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Inflammable object lessons: sustaining "life without a gut" on home parenteral nutrition

Hana Porkertová[1] & Tereza Stöckelová[1]✉

Providing a detailed sociological case study of "life without a gut", this article de-essentialises the gut as fundamental to metabolism and health, and de-fetishises the value of "real food" as a universal good. The study draws on qualitative research into the biosocial life story of Martin, who, since childhood, has lived on home parenteral nutrition (HPN), a technology that bypasses the digestive system by delivering nutrients directly into the bloodstream. It examines efforts to manage Martin's "fire gut" through biomedical interventions, scrutinises HPN as a fluid object, and investigates the essential role of specific biosocial compartmentalisations of metabolism required for making HPN as safe and functional as possible. To explore the complex enactments of "life without a gut", the analysis draws on the social topology of objects within (post-)actor-network theory, which demonstrates how maintaining objects' identities may rely on reassembling the relations that constitute them rather than preserving their rigid forms. The study introduces an original concept of "the inflammable object" to articulate the modalities of life on HPN that are sustainable in the long term. In conclusion, the article reflects on the analytical potential of "inflammability" beyond this case and considers how it may help theorise the mode of modernity we currently live in.

[1] Institute of Sociology of the Czech Academy of Sciences, Prague, Czech Republic. ✉email: tereza.stockelova@soc.cas.cz

Introduction

Recent advances in research on the gut and especially the gut microbiome have not only transformed how gastrointestinal and metabolic processes are understood in the life sciences (e.g., Shreiner et al. 2015) but have also attracted substantial attention in the social sciences and the humanities (e.g., Benezra, 2023; Friis 2023; Hobart and Maroney, 2019; Stöckelová, 2021; Wolf-Meyer, 2024). Connections have been drawn between the microbial life of the gut—its quality, diversity, and ecology—and various bodily functions in humans. It has been suggested that the gut microbiome plays a key role in immunity (Hooper et al. 2012) and significantly influences various ailments and disabilities, ranging from Crohn's disease (Gevers et al. 2017; Hedin et al. 2017) to Autism Spectrum Disorder (Sharon et al. 2019) and psychiatric conditions (MacQueen et al. 2017; Lucas, 2018).

These research findings coincide with and feed into a growing awareness of, and concern about, the collateral damage to biodiversity and human health caused by the modernisation of agriculture and food production in the 20th century. Within the discourse emphasizing how humans are entangled in wider ecologies, the gut is theorised as "the largest portal between the inside of the body and the world around us" (Marya and Patel, 2021), situating it at the intersection of human and planetary health.

But what happens when this portal poses a lethal threat to life rather than supporting it? In the present study, we investigate a case in which the gut had to be disconnected from metabolic pathways and from "real food" to sustain life. What biosocial and sociomaterial reassembling does such a disconnection of the gut require? How does it challenge the taken-for-granted assumptions about digestion and metabolism? To answer these questions, we detail here the biosocial life story of a young man we call Martin, who, since the age of two and a half, has been living with severely malfunctioning intestines, which made him dependent on parenteral nutrition.

People may need parenteral nutrition for various reasons, sometimes only temporarily, but often upon starting they receive it for the rest of their lives. What they all have in common is the inability to use their intestine for proper food digestion. For some reason, their gut refuses to participate in metabolising food sufficiently, and the only viable solution for these people is to infuse all or some essential nutrients directly into their bloodstream, bypassing the digestive system [Fig. 1]. While the method was developed in the 1960s, shortly thereafter, attempts were made to move parenteral nutrition into the home setting. Medical advances in the late 1980s and early 1990s ensuring safer central venous access and the greater availability of nutrient substrates, expanded home parenteral nutrition (HPN) worldwide (Hurt and Steiger, 2018), which is also the case in Czechia, where Martin and his family live.

By examining life without a gut—or, as we will argue, life with an "absent present" gut—we aim to reveal not only which metabolic relations, taken for granted by most of us, must be disconnected but also which new ones must be established and maintained. These reassemblings require opening some of the "black boxes", shifting attention to the materiality of the gut itself. Rather than employing the gut as a metaphor to spark broader discussions, we engage directly with the bodily flesh of the intestines, reworked through various technologies and biomedical interventions.

Making the gut visible, audible, tangible, and knowable

To date there have been only a handful of social science studies on home parenteral nutrition. Pascal Lehoux studies HPN along with other home-use technologies to discuss the broader context of high-tech home care (Lehoux et al. 2004) and to explore how the "patient's view" is co-constructed in focus groups (Lehoux et al. 2006). Smith et al. (1993) centred their study on HPN and highlighted the need for more comprehensive education of caregivers regarding not only the technical and emergency-related aspects of HPN but also emotional and social support.

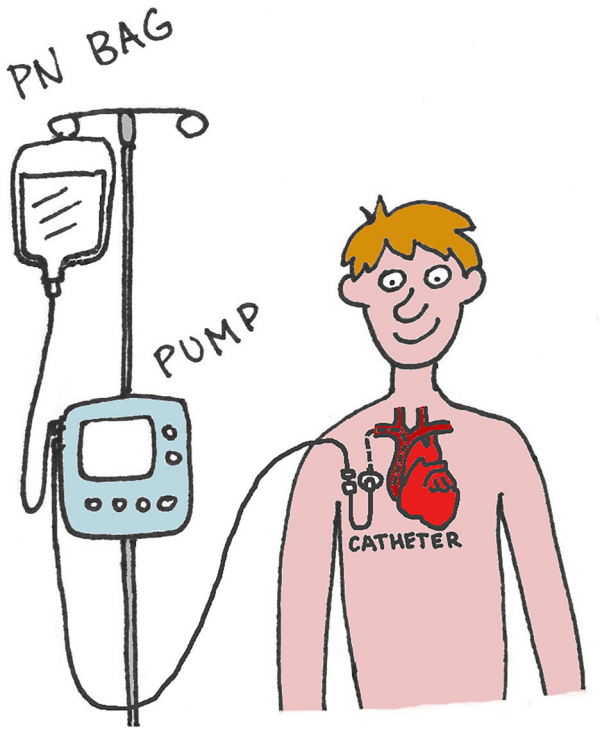

Fig. 1 Sketch depicting the process of parenteral nutrition (PN). Author: Hana Porkertová.

Unlike these studies, our research not only investigates life with HPN but also pays attention to the gut and metabolism. Our study is inspired by the praxiographic approach developed by Annemarie Mol (2002) in her study of atherosclerosis conducted in a Dutch hospital. Practices—rather than meanings or feelings—are the focus of the investigation. A praxiographer "stubbornly takes notice of the techniques that make things visible, audible, tangible, knowable" (Mol, 2002, p. 33). Mol described how she listened to a research participant "as if he were *his own ethnographer*. Not an ethnographer of feelings, meanings, or perspectives. But someone who tells how living with an impaired body is *done* in practice" (Mol, 2002, p. 15, emphasis in the original). Following this approach, we draw on research interviews and collected documentation to engage with the physicality and agency of the gut and HPN and the sociomaterial practices they put in motion.

To empirically trace and theorise Martin's gut and metabolism as enacted through HPN, we build on concepts developed in Science and Technology Studies. Our analysis draws on investigations into the social topology of objects within (post-)actor-network theory, with particular attention to how the plasticity of HPN enables it to maintain its topological identity and effectively deliver essential nutrients to the body while supporting the best possible quality of life. Specifically, we engage the concepts of "fluid" and "fire" objects (de Laet and Mol, 2000; Mol and Law, 1994; Law and Singleton, 2005).

