

Bio-imaginaries

‘Biologics’, Bricolage, and the Making of Pharmaceutical Knowledge

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Abstract

What does it mean when pharmaceuticals are called ‘biologics’? This article follows a pregnant person who has been hospitalised on a Norwegian rheumatology ward after being taken off her monoclonal antibody (mab) medication. She is painfully trapped in a crisis that is medical and existential, but also epistemological. Weighing the debilitating consequences of her disease against concerns about pharmaceutical risks for herself and her unborn child, she creates and adapts her own knowledge of mabs as ‘biologics’. Far from being passively receptive, she thus becomes part of a complex project of semantics where analogies and oppositions of biologic and chemical, natural and man-made, health and unhealth work to render some knowledge plausible and some implausible. Placing the individual and the pharmaceutical label at the centre of this semantic economy, the article suggests that pharmaceutical labels play an important albeit unacknowledged role in the making of pharmaceuticals as safe and efficacious.

Keywords

Pharmaceuticals, Knowledge, Classification, Monoclonal antibodies, Nature.

Introduction

In October 2018 I held a small party to celebrate that my project *Chronic Knowledge* had received funding. I gave a short speech saying that while this project built on an earlier hospital study, it was focused more on how people came to understand so-called ‘biological pharmaceuticals’ as safe and efficacious. After my speech, a friend of mine approached me and asked to know more about my interest in what he now called ‘ecological pharmaceuticals’.¹

I smiled. ‘Ecological? Was that it?’

He hesitated. ‘What was it then? Nature-based pharmaceuticals?’

‘It was biological’, I said. A few months later, I heard a different person enthusiastically explain how a relative had been able to try a similar pharmaceutical. When asked to elaborate, he said, ‘Well, it is some ecological medicines, made from plants, I don’t really know.’

The pharmaceuticals on which the project focused were monoclonal antibodies (mabs). These are immunoglobulins, similar to the antibodies produced by the human body, but grown in laboratories from human and rodent cells. They are pre-programmed to tag specific molecules for destruction by the body’s immune cells. In the treatment of inflammatory joint diseases, they are aimed at preventing the destruction or ossification of joints by intervening in the inflammatory cascade, thus modifying the destructive course of the disease. They are what rheumatologists call ‘disease-modifying anti-rheumatic drugs’ (or DMARDs). While classified as immunosuppressants according to the WHO’s Anatomical Therapeutic Chemical (ATC) classification system, these pharmaceuticals were referred to as ‘biologics’ both at the Norwegian rheumatology ward where I conducted my first fieldwork back in 2012 and more broadly (see e.g., Stoff, Wahrig, and Schwerin 2013, 15; Gjersvik and Bretthauer 2010, 1846).

The first mabs were introduced to rheumatology in Norway and elsewhere in 1998. After their introduction, they were rapidly accepted as having transformed the field (Marks 2015). Fourteen years later, the impression I got was that these medicines were held to be efficacious and safe, and that they had finally provided a means to control rheumatic disease. During my fieldwork at the ward, no one really seemed to question their efficacy, although some patients ‘did not have benefit’ from them. They were in general not talked about as something dangerous, and performed as safe. At the same time, however, the medicines were on Norway’s national list of pharmaceuticals being surveilled for potentially severe side effects. Beyond the increased risk of infection due to immunosuppression, there were

¹ All translations from Norwegian to English are the author’s.

concerns about the risk of cancer, as well as a number of devastating, albeit rare, changes in immune mechanisms (see Cañete, Hernández, and Sanmartí 2017a, for a recent evaluation). Adverse events were typically not managed on this ward and were rarely mentioned by my interlocutors. It was outside the ward, when I talked to patients and health workers in other settings, that I began encountering stories of serious adverse events related to the use of mab medication. I recall in particular a patient representative I talked to in 2020. When she had tried a ‘biologic’, she had soon started freezing and shaking, while her stomach burned so much that she thought it would burn off. Although she was taken off the treatment and given cortisone, she got vaginal bleedings so severe that she spent the weekend in the bathroom. She was shocked by these effects, but when she told other patients, they said that such reactions were normal. Most seemed to have had similar experiences, some even bleeding from their gut. ‘But why had no one told me?’ she wondered. To me, she remarked, ‘You see, you’re merely getting the sunshine stories. There are things not being said, and things being said.’

This article is concerned with the role labels like ‘biologics’ play in rendering plausible pharmaceutical efficacies and safeties. Posing the individual at the centre of pharmaceutical knowledge production, it uses one expanded case to demonstrate how pharmaceutical effects, like linguistic signs, may come about as a result of people’s tinkering with oppositions and analogies to pharmaceutical labels. It argues that associating the label ‘biologics’ with ideas of the natural, which I found to be commonplace, renders plausible particularly strong notions of these drugs being healthful and safe.

In the early summer of 2012 I was allowed to spend 11 days following a woman whom I have called Anna Larsson,² whose case I have organised this article around. For 85 days between February and August that year, I was present and observing on a ten-bed rheumatology ward specialised in the treatment of severe or complex cases of rheumatoid arthritis (RA), psoriatic arthritis (PsA) and ankylosing spondylitis (AS). Searching for the specific micro-situations in which transactions of meaning took place, I organised the collection of data as a series of micro-studies in each of which I followed one patient through their stay on the ward. On the ward, I recruited patients (preferably upon their arrival), observed and recorded their consultations, and interviewed the patients and the health workers involved in their care at several times throughout the period of observation. In addition to patients, I interviewed and observed the staff in their daily activities. After fieldwork on the ward, I continued to contextualise the observed interactions, treating government documents and research papers as field sites (Asdal and

2 All names are pseudonyms.

Reinertsen 2022), and examined the English and Norwegian language medical literature (as well as other sources) that emanated from contexts with which the people at the ward would have been in direct or indirect contact. Finally, during 2019 and 2020, as part of the project *Chronic Knowledge*, I observed and conducted interviews, mainly with patients and patient representatives, in activities outside the hospital.

