the

international vaccines, they posit Finland as a technological leader capable of producing a top-quality product. One of the interviewed researchers suggests that ‘instead of a speed race the idea is to make a vaccine that is as good as possible’ (Koskela 2020). At the same time, the Finnish vaccine projects were framed as national projects that, if successful, would guarantee the availability of vaccine amidst expected supply problems (Koskela 2020; Parviala 2020b). Interestingly, recent studies have shown how perceived hierarchies between domestic and international COVID vaccines were invoked also in other national contexts—although in some cases highlighting the perceived superiority of the international vaccines rather than a domestic one (e.g., Azak and Wigen 2022).

Towards the end of the summer of 2020 it had become increasingly clear that the state would not provide the large-scale funding required for carrying out the clinical trials of a Finnish vaccine. Nevertheless, the attention given to the plans for a Finnish vaccine made apparent that the products of the prospective market leaders, Moderna, Pfizer and AstraZeneca, were just some of the possible vaccine technologies. The discussion about Finnish vaccines thus undermined the assumption that whatever vaccine candidate finished the clinical trials first provided an ideal level of immunity. To put it slightly differently, the comparison between national and international models of vaccine development suggested that the rationale of mobilising possibility and ‘ratcheting up’ (Adams, Murphy, and Clarke 2009, 258) was unlikely to lead to an immunologically ideal vaccine.

Reconfigurations of speed

Speed plays a key role in anticipation, as it is understood to mark the distance between the present moment of preparing and the desired future outcome. A sense of speed made futurity palpable, as if we were about to fall from the ‘threshold’ into a future (Bryant and Knight 2019). By November 2020, Pfizer and AstraZeneca had emerged as the most likely vaccine candidates to be used in Europe. Their clinical trials appeared to be progressing smoothly and EMA had begun review of safety and efficacy data to enable swift approval and vaccine roll-out. Around this time, there was a distinct shift in the Finnish news coverage: vaccination strategies were compared, vaccine availability discussed, and the logistics of storing vaccines addressed in concrete terms. Concerns and hopes around the speed of vaccine development were shaped by suggestions of concrete steps toward a post-pandemic future.

As the results from Phase 3 clinical trials were published through the autumn of 2020, news stories reflected both growing optimism and yet ongoing concerns about the level of vaccine-induced immunity. Immunity as an object of anticipation had become increasingly blurry. For example, in October 2020, newspapers

reported widely on a text published in *The Lancet* that suggested that the novel vaccines may protect only against symptomatic illness and may not stop infections. As one text puts it, if the first vaccines are not able to produce herd immunity, ‘they will not bring the much-awaited time of freedom’ (Puttonen 2020a). These concerns were countered by a strengthening of hopes in November, as Pfizer and BioNTech announced that their vaccine would be over 90% effective. Yet, many news articles noted that it was not known whether a vaccinated person could still infect others (e.g., Niinistö and Kataja 2020; Puttonen 2020e). This resulted in balancing between hopes and concerns, as when one text noted that ‘the vaccine won’t immediately stop the epidemic, but it will make it less harmful for society’ (Puttonen 2020e). As immunity emerged as increasingly concrete, it also appeared as less achievable, its completion constantly postponed.

The amount of technical detail in news articles increased with the approaching approval of the first COVID vaccines. There is considerable discussion of the compounds included in each vaccine, the mechanisms through which different vaccines induced an immune response, and how immunity works when the body is later exposed to Covid (e.g., Laakkonen 2021; Malminen 2020a). These descriptions gave a sense of safety to the technological novelty of mRNA vaccines. For example, one article quotes a vaccine scientist as saying that the new mRNA vaccines are actually ‘the simplest’ of all vaccines, that ‘we have RNA molecules inside cells anyway’, and that RNA molecules ‘disappear from the system quickly’ (Malminen 2020b). Another article emphasises that immunity-related adverse effects (such as various autoimmune conditions like narcolepsy) are unlikely because the vaccine generates an immune reaction only to the spike protein (Puttonen 2020d). Several texts also highlight that despite relying on RNA technologies, the mRNA vaccines could not affect a person’s DNA (e.g., Löytömäki 2020). By locating the novelty of the mRNA vaccines in their perceived simplicity, such descriptions made mRNA technologies appear as a natural rather than experimental choice for a vaccine, one that has been waiting all along for discovery.

As the first novel vaccines were under EMA review in November and December 2020, attention in the news articles turned to the practical questions of logistics and vaccine availability (e.g., Harju 2020; Puttonen 2020c; Söderkuntahti 2020). A sense of relief that vaccinations were really happening came with new concerns. Questions were raised about how a failure to store the Pfizer vaccine at the required -70° Celsius would affect vaccine safety or vaccine-induced immunity. This contradicted the reassuring framing that posited mRNA vaccines as a natural development in vaccine research. At the same time, news stories included comments by Finnish public health officials that posit the challenges of cold storage as simply practical and thus solvable: ‘Vaccinations will be planned so that

we can meet these requirements' (Koskinen 2020). This suggested that COVID vaccination practices should be seen as part of the continuum of established vaccination practices.

The perceived speed of COVID vaccine development had become increasingly naturalised by the late autumn of 2020. This discursive shift is visible in the following example from the largest daily newspaper: 'It is no wonder that people are concerned. It is easy to get the impression that the tests have been done too fast, and that therefore there are too many risks. It sounds like daring shortcuts have been taken in vaccine development. Thankfully not' (Vasantola 2021). The text explains that the 'reasons for the speed are elsewhere than in shortcuts', as the RNA method 'was studied in medicine already in the 1990s' and 'was used in stem cell research, which aimed to develop gene-based therapies for cancer and other serious diseases' (Vasantola 2021). Potential concerns were also alleviated by attributing speed to the smooth management of the clinical trials and EMA's efficient review of data (e.g., Malmberg 2020; Vasantola 2021).

Yet concerns about speed continued to structure the news coverage. Some articles mentioned that data collected during the first months after the vaccine's approval constitute Phase 4. As one article explains: 'Not all possible rare side effects are visible during Phase 3 human clinical trials. They are traced in Phase 4 when the vaccine is used in large populations' (Juonala 2020b). While reporting of rare adverse effects after licensing is a standard procedure, these mentions of 'Phase 4' had the effect of associating the vaccination programme with the clinical trials. The contrast between this framing and the reassuring rhetoric (as seen above) that highlighted the completion of safety reviews underlines a central tension in anticipation of immunity: speed is perceived as both a potential threat and a promise of futurity.