The notion of fluidity was introduced by Mol and Law (1994) to describe objects that, unlike "immutable mobiles" (Latour, 1987), maintain coherence and functionality not in spite of but

because of their mutability. Fluid objects are neither scientific facts established solely through controlled, costly technoscientific networks, nor are they technologies whose design and ownership are enforced by patents (de Laet and Mol, 2000). Nonetheless, their agency remains relatively predictable, as their changes are gradual rather than abrupt, allowing for modest, incremental interventions.

In contrast, fire objects are much more unpredictable and agential. They are prone to changing their shape abruptly and with brute force, transforming the patterns of presence and absence that constitute them. Law and Singleton (2005) described the alcoholic liver disease they encountered during their fieldwork in northwest England as "much more dynamic, more sporadic, less predictable, and, yes, more discontinuous than is suggested by the metaphor of flow. This is why it is a fire object for us: it lives in and through the juxtaposition of uncontrollable and generative othernesses" (Law and Singleton, 2005, p. 347).

Although the "life without a gut" that we aim to depict has some fluid as well as fire characteristics, we propose and develop the concept of the "inflammable object" to express the inflammable quality of living on HPN, which also pertinently echoes the biomedical concept of inflammation, a process and state that, in Martin's case, may be rather easily triggered. While Martin's absent present gut is obscure, dislocated, and unpredictable, and there is always a lurking risk of a fatal failure, unlike a fire object, it can be domesticated and lived with relatively sustainably for a long period of time.

While the concept of the inflammable object emerged from our inductive engagement with specific ethnographic data, we suggest it can be used as well to capture and make sense of realities other than a life without a gut. In fact, we argue that the quality of inflammability is becoming increasingly significant in today's world, characterised by substantial instability, unpredictability, and dislocation. The notion of flammability encapsulates how, even if life appears to proceed as usual, we sense tipping points in the air—moments with the potential to fatally disrupt "normality". Consider global events such as the recent financial and geopolitical crises, the COVID-19 pandemic, and the heatwaves, fires, and storms driven by escalating climate instability. These events can be understood as instances in which inflammable objects ignite into full-blown crises.

Inflammability is not the only term we use that bridges the social sciences and medicine. We also pay special attention to various modes of compartmentalisation. In clinical research and biomedicine, fluid compartmentalisation describes the separation and regulation of bodily fluids into distinct compartments to maintain homoeostasis and proper physiological function. A less common but equally relevant notion of metabolic compartmentalisation refers to the spatial and temporal separation of metabolic pathways and components.

Landecker (2023) argues that while the concept of metabolism in the social sciences and humanities has mostly been used to draw attention to the entanglements of entities and (their) environments, pointing to the incessant (ex)change of matter, compartmentalisation is an equally important process that enables life. It is the functional metabolic compartmentalisation that is disrupted by the modern industrialisation of metabolism, which involves significant transformation of agriculture and food production systems, as well as factory shift (night) work. Excessive porosity is the danger.

Although compartmentalisation has received little attention in the social sciences, we argue that it may represent a missing link between substances and complexity—one that must be examined and attended to in the processes of reassembling and sustaining life. By exploring the complex enactments of life without a gut, we respond to calls for empirically grounded theorisation and refrain from an uncritical celebration of flows and entanglements (cf. Landecker, 2023; Roberts, 2017). Thus, we rehabilitate the need for certain purifications of processes and categories, an urge characteristic of modernity according to Latour (1993), while acknowledging that, rather than being inherent, they have to be actively achieved.

First, we investigate the effort to tame Martin's fire gut through a set of biomedical compartmentalisations. We focus on the attempts made by physicians and parents to understand and manage Martin's gut, including various medical examinations and trials conducted to decipher its unpredictable agency, preferences, and its (in)compatibility with different foods and liquids. We then analyse the fluid nature of HPN and the indispensable role of various compartmentalisations of metabolism through HPN in order to make it as safe and functional as possible. We trace how Martin's metabolism is enacted when the gut is bypassed by parenteral nutrition, initially in and later outside the hospital, and what metabolic techniques and extensions are required for "life without a gut". We borrow the notion of "life without a gut" from the name of a patient association of people living on HPN in Czechia. The association was set up in 2008, nearly thirty years after HPN was introduced in the country, and since 2012 it has been headed by Martin's parents. Finally, by conceptualising Martin's metabolism as an inflammable object, we show how, with the constant work of relational reassembling, flare-ups can be kept at bay. In conclusion, we consider the analytical potential of the concept of inflammability beyond the present case and how it may be used to theorise the mode of modernity we currently live in.

Methods and data

The case study presented in the article is part of an ongoing research project titled "Technocultures of Extended Metabolism", which examines the biosocial metabolic processes and practices of people living with obesity, diabetes, and parenteral nutrition. Following the principles outlined by Roberts and Sanz (2018), who call for "a synthetic, symmetrical analysis" (p. 749) of social science and biomedical data, we conduct "bioethnography" in collaboration with the Centre for Research on Nutrition, Metabolism, and Diabetes at the Third Faculty of Medicine, Charles University to interrogate in detail the biosocial nature and conditioning of metabolic health. We draw on the concept of the biosocial as developed by Mauricio Meloni and colleagues that highlights how "biological matter itself […] irremediably social, not only in its form but also in its content. And vice versa: the very fabric of sociality is always enabled, mediated, and modulated by fleshy substrates […]. At all levels, the biological and the social are *in* one another" (Meloni et al. 2018, p. 5, emphasis in the original; on interdisciplinary biosocial collaboration see Pentecost et al. 2024).

The tip for the first participant in our study on HPN came from one of the clinical researchers on our team, Jan Gojda, and we then used snowball sampling to recruit other participants. To date, our study of HPN consists of 22 interviews with representatives of the patient association "Life without a Gut", patients, their families, and health professionals, amounting to 46 h and 21 min of recorded material, along with ethnographic observation in a clinic, at medical congresses, and patients' home. We also analysed official webpages and documents, including medical guidelines, guides for patients and the public, medical reports, personal notes, binders, notebooks, and photographic documentation. Each fieldwork was then thoroughly reflected upon in a report that served not only as field notes but also as a methodological reflection on the ongoing research. Although we have not interviewed Martin himself, we have met him, and he is

aware of this research and agrees with his mother talking with us about their metabolic compartment. To learn essential information on HPN, the social science part of the team underwent training, which was conducted by their colleagues from the field of biomedical research, who also provided feedback on this article.

While the research interviews were originally designed to be semi-structured, some evolved into a more unstructured format. This was the case of the interview with Vlasta, whose son's gut troubles led his parents to become actively involved in the patient association. She has been an incredibly resourceful guide, supplying us with details. She has, in fact, been an ethnographer—or praxiographer (Mol, 2002)—of Martin's gut since the onset of his problems dating back to 2007. Besides telling their story in great depth, she has kept detailed diaries and photographic documentation of the metabolic processes, biosocial relations, and sociomaterial practices engaging Martin's gut, which she was generous enough to share with us.

