Commentary

Vaccines Revisited: The Case Against "Natural Immunity"

Caroline C. Rodgers[1]

1. Independent researcher

This commentary challenges the notion that natural infection builds immune resilience, arguing instead that infections deplete three core physiological systems: mitochondrial energy production, proteostatic balance, and neuroimmune regulation. Vaccines deliver the same immunological information at a fraction of the biological cost. Common sources of vaccine hesitancy — including the debunked autism association, concerns about adjuvants and preservatives, and distrust rooted in early manufacturing failures — are addressed in light of current evidence. Measles is examined as a case study illustrating how natural infection can destroy existing immune memory, leaving children vulnerable to a broad range of secondary infections. RNA vaccine platforms are presented as biologically elegant tools that confer protection without viral replication or metabolic burden. The manuscript concludes that vaccination is not a departure from nature but an extension of it, offering protection without injury across both individuals and communities.

Corresponding author: Caroline C. Rodgers, caroline.rodgers@rocketmail.com

Introduction

For generations, a quiet assumption has shaped how many people think about childhood illness: that surviving infections is a kind of biological training, a rite of passage that strengthens the immune system through adversity. It's a worldview rooted in "survival of the fittest," where each fever is a test that leaves a child tougher than before. But biology tells a different story. The immune system does not grow stronger by enduring repeated infections – each major infection is a whole-body event that does not build capacity but consumes it. The intuition is ancient; the biology is modern – and the two no longer align.

 doi.org/10.32388/E1GCTW

The appeal of “natural immunity” rests on a partial truth: surviving an infection does leave behind an immunological memory, providing the tools necessary to quickly quell the same pathogen when it is next encountered. But the cost of acquiring this information is high – days or weeks of metabolic diversion, tissue damage that must be repaired and the risk of serious complications. Vaccines provide the reference material without the metabolic or inflammatory cost.

Every infection draws on the same three biological pathways the body uses to maintain health: mitochondrial energy production, proteostatic balance, and neuroimmune regulation [1]. These pathways are finite. When a pathogen forces the body into high-intensity inflammation, a predictable sequence of events engages these pathways in rapid succession, as follows:

- **MITOCHONDRIA ALERT (Minutes)** As soon as a pathogen is detected, mitochondria shift from powering normal physiology to coordinating immune defense. Pattern-recognition receptors trigger interferons and cytokines within minutes [2], and these pyrogenic signals induce fever, raising the hypothalamic set point and increasing metabolic demand [3]. Mitochondria release mtDNA and reactive oxygen species (ROS), amplifying immune signaling [4]. This diversion of mitochondrial output pulls energy away from cognition, mood regulation, and physical endurance.
- **PROTEOSTATIC STRESS (Hours)** As viral replication accelerates, the proteostasis network is overwhelmed by a surge of misfolded proteins and cellular debris [5]. Chaperones, proteasomes, and autophagy systems abandon routine maintenance to manage the crisis. This is the second major resource drain: the cell must repair or degrade damaged proteins instead of carrying out its normal housekeeping [6]. Clearance and tissue repair can continue for weeks after the infection resolves.
- **NEUROIMMUNE RESPONSE (Hours to days)** Circulating cytokines signal the brain, triggering the coordinated response known as sickness behavior: fatigue, cognitive slowing, reduced motivation, and social withdrawal [7]. This is not a psychological reaction but a regulated neuroimmune program that conserves energy for immune defense and tissue repair.

The only lasting benefit of an infection is the formation of immune memory — a small subset of B and T cells set aside as long-lived memory after the pathogen is cleared [8]. However, that benefit arrives only after the body has paid the full biological cost of “natural immunity.”

Long before vaccines existed, biology had already devised a way to give infants immunity without exposing them to the full cost of infection. Antibodies passed from mother to child – first through the

placenta, then via breast milk – provide short-term protection during the most vulnerable months of life [9]. This passive immunity does not build the infant's immunological "reference library" – it is a temporary bridge that soon dissolves so the child's immune system can start creating its own, personalized library [10].

The idea that immunity can be gained without enduring the full cost of infection is not new. It dates back to 1796, when Edward Jenner observed that dairy workers exposed to cowpox – a mild infection – were protected from smallpox, one of the deadliest diseases in human history. On May 14th of that year, he tested the idea by inoculating an eight-year-old boy with cowpox and later exposing him to smallpox – an experiment that would never be allowed with today's ethical standards [11]. When the boy remained healthy, it demonstrated that a mild exposure could provide the immune system with the information needed for protection — the foundational insight behind all vaccination.