Concerns about speed were addressed in several texts by emphasising that non-vulnerable middle-aged and young people would have to wait several months until prioritised groups had been vaccinated. As one text puts it: 'When it's healthy 44-year-olds' turn to get vaccinated, there will be information also about very rare adverse effects' (Mutanen 2020). At the same time, another text voices the concerns of some health care workers that as the first vaccinated group they might inadvertently become test subjects (Grönholm 2020). Invocations of speed thus operated differently rhetorically depending on a person's place in the vaccination order. The hopes and concerns around speed were also shaped by what was known about risks from infection: if the risks were perceived as relatively low at the time, as with some young healthcare workers, being among the first vaccinated groups appeared as charged with uncertainties (Grönholm 2020; Mutanen 2020).

What, then, were the imagined risks of vaccination at this point? The Pandemrix-narcolepsy case continued to appear in news stories throughout the first months of the vaccination programme. While during COVID vaccine development Pandemrix had operated as a precedent that we needed to learn from, at the end of 2020 COVID vaccines were often *contrasted with* Pandemrix as technologies (Malmberg 2021). One vaccine researcher is quoted as saying: “reappearance of narcolepsy cases is extremely unlikely because Pandemrix vaccine and the Covid vaccines currently furthest in their development are completely different” (Löytömäki 2020). This enactment of a material difference between COVID vaccines and past pandemic vaccines demonstrates how the sense of anticipation in news media discourses around a novel vaccine may evolve when an abstract prospective technology becomes concrete reality.

Waiting for one’s turn

While concerns about vaccine safety centred around the idea of being among the first to receive a novel vaccine, being first was also a hoped-for state, especially as problems with vaccine availability became increasingly evident in January 2021. At the end of November 2020, with the Pfizer vaccine under review, optimism abounded. For example, one news article describes COVID vaccines as a ‘Christmas present to the world’:

Vaccines are waiting in the company’s central storage facility in Germany in dry ice in -70 degree Celsius for the command to ship. Trucks will take the vaccines to the airport, from where the flight to Finland will be a few hours. The manufacturer has promised to deliver the vaccines directly to multiple destinations in Finland. They will be there within the same day (Hyytinen 2020).

Reflecting reports of anticipated increases in vaccine production, the text envisions a future in which the whole adult population of Finland could be vaccinated by the summer (Hyytinen 2020). There is a palpable sense of an endpoint that promises to push us into a future.

Following news about delays in vaccine production in January and February, concern and disappointment about almost reaching the goal were evident in the news coverage (Saarikoski, Juhola, and Melkkilä 2021; Tyystjärvi 2021). Several articles highlighted an updated forecast that vaccinating the adult population in Finland might take until the end of 2021, a framing that shows how changes in simulations and computer modelling can shape the affective dynamics of anticipation, especially the interplay of hope and concern. The shift in news discourse also draws attention to the politics of waiting. That COVID vaccines

finally existed but were not available resulted in both collective and personal frustration.

The collective frustration took the shape of vaccine nationalism, the aim of accruing vaccines for one's nation. This made visible that the dynamics of anticipation take shape in relation to a specific location. News articles noted that 'Finland has been one of the slowest vaccinators in Europe' (Saarikoski, Juhola, and Melkkilä 2021). There were also comparisons between national policies responding to vaccine shortages, especially the UK's decision to extend the time between the two required doses from a month to 12 weeks. Concerns about the virus potentially mutating because of these extensions were discussed on the news sites (e.g., Nykänen 2021). Whether Finland should follow this course, or make other adjustments, such as halving one of the doses, emerged as topics charged with both hope and fear (Kataja 2021). Not surprisingly, the eventual decision in Finland to extend the time between the doses was addressed through language of concern and dismay, evident in the following news commentary: 'Finland follows Britain onto thin ice. Only time will tell if Finland will keep its feet dry, or if the vaccination strategy announced by the Finnish Institute for Health and Welfare on Wednesday will fall into freezing water' (Seppä 2021a). That so little was known about vaccine-induced immunity consolidated worries and a sense of frustration that after so much waiting immunity might slip away through a policy change: 'What if the protection provided by the first shot will disappear within 84 days? It would be a national disaster if Finland ended up vaccinating tens of thousands, perhaps hundreds of thousands, of over-70-year-olds without them developing immunity against the coronavirus' (Seppä 2021a).

As to the individual level, many texts depicted the order of vaccinating different groups in Finland as a highly emotionally charged topic. This made visible a tension between optimisation of individual immunity and optimisation of collective, nationally framed immunity. The use of different vaccines for different groups emerged as a particularly sensitive topic with its roots in several months of comparisons of vaccine candidates in the media described above. Since the Moderna vaccine could be stored at regular freezer temperatures, it was used outside urban centres. When the Moderna supplies turned out to be low, news stories reported on anger and disappointment over how people in different regions were treated. For example, in one article, a manager of an affected healthcare district addresses the concerned feedback they had received: "I understand well the worry about whether we will fall behind in vaccine coverage or vaccine availability" (Karppi 2021).

The most intense debate centred on the assignment of AstraZeneca and Pfizer vaccines to specific age groups, with over-70-year-olds receiving a Pfizer vaccine

and under-70-year-olds an AstraZeneca vaccine in the first couple of months of vaccine rollout.¹ Clinical trial results had suggested that the Pfizer vaccine produced a higher level of immunity, which had rendered Pfizer an ‘elite’ vaccine in public discussion (Puttonen 2021; Seppä 2021b; Terävä 2021). Many of the texts included accounts of people’s disappointment about being assigned an AstraZeneca vaccine as well as interview quotes from health officials and scientists seeking to assure that there was no significant difference in immunity. For example, one vaccine researcher notes: “In my view, it is much more important whether and when you get a vaccine than which vaccine you get” (Terävä 2021). This juxtaposition of speed and level of protection suggested that compromise was necessary for effective pandemic strategies. Yet the repetition of reassuring comments from health officials indicates that the news sites assumed—or wanted to suggest—that considerable societal unease about prioritising some groups’ immunity over others’ persisted. Such descriptions highlighted a tension between individual and communal immunity as objects of anticipation.