Although the participants' names were changed, the patient association is the only one focused on HPN in Czechia, which means it is not difficult to identify it, along with our participants. However, the participants were informed about this and were asked to authorise the excerpts from the interviews used in the article. Moreover, the story of Martin's gut has already been presented by Vlasta and the association in various contexts, used as an illustrative, paradigmatic case (Flyvbjerg, 2006) of life on HPN for educational and activist purposes. In this particular study, it serves as both an exemplary and an extreme case rich in information (Flyvbjerg, 2006) and foregrounds the simultaneous processes of compartmentalisation and the entangling of (human) metabolism.

The fire gut: domestication trialled and failed

Vlasta greets Hana with a pile of notebooks—eight notebooks representing eight years of her and her son Martin's life on home parenteral nutrition. Later, during the interview, she shows Hana another pile of materials—a thick stack of binders. "This is Martin over the last seventeen years", she says.

Seventeen years ago, when Martin was just two and a half, Vlasta did not need such notebooks and binders. But suddenly, something did not seem right with his gut. Vlasta's mother, a registered nurse, said, "This is not what a stool looks like. You must do something about it". Unfortunately, the senior doctor at their regional hospital did not acknowledge these concerns, claimed Martin's symptoms were just common gastroenteritis that would pass in a week, and called Vlasta hysterical. But the "gastroenteritis" persisted, and Vlasta did not calm down; instead, she fought to get recognition that there was something seriously wrong with her son's intestines. With the help of his GP, Martin obtained a medical examination from specialists in Prague, who suspected he had coeliac disease—a diagnosis later confirmed by tests. It was then that Vlasta began recording Martin's (food) intake and (stool and urine) output in notebooks.

It was at that point that, through efforts to soothe it, Martin's gut became an object of presence, absence, and absent presence. Law and Singleton (2005, p. 342) note that, ontologically speaking, any presence always implies a set of absences. Certain ingredients and substances that need to be present or absent to ensure that the gut functions properly can be identified through laboratory tests. Martin was found to be gluten-intolerant, and for a while, a gluten-free diet indeed helped to stabilise him. He enjoyed his food, and his stools looked normal again, suggesting that the cause had been identified and the problem solved. However, this lasted for only six weeks before his gut began acting up again.

Merely eliminating gluten was no solution, as Martin's intestine proved to be a *fire object* of "discontinuity between absence and presence" (Law and Singleton, 2005, p. 331). He ceased to be able to tolerate food and he vomited and had diarrhoea twenty to thirty times a day. It was impossible to know or predict what he should eat, what he should avoid, and how the presence or absence of specific foods related to the behaviour of the gut. Once again, Martin and Vlasta ended up in the regional hospital. Although Vlasta had adhered to a strict gluten-free diet and showed her notebook to the doctor as proof, she was accused of slipping something with gluten to Martin on the side, something absent from the notebook that she had completed with meticulous care. After a week in the hospital, during which Martin became too weak to walk, and following tough negotiations with the doctor, who still considered her hysterical, Vlasta arranged for Martin to be transferred to a Prague hospital at the last minute. There, he was immediately connected to 24/7 parenteral nutrition.

The notebooks that Vlasta showed Hana at the beginning of their second interview represented more than just the years of Martin's disobedient gut. They also demonstrated the effort and labour that Vlasta had been putting into finding the cause of the troubles and then managing them. Looking at one of the notebooks, she described it as follows:

> This is the oldest one, when no one had any idea what was going on. The notebook was my helper from the beginning. I'd write down everything that happened in the hospital that day. So here, we still see the number of teaspoons of potatoes with boiled chicken, 100 ml of Neocate [medical food for children with an allergy to cow's milk protein], dried banana. Well, that lasted about a month, and then, in February, came the last day he received anything by mouth. I wrote down what he ate and how much, everything was measured, everything was weighed, so these are the figures of how much he consumed. Here, he was already only on water. And the second column shows the amount of anything that came out of him, whether stool or urine, its colour and consistency. Essentially, you can look back and see the inputs and outputs.

Vlasta's records of inputs and outputs align with a perception of metabolism as a factory, which Landecker (2013) attributes to the industrial era. In this paradigm, the autonomous body converts food into energy, functioning as a "human engine" whose disorders are described as "inborn errors". Although different metabolisms may function at different speeds, metabolism is seen as a universal mechanism across all life forms, which allows organisms to live as free and autonomous beings in the environment external to them (Landecker, 2013). Whatever goes beyond the clear-cut, linear processes of a "factory for the conversion of substrates" (Landecker, 2011, p. 167) is othered. Consequently, when Vlasta told us: "I'd write down *everything* that happened in the hospital that day", she was not mistaken. She indeed wrote down all the critical information on the type and amount of Martin's nutritional input and output that the medical staff worked with. As Viktor, a clinical researcher in our research team, told us during one of our team meetings, the idea of metabolism as a factory persists in biomedicine to today because, in many instances, it is a useful conceptual model that "simply works". But not for Martin.

In his case, the problem could not be addressed solely through the "input/output" logic, and the seemingly essential relationship between an organism and its food, pivotal for the factory model of metabolism, had to be disconnected. Instead, a closed loop of parenteral nutrition was created that would bypass Martin's gut and make common, oral food absent. Yet, despite the note from

the head of the paediatric department that "there is something wrong, he looks healthy when he doesn't eat, while after eating, he's almost dead", there was still hope that, eventually, Martin would be able to accept or at least tolerate an oral diet.

This could only be achieved with the aid of highly controlled and compartmentalised clinical trials that tried to manage his gut's various absences and presences. Landecker (2022, p. 129) highlights that "the human gut is a great example of the importance of compartmentalization", which can be extended beyond the gut itself to describe the metabolic relations that needed to be reassembled to keep Martin alive. Specific "compartments" refer to an "intentional ordering of boundaries" (Landecker, 2023) so that biological processes, scientific research, and medical examinations can take place. During the clinical trials, Martin's food consisted only of specific items, separated from each other so that the gut's reaction could be easily traced. With Vlasta's assistance, the doctors tried giving Martin small amounts of cooked carrots, grated carrots, or baby food purees. Nothing else. But within two hours, his belly would swell by ten centimetres, his intestinal passage would become blocked, and he would start vomiting. The doctors would therefore stop and try something else two weeks later. Believing that Martin might be swallowing air while eating with a spoon, he was administered the carrots through a feeding tube to ensure a clear separation between food and air. However, his belly still swelled by 10 to 12 centimetres. After being released home, Martin and Vlasta would return to the hospital monthly for new two-week trials.

Despite all the efforts and monitoring, these feeding trials aimed at taming Martin's wild gut failed. Although the digestive system may seem like an object with clear-cut boundaries and is easily dismantled in a laboratory for various tests, none of these compartmentalisations worked. Like the alcoholic liver disease that Law and Singleton (2005) described as a fire object, Martin's gut was methodologically and epistemologically "a more or less unknowable mess" (Law and Singleton, 2005, p. 334). As Vlasta remarked, it is not even certain whether the troubles stem from the intestine itself or from nerve connections and innervation, or whether some other "external" factors are affecting the intestine. "The gut just behaves oddly, and no one really knows why", she says. Ultimately, finding a primary cause ceased to be a priority, and Martin was eventually given the label of having intestinal pseudo-obstruction syndrome, which is characterised by symptoms and signs of intestinal obstruction without any physical blockage (DeGiorgio et al. 2011). It is an absent present obstruction that can occur at any time without any obvious cause and that needs to be constantly taken into account.