In the following, I briefly clarify my position on pharmaceutical effects, meaning, and knowledge, and explain why I think it is useful to pay attention to the semantics of pharmaceutical labels and classification. A second section then traces Anna Larsson's stay at the ward in 2012 as she tinkered with analogies and oppositions to form and unform her understanding of 'biologics' in response to changing circumstances. A third section traces antecedents to the meaning-making in which Larsson and her interlocutors engaged—in particular, the opposition of 'biologics' to 'chemicals', and Larsson's associations of 'biologic' with 'biodynamic'. Without pretending to offer a conceptual history, it will illustrate how the term 'biologics' has been valued differently within different linguistic contexts and at different moments in time, arguing that these different configurations have rendered different 'biologics' plausible, in particular that the association the label mediated between mabs and ideas of nature have supported understandings of mabs as safe and efficacious. A final section argues that the ways in which the label 'biologics' could articulate with imaginaries of health and nature in the Norwegian context drew in new layers of meaning to emphasise that effect. This last part accordingly also details *how* labels may articulate with local culture.

Labels, individuals, and pharmaceutical knowledge-making

Like meaning, pharmaceutical effects are context-dependent. Molecules, even large ones like mabs, are 'constituted in their relations to complex informational and material environments' (Barry 2005, 52). One molecule can emerge with different pharmaceutical properties in different places (Gomart 2002). Pharmaceuticals are thus conceptualised differently in different situations and made safe and efficacious in different ways as 'local iterations of pharmaceutical action' (Hardon and Sanabria 2017, 127; see also Bertotti and Miner 2019; van Bommel and van der Weegen 2019; Hendy 2021). Pharmaceutical objects are not merely burdened by excess meaning, nor are pharmaceutical effects complemented by an excess 'meaning effect' (Moerman 2002); pharmaceuticals *need* to be associated with specific meaning for their potentials to be realised (Geest, Whyte, and Hardon 1996, 171). Beyond iterations of safety and efficacy, pharmaceuticals may take on meanings that can be at once practical, moral, and economic (see e.g., Glabau 2016). Speaking of 'mere semantics' is therefore

helpful neither for understanding the realisation of pharmaceutical effects, nor for grasping the role of pharmaceuticals in the constitution of contemporary socialities. Speaking of labels is.

Classifications and concepts shape worldviews and structure perception and relations (Bowker and Star 1999; Lakoff and Johnson 2003). Pharmaceutical labels are no exception. One must therefore assume that labels, classes and categories play a key role in what Antoine Lentacker has called the ‘symbolic economy of drugs’ (Lentacker 2016). However, even Lentacker’s programmatic paper does not explicitly touch upon drug categories and labels as vectors for symbolic meaning. Despite anthropology’s record of analysing classification systems, it seems that pharmacological classification has also not been fully developed as a domain of ethnographic inquiry. The anthropology of pharmaceuticals was for many years focused on the trajectories of pharmaceutical objects (see Geest, Whyte, and Hardon 1996). As old approaches were superseded by new materialist ones, meaning became an integral part of pharmaceutical matter (see Hardon and Sanabria 2017). But while there is a growing literature devoted to understanding how pharmaceutical industry actors shape concepts of disease (Greene 2007; Dumit 2012), pharmaceutical concepts and categories still attract limited theoretical interest.

One reason for this may be that ‘scientific’ classifications and other ‘scientific’ knowledge tend to be seen as developed by scientists in laboratories, trickling down and out to be ‘operated in a wider social environment’ (Douglas 1986, 56; see also Gaudillière and Löwy 1998; Pollock 2014). Meaning tends to be seen as ‘inscribed’ first in the laboratory, and only then ‘reinscribed’ on the outside (Hardon and Sanabria 2017, 122). However, pharmaceutical labels are not scientific products. They have not been subjected to the rigorous practices said to characterise science. They are words, linguistic signs, as polyvalent as any. Their application may have its origins in ‘laboratory slang’ (Lindenmann 1984, 282), ‘clinical ideology’ (Young 1995, 223)—or indeed on the outside both of laboratory and clinic. They also evade regulation. As products of language rather than laboratory practice, labels seem to call for a more decentered approach to pharmaceutical knowledge and its production.

Following Fredrik Barth (1987, 2002), my approach is therefore that pharmaceutical knowledge, like other kinds of knowledge, is ‘a corpus of substantive assertions and ideas’ that ‘provides people with a way to understand major aspects of the world, ways to think and feel about the world, and ways to act on it’ (Barth 2002, 3–4); it is imaginaries people create and apply ‘to grasp the world, relate to it, and manipulate it’ (Barth 1987, 87). Pharmaceutical knowledge thus conceived is created wherever people grapple with pharmaceuticals and their

mysteries, and remains pharmaceutical no matter who holds it. It is through such imaginaries that pharmaceuticals become what they are to people. This approach opens up the possibility to bypass binaries such as expert/lay, or patient perspective/medical knowledge—with their associated pitfalls of reifying people (Taussig 1980) or making them up (Hacking 1986)—or otherwise avoid unthinkingly adopting categories whose social impact one may not want to reinforce (Beaudevin and Schramm 2019, 278). Therefore, when I speak of someone as a patient or a physician in this article, that label points to their transient role in that particular situation, and not to any predefined epistemological position.