Conclusion

The article has traced anticipation of vaccine-induced immunity and vaccine safety concerns in the Finnish news media as the first COVID vaccines were developed, tested and distributed. Drawing on social science literature on anticipation, I have shown how vaccine-induced immunity operates as a goal that structures visions of the future yet remains an evasive object that cannot be pinned down. My analysis contributes to the existing literature on anticipation and immunity by tracing how the sense of anticipation around vaccine development is structured by an evolving interplay of ideas of vaccine-induced immunity and vaccine safety. The analysis shows that during intense development of multiple novel vaccine technologies amidst a public health emergency, even relatively small shifts in what is known about or expected of vaccine-induced immunity and vaccine safety may considerably change the dynamics of anticipation. The analysis also demonstrates that discursive mobilisations of affects such as hope, doubt, excitement or disappointment play a key role in enhancing the impact of such small shifts in knowledge on anticipation.

Through the analysis of the Finnish news materials, several reconfigurations of anticipation appear. First, there is movement between anticipation of an abstract technology and anticipation of concrete biotechnological practices, as vaccines are seen increasingly as a possibility yet face moments of uncertainty during clinical trials and production. Anticipation as an abstract orientation invokes hopes as well as a sense of disbelief that a vaccine developed with such speed could be effective

1 This policy changed after mid-March following reports about rare cases of a form of thrombosis among younger and middle-aged age groups vaccinated with the AstraZeneca vaccine.

and safe. By contrast, anticipation as an orientation towards a concrete biomedical practice—the embodied act of immunisation with a specific vaccine—evokes a different host of hopes and concerns. These range from fear of vaccine injury to frustration with the perceived slow pace of vaccination or regional differences in who is vaccinated—and with which vaccine. In these moves between abstract and concrete, anticipation encompasses locally situated politics of waiting for one’s turn as well as a sense that the object of anticipation—immunity—is dissolving the closer we get.

A second reconfiguration of anticipation is the framing of COVID vaccines as part of different reconstructed historical trajectories of biomedicine. If framed within a history of perceived biomedical successes, such as the use of mRNA techniques in cancer medicine, COVID vaccine projects appear as imbued with hopes of further success. Representing COVID vaccines as part of a history of vaccine safety concerns, in turn, engenders a sense of uncertainty. The analysis shows that a particularly significant case in the Finnish context is the 2009 Pandemrix vaccine, which is referenced consistently in the news stories. There is, however, a noticeable shift from October 2020 onwards as texts increasingly emphasise that COVID vaccine technologies are distinct from vaccine technologies used in 2009. In fact, many texts bring together the histories of vaccine injuries and cancer biomedicine at this point, suggesting that the history of cancer biomedicine is the more important one.

A third reconfiguration of anticipation centres on the abundance of technical detail in the news coverage. I have argued that this repetition renders novel technologies familiar. Many of the texts painstakingly explain what each type of novel vaccine contains, how it generates an immune reaction and how it differs from traditional vaccines. However, descriptions of technical detail often take the form of comparison between vaccine candidates, a situation rarely seen previously in public discourses of vaccines. Comparisons of vaccine technologies lead to valuations in terms of the level of immunity each vaccine could achieve, while also suggesting that the mobilisation of possibility (Adams, Murphy, and Clarke 2009) rarely results in an ideal vaccine. Furthermore, that the vaccine eventually perceived as the ‘better’ vaccine was not offered to everyone made visible tensions between optimisation of immunity as a personal goal and optimisation of immunity as a collective project, highlighting that immunity is a political issue through which differences are enacted between people and populations. At the same time, the moves between personal and collective scales of immunity in the news discourse changed considerably what kind of futures emerged as objects of anticipation.

It is likely that results from other national contexts would look different, considering the Finnish public awareness of the 2009 Pandemrix case as well as the generally

high trust in vaccination programmes in Finland. Likewise, an analysis of anti-vaccine websites would have engendered different results. However, focusing on Finnish news media has provided a viewpoint into how new vaccine technologies, including questions of vaccine-induced immunity and vaccine safety, emerge as objects of anticipation in a discursive environment that has been historically relatively vaccine-friendly. Finally, the analysis contributes to the understanding of anticipation of immunity as evolving over time. Tracing the interplay of immunity and vaccine safety over the course of a year has made it possible to track both gradual and abrupt shifts in anticipation of immunity in order to understand how hopes and concerns accumulate and resolve as vaccine candidates move from clinical trials to licensing and production. It reveals that even small shifts in how vaccine candidates are discussed may reshape and redirect affects such as hope, doubt, disappointment and relief around novel vaccines in anticipatory news discourse.

Authorship statement

The author is the sole author of this article.

Ethics statement

The research did not involve human subjects. The research follows the ethical guidelines of the Finnish National Board on Research Integrity.

Acknowledgements

I would like to thank Laura Keskinen, Veera Pelkonen, and Erika Saarnio for invaluable research assistance. The anonymous reviewers and the special issue and journal editors provided generous and detailed feedback. The research was funded by the Research Council of Finland (decision number 326546).

About the author

Venla Oikkonen is an Associate Professor at Tampere Centre for Knowledge, Science, Technology and Innovation Studies (TaSTI), Tampere University. She is the author of two books, *Population Genetics and Belonging* (2018) and *Gender, Sexuality and Reproduction in Evolutionary Narratives* (2013). She has published on cultural aspects of genetic ancestry testing, infectious diseases, vaccination

debates, and affect and embodiment. Her current research focuses on experiences of pharmaceuticals and self-tracking in endometriosis.