Consequently, as a fire object, Martin's gut could not participate in his metabolism, and between the ages of two-and-a-half and five, Martin relied solely on PN. Then, doctors attempted to compartmentalise the gut through a series of surgical procedures that involved disconnecting the large and small intestines, suspecting that the large intestine was the primary cause of malfunction. However, even this approach failed, and the large intestine, remaining stretched and non-functional, had to be surgically removed and topped with a stoma.

The fact that Martin's gut withdrew from his metabolism did not mean, however, that it was absent from his body. When nothing passes through it, the gut begins to atrophy and becomes more prone to inflammation. Thus, Martin's new doctor suggested that he start attempting oral ingestion again after three years of relying solely on PN. Landecker (2011) highlights current scientific research that views metabolism as a regulatory interface configured by the environment and conceptualises "food as exposure", where the epigenome and the body's physiology are shaped by food, which goes beyond the notion of food as merely fuel or substrate. In Martin's case, the primary purpose of enteral nutrition was to bring the gut back to presence in order to resist atrophy and inflammation, thus using food to shape the body's physiology, rather than just using it as fuel. But this time, it was done differently than before, minimising trial and error—just enough food to keep the gut alive but not too much to ignite it.

Special nutridrinks specifically formulated for people with severe gastrointestinal issues to reduce intestinal strain are utilised for this purpose. Unlike dietary recommendations promoting food diversity to support the gut microbiome (Spector, 2024), cautioning against ultra-processed foods (Lane et al. 2024), and connecting food to local soils and seas (Marya and Patel, 2021), nutridrinks are characterised by precise, laboratory-formulated composition that includes a long list of ultra-processed ingredients, such as whey protein from cow's milk, maltodextrin, vegetable oils, sugar, soy protein isolate, acidity regulator, colouring, and so on. The content of nutridrinks is highly standardised and different packages vary only in flavour (ranging from fruit to coffee flavours). In fact, it is the uniformity and meticulous standardisation that is their greatest advantage. They are designed to prevent diversity and exposure to the unknown. This meant that Martin experimented not with different types of food but only with its quantity, starting with 2 or 3 millilitres a day, which was gradually increased to 600–800 millilitres. These nutridrinks not only maintained the gut's presence to keep it active but also allowed Martin to gradually reduce the parenteral nutrition he received from 18 to 13 hours a day.

The fact that highly processed and standardised nutridrinks are the best food for Martin underscores that the notion of what constitutes "good food" is always a specifically situated and relational issue (Cuj et al. 2021; Mol, 2021). As Roberts (2017) shows, bottled soda, which is often an ultra-processed drink, may be preferable in contexts where simple tap water is unreliable and easily contaminated. Moreover, the goodness of food need not only be an individual issue. In the context of the Anthropocene and the current size of the human population on Earth, some environmentalists, such as George Monbiot (2023), argue for the need to switch to highly industrialised ways of producing proteins, such as precision fermentation or cultivated meat. The "real food" that may be the best option for an individual eater can be harmful to collective humanity and planetary ecosystems because of their unsustainable production methods requiring extensive land use.

Fluid nutrition: bypassing the gut with (H)PN

Given the closed loop of Martin's compartmentalised gut, the ordering of boundaries established through surgeries and stomas, and his ingestion of strictly laboratory-controlled food via parenteral nutrition and specialised nutridrinks, the modernist factory model analogy of metabolism may seem apt. But this would be far from accurate. In fact, Martin's metabolism, enacted by parenteral nutrition, visibly demonstrates metabolism's extended nature, as it makes apparent a broad spectrum of metabolic relations that spread far beyond the human body as understood in modern biomedicine. Though extreme and assembled differently, and perhaps in a more controlled manner, Martin's case dramatically highlights the industrial character of contemporary metabolic exchanges common to all, exemplifying the recent biomedical conceptualisation of metabolism as a regulatory zone in dialogue with environmental stimuli (Landecker, 2013). Not only Martin, but all of us are "eating besides ourselves" (Paxson, 2023).

The most apparent extensions characteristic of HPN are physical ones. Although nutrients go directly into the bloodstream, bypassing the longest organ in the human body, their journey is actually far from short. The essential equipment that ensures the

process includes a central venous catheter, parenteral nutrition bags and solutions, an infusion pump, and a pole or backpack. However, this is only a tiny fraction of all the equipment involved, as each of these items has extensions that depend on the skilful management of various presences and absences.

Operating a central venous catheter, leading to a large central vein, requires the use of strictly aseptic procedures, which depend further on other indispensable equipment—hand sanitiser, sterile gloves, disinfectant, dressing and dressing kits, syringes and needles, flush solutions, and a dedicated space that can be kept sterile. Because Martin also has a stoma, which sometimes leaks, sterile aluminium foil must be used to cover it when redressing the catheter. Whereas for oral eaters, food contamination and poisoning are at most an annoyance that lasts a few days, in the case of parenteral nutrition any contamination is life-threatening. The "entry point" itself, called "venous access", is a potential site for sepsis.

Furthermore, only six sites can be used for such access—four on the upper body and two in the groyne—and they are extremely delicate. Once a catheter site is compromised, that precious venous access is permanently lost. When only two sites remain, an intestinal transplant—a highly complex surgery with an uncertain outcome—is considered. For this reason, it is only pursued as a last resort. Aseptic procedures must therefore ensure that the spatial and temporal reordering of boundaries is secure. They compartmentalise particular aspects of HPN to eliminate various exposures (cf. Shrum et al. 2020) that could compromise HPN and cause irreversible damage. Therefore, as evident in Martin's extended metabolism, compartmentalisation does not constitute the opposite of extension but is rather an essential aspect of it. Without compartmentalisation, the extensions lack stability, resulting in uncontrolled and potentially deadly growth (cf. Deleuze and Guattari, 2005).

Compartmentalisation and separation from exposure to anything that could lead to an infection requires a great effort to achieve. Since administering HPN is a key activity that needs to be done with each new bag, adult patients are trained to do it for themselves, while in the case of children it is the parents who carry out this work—making it not only "parenteral" but truly "parental" nutrition. Nowadays, patients can go home after they complete the official training (cf. Lehoux et al. 2004) and are approved as having acquired the necessary skills by an attending physician and the head of the department. If they are unable to do everything themselves, a home care agency will manage it for them. Nevertheless, despite following all the rules and procedures, the threat of sepsis is always there, always present.

The central venous catheter is connected to solution bags with nutrients containing water, amino acids, and fats through tubing that is between a few decimetres to several metres in length. But it is not just the physical components that are long and complicated. Administering and processing HPN also takes a considerable amount of time. Although standardised and highly processed food is usually meant to save time spent on cooking and eating, this is not the case with parenteral nutrition. During oral food intake, nutrition goes through several compartments, and while the eating itself can take just a few minutes, the metabolising processes take much longer. However, when nutrients flow directly into the bloodstream, their metabolisation begins instantly, and the length of infusion corresponds to the metabolic state after enteral eating. This ensures that the body can absorb and utilise the nutrients and that metabolic complications such as imbalances or fluid overload that can compromise the liver are avoided.

So far, we have skipped one essential component that comes between the bag and the central venous catheter: the infusion pump. Nowadays, Martin has an advanced model that uses a motorised mechanism to deliver the nutrient solution from the bag to the catheter, which works in any position. However, things were quite different in 2007, as the infusion pump had to be carefully vertically aligned and monitored by a drip sensor that would detect each drop infused through the catheter. During Martin's initial hospitalisation, this literally kept him (and Vlasta) locked in the hospital room for many long weeks. The feeling of being stuck was further exacerbated by the fact that they stayed in a room designed for potentially suicidal patients—the window was barred, and the doors could not be opened from the inside. Mobility was sacrificed in favour of ensuring that the apparatus securing nourishment remained immutable.