The main contribution of this article lies in examining how individuals may go about using labels to create pharmaceuticals as safe and efficacious, and how such conceptualisations may be rendered *plausible* in specific contexts (Berger 1969). Instead of mapping the shifting conceptualisations of ‘biologics’ on the rheumatology ward or in Norway more broadly, this article will therefore focus on one individual, Anna Larsson. As there is no certain way of knowing exactly which associations an individual uses to make meaning, which contexts they have been drawing on in their imaginaries, I describe her process of knowledge-making in detail, and then explore the contexts she *may* have been drawing on, suggesting some factors that may have contributed to rendering knowledge like hers plausible. While I argue that Anna Larsson is representative for any person in that she is making her own knowledge, she is a representative only for herself when it comes to her particular combinations of meaning.

Larsson understands: Analogies and oppositions

I met Anna Larsson on a Monday afternoon in the summer of 2012. The nurse who suggested I talk to her had described her as a young woman who had been ill with ankylosing spondylitis or AS, an inflammation of the spine and joints of the pelvis, for a few years. She had been hospitalised just before the weekend and was now in such strong pain that even the seasoned nurses were taken aback. I also got the impression that there had been difficulties, perhaps outright conflict, between Larsson and some of the health workers. What is more, she was pregnant. Her pregnancy, I realised later, had created a situation where her so-called ‘biological’ medicines were no longer performed as safe by the staff. This challenged Larsson’s knowledge of ‘biologics’. Reality impinged, so to speak, on her imaginaries (Barth 1987, 87). Being pregnant, her responsibility to take care both of herself and of the unborn within was central to her crafting of ‘a childbearing self’ (Ford 2020a, 622; see also Ravn 2004, 102). Yet, at the same time, her actual capacity to do so was undermined, as her treatment was withheld, leaving her helpless. Reality thus also impinged on her project of crafting a self as an autonomous mother. In this, a lot hinged on the label ‘biologics’; in a situation

where both her physical functioning and her functioning as a mother-in-becoming were impeded, that label had been the point of departure for her knowledge of the medication she requested.

Anna Larsson had been diagnosed with AS just a few years before I met her at the ward. She had initially been put on a paracetamol and NSAID regime.³ As her pain persisted, and the medicines furthermore hurt her stomach, she eventually got to try a monoclonal antibody, golimumab, which she referred to in our conversations by its brand name Simponi. Larsson recalled that Simponi had had such an effect that she had believed herself cured, and stopped taking the medication. Her pain had then returned. Yet, as soon as she got back on her medication, it had disappeared once more. A year or so after these events, Larsson decided to have a child. Her treatment with Simponi was therefore discontinued. She also could not take NSAIDs during the pregnancy. Instead, she started taking fish oil (*tran*), which she took to be helpful both for her joints and for her pregnancy. Dietary choices also seemed like a means to manage symptoms. After a while, however, her pain returned. Gradually she got worse, to the point where she lost her capacity to take care of herself and, by extension, of the unborn baby. Her autonomous childbearing project threatened to crumble.

She returned to the hospital's outpatient clinic, and asked for Simponi, her only known solace, but got instead a one-week course of the steroid medicine prednisolone. A week later, she literally could not get out of bed. She returned to the outpatient clinic by ambulance. Again, she asked for Simponi, again in vain. Then, as the rheumatologist challenged her knowledge by suggesting that some of her pain could be a spinal disc herniation, Larsson cracked, and scolded the rheumatologist. 'Jesus, I abused her,' Larsson told me on our first meeting. Following her outburst, Larsson was hospitalised on code urgent, and sent upstairs to the inpatient ward. It was Friday afternoon, high summer and low staffing. So for two days Larsson was left to cope on her own and—immobilised and in severe pain—figure things out. It was three days after this, on the Monday that followed, when I met her. Ten days had then passed since her first visit to the outpatient clinic. She had still not got the medication she had asked for.

On the following day, a Tuesday, I asked Larsson if she and her assigned rheumatologist, Ingjerd Barlien, had discussed medication any further. Larsson answered that they had talked a little about it and said she had understood that Simponi was not really an option while she was pregnant. Because of its relatively long half-life, it would take too long for it to get out of the body in case of adverse events. There was, however, a somewhat similar medication with a shorter half-

3 The label 'non-steroidal anti-inflammatory drugs' (NSAIDs) defines a number of pharmaceuticals in tacit opposition to anti-inflammatory steroids (see Buer 2014).

life, making its effects more easily controlled. This was Enbrel, or etanercept, another 'biologic', and they were now waiting for the National Advisory Unit on Pregnancy and Rheumatic Diseases to decide if this was indeed an option for her. Larsson explained to me that they lacked knowledge about this because the medication was rather new, and research on effects on the fetus not possible. She concluded, 'So then it's kind of really not legal to simply say: Yes, we think that you shall take it.' When I asked for her own opinion, she answered that her opinion was that she had read far too little about the medication she had been taking. She paused, and then expanded, 'Well, I have all the time believed that it was, you know, like biodynamic ... That is, up inside my head, I have turned it into something mega-healthy.'

I was familiar with the term 'biodynamic' as referring to a form of ecologic agriculture inspired by the anthroposophical teachings of Rudolf Steiner. When I restated that she had believed that Simponi was biodynamic, she continued, laughingly: 'Yes, I thought ... I thought that those medicines were not... well, that it was not something chemical. And that it is ... well, medicines that have been, you know, grown you know, very organically in a way. You know, nothing like ... chemical.'

I asked Larsson if she meant grown 'organically' as in organic carrots.

She answered, 'Yes, kind of!' She laughed, and continued, 'Yes, or like, almost something like that. So that [the medication] somehow is grown through natural things. That's how I've been thinking.' She recalled that she had been given information about the pharmaceutical before she started taking it, but that she had 'kind of forgotten.' She went on:

I somehow did not think any more about what it is that I actually inject, other than that I have made up a story about it being all biodynamic and ... all that stuff. [...] Well, that's how I understood the information. It's [...] like it's totally, you know, super-ecological. I was, you know, super proud of it when I told my yoga teacher about it and everything, like, 'Now I am super-healthy, kind of!' and so on, yes, when I stopped taking those other drugs, those NSAIDs or what it is that they're called.