References

- Adams, Vincanne, Michelle Murphy, and Adele E. Clarke. 2009. 'Anticipation: Technoscience, Life, Affect, Temporality.' *Subjectivity* 28: 246–65. <https://doi.org/10.1057/sub.2009.18>.
- Ahtela, Kaija. 2020. 'Koronarokote voi olla käytössä jo syksyllä – "hopealuotia ei vielä ole."' *Kauppalehti*, 20 May 2020. <https://www.kauppalehti.fi/uutiset/koronarokote-voilla-kaytossa-jo-syksylla-hopealuotia-ei-viela-ole/d91522e3-31ff-4e2e-8ddd-daeb224c705e>.
- Autti, Ellinoora, and Tatu Myllykoski. 2020. 'STM paljasti strategiansa: Suomi aikoo hankkia kolmenlaisia koronarokotteita – eri ikäryhmille erilaiset rokotteet.' *Ilta-Sanomat*, 24 August 2020. <https://www.is.fi/kotimaa/art-2000006611583.html>.
- Azak, A. Nalan, and Einar Wigen. 2022. "Whatever They Say I Do the Opposite": Vaccine Resistance in Turkey During the Covid-19 Pandemic.' *Medical Anthropology* 41 (8): 778–93. <https://doi.org/10.1080/01459740.2022.2142578>.
- Bear, Laura. 2014. 'Doubt, Conflict, Mediation: The Anthropology of Modern Time.' *Journal of the Royal Anthropological Institute* 20: 3–30. <https://doi.org/10.1111/1467-9655.12091>.
- Blue, Gwendolyn, Debra Davidson, and Kristy Myles. 2022. 'Expectations of Genomic Selection for Forestry: Expert Narratives of Anticipation and Legitimation.' *Science as Culture* 31 (2): 256–75. <https://doi.org/10.1080/09505431.2022.2025773>.
- Borup, Mads, Nik Brown, Kornelia Konrad, and Harro Van Lente. 2006. 'The Sociology of Expectations in Science and Technology.' *Technology Analysis & Strategic Management* 18 (3–4): 285–98. <https://doi.org/10.1080/09537320600777002>.
- Boyce, Tammy. 2007. *Health, Risk and News: The MMR Vaccine and the Media*. New York, NY: Peter Lang.
- Brown, Nik. 2019. *Immunitary Life: A Biopolitics of Immunity*. London: Palgrave Macmillan.
- Brown, Nik, and Mike Michael. 2003. 'A Sociology of Expectations: Retrospecting Prospects and Prospecting Retrospects.' *Technology Analysis & Strategic Management* 15 (1): 3–18. <https://doi.org/10.1080/0953732032000046024>.
- Bryant, Rebecca, and Daniel M. Knight. 2019. *The Anthropology of the Future*. Cambridge: Cambridge University Press.
- Conis, Elena. 2015. *Vaccine Nation: America's Changing Relationship with Immunization*. Chicago, IL: University of Chicago Press.
- Dehner, George. 2012. *Influenza: A Century of Science and Public Health Response*. Pittsburgh, PA: University of Pittsburgh Press.

- Diehl, Laura. 2013. 'American Germ Culture: Richard Matheson, Octavia Butler, and the (Political) Science of Individuality.' *Cultural Critique* 85: 84–121. <https://doi.org/10.1353/cul.2013.a528575>.
- Dolez, Antoine, Céline Granjou, and Séverine Louvel. 2019. 'On the Plurality of Environmental Regimes of Anticipation: Insights from Forest Science and Management.' *Science & Technology Studies* 32 (4): 78–96. <https://doi.org/10.23987/sts.64919>.
- European Union. 2019. *Eurobarometer: Europeans' Attitudes towards Vaccination*. <https://europa.eu/eurobarometer/surveys/detail/2223>.
- Feldman-Savelsberg, Pamela, Flavien T. Ndonko, and Bergis Schmidt-Ehry. 2000. 'Sterilizing Vaccines or the Politics of the Womb: Retrospective Study of a Rumor in Cameroon.' *Medical Anthropology Quarterly* 14 (2): 159–79. <https://doi.org/10.1525/maq.2000.14.2.159>.
- Fiske, Amelia, Franziska Schönweitz, Johanna Eichinger, Bettina Zimmermann, Nora Hangel, Anna Sierawska, Stuart McLennan, and Alena Buyx. 2022. 'The COVID-19 Vaccine: Trust, Doubt, and Hope for a Future beyond the Pandemic in Germany.' *PLoS ONE* 17 (4): e0266659. <https://doi.org/10.1371/journal.pone.0266659>.
- Flear, Mark L. 2021. 'Expectations as Techniques of Legitimation? Imagined Futures through Global Bioethics Standards for Health Research.' *Journal of Law and the Biosciences* 8 (2): Isaa086. <https://doi.org/10.1093/jlb/Isaa086>.
- Gabay, Gillie, and Mahdi Tarabieh. 'Science and Behavioral Intentions among Israeli Jewish Ultra-Orthodox Males: Death from COVID-19 or from the COVID-19 Vaccine? A Thematic Study.' *Public Understanding of Science* 31 (4): 410–27. <https://doi.org/10.1177/09636625211070500>.
- Gottlieb, Samantha. 2018. *Not Quite a Cancer Vaccine: Selling HPV and Cervical Cancer*. New Brunswick, NJ: Rutgers University Press.
- Grönholm, Pauliina. 2020. 'Sairaanhoitaja Mikko Weckström aikoo ottaa koronarokotteen ensimmäisten joukossa – "Enemmän huolettaa, antaako se tarpeeksi suojaa." *Helsingin Sanomat*, 6 December 2020. <https://www.hs.fi/kotimaa/art-2000007664564.html>.
- Hanhinen, Hanna. 2020. 'Lääkeyhtiö keskeytti koronarokotteen testit – THL:n ylilääkäri kehottaa laittamaan jäitä hattuun: Tämä on tavallista isoissa tutkimuksissa.' *YLE*, 9 September 2020. <https://yle.fi/uutiset/3-11534824>.
- Hannula, Päivi. 2020. 'Historian karmeimmin rokotemoka: 5 lasta kuoli ja 51 halvaantui Yhdysvalloissa, kun poliorokote sisälsi vahingossa eläviä viruksia.' *MTV Uutiset*, 16 May 2020. <https://www.mtvuutiset.fi/artikkeli/historian-karmeimmin-rokotemoka-5-lasta-kuoli-ja-51-halvaantui-yhdysvalloissa-kun-poliorokote-sisalsi-vahingossa-elavia-viruksia/7821826#gs.2yxr9x>.
- Harju, Jukka. 2020. 'Ensimmäiset koronarokotteet saatetaan pistää Suomessa tammi-kuussa – Pfizerin rokotteen "teho on erinomaisen hyvä", sanoi THL:n ylilääkäri.'