Out of despair and a longing for sunlight, Vlasta began experimenting with making Martin's parenteral nutrition a bit mobile so they could go out into the hospital yard. She treated the infusion pump as a *fluid object* (de Laet and Mol, 2000) that has to be changed to stay the same. To achieve this, Vlasta had to carefully handle the various presences and absences that the pump was designed to monitor. With the help of a girl who shared a room with Martin, she managed to outsmart the drip sensor that was programmed to trigger an alarm in the case of a vertical misalignment. Inspired by a mobile pump that Vlasta found on the internet, they took the pump and the bags off the pole—an important part of the original HPN configuration—and placed the pump into a rucksack and hung the bags on it (Figs. 2, 3). Unlike fire objects that change in jumps and discontinuities, absences and presences related to fluid objects can be controlled and managed much better. However, the changes had to be made very gently and carefully, to avoid any abrupt actions (cf. de Laet and Mol, 2000).

In the shadow of night at the hospital, so no one could see them, Vlasta and the girl opened up the "black box" (Pinch and Bijker, 1987) of the infusion apparatus and created what Vlasta called a "home-made mobile pump". To maintain the drip flow and avoid triggering the alarm, she had to keep the apparatus in the correct position by "walking like a robot". But it worked, and in her effort to get her child moving, she managed to make her walking so stable and still that, for the sensor, her movement was absent. The next morning, she was able to tell the doctor that she had managed to get the pump into a rucksack and asked if they could go outside. At first, he was unable to imagine how this setup could work. But when Vlasta demonstrated everything to him, he just sighed and said, "What am I supposed to do with you? We can't keep you indoors anymore", and he agreed to try it again on the weekend when the clinic's management was not around.

Therefore, when using "technology-in-practice" (Timmermans and Berg, 2003), both absence and presence had to be considered not only in order to adjust the mechanical setup but also to include and avoid certain people. Fortunately, when the head of the clinic accidentally saw them with the pump in the rucksack one day, even he got excited, and he approved their "home-made" pump. Vlasta then discovered that the hospital has infusion pumps that allow the drip sensor to be turned off. Although this was risky, as it was then impossible to monitor the presence of dripping, taking on this risk immensely improved Martin's quality of life on (H)PN nutrition (see Kirk et al. 2024; Saqui et al. 2014). "Even his back was smiling", one of the nurses remarked, commenting on Martin's visible change in mood. From then on, Vlasta and Martin formed an extended, occasionally even physical, "metabolic compartment", connected by the two-metre tube that linked the heavy nutrition bags and infusion pump, which Vlasta or her husband carried in the rucksack, to the central venous catheter that led into Martin's bloodstream. The term "compartment" reflects not only their assemblage-like character but also the history of the various biomedical, spatial, and temporal compartmentalisations that have shaped it.

Fig. 2 Martin's father, Adam, with a parenteral nutrition bag. Author: Vlasta.

Fig. 3 Martin connected to his father through a tube. Author: Vlasta.

Inflammable metabolism: reassembling the biosocial

Since the onset of Martin's troubles, Vlasta and Martin have formed a closely integrated metabolic compartment. She has become a key agent in the gentle relational reorderings—characteristic of fluid objects (de Laet and Mol, 2000)—constantly striving to ensure the best possible quality of life for her son. These reorderings do not take place in a stable external environment, but in a processual, relational, and situated environmentality (Formosinho et al. 2022), such as the hot weather in which Martin's uptake of hydration increases. However, living on HPN can still easily ignite a fire that jumps from place to place in a creative, destructive, and more or less unpredictable manner (Law and Singleton, 2005).

We conceptualise metabolism through HPN as an *inflammable object*—not merely as an inter-topological interference (Law, 2002), that is, as the confluence of fire and fluid topologies, but as an articulation of the specific *capacity* to catch fire. Our attention to flammability echoes the way inflammation is currently positioned in biomedical research as a key explanatory factor for many chronic diseases prevalent in industrialised countries, including mental, metabolic, and postviral conditions. In such models, the biophysical and psychosocial substance of human life is understood in terms of socially formatted, human-made alterations to food, air, water, sleep patterns, and other factors—factors that do not remain external to the body as mere context but manifest through multiple entry points as the setting of physiological processes.

Closely engaging with biomedical research, Landecker (2024a) retains the term *inflammatory* to describe the relationship between the metabolic milieu and bodily responses resulting in inflammation. In contrast, we propose the term *inflammable* to conceptualise more than bodily assemblages characterised by imminent flammability—assemblages that can suddenly become *fire objects*, abruptly changing shape and transforming patterns of presence and absence. Living on HPN highlights the ongoing processes that keep these assemblages in a smouldering, volatile state. To be managed and domesticated, HPN must be treated as *inflammable*, not only by those living on it, but also by their physicians and companions.

Aware of the inflammable nature of HPN, which not only necessitates a gentle reordering but also requires the prevention and extinguishing of fires, Vlasta immediately began studying the vital information right after their first hospitalisation. She said, "The first thing you do is study your own child". She has since become an active partner in collaborative decision-making regarding her son's medical treatment (Brotherton et al. 2007; MacKean et al. 2005; McKenna et al. 2010) and her engagement in biomedical research (Armstrong, 2011; Gardner and Cribb, 2016; Liberati et al. 2015). In a study on children with cochlear implants, Mauldin (2016) observed that implantation is not a stand-alone surgical event but rather a processual entanglement of medical interventions and family life. Mothers, in particular, are deeply involved in therapeutic interventions, which is also Vlasta's case. She studied the worst-case scenarios related to having a stoma and administering parenteral nutrition, so when Martin's gut started to protrude from his abdomen just six weeks after the stoma was created, she already knew what it was and what to do:

> I knew it was a prolapse and that I should put wet, ideally sterile, gauze on it and head to the hospital. I knew I didn't want to call an ambulance because it would take much longer than just putting him in the car and driving the 10 kilometres. I knew what to do, and it wasn't an immediate emergency—there was no blood. But on the other hand, I knew I couldn't show it to my husband because he would have likely collapsed in the garden. So, I just […] I told him,

> "Put down the chainsaw, go wash up, we're going to the hospital". "Why?" "You don't need to know. You just need to know that we're leaving in five minutes". And he didn't ask any questions. […] In the car on the way to the hospital, I told him that our son had a stoma prolapse, but he had no idea what I was talking about. I used the medical term so that he wouldn't understand it right away.

Since Vlasta's husband cannot stand the sight of blood, he does not have nearly as much medical knowledge as his wife, and Martin's fire gut frightens him. In some situations, biomedical notions such as "stoma prolapse" and aspects of Martin's embodiment are best kept black-boxed for him. Nevertheless, as a person educated in the law, he has other important competencies for reassembling HPN, such as the ability to negotiate with health insurance companies.

It is not just the mechanical configuration of HPN that alters in order to adapt to the changeable environmentality and Martin's gut, "but also the practices that produce its success" (Law and Singleton, 2005, p. 338). These practices often go against the established norms and lead to further reassemblings, extensions, and alterations of presences and absences. HPN may even shake up the established order of a hospital, as Martin's nourishment does not cease to be *home* parenteral nutrition even when it is relocated to a hospital setting. When Martin was once hospitalised with laryngitis, Vlasta immediately informed the healthcare professionals that his parenteral nutrition was "her business", demonstrating her experiential authority (Nelson et al. 2023). Moreover, she resolutely negotiated and reassembled the entire admission process to ensure that Martin could skip the emergency waiting room and avoid sharing space with kids who had various infections that could easily ignite Martin's smouldering inflammation.