Larsson said she now understood why she had not been given Simponi, but that she had been struggling to understand until the last couple of days. She said the reason for her failure to grasp potential risks for the child she was carrying was that she had perceived Simponi as being biodynamic and thus healthy. Also, she had experienced no side effects. She compared Simponi to the other drugs that she had been taking:

[With Simponi] I have not experienced the kind of symptoms—or like ... much like ulcers and that kind of things—that I have done with many other [drugs], like painkillers, or these—what do they call them? NSAIDs? If I can take [paracetamol] and that kind of thing, cortisone and so on, I've been thinking, then I would really think I could take that injection [...]. Because it is soooo good and my body responds so well to it ... right? Yes.

Anna Larsson had made herself 'biologics' that were safe and efficacious. More than 'making up a story', as she put it herself, she had been making connections, drawing on semantic patterns, in which different concepts gained meaning from their relation to each other (biologic, nature, health vs chemical, synthetic and so on). The full range of her sense-making seems to have been as follows:

Simponi = biological = biodynamic/ecological = natural = healthy/safe.

Her understanding also appeared to rest on a series of oppositions:

Simponi/Enbrel	:	cortisone, NSAID, paracetamol
biological medicines	:	other drugs
natural	:	chemical/synthetic
healthy/safe	:	unhealthy/unsafe

Figure 1: Illustration of conceptual oppositions made in relation to each other by Anna Larsson. Illustration by the author.

This conception of the biological had impeded her seeing Simponi and Enbrel as potentially more dangerous than NSAIDs, paracetamol and prednisolone. The turning point had been her second consultation in the outpatient clinic, after she returned by ambulance. She told me she had then asked if she could not just get those medicines straight away, as they were biodynamic, whereupon the rheumatologist had said, 'They are not biodynamic, they are biological.' Larsson recalled, '[The rheumatologist] did not say so much, but she said enough to give me the impression that it's *not* like it's super-healthy ... Yes, carrots, that is that it's not liquid carrots. That's *not* what it is, kind of.'

I asked what she thought it meant that they were called 'biological'. She answered, 'I don't know. No idea. They said that it is *biological* medicines; it is not biodynamic medicines; [it's] *biological* medicines. And then I don't know much more about it really.'

The following day, it appeared that Larsson wanted to examine the validity of the connection between 'biological' and 'natural'. I had come with Dr Barlien to Larsson's room. Christine Opstad, Larsson's nurse that day, was already there. Larsson turned to Barlien for clarification.

Larsson: But ... but are those medicines more natural?
 Barlien: Because they are called 'biologic', you mean?
 Larson: Yes.
 Barlien: No, not really necessarily.
 Larsson: Not really.
 Barlien: No.
 Larsson: No.
 Barlien: Or it is ... You can say that it is a ... If you look at the inflammatory reaction as a cascade of different reactions ...
 Larsson: Yes.
 Barlien: In this picture there are a whole lot of cells that are required, and they ... In order to make that possible, there must be a shower of small substances that are required to fire these cells all the way.

Barlien snapped her fingers repeatedly to illustrate the firing. She continued, 'And it's these small substances that we need to block in different ways, with these biological medicines'. Larsson replied, 'Okay'. Barlien had not answered Larsson's question about why the medicines were called 'biologics'. The nurse, Christine Opstad, brought the conversation back on topic.

Opstad: And then it's also the way in which they are made.
 Barlien: How come?
 Opstad: No ...

Barlien cut the nurse off.

Barlien: Yes, no, that's the basis for the term 'biologic', yes, that's correct.
 Opstad: That they are kind of made from ... from ... cells that are either from animals or from humans, right?
 Barlien: Yes.
 Larsson: Oh well?
 Opstad: While the other [drugs] are made from chemical ...
 Barlien: ... are synthetic.
 Larsson: Yes, that's what I ... I thought it was something like that. Or perhaps more like ... perhaps not animals and humans ... More like ... carrots and ...

Larsson and the nurse laughed. Later that same afternoon, I asked Larsson if she would share with me what she had now understood. She said that what she had managed to grasp was that the reason why these pharmaceuticals were called 'biologics' had to do with 'how they are grown ... or produced'. She explained, 'They are produced from things that come from animals and humans. Therefore, they're called biological. It has not got as much to do with ... like nature ... as I thought.' For Larsson, the association between Enbrel and Simponi and the 'natural' had been undone.

Five more days were going to pass before Anna Larsson was given Enbrel. On the day following the injection, the body that had been increasingly crippled by pain over several weeks could walk with ease down the corridors. Four days later she was discharged and returned home.

Before her discharge, she had a consultation with Magdalene Elisabeth Gregersen, a pharmacist who was serving the ward. In that conversation, there was no mention either of nature, biodynamics, organic carrots or any other thing which might indicate Larsson's previous conception of these medications as inherently healthy. What seemed to occupy her mind now were her concerns about the child with whom she was pregnant.

Larsson: Also, I don't know how [prednisolone] negatively affects the fetus ... Neither that nor the Enbrel that I have started taking.

Gregersen: Yes.

Larsson: Yes.

Gregersen: Yes, but we can take ...

Larsson: What I have actually chosen to *expose* it to ...

Gregersen: Yes, yes, yes.

Larsson: And that, I don't know.

Larsson kept returning to the question of what negative effects her medication could have on her unborn child, but Gregersen seemed to have nothing to say that could settle the issue. A little later Gregersen asked, 'So, if you were to sum up what we have been talking about now, what do you think is going to be important for you to take with you?'