- Helsingin Sanomat*, 1 December 2020. <https://www.hs.fi/kotimaa/art-2000007653987.html>.
- Harrison, Mia, Kari Lancaster, and Tim Rhodes. 2022. “A Matter of Time”: Evidence-making Temporalities of Vaccine Development in the COVID-19 Media Landscape.’ *Time & Society* 31 (1): 132–54. <https://doi.org/10.1177/0961463X211032201>.
- Heikkilä, Jari. 2020. ‘Tutkijat pelkäävät koronarokotteen kehittämisen epäonnistuvan: Vaihtoehto kuulostaa puistattavalta.’ *MTV Uutiset*, 26 April 2020. <https://www.mtvuutiset.fi/artikkeli/tutkijat-pelkaavat-koronarokotteen-kehittamisen-epaonnistuvan-vaihtoehto-kuulostaa-puistattavalta/7801728#qs.2ywqk8>.
- Heino, Elina. 2020. ‘Lääkejätti käy mittavia rokoteneuvotteluja “verhojen takana” – USA osti 1,2 miljardilla käyttöoikeuden koronarokotteeseen, jota ei ole vielä olemassa.’ *Uusi Suomi*, 23 May 2020. <https://www.uusisuomi.fi/uutiset/laakejatti-kay-mittavia-rokoteneuvotteluja-verhojen-takana-usa-osti-1-2-miljardilla-kayttooikeuden-koronarokotteeseen-jota-ei-ole-viela-olemassa/bd55d7df-62f2-4fa8-b2fc-c027132771aa>.
- Hyytinen, Tuomas. 2020. ‘Koronarokotukset voivat alkaa Suomessa jo ennen joulua – Valmiit annokset odottavat lähtökäskyä rokotetehtaalla.’ *YLE*, 30 November 2020. <https://yle.fi/uutiset/3-11670413>.
- James, Myfanwy Vaughan, and Shelley Susan Lees. 2022. “Are You Sure It’s Not the Corona Vaccine?” An Ebola Vaccine Trial During COVID-19 in DRC.’ *Medical Anthropology* 41 (5): 503–17. <https://doi.org/10.1080/01459740.2022.2097908>.
- Joukanen, Toni. 2020. ‘Testit alkavat 30 000 ihmisellä: Näin toimii Oxfordin lupaavaksi osoittautunut koronarokote – THL:n ylilääkäri: “Vielä ei tiedetä, miten rokote toimii tosielämässä.”’ *MTV Uutiset*, 21 July 2020. <https://www.mtvuutiset.fi/artikkeli/testit-alkavat-30-000-ihmisella-nain-toimii-oxfordin-lupaavaksi-osoittautunut-koronarokote-thl-n-ylilaakari-viela-ei-tiedeta-miten-rokote-toimii-tosielamassa/7876870#qs.2z27lr>.
- Juonala, Jouko. 2020a. ‘Koronaa vastaan on tulossa rokote, mutta valmisteen kehittäminen vie aikansa – ja siihen on hyviä syitä.’ *Ilta-Sanomat*, 17 March 2020. <https://www.is.fi/tiede/art-2000006442524.html>.
- Juonala, Jouko. 2020b. ‘Näin koronarokotteet syntyvät – kaikki tutkimusvaiheet käydään läpi turvallisuudesta tinkimättä.’ *Ilta-Sanomat*, 8 December 2020. <https://www.is.fi/kotimaa/art-2000007669928.html>.
- Juonala, Jouko. 2020c. ‘Tältä näyttää tarkkaan varjellussa laboratoriossa, jossa tehdään suomalaista koronarokotetta.’ *Ilta-Sanomat*, 5 September 2020. <https://www.is.fi/kotimaa/art-2000006625146.html>.
- Kantola, Anne. 2020. ‘Kilpajuoksu koronavirusrokotteen kaupallistamiseksi käy kovana, ensimmäiset testit alkaneet – “Tämä on minulle mahtava mahdollisuus tehdä

- jotakin”, sanoo testirokotteen saanut.’ *Helsingin Sanomat*, 17 March 2020. <https://www.hs.fi/ulkomaat/art-2000006442462.html>.
- Karppi, Tiina. 2021. ‘Koronarokotteiden saatavuusongelmat ovat hidastaneet rokottamista Uudellamaalla: “Olemme kuulleet palautetta ja ihmetystä siitä.”’ *YLE*, 11 March 2021. <https://yle.fi/uutiset/3-11827677>.
- Kataja, Marika. 2021. ‘Rokoteasiantuntija: Koronarokotteen riittävyttä voitaisiin lisätä puolittamalla tehosteannos.’ *YLE*, 18 January 2021. <https://yle.fi/uutiset/3-11743274>.
- Kauppinen, Ina. 2020a. ‘NY Times: Jo kymmeniä koronavirusrokoteita testataan ihmisillä – tällaisia ovat lupaavimmat ehdokkaat.’ *Iltta-Sanomat*, 10 July 2020. <https://www.is.fi/ulkomaat/art-2000006568267.html>.
- Kauppinen, Ina. 2020b. ‘WSJ: Kiinassa sadattuhannet ovat jo saaneet kokeellisen koronarokotteen – länsimaissa ollaan huolissaan.’ *Iltta-Sanomat*, 11 September 2020. <https://www.is.fi/ulkomaat/art-2000006633496.html>.
- Kokkonen, Yrjö, and Leo Kosola. 2020. ‘Koronarokotteen testit antoivat lupaavia tuloksia Britanniassa ja Kiinassa – THL:n ylilääkäri: “Toiveikkuutta herättävää.”’ *YLE*, 20 July 2020. <https://yle.fi/uutiset/3-11457252>.
- Koskela, Annukka. 2020. ‘Suomalaiset koronarokotteen kehittäjät tähyävät ensimmäisen tautiaallon toiselle puolen.’ *Iltta-Sanomat*, 9 May 2020. <https://www.is.fi/kotimaa/art-2000006502556.html>.
- Koskinen, Anu Leena. 2020. ‘Koronarokotteen vaatima -70 asteen syväjääditys herättää useita kysymyksiä – asiantuntija lähetti kollegalle paljon puhuvan emojiin.’ *YLE*, 11 November 2020. <https://yle.fi/uutiset/3-11641577>.
- Kukko-Liedes, Pirkko. 2020. ‘Tutkijat ympäri maailmaa kehittävät kiivaasti rokotetta koronavirukseen, mutta tähän hätään se ei auta – altistuskokeetkin vievät aikaa.’ *YLE*, 30 January 2020. <https://yle.fi/uutiset/3-11184070>.
- Laakkonen, Johanna. 2021. ‘Moni koronarokote on vielä mysteeri, eikä haitoistakaan kerrota: tässä kaikki, mitä 8 rokotteesta tiedetään juuri nyt.’ *Yle*, 23 January 2021. <https://yle.fi/a/3-11750243>.
- Laine, Linda. 2020. ‘Kymmenillä eri koronarokotteilla tehdään jo ihmiskokeita – tällainen on matka aihioista rokotteeksi.’ *Iltalehti*, 10 September 2020. <https://www.iltalehti.fi/koronavirus/a/4c1e2ee0-9ff0-4fbd-9293-686e8698cf4e>.
- Lasco, Gideon. 2022. “I Think I Have Enough for Now”: Living with COVID-19 Antibodies in the Philippines.’ *Medical Anthropology* 41 (5): 518–31. <https://doi.org/10.1080/01459740.2022.2089569>.
- Lindén, Lisa. 2020. ‘Love and Fear? Affect, Public Engagement and the Use of Facebook in HPV Vaccination Communication.’ *Science & Technology Studies* 33 (3): 2–18. <https://doi.org/10.23987/sts.73095>.
- Lockyer, Bridget, Shahid Islam, Aamnah Rahman, Josie Dickerson, Kate Pickett, Trevor Sheldon, John Wright, Rosemary McEachan, Laura Sheard, and the Bradford Institute for Health Research Covid-19 Scientific Advisory Group. 2021.