Therefore, in order to live on HPN well and sustainably, it is crucial to create relations where previously there were none, like physically attaching a person to external catheters, tubing, pumps, and bags, studying vast amounts of information and worst-case scenarios, and creating contacts and allies that one can mobilise. At the same time, what typically sticks together must be disconnected to prevent particular exposures—a child and their food, microbes and nutrition, a pump and drip sensor, or kids sharing the same hospital waiting room. The constant work of relational reassembling ensures that, with tremendous effort and great determination, the fires in and around Martin can be domesticated. However, there is there is always the risk that things will go awry and fires will flare up. Thus, the inflammable object embodies both the *potentiality* of suddenly erupting in fire and the *possibility* of somehow maintaining control and preventing a fire from breaking out and causing irreversible damage.

The precautions that need to be taken relate not only to present exposures but also to future ones. Let us return to the notebooks that Vlasta showed Hana during their second meeting. They not only represent Martin's gut and the immense efforts his mother has been putting into managing her son's troubles, recording everything that might be important, but they also work as vehicles of Martin's extended metabolism that allow him to be mobile. When Martin and his family go on a holiday, they need to bring along more than just the things that are directly involved in administering parenteral nutrition. The paperwork is equally important. Vlasta takes the most recent binder with her, which contains essential medical information about Martin's HPN, along with the latest medical reports, results, and hospitalisations, listed in chronological order. Additionally, Martin needs a card with crucial instructions for HPN management, including a note that this can be managed by his parents even in a hospital, all confirmed by his attending physician. These documents cover various medical and legal procedures—to bypass the intestines, all sorts of alternative relations need to be assembled.

These documents also have a significant temporal dimension, allowing the substantial history of Martin's gut and his life on HPN to be brought into the present. M'charek (2014, p. 29) criticises topological accounts of objects, including fire objects and fluid objects, for "not provid[ing] us with a way to understand their historicity" and for being "timeless, motionless pictures rather than things that change over time". However, Martin's—and Vlasta's—binders actually do "gather heterogeneous spaces and temporalities together", as M'charek (2014, p. 33) would expect from what she conceptualises as "folded objects", which embody history and make it visible.

Inflammable objects are not only "folded" but they also mitigate the fear of exposure. In their study of the 2014 Ebola epidemic in Western Africa, Shrum et al. (2020) argue that epidemics are fire objects that "generate locative fears through encounters that focus attention on entities that are unknown or imprecisely known, transforming spaces and humans into indeterminate dangers, alternating appearance and absence" (p. 707). While HPN itself can become infected, it cannot infect others. Yet, the inflammability of HPN transforms it into an indeterminate danger that generates locative fears, because if something goes wrong, a solution needs to be found. Consequently, parents of children on HPN often struggle to get schools to admit their children. And in Martin's case, even the regional hospital in his area was apparently afraid of being exposed to HPN and sent six people in three ambulances to his home when he was sick with laryngitis. The historicity in the binders then makes HPN less unknown, and it not only provides clues to what exposures to avoid and what to pay attention to in the case of an emergency, but also offers evidence that flare-ups have been successfully extinguished before and can be again.

The documents alone, though, are not enough to create relations that can be mobilised in case of *future* events. To find places where the documents can be of use, it is necessary to identify in advance (and preferably to contact) a nearby hospital that can take care of the patient. Vlasta laughs, saying that, because of this, they have only ever travelled to Poland and Slovakia, two neighbouring countries where she can make herself understood. But Martin's own current plans are much bigger than that. Together with his older brother, he is planning a trip to Japan.

"I almost fainted. This is going to be like severing the umbilical cord", Vlasta tells us with a trembling voice. In her relationship with her son, several physical cords had to be cut. Not only the umbilical cord, but also that of Martin's parenteral nutrition in Vlasta's backpack. Several years ago, thanks to the great efforts of the patient association as well as physicians specialising in HPN, a certified mobile pump that patients like Martin can carry on their own was introduced in Czechia. Nevertheless, Vlasta has even then remained present or at least absent-present and ready to intervene whenever needed. But an imaginary cord leading halfway across the world is too long, so even this one needs to be cut to let a now adult Martin and his brother set out on their own.

Conclusion

In this paper, we detailed the case of "life without a gut" with the aim of de-essentialising the gut and its microbial life as a fundamental part of human metabolism and health, and, relatedly, to de-fetishise "real food" as a universal good. Life without a gut, or rather with an absent present gut, is precarious and demanding. But it is achievable and it can be a good life that generates new relations and potentialities. It is certainly not a life without *guts*. And, importantly, such a life is possible not only because of the attention provided by relatives and doctors but also thanks to

sophisticated biomedical technologies. It is a life enabled by modern technoscience.

As Landecker (2023) notes, the spatial and temporal metabolic compartmentalisation in and of the intestine, enacted by gut microbiota, is vital for the proper functioning of any body. In Martin's case, however, the labour of metabolic compartmentalisation is not executed by microbes. On the contrary, contact with microbes represents a fatal threat. The technoscientific extensions of metabolism that bypass the gut require sophisticated spatial arrangements and the use of chemical substances to rigorously ensure separation, purification, and sterility. These compartmentalisations have to be made a routine part of a daily nutritional practice that involves not only Martin and his parents but also the pharmacist who prepares his personalised nutrition bags in a dedicated sterile space. The specific compartmentalisations that HPN requires are rather unique and, in a way, contrast with the current emphasis on the multispecies nature of digestion and the human as a holobiont co-constituted by (gut) microbiota (Gilbert, 2014). Consequently, Martin's particular case underscores that there is no universally good mode of extending and compartmentalising metabolism.

To conceptualise the metabolic assemblage that enables Martin to live, we proposed the notion of the inflammable object. The search for a new concept arose from our analytical unease with understanding the metabolic assemblage solely in terms of fluidity, which can be regulated by making cautious and gentle changes, and fire, which is elusive, spreads, and jumps uncontrollably, requiring immediate and sometimes even harsh action.

We suggest that in social—or, for that matter, biosocial—studies of medicine, the notion of the inflammable object may be especially useful for conceptualizing the processes of chronic inflammation and studying them ethnographically. While chronic inflammation does not pose an acute threat to a person's life or severely compromise its quality in the short term, it is likely to contribute to serious medical problems in the long run. For instance, chronic inflammation plays a significant role in the development of atherosclerosis, which is the build-up of plaques in the arteries. This can result in heart attacks and strokes (Hansson, 2005; Libby et al. 2002). Persistent inflammation can also lead to DNA damage and promote an environment that supports the growth and survival of cancer cells, like the colorectal cancer associated with inflammatory bowel disease (Grivennikov et al. 2010). As Mantovani and colleagues (2008, p. 436) put it, "'smouldering' inflammation in the tumour microenvironment has many tumour-promoting effects". We suggest that as well as inscribing itself into the body, the history of inflammation may—and should—also be inscribed in documents and other materials that help to control it and to prepare for acute (fire) emergency events.