Anna Larsson sighed, and paused, before she spoke. 'That ... that if it's critical and one needs Enbrel to get better, then ... it is okay for me ... That is, it's my choice, and I have chosen it.' Anna Larsson seemed to accept her situation, and her responsibility.

At the end of the conversation, Larsson asked the pharmacist about a food supplement that a visitor had brought. She wanted to know if it was okay for her to take that supplement. The pharmacist grasped the box that Larsson handed her. 'Let's see ... supplement for the joints,' she read out loud. Then she sighed and continued: 'Yes. Eh ... I don't think I can answer that question.'

Having accepted both Enbrel and accountability for risks well beyond her control, Larsson was again capable of taking care of herself and her unborn. She had in a sense reclaimed the responsibility for her unborn child that had been invalidated when the rheumatologists refused to give her Simponi.

Anna Larsson had initially made herself knowledge that helped her accept mab treatment when it was first offered. Later, when she was denied those same mabs,

that knowledge was no longer helpful. Crisis ensued. When the rheumatologist at the outpatient clinic told her that Simponi was not ‘biodynamic’ but ‘biologic’, a process of reconceptualisation started, by the end of which her knowledge of mabs as ‘biologics’ had found a shape adapted to the needs of her new situation. At the same time, from the moment Barlien went off about ‘the inflammatory cascade’ and ‘a shower of small substances’, it was obvious that the rheumatologist grasped ‘biologics’ through different imaginaries. Versed as physicians are in organic chemistry and biochemistry, Barlien was accustomed to thinking biology and biologics in terms that did not associate unilaterally with nature or health. In her mind, the opposition between biologic and chemical was furthermore not a valid one, as illustrated when she corrected the nurse, instead contrasting ‘biological’ with ‘synthetic’. Despite these differences, Larsson’s and Barlien’s bio-imaginaries shared traits, as both were operating with a notion of the ‘biologic’ as opposed to some man-made entity. For Larsson, this other entity was the ‘chemical’; for Barlien, the ‘synthetic’.

The ways in which Larsson and Barlien made meaning seem to have been dictated neither by their transient statuses as a patient or physician, nor by contexts with which they connected. They were instead made *plausible* by different factors at the intersection of science, language and culture. The same structures that rendered Anna Larsson’s imaginaries plausible thus allowed others to make their own, in their own way. Each person was in dialogue with the other, and with different pasts and presents that rendered some imaginaries plausible, others implausible. Clearly, had ‘antibodies’ and not ‘biologics’ been the conventional shorthand for ‘monoclonal antibodies’, the range of plausible ways to make sense of Simponi would have been a different one. Being man-made, monoclonal antibodies might in such a case have been considered *synthetic* antibodies in analogy with, for instance, ‘synthetic yeast’ (Szymanski 2019) or ‘synthetic hormones’ (Ford 2020a, 607), and opposed to the *natural* or *organic* antibodies produced by the body. Had Larsson been presented with Simponi not as a ‘biologic’ but as a ‘synthetic antibody’ medication, she might have been deterred from accepting the treatment. It is also less likely that she would have told her yoga teacher how healthy she was for taking ‘anti-body’ drugs. But mabs were not spoken of as ‘antibodies’. They were uniformly ‘biologics’. And like Larsson had come to see Simponi as safe and efficacious by *analogy* with nature and in *opposition* to ‘chemical’ NSAIDs, paracetamol and steroids, others could arrive at similar understandings by contrasting ‘biologic’ with methotrexate, sulfasalazine, hydroxychloroquine and gold injections—and so demarcate against these ‘synthetic’ predecessors of mabs within the group of *disease-modifying anti-rheumatic drugs*, or DMARDs.

Antecedents: ‘Bio’ as danger, ‘bio’ as health

The *Oxford English Dictionary* documents use of the term ‘biologic’ dating back to 1853, while the use of ‘biological’ dates to 1822. The term ‘biology’ designating a branch of science dates to at least 1799, prior to which it referred to biographical study and writing. The origin of the pharmaceutical label ‘biologics’ is conventionally placed in the US 1902 Act to Regulate the Sale of Viruses, Serums, Toxins and Analogous Products (see e.g., Katz 2006, 809; Stoff, Wahrig, and Schwerin 2013, 4). The purpose of this law was to regulate the manufacture of blood products or other products of animal or human origin applicable ‘to the prevention, treatment or cure of diseases or injuries in man’ (Stoff, Wahrig, and Schwerin 2013, 4). Among these products were vaccines, antitoxins, therapeutic sera, and blood components. After Fred Lackenbach in 1912 proposed the term ‘biologics’ for the group of substances in question (Lackenbach 1912), the law would come to be known as the Biologics Control Act (see Stoff, Wahrig, and Schwerin 2013 for a detailed presentation of these developments). Later, insulin was to be added to the category, as were monoclonal antibodies, before the term eventually narrowed down to specifically designate the latter.

Thus, the opposition of ‘biologics’ to ‘chemical’ drugs like NSAIDs that Larsson relied on for her thinking, as well as the binary of ‘biologic’ and ‘synthetic’ that Barlien leaned on, had antecedents in early 20th century legislation. However, while Larsson associated ‘biologics’ with health, the group of substances to which the label had referred in 1902 had been associated with danger. The regulation had in fact been prompted when 13 children died after being vaccinated against diphtheria with antitoxins from a tetanus-infected horse (Stoff, Wahrig, and Schwerin 2013, 4). It therefore imposed a stronger focus on production procedures for substances of human or animal origin, compared to those of plant or mineral origin.⁴ A look at the stem of the term ‘biologics’—i.e., the morpheme ‘bio’—reveals that other concepts key to 20th century medicine found their shape within an analogous semantic framework where ‘bio’ was associated with danger or with the agent of unhealth. For instance, when Selman Waksman in 1947 suggested the term ‘antibiotics’ to categorise pharmaceuticals like penicillin, the stem ‘bio’ equated the microbial pathogens that the *antibiotics* targeted. Likewise, the ‘bio’ in ‘biohazard’ refers to pathogens. When Paul Ehrlich in 1906 suggested the term ‘chemotherapy’ to describe ‘the use of chemicals to treat diseases’, his suggestion made sense as an expansion of a similarly valued bio/chemo binary, where ‘chemo’ qualified the treatment and associated it with health.⁵

4 Pharmaceuticals of plant or mineral origin remained unregulated in the US until the 1906 Pure Food and Drug Act, and for many practical purposes until The Elixir Sulfanilamide incident of 1937 prompted the passing of the Food, Drug, and Cosmetic Act.