- 'Understanding COVID-19 Misinformation and Vaccine Hesitancy in Context: Findings from a Qualitative Study Involving Citizens in Bradford, UK.' *Health Expectations* 24 (4): 1158–167. <https://doi.org/10.1111/hex.13240>.
- Lorimer, Jamie. 2019. 'Hookworms Make Us Human: The Microbiome, Eco-immunology, and a Probiotic Turn in Western Health Care.' *Medical Anthropology Quarterly* 33 (1): 60–79. <https://doi.org/10.1111/maq.12466>.
- Löytömäki, Simo. 2020. 'Miten alle vuodessa kehitetty koronarokote voi olla turvallinen, ja miten elämä jatkuu rokotuksen saamisen jälkeen? Asiantuntijat vastaavat HS:n lukijoiden kysymyksiin uusista rokotteista.' *Helsingin Sanomat*, 13 December 2020. <https://www.hs.fi/kotimaa/art-2000007679124.html>.
- Malmberg, Katarina. 2020. "'Ilman rokotetta koronavirus ei katoa.'" *Helsingin Sanomat*, 12 December 2020. <https://www.hs.fi/hyvinvointi/art-2000007678660.html>.
- Malmberg, Katarina. 2021. 'Monelle nousee koronarokotteen jälkeen kuume – Asiantuntija kertoo, mistä se johtuu ja mitä rokotteen sivuoireista tiedetään juuri nyt.' *Helsingin Sanomat*, 12 February 2021. <https://www.hs.fi/hyvinvointi/art-2000007798014.html>.
- Malminen, Ulla. 2020a. 'Pelottaako koronarokotteen turvallisuus, mietityttääkö sen tehokkuus? Lue seitsemän kysymystä ja asiantuntijan vastaukset.' *YLE*, 14 October 2020. <https://yle.fi/uutiset/3-11593064>.
- Malminen, Ulla. 2020b. 'Suomi odottaa kuumeisesti ensimmäistä koronarokotetta – lue uusimmat tiedot sen turvallisuudesta ja tehokkuudesta.' *YLE*, 4 December 2020. <https://yle.fi/uutiset/3-11679367>.
- Martin, Emily. 1994. *Flexible Bodies*. Boston, MA: Beacon Press.
- Manninen, Laura. 2020. 'Voiko rokotekaupoilla käydä kuten maskien kanssa? Näin Suomi valmistautuu hankkimaan koronarokotetta.' *Iltä-Sanomat*, 13 July 2020. <https://www.is.fi/politiikka/art-2000006569666.html>.
- Mattila, Sanni. 2020. 'Narkolepsiakohu ei unohdu: THL-ylilääkäri kertoo, millaisia ovat koronarokotteen mahdolliset haitat – "Tulevat yleensä ilmi vasta, kun rokote otetaan laajaan käyttöön.'" *MTV Uutiset*, 15 May 2020. <https://www.mtvuutiset.fi/artikkeli/narkolepsiakohu-ei-unohdu-thl-ylilaakari-kertoo-millaisia-ovat-koronarokotteen-mahdolliset-haitat-tulevat-yleensa-ilmi-vasta-kun-rokote-otetaan-laajaan-kayttoon/7821480#gs.2ynpg1>.
- Mikkonen, Mikael. 2020. 'Miten koronarokotteen turvallisuus varmistetaan? Osa lääkefirmoista aikoo käyttää ainetta, jota narkolepsiaa aiheuttanut rokote sisälsi.' *MTV Uutiset*, 15 July 2020. <https://www.mtvuutiset.fi/artikkeli/miten-koronarokotteen-turvallisuus-varmistetaan-osa-laakefirmoista-aikoo-kayttaa-ainetta-jota-narkolepsiaa-aiheuttanut-rokote-sisalsi/7872466#gs.2ymInf>.
- Montgomery, Catherine M. 2017. 'From Standardization to Adaptation: Clinical Trials and the Moral Economy of Anticipation.' *Science as Culture* 26 (2): 232–54. <https://doi.org/10.1080/09505431.2016.1255721>.