Chronic inflammation is often considered an effect and symptom of modern civilisation (cf. Marya and Patel, 2021), related to the industrialisation of food and dietary patterns, a sedentary lifestyle, stress, and exposure to toxins. As Landecker (2024b, p. 1), argues "the fallibility of knowledge—from unanticipated consequences to wicked problems—is too generic to fully grasp the nature of the living within reconfigured biotic-abiotic relations in the aftermath of industrialization". She proposes an analytic of "anthropogenic biology", specifically addressing the relations between knowledge and life in the wake of the industrial twentieth century. In view of this, and also the many "tipping points" tangible in the current geopolitical and geosocial climate (Stein Pedersen et al. 2019), we suggest that the present condition of the Earth's "critical zone", inhabited by humans and their kin forms of life (Latour and Weibel, 2020), and shaped by all-pervasive industrialisation, may be conceptualised as inflammable.

Bauman (2000) described "solid modernity" as a period marked by stable and predictable social structures, later characterising modernity in the 1990s as liquid in order to emphasise the constant change and fluidity of social relationships, identities, and institutions. We argue that while there is no return to stability, the changes we are now experiencing are not merely constant. They are energetically smouldering, with the potential to flare up into something abrupt, unexpected, and destructive. We suggest that we now live in a time when these embers cannot be readily extinguished. Regardless of whether we continue to refer to the present era as modernity, we suggest we have much to learn from Martin and his social, technical, and chemical metabolic allies about how to keep the smouldering inflammables at bay.

Data availability

The datasets generated and analysed in this study are not publicly available, as participants did not consent to data sharing with third parties. The data are securely stored on the protected drive of the Institute of Sociology, Czech Academy of Sciences. Upon reasonable request, the original Czech excerpts used in the article may be available from the corresponding author, pending additional consent from the research participants.

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References

Armstrong D (2011) The invention of patient-centred medicine. Soc Theory Health 9:410–418. https://doi.org/10.1057/sth.2011.13
Bauman Z (2000) Liquid modernity. Polity Press, Cambridge
Benezra A (2023) Gut anthro: An experiment in thinking with microbes. University of Minnesota Press, Minneapolis
Brotherton A, Abbott J, Hurley M et al. (2007) Home enteral tube feeding in children following percutaneous endoscopic gastrostomy: perceptions of parents, paediatric dietitians and paediatric nurses. J Hum Nutr Diet 20:431–439. https://doi.org/10.1111/j.1365-277X.2007.00811.x
Cuj M, Grabinsky L, Yates-Doerr E (2021) Cultures of nutrition: classification, food policy, and health. Med Anthropol 40(1):79–97. https://doi.org/10.1080/01459740.2020.1826475
De Giorgio R, Cogliandro RF, Barbara G et al. (2011) Chronic intestinal pseudo-obstruction: clinical features, diagnosis, and therapy. Gastroenterol Clin North Am 40(4):787–807. https://doi.org/10.1016/j.gtc.2011.09.005
de Laet M, Mol A (2000) The Zimbabwe bush pump: mechanics of a fluid technology. Soc Stud Sci 30(2):225–263
Deleuze G, Guattari F (2005) Thousand plateaus. University of Minnesota Press, Minneapolis
Flyvbjerg B (2006) Five misunderstandings about case-study research. Qualitative Inq 12(2):219–245. https://doi.org/10.1177/1077800405284363
Formosinho J, Bencard A, Whiteley L (2022) Environmentality in biomedicine: microbiome research and the perspectival body. Stud Hist Philos Sci 91:148–158. https://doi.org/10.1016/j.shpsa.2021.11.005
Friis T (2023) One time my gut and psyche talked to each other. Ph.D. thesis, University of Copenhagen. https://researchprofiles.ku.dk/en/publications/one-time-my-gut-and-psyche-talked-to-each-other
Gardner J, Cribb A (2016) The dispositions of things: the non-human dimension of power and ethics in patient-centred medicine. Sociol Health Illn 38(7):1043–1057. https://doi.org/10.1111/1467-9566.12431
Gevers D, Kugathasan S, Knights D et al. (2017) A microbiome foundation for the study of Crohn's disease. Cell Host Microbe 21(3):301–304. https://doi.org/10.1016/j.chom.2017.02.012
Gilbert SF (2014) A holobiont birth narrative: the epigenetic transmission of the human microbiome. Frontiers in Genetics. https://doi.org/10.3389/fgene.2014.00282
Grivennikov SI, Greten FR, Karin M (2010) Immunity, inflammation, and cancer. Cell 140(6):883–899. https://doi.org/10.1016/j.cell.2010.01.025
Hansson GK (2005) Inflammation, atherosclerosis, and coronary artery disease. N. Engl J Med 352(16):1685–1695. https://doi.org/10.1056/NEJMra043430
Hedin CR, van der Gast CJ, Stagg AJ et al. (2017) The gut microbiota of siblings offers insights into microbial pathogenesis of inflammatory bowel disease. Gut Microbes 8(4):359–365. https://doi.org/10.1080/19490976.2017.1284733