5 Waksman classified antibiotics as a chemotherapy in his article (Waksman 1947, 565, 567–8).

<i>Bio as danger</i>		<i>Bio as health</i>	
drug	: biologic	biologic	: chemical
chemotherapy:	disease	natural	: artificial
antibiotics	: microbes	health	: danger
health	: danger		

Figure 2: Bio as danger and bio as health. Biologic is in the one configuration positioned alongside danger, in indirect opposition to health. In the other configuration biologic is positioned alongside health, and indirectly contrasted with danger. Illustration by the author.

This pattern, where ‘bio’ is associated with danger and ‘chemo’ with health, may be said to coexist with the inverse (see Fig. 2). Within this inverted semantic configuration, ‘bio’ is still opposed to ‘chemical’, but now ‘bio’ is at the healthy end of the dichotomy while ‘chemo’ is valued negatively. Anna Larsson’s association of ‘biologics’ with nature and health appears to follow this logic. This configuration may have had particular traction in the Germanic world, on the fringe of which Norway sits, where the science of biology was from its beginnings shaped by ‘romantic and holistic’ ideas, and where the term ‘biological’ connoted natural health as early as the 1890s (Stoff, Wahrig, and Schwerin 2013, 12). In this context, ‘biological’ agents had become ‘prototypes for ideas of naturalness and purity’ and could protect ‘bodies from deficiencies and so-called diseases of civilization and that simultaneously enable utopian visions of human enhancement’ (Stoff, Wahrig, and Schwerin 2013, 2, 12).

In agriculture, this alignment of biologic with nature and health had the potential to express ideas of nature as some real and constant quality as opposed to an artificial man-made environment. Biodynamic methods of production, by which Larsson at first took Simponi to have been produced, were developed during the early 20th century as one approach within the broader movement of so-called ‘organic’ or ‘ecological’ farming. Its proponents professed that their agricultural products were cleaner, safer and more nutritious, advocating a return of the ‘over-civilised man’ to a state of harmony with nature (see e.g., Paull 2011, 26). The anthroposophical teachings of Rudolf Steiner, the Austrian thinker who formulated the principles of biodynamic agriculture, had and continue to have substantive following in Norway, not only concerning agriculture but also pedagogy.⁶

When Larsson and Barlien made sense of ‘biologics’ in opposition to other pharmaceuticals, the term had been placed in opposition to ‘chemical’ and

6 Among many other public figures, Jens Stoltenberg, the prime minister at the time of Larsson’s hospitalisation, who was also publicly enacting a role as rheumatic patient (see Fig. 4), was educated in a Steiner or Waldorf School (Stoltenberg 2016).

'synthetic' for at least a century, valued as either dangerous or healthy. When US legislators made products of human and animal origin a separate pharmaceutical domain; when Lackenbach proposed the term 'biologics' to label that domain; when Ehrlich combined 'chemo' with 'therapy' and Steiner 'bio' with 'dynamic'; when Waksman suggested the term 'antibiotic'—they were all tinkering with analogies and oppositions as part of a large project of semantics. Struggling to make sense of her 'biologics' by combining and recombining meaningful elements, Larsson was a *bricoleur* in a world of *bricolage*.

This is not to say that 'biologics' or 'bio' was always associated either with health or with unhealth. For instance, when the terms 'biomedicine' and 'biopsychosocial' gained currency during the 1960s and 1970s, or when Michel Foucault from the mid-1970s introduced his concepts of 'biopower' and 'biopolitics', these neologisms drew their meaning neither from association with health, nature or the good, nor from associations with microbes or death. In the last decades of the 20th century, however, the semantic configuration where 'bio' is associated with nature, health and the good seems to have become more productive, as human-induced ecological damage have put 'nature' on contemporary agendas more than ever before (Braun and Castree 1998, 3).

The values attached to terms such as 'antibiotics' and 'chemotherapy' have also changed, troubling their associations with health. Materially, decades of exaggerated antibiotics use have brought about the spectre of multi-resistant bacteria, turning solution into problem (Orzech and Nichter 2008). Semantically, the term 'antibiotics' has become contrasted with (health-bringing, harmonising, natural) 'probiotics' (see Lorimer 2020). The term 'chemotherapy' has similarly disconnected from Ehrlich's initial meaning, and come to equate with cytotoxic cancer treatment (see DeVita and Chu 2008, 8643), and associate with deadly disease and devastating side effects. At the same time, distinctions on which established bio-imaginaries relied have been challenged. Biotech, both as technology and as semantic formation, undermines the bio/chemo binary (see Gradmann 2013, 199). While diseases increasingly have come to be conceptualised as 'autoimmune' (Cohen 2017), the human body has come to be seen both as more embedded in nature (Martin 1998) and as molecular (Myers 2015). Finding middle ground between the 'natural' and 'technological', or sidestepping the binary altogether, have become commonplace strategies for navigating bodies, medicine, and health (Ford 2020a). It is in the midst of trends leading there that the label 'biologics' narrowed from labelling the entire group of products to which mabs belonged, to specifically designating these new therapies, thus precipitating a conceptual and semantic change in the field of rheumatology.