- Mutanen, Annikka. 2020. 'Uskaltaako koronarokotteen ottaa? "Ihmiset luonnollisesti miettivät, millaisia ovat plussat ja miinukset", sanoo Rokotetutkimuskeskuksen johtaja.' *Helsingin Sanomat*, 3 December 2020. <https://www.hs.fi/tiede/art-2000007657803.html>.
- Myllyniemi, Timo. 2020. 'Asiantuntijat: Koronarokotteesta ei kannata odottaa ihmelääkettä – todennäköisesti ei estä edes puolia tartunnoista.' *Iltasanomat*, 24 May 2020. <https://www.is.fi/ulkomaat/art-2000006517607.html>.
- Niinistö, Meeri, and Marika Kataja. 2020. 'Voiko rokotteen RNA jäädä osaksi geeniperimää? Estääkö rokote viruksen leviämisen? Kysyitte koronarokotteista, asiantuntijat vastaavat.' *YLE*, 10 November 2020. <https://yle.fi/uutiset/3-11641276>.
- Nurmi, Johanna, and Bronwyn Harman. 2022. 'Why Do Parents Refuse Childhood Vaccination? Reasons Reported in Finland.' *Scandinavian Journal of Public Health* 50 (4): 490–96. <https://doi.org/10.1177/14034948211004323>.
- Nykänen, Marikki. 2020. 'Tutkijat: Venäjän koronarokotteen data näyttää "photoshopatulta."' *Iltalehti*, 9 September 2020. <https://www.iltalehti.fi/ulkomaat/a/5ad79fa2-91ef-452c-a258-77cf88716418>.
- Nykänen, Riika. 2021. 'Mitä voi seurata, jos koronarokotusten antoväliä pidennetään? Nohynek kertoo kaksi huolenaihetta.' *Iltasanomat*, 6 January 2021. <https://www.is.fi/kotimaa/art-2000007723422.html>.
- Oikkonen, Venla. 2021. 'Post-Pandemic Futures and the Affective Appeal of Immunity.' *Lambda Nordica* 26 (2–3): 21–46. <https://doi.org/10.34041/ln.v27.740>.
- Oikkonen, Venla. 2022. 'The 2009 H1N1 Pandemic, Vaccine-associated Narcolepsy, and the Politics of Risk and Harm.' *Health* 26 (2): 162–80. <https://doi.org/10.1177/1363459320925880>.
- Paananen, Arja. 2020. 'Putin vihjaili Niinistölle koronaläpimurrosta – Yllättääkö Venäjä omalla rokotteellaan?' *Iltasanomat*, 18 March 2020. <https://www.is.fi/ulkomaat/art-2000006444281.html>.
- Paananen, Karoliina. 2020. 'Rokotetta koronavirukseen kiirehditään.' *Suomen Kuvalehti*, 29 January, 2020. <https://suomenkuvalehti.fi/tiede-ja-teknologia/koronavirukseen-kehitetään-rokotetta-pikavauhtia-kyse-kilpajuoksusta-aikaa-vastaan/>.
- Palomäki, Janne. 2020. 'Kisa aikaa vastaan – yli 40 tutkijaryhmää yrittää keksiä koronavirusrokotteen.' *Iltalehti*, 27 March 2020. <https://www.iltalehti.fi/koronavirus/a/4ab26f03-2daa-4f4c-b3d6-d7eb0ca8d8e3>.
- Palonen, Wilhelmiina. 2020. 'Taudin tappajat.' *Suomen Kuvalehti*, 3 April 2020. <https://suomenkuvalehti.fi/tiede-ja-teknologia/koronavirus-on-kuin-nopeasti-liikkuva-auto-joka-pitaisi-pysayttaa-nain-rokotetutkijat-yrittavat-paasta-kasiksen-moottoriin/>.
- Parviala, Antti. 2020a. 'Halutaanko Suomeen suomalainen vai paras rokote? THL:n mukaan molempia ei ehkä voi saada.' *YLE*, 12 May 2020. <https://yle.fi/uutiset/3-11346645>.

- Parviala, Antti. 2020b. 'Suomalainen koronarokote otetaan testeihin lähipäivinä – nopeimmista ollaan puoli vuotta jäljessä, mutta se voi olla etu.' *YLE*, 1 August 2020. <https://yle.fi/uutiset/3-11469034>.
- Puttonen, Mikko. 2020a. 'Ensimmäiset koronarokotteet eivät ehkä vapauta meitä normaaliin elämään – HS selvitti, mitä rokotteista ja niiden antamasta suojasta nyt tiedetään.' *Helsingin Sanomat*, 23 October 2020. <https://www.hs.fi/tiede/art-2000006688474.html>.
- Puttonen, Mikko. 2020b. 'Kilpajuoksu koronarokotteen kehittämiseksi on käynnissä, ja yksi kandidaatti pääsi jo ihmiskokeisiin.' *Helsingin Sanomat*, 23 March 2020. <https://www.hs.fi/tiede/art-2000006448898.html>.
- Puttonen, Mikko. 2020c. 'Miksi koronarokotteen säilyvyys vaatii lämpötilaa, joka lyö laudalta Etelämantereen pakkaset?' *Helsingin Sanomat*, 3 December 2020. <https://www.hs.fi/tiede/art-2000007657811.html>.
- Puttonen, Mikko. 2020d. 'Näin uudet koronarokotteet toimivat: Rna-rokote sisältää viruksen omaa perimää, viruskuljettimia on jo käytetty syöpähoidoissa.' *Helsingin Sanomat*, 10 December 2020. <https://www.hs.fi/tiede/art-2000007672318.html>.
- Puttonen, Mikko. 2020e. 'Tehokkaaksi todettu rokotekaan ei lopeta epidemiaa: "Viruksesta ei päästä heti eroon, mutta meidän on helpompi toimia."' *Helsingin Sanomat*, 11 November 2020. <https://www.hs.fi/tiede/art-2000007611297.html>.
- Puttonen, Mikko. 2021. 'Tutkija: Astra Zenecan rokotetta karsastetaan turhaan, sillä se estää erittäin hyvin vakavia tautimuotoja.' *Helsingin Sanomat*, 21 February 2021. <https://www.hs.fi/tiede/art-2000007816759.html>.
- Reich, Jennifer A. 2016. *Calling the Shots: Why Parents Reject Vaccines*. New York, NY: New York University Press.
- Ringel, Felix. 2016. 'Beyond Temporality: Notes on the Anthropology of Time from a Shrinking Fieldsite.' *Anthropological Theory* 16 (4): 390–412. <https://doi.org/10.1177/1463499616659971>.
- Saarikoski, Jyrki, Teemu Juhola, and Katariina Melkkilä. 2021. 'Rokotusten hidas käynnistyminen hermostuttaa eri puolilla Eurooppaa – Britannia kirii siirtämällä toisen rokotuspiikin antoa.' *YLE*, 4 January 2021. <https://yle.fi/uutiset/3-11723214>.
- Seppä, Petri. 2020. 'ChAdOX1-koronarokote tepsii kuuteen apinaan, lääkejätti pisti 40 miljoonaa annosta tekoon – "Osoittaa uskoa."' *Ilta-Sanomat*, 11 May 2020. <https://www.is.fi/ulkomaat/art-2000006504491.html>.
- Seppä, Petri. 2021a. 'Kommentti: Tekeekö Suomi koronarokottamisessa karmean munauksen – pelaa kovaa uhkapeliä Pfizerin rokotteella.' *Ilta-Sanomat*, 5 February, 2021. <https://www.is.fi/kotimaa/art-2000007784200.html>.
- Seppä, Petri, 2021b. 'Näitä koronakysymyksiä ihmiset nyt pohtivat – lue vastaukset 20 kysymykseen.' *Ilta-Sanomat*, 13 February 2021. <https://www.is.fi/kotimaa/art-2000007801124.html>.