Hobart HJ, Maroney S (2019) On racial constitutions and digestive therapeutics. Food, Cult Soc 22(5):576–594. https://doi.org/10.1080/15528014.2019.1638120
Hooper LV, Littman DR, Macpherson AJ (2012) Interactions between the microbiota and the immune system. Science 336(6086):1268–1273. https://doi.org/10.1126/science.1223490
Hurt RT, Steiger E (2018) Early history of home parenteral nutrition: from hospital to home. Nutr Clin Pract 33(5):598. https://doi.org/10.1002/ncp.10180
Kirk C, Mathers J, Pearce M et al. (2024) Factors that impact on the quality of life of intestinal failure patients treated with home parenteral nutrition: protocol for a multicentre, longitudinal observational study. BMJ Open 14:e082163. https://doi.org/10.1136/bmjopen-2023-082163
Landecker H (2011) Food as exposure: nutritional epigenetics and the new metabolism. Biosocieties 6(2):167–194. https://doi.org/10.1057/biosoc.2011.1
Landecker H (2013) Postindustrial metabolism: fat knowledge. Public Cult 25(3):495–522. https://doi.org/10.1215/08992363-2144625
Landecker H (2022) The five things I thought about this year. Jahrbuch 2021/2022. Wissenschaftskolleg zu Berlin
Landecker H (2023) Metabolism is not a metaphor. WCCEH Annual Public Lecture. Available via: https://www.youtube.com/watch?v=W68Tbdbl7wk. Accessed 2 Feb 2024
Landecker, H (2024a) How the social gets under the skin: from the social as signal to society as a metabolic milieu. Köln Zeitschrift für Soziologie und Sozialpsychologie. https://doi.org/10.1007/s11577-024-00951-5
Landecker H (2024b) Life as aftermath: social theory for an age of anthropogenic biology. Science, Technology, & Human Values. https://doi.org/10.1177/01622439241233946
Lane MM, Shutong D, McGuinness AJ et al. (2024) Ultra-processed food exposure and adverse health outcomes: umbrella review of epidemiological meta-analyses. BMJ 384:e077310. https://doi.org/10.1136/bmj-2023-077310
Latour B (1987) Science in action: how to follow scientists and engineers through society. Harvard University Press, Cambridge
Latour B (1993) We have never been modern. Harvard University Press, Cambridge
Latour B, Weibel P (2020) Critical zone: The science and politics of landing on Earth. MIT Press
Law J (2002) Objects and spaces. Theory, Cult Soc 19(5–6):91–105. https://doi.org/10.1177/026327602761899165
Law J, Singleton V (2005) Object Lessons. Organization 12(3):331–355. https://doi.org/10.1177/1350508405051270
Lehoux P, Saint-Arnaud J, Richard L (2004) The use of technology at home: what patient manuals say and sell vs. what patients face and fear. Sociol Health Illn 26(5):617–644. https://doi.org/10.1111/j.0141-9889.2004.00408.x
Lehoux P, Poland B, Daudelin G (2006) Focus group research and "the patient's view". Soc Sci Med 63(8):2091–2104. https://doi.org/10.1016/j.socscimed.2006.05.016
Libby P, Ridker PM, Maseri A (2002) Inflammation and atherosclerosis. Circulation 105(9):1135–1143. https://doi.org/10.1161/hc0902.104353
Liberati E, Gorli M, Moja L et al. (2015) Exploring the practice of patient centered care: the role of ethnography and reflexivity. Soc Sci Med 133:45–62. https://doi.org/10.1016/j.socscimed.2015.03.050
Lucas G (2018) Gut thinking: the gut microbiome and mental health beyond the head. Microb Ecol health Dis 29(2):1548250. https://doi.org/10.1080/16512235.2018.1548250
MacKean GL, Thurston WE, Scott CM (2005) Bridging the divide between families and health professionals' perspectives on family-centered care. Health Expect 8(1):74–85. https://doi.org/10.1111/j.1369-7625.2005.00319.x
MacQueen G, Surette M, Moayyedi P (2017) The gut microbiota and psychiatric illness. J Psychiatry Neurosci 42(2):75–77. https://doi.org/10.1503/jpn.170028
Mantovani A, Allavena P, Sica A et al. (2008) Cancer-related inflammation. Nature 454(7203):436–444. https://doi.org/10.1038/nature07205
Marya R, Patel R (2021) Inflamed: Deep medicine and the anatomy of injustice. Farrar, Straus and Giroux, New York. ebook
Mauldin L (2016) Made to hear: cochlear implantation and raising deaf children. University of Minnesota Press, Minneapolis, London
M'charek A (2014) Race, time and folded objects: the HeLa error. Theory, Cult Soc 31(6):29–56. https://doi.org/10.1177/0263276413501704
McKenna K, Collier J, Hewitt M et al. (2010) Parental involvement in paediatric cancer treatment decisions. Eur J Cancer Care 19:621–630. https://doi.org/10.1111/j.1365-2354.2009.01116.x
Meloni M, Cromby J, Fitzgerald D, Lloyd S (2018) Introducing the new biosocial landscape. In: Meloni M, Cromby J, Fitzgerald D, Lloyd S (eds) The Palgrave handbook of biology and society. London, Palgrave Macmillan UK, p. 1–22
Mol A (2002) The body multiple: ontology in medical practice. Duke University Press, Durham and London
Mol (2021) Eating in theory. Duke University Press, Durham
Mol A, Law J (1994) Regions, networks and fluids: anaemia and social topology. Soc Stud Sci 24(4):641–671. https://doi.org/10.1177/030631279402400402
Monbiot G (2023) Regenesis: feeding the world without devouring the planet. Penguin, London
Nelson RH, Moore B, Lynch HF et al. (2023) Bioethics and the moral authority of experience. Am J Bioeth 23(1):12–24. https://doi.org/10.1080/15265161.2022.2127968
Paxson H (ed.) (2023) Eating besides ourselves. Duke University Press, Durham
Pentecost M, Keaney J, Moll T et al (eds) (2024) The handbook of DOHaD and society: past, present, and future directions of biosocial collaboration. Cambridge University Press
Pinch, T, Bijker WE (1987) The social construction of facts and artefacts: or how the sociology of science and the sociology of technology might benefit each other. In: Bijker WE, Hughes T, Pinch T (eds) The social construction of technological systems: new directions in the sociology and history of technology. The MIT Press, Cambridge, p. 21–22
Roberts EFS (2017) What gets inside: violent entanglements and toxic boundaries in Mexico City. Cult Anthropol 32(4):592–619. https://doi.org/10.14506/ca32.4.07
Roberts EFS, Sanz C (2018) Bioethnography: A how-to guide for the twenty-first century. In: Meloni M, Cromby J, Fitzgerald D et al (eds.) The Palgrave handbook of biology and society. Palgrave Macmillan, New York, p. 749–775
Saqui O, Fernandes G, Allard JP (2014) Quality of life analysis during transition from stationary to portable infusion pump in home parenteral nutrition patients: a Canadian experience. Crit Care Nutr 29(1):131–141. https://doi.org/10.1177/0884533613516129
Sharon G, Cruz NJ, Kang D et al. (2019) Human gut microbiota from autism spectrum disorder promote behavioral symptoms in mice. Cell 177(6):1600–1618. https://doi.org/10.1016/j.cell.2019.05.004
Shreiner AB, Kao JY, Young VB (2015) The gut microbiome in health and in disease. Curr Opin Gastroenterol 31(1):69–75. https://doi.org/10.1097/MOG.0000000000000139
Shrum W, Aggrey J, Campos A et al. (2020) Who's afraid of Ebola? Epidemic fires and locative fears in the Information Age. Soc Stud Sci 50(5):707–727. https://doi.org/10.1177/0306312720927
Smith CE, Moushey L, Marien L et al. (1993) Family caregivers' perceptions of important knowledge and skills needed for managing total parenteral nutrition in the home. Patient Educ Counsel 21(2-3):155–164. https://doi.org/10.1016/0738-3991(93)90054-9
Spector T (2024) Food for life: The new science of eating well. Jonathan Cape, England
Stein Pedersen JV, Latour B, Schultz N (2019) A conversation with Bruno Latour and Nikolaj Schultz: reassembling the geo-social. Theory, Cult Soc 36(7-8):215–230. https://doi.org/10.1177/0263276419867468
Stöckelová T (2021) Life according to ZOE: The promises and limits of studying more-than-human uniqueness. In: Janečková H, Jakalová Z (eds) Multilogues on the Now 4: On glands, membranes and cavities, Display, Prague, pp. 16-33
Timmermans S, Berg M (2003) The practice of medical technology. Socio Health Illn 25:97–114. https://doi.org/10.1111/1467-9566.00342
Wolf-Meyer MJ (2024) American disgust: racism, microbial medicine, and the colony within. University of Minnesota Press

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Author contributions

H.P. conducted the fieldwork. T.S. and H.P. wrote and revised the main manuscript text. Both authors reviewed the manuscript.

Competing interests

The authors declare no competing interests.

Ethical approval

This research was approved by the Research Ethics Board of the Institute of Sociology of the Czech Academy of Sciences (approval no. SOÚ-384_3/2024; approval date: 1 October 2024) and by the Ethics Committee for Multi-Centric Clinical Trials of the University Hospital Královské Vinohrady (approval no. EK-VP/54/2024; approval date: 6 November 2024).

Informed consent

Consent for the use of the interview, including authorisation of quoted excerpts and photographs, as well as for the publication of this article, was granted by Vlasta—the sole interviewee cited in this study—on 21 March 2025. Underscoring our commitment to a processual ethics approach to social research, we provided Vlasta with an extended Czech-language summary of the article's content and main arguments to enhance transparency and minimise the risk of misrepresentation.

Additional information

Correspondence and requests for materials should be addressed to Tereza Stöckelová.

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