Up until the introduction of mabs as ‘biologics’, anti-rheumatic drugs were conceptualised as ‘chemical’ or ‘synthetic’. After their introduction, it became possible to see the most recent advances in anti-rheumatic treatment as aligned with nature. Importantly, applying the label ‘biologics’ to mabs thus underpinned understandings of these pharmaceuticals as *both* natural (e.g., ‘biodynamic’ and ‘super-ecological’) and technologically advanced (e.g., ‘inflammatory cascade’ and ‘a shower of small substances’; see also Myers 2015). Similar to how homeopathy in Calcutta could come forward as a *hypermodern* alternative to biomedicine (Ecks 2014, 56–57,110), mabs could come forward not as a continuation of or improvement on established rheumatological treatments, but as an alternative fundamentally distinct and *sublime* (cf. Glabau 2019). Mabs as ‘biologics’ can be visualised as both natural and hypermodern through semantic dichotomies like these:

biological	:	chemical
natural	:	artificial
healthy	:	unhealthy
'biologics'	:	other drugs / chemotherapy
probiotics	:	antibiotics
hypermodern	:	modern
future	:	past

Figure 3: Semantic configurations by which mabs as ‘biologics’ can be understood as both ‘natural’ and ‘hypermodern’, and thus draw meaning from ideas of both a pre-modern past and an imminent future. Illustration by the author.

The developments amidst which mab medications were introduced as biologics were suffused with environmental and ecological concerns. These concerns were not new, but increasing perceptions of tension between human activity and the preservation of Earth as an inhabitable planet had raised the stakes. After the introduction of mabs in 1998, such concerns have continued to rise. For people subscribing to these ideas, ‘human fingerprints are everywhere and everything humans do has consequences for the natural world’ (Malhi 2017, 93). Fundamentally, these ideas place an emphasis on individuals’ actions and responsibilities (Latour 2017, 38). When one’s consumer choices can be construed as determining one’s moral position in relation to entities like ‘nature’ or ‘the earth’, negotiating ‘ethical’ or ‘sustainable’ consumer practices can be challenging. For pregnant people—whose consumer choices also need to answer to the perceived needs of an unborn child—pressures to make ‘ethical’ and ‘sustainable’ consumption choices can be paralysing (Ford 2020b, 18; see also Ravn 2004, 102; MacKendrick 2010). Enter ‘ecological’ and ‘nature-based’ therapies. By promising

safety both for the individual consumer and for their environment, ecological imaginaries answers to such combined obligations. The labelling of mabs as ‘biologics’—and concomitant associations with ‘biodynamic’, ‘ecological’, or the ‘natural’—makes it possible for people to see these therapies as sharing ‘ecological’ products’ potential for generalised well-doing. Like the label ‘ecological’ generally works to justify higher prices in other consumer products, the label ‘biologics’ may also work to justify the high costs of mab treatments, costs which in themselves may contribute to producing the treatment as valuable, i.e., safe and efficacious. A person’s choice to accept mabs as ‘biologics’ can in other words draw fervour from deeply-felt moral and identity-shaping meanings (cf. Glabau 2016). For a person in Larsson’s situation, deciding on Simponi alongside fish oil and ‘natural’ food supplements may therefore be a position carefully negotiated for themselves and their baby in a more-than-human world. Giving up such a position might seem a costly decision.

Local efficacies: Nature, health, and nation

During my fieldwork in the ward, I once asked hospital pharmacist Gregersen what she thought about the labelling of mabs as ‘biologics’. She responded that in her experience, people ‘feel perhaps that it adds something that is more natural to their body’. Calling mabs ‘biologics’ may allow people to think of antibody-based pharmaceuticals as something ‘more natural’. However, as imageries of health and nature are everywhere articulated in different and specific ways, what it means to have ‘something that is more natural’ added to one’s body will vary accordingly. It is worthwhile to remain with Larsson’s Norwegian context and detail how the label ‘biologics’, by attaching mabs to specific configurations of ‘nature’, may allow people to tinker distinctively local pharmaceutical effects (cf. Hardon and Sanabria 2017, 127).

As in other Western countries, belief in the power of nature and its applicability to healing has been manifest in Norway at least since the 19th century, and underpinned by the notion that ‘humans have distanced themselves too much from Nature’ which they have consumed and polluted (Alver and Selberg 1992, 213). Living ‘in harmony with Nature’ has long been perceived as the solution to many health problems (Alver and Selberg 1992, 213, 203). Furthermore, when mabs were introduced into rheumatology at the turn of the millennium, associations between health and nature were drawn upon not only by *naturleger* (nature doctors), but also the public health services and other state-sponsored initiatives. For example, a so-called *grønn resept* (green prescription) was introduced in 2003 as a means to have patients engage in supposedly health-bringing outdoor activities (Kristiansen and Wisløff 2003). Nature was construed as a health resource both in alternative medicine and in official health policies.

During the decades leading up to the introduction of mab therapies, regular physical activity had been the backbone of disease management in ankylosing spondylitis (AS) in addition to paracetamol and NSAIDs. In 2012, international guidelines still pointed to physical activity as an essential part of the management of the disease. In Norway, this would often translate to physical activities in forest or mountain terrains.⁷ For many AS patients, such exercise was much of the time sufficient for controlling their disease, and pharmaceuticals were often deemed unnecessary (see Fig. 4).