- Smith, Naomi, and Tim Graham. 2019. 'Mapping the Anti-vaccination Movement on Facebook.' *Information, Communication & Society* 22 (9): 1310–27. <https://doi.org/10.1080/1369118X.2017.1418406>.
- Söderkultalahti, Olli. 2020. 'Asiantuntija: Näin toimiva rokote muuttaisi jokaisen elämää – varovaisuutta tulisi noudattaa, mutta useita arkisia asioita ei tarvitsisi enää pelätä.' *Iltta-Sanomat*, 17 November 2020. <https://www.is.fi/kotimaa/art-2000007622792.html>.
- Stöckl, Andrea, and Anna Smajdor. 2017. 'The MMR Debate in the United Kingdom: Vaccine Scares, Statesmanship and the Media.' In *The Politics of Vaccination: A Global History*, edited by Holmberg, Christine, Stuart Blume, and Paul Greenough, 239–59. Manchester: Manchester University Press.
- Tanner, Matti. 2020. 'Suomalaistutkijat kehittävät kovaa vauhtia nenäsumutteena annettavaa koronarokotetta – valmis testeihin jo syksyllä.' *Iltalehti*, 16 April 2020. <https://www.iltalehti.fi/koronavirus/a/3cf76dac-87e7-4885-9254-5b4bdbafe333>.
- Tarkkala, Heta, Ilpo Helén, and Karoliina Snell. 2019. 'From Health to Wealth: The Future of Personalized Medicine in the Making.' *Futures* 109: 142–52. <https://doi.org/10.1016/j.futures.2018.06.004>.
- Terävä, Hanna. 2020. 'Koronavirusrokotetta testataan jo ihmisillä – asiantuntijat pohtivat jopa yhden tärkeän vaiheen ohittamista kehityksen nopeuttamiseksi.' *YLE*, 6 April 2020. <https://yle.fi/uutiset/3-11290069>.
- Terävä, Hanna. 2021. 'Asiantuntija koronarokotteiden tehosta: "Henkilö, joka rokotteesta huolimatta saa taudin, on saattanut hyötyä siitä kaikkein eniten."' *YLE*, 6 February 2021. <https://yle.fi/uutiset/3-11770311>.
- Thiongane, Oumy Baala. 2021. 'Global Health Initiatives as a "Drunken Boat": The Meningitis Vaccines Project Case Study.' *Medicine Anthropology Theory* 8 (1): 1–12. <https://doi.org/10.17157/mat.8.1.5228>.
- Tuomisto, Emmi. 2020. 'Synkkä arvio: Koronan sairastaneille ei voi luvata immuniteettia eikä "immuniteettipassia" – Myös rokotus olisi otettava jopa monta kertaa vuodessa.' *Uusi Suomi*, 30 June 2020. <https://www.uusisuomi.fi/uutiset/synkka-arvio-koronan-sairastaneille-ei-voi-luvata-immuniteettia-eika-immuniteettipassia-myo-rokotus-olisi-otettava-jopa-monta-kertaa-vuodessa/206df615-4e6a-4850-a389-9f9ed894d004>.
- Tyystjärvi, Ilona. 2021. 'Kaikkien yli 16-vuotiaiden suomalaisten rokottamisessa voi kulua koko vuosi, rokotetoimitukset ovat olleet odotettua pienempiä.' *Helsingin Sanomat*, 5 January 2021. <https://www.hs.fi/kotimaa/art-2000007722410.html>.
- Vaittinen, Hanna. 2020. 'Koronarokote Suomessa käytössä poikkeusluvalla jo ensi syksynä? Ensin Suomen pitäisi päättää rokotusstrategia: "Ei ole ollenkaan selvää, keille kaikille annoksia riittää."' *MTV Uutiset*, 18 May 2020. <https://www.mtvuutiset.fi/artikkeli/koronarokote-suomessa-kaytossa-poikkeusluvalla-jo-ensi-syksyna-ensin-suomen-pitaisi-paattaa-rokotusstrategia-ei-ole-ollenkaan-selvaa-keille-kaikille-annoksia-riittaa/7824172#gs.2yv1g6>.

- Vanhalakka, Vesa. 2020. 'Toimivaa lääkettä koronavirukseen saadaan odottaa 2–3 vuotta: "Ihmisten turvallisuutta vaarantavia riskejä ei oteta.'" *Kauppalehti*, 7 March 2020. <https://www.kauppalehti.fi/uutiset/toimivaa-laaketta-koronavirukseen-saadaan-odottaa-23-vuotta-ihmisten-turvallisuutta-vaarantavia-riskeja-ei-oteta/1eae8c0-805f-4460-8274-ca7879b93daa>.
- Vasantola, Satu. 2021. 'Nopean rokotteen pelko.' *Helsingin Sanomat*, 16 January 2021. <https://www.hs.fi/sunnuntai/art-2000007742483.html>.
- Wald, Priscilla. 2000. 'Future Perfect: Grammar, Genes, and Geography.' *New Literary History* 31 (4): 681–708. <https://doi.org/10.1353/nlh.2000.0051>.
- Wilcox, Sarah A. 2003. 'Cultural Context and the Conventions of Science Journalism: Drama and Contradiction in Media Coverage of Biological Ideas about Sexuality.' *Critical Studies in Media Communication* 20 (3): 225–47. <https://doi.org/10.1080/07393180302772>.