Figure 4: A forest of symbols. Jens Stoltenberg was prime minister at the time of Larsson’s hospitalisation, and diagnosed with AS. Lending himself to the promotion of regular outdoor exercise as the non-pharmaceutical pillar of AS treatment, he was on several occasions, as in this article from April 2013, portrayed in media as keeping his disease ‘in check’ by regularly exercising, in particular skiing, in the woodlands that surround the capital. Doing so, he conflated international recommendations for the management of AS with the Norwegian notion of *friluftsliv*, while posing for political legitimacy (Rasmussen 2013, reproduced with permission from Se & Hør).

In the Norwegian setting, physical activities performed outdoors could take on complex meanings: while following from medical advice, they conflated international recommendations for the management of AS with the Norwegian notion of *friluftsliv* (‘free-air life’ or ‘open-air life’ in English). Sitting at the junction of Norwegian nature and health imaginaries, *friluftsliv* arguably functions as a key symbol in Norwegian everyday life (see e.g., Ween and Abram 2012), its ideologies being adopted and its practice also promoted by the Norwegian state. A recent white paper, *Friluftsliv — Natur som kilde til helse og livskvalitet* [Nature as a source for health and quality of life] (MCE 2016) describes *friluftsliv* as ‘an important part of the government’s public health policy’, and calls for an increased

7 One interlocutor who had also received rheumatic care within the British NHS said that in the UK, by contrast, ‘the recommendation is often a cup of tea or having a pint at the pub.’ The only walks she recalled having been recommended were short walks to the local pub.

use of ‘nature and *friluftsliv*’ in preventive health (MCE 2016, 9). While the Norwegian topography makes nature-as-outdoors accessible even for people living in urban settings, the private citizen’s right to freely roam this wilderness has also been legally secured through the concept of *Allemannsrett* (‘the everyman’s right’, see Gullestad 1997, 26). Adding to this close relation of nature-as-outdoors to health, Norwegian nature imaginaries and outdoor practices are core elements of Norwegian national identity (Ween and Abram 2012, 2; Gullestad 1997, 22). In this sense, there is a Norwegian nature-health-nationalism where notions of nature, health and Norwegianness are mutually constituted and reinforced. Trekking and cross-country skiing are means both of maintaining health and of performing Norwegianness. The forests that can be privileged places for keeping rheumatic disease in check are, quite literally, forests of symbols, and trips into these forests can themselves condense multiple meanings. Calling mabs ‘biologics’ and thinking of them as ‘more natural’ may connect mabs to such salient local articulations of nature, health and nation. Like *friluftsliv* activities, mabs as ‘biologics’ can be made sense of as a nature-based means of controlling a rheumatic disease, and understood as a pharmaceutical ‘green prescription’ that offers people a sense of being ‘in harmony with Nature’ (Alver and Selberg 1992, 213), without having to engage in outdoors activities.

While thinking of mabs as natural will always have implications for the kind of mabs which are rendered plausible, in a Norwegian setting associating ‘biologics’ with nature implies that ‘mabs’ are to be understood within a symbolic landscape where nature is an ‘indisputable good’ (Alver and Selberg 1992, 208), associated with health and nation, and contrasted with unhealth, and at times with the foreign and alien (Broch 2022). The mutual constitution of notions of nature, health and Norwegianness seems in fact to indicate that people who subscribe to these ideas and attitudes cannot as easily associate the natural or the national with unhealth or danger as they can associate it with health and safety. In their ‘struggle to grasp the world’ (cf. Barth 1987, 87), they may instead be inclined to imagine ‘biologics’ as good and aligned with values associated with national identity, while anything synthetic—like the NSAIDs and paracetamol that gave Larsson ulcers and stomach aches—can more easily be understood as alien and potentially harmful. Situated semantics like these may have contributed to rendering plausible Anna Larsson’s initial understanding of ‘biologics’—that which prevented her from making sense of Simponi and Enbrel’s harmful potentials. The strong connection that the term ‘biologics’ creates between mabs and local nature symbolism may also partly explain why stories of serious side effects of mabs may be difficult to formulate, or why, in the words of the patient representative I quoted in the introduction, ‘you’re merely getting the sunshine stories’ of mab therapy. In certain contexts, some pharmaceuticals facts may be harder to conceive.

Conclusion: ‘Biologics’, bricolage and pharmaceutical knowledge-making

This article has focused on the label ‘biologics’ as applied to mab medication, and on the case of one patient, Anna Larsson. By showcasing how individuals may go about using a label to produce pharmaceuticals as safe and efficacious, it has made a case for pharmaceutical labels, categories and classes in the ‘symbolic economy of drugs’ (Lentacker 2016). Taking pharmaceutical knowledge to be the imaginaries that people create and apply to make sense of pharmaceuticals, the article furthermore situates pharmaceutical knowledge production in the individual’s creative struggle to make sense of things pharmaceutical. As one such individual, Anna Larsson made and unmade her understanding of mabs in response to changing circumstances and needs. Doing so, she took part in an economy of knowledge where other individuals had manipulated the same signs to create meanings suiting their own perceived needs. Her case thus also offers a model of the patient, positioned right at the centre of pharmaceutical knowledge production, not as passively receiving but as a *bricoleur* in a world of *bricolage*.

A label like ‘biologics’ harbours no explanation but carries a multiplicity of possible meanings and associations, which can be drawn on by individuals in their making of pharmaceutical knowledge. While the term ‘biologics’ may open an array of differently valued meanings, the label’s application to mabs appears to bring to the fore associations with ‘nature’, of ‘natural health’. I have argued that the connection the label ‘biologics’ mediates between mabs and imaginaries of the natural draws a second layer of meanings into play. The knowledge that results as different individuals seek to render mabs cosmologically meaningful may align mab treatment with culturally salient notions such as clean living, ecological agriculture, environmentalism and nationalist notions of the good life—locally, or even privately.

Authorship statement

The article was conceived and written in its entirety by the author.

Ethics statement

All data were handled and kept according to the rules of the Norwegian Data Protection Authority.

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