Whereas the fitness value of "natural immunity" is a myth, characterizing vaccines as "heroic" is also wrong. The value of vaccines is in their restraint – in offering the immune system the information it needs without demanding the biological cost of acquiring it the hard way.

Vaccine fears

No discussion of vaccine concerns can begin without acknowledging the most persistent one: the belief that vaccination can trigger autism. This fear is rooted in timing, not biology. Autism traits often become evident in the second year of life — the same period when children receive several routine vaccinations — and coincidence has been mistaken for causation. Large, carefully conducted studies across multiple countries have found no association between vaccination and autism [12]. For every parent who says, "My child was fine until he was vaccinated and became autistic," there are millions who could just as truthfully say, "My children received all their vaccinations and remained healthy for years." The difference is that the second story is not told, because nothing frightening happened.

Concerns about vaccines often arise because they can trigger fevers and, very rarely, more serious reactions. These responses are real, but they are fundamentally different in scale and consequence from the metabolic storm of a full infection. A vaccine activates the immune system in a controlled, low-load way: enough to build the reference library of immune memory, but not enough to force the body into days or weeks of mitochondrial diversion, proteostatic overload, or inflammatory damage [13]. Natural infection delivers the same information at a vastly higher biological cost.

Another reason parents remain wary is that there were serious mistakes in the early history of vaccine manufacturing — contamination events, live vaccines that were either strong enough to cause disease or too weak to reliably prevent it, and inconsistencies in production that affected safety or effectiveness. These failures were not faults regarding vaccine efficacy; they were failures of early industrial processes, insufficient purification, limited regulatory oversight, and the primitive technology available at the time [14]. Acknowledging these events is important, but using them to reject today's vaccines — built with modern molecular tools, stringent quality control, and decades of accumulated safety data — while understandable, is ultimately a costly overreaction.

There are also concerns about the number and clustering of vaccines in early childhood. It is true that the schedule has expanded over the decades, but the biology has not changed: these injections do not infect children — they simply deliver information. Even in the most extreme example, the MMR vaccine, which protects against measles, mumps, and rubella in a single dose, the body is not fighting three infections at once -- it is receiving three sets of instructions on how to recognize three pathogens [15]. Mild reactions such as fever, fussiness, or achiness reflect this brief immune activation, not the metabolic storm that real infections would trigger. More noticeable reactions — such as higher fever or swelling of a limb — are uncommon but self-limited. One of the rarest reactions, a febrile seizure, is understandably frightening for parents, but it is triggered by the fever itself rather than the vaccine, and it is not known to cause lasting harm [16]. Separating the MMR into multiple visits does not reduce biological burden; it only increases the risk that children will miss doses and remain unprotected during vulnerable periods.

Some parents also worry about the preservatives or adjuvants contained in some vaccines, but these concerns often stem from misunderstandings about what these components do and where they are used. Thimerosal — an ethylmercury-based preservative used to keep multidose vials free of bacterial contamination — was removed from childhood vaccines more than twenty years ago, even though extensive research has found no evidence of harm beyond minor local reactions. Today, the only preservatives used in U.S. vaccines are phenol, 2-phenoxyethanol, or benzethonium chloride, and these appear only in a small number of vaccines not routinely recommended for children. Adjuvants, such as aluminum salts, are added to some vaccines to help the immune system notice the antigen, allowing for lower doses and fewer injections. They have been used safely for decades in quantities far smaller than what we ingest in food or water [16]. These components are tools for safety and effectiveness, not threats — and they are largely irrelevant to modern platforms like RNA vaccines, which contain no preservatives, no adjuvants, and no viral material at all [13].

RNA vaccines – an elegant adaption of nature's own machinery

Where there is fear regarding RNA vaccine technology, there should be wonder. RNA technology is not a manipulation of genes; it is a way to co-opt nature's own communication system. RNA is the molecule that cells already use to pass along temporary instructions — messages that disappear once they show immune cells how to identify a pathogen. It provides the immune system with important blueprint details. Nothing is altered, nothing is integrated, and nothing persists [13]. In short, there is no need to shoot the messenger.

RNA vaccines deliver reference material through transient instructions that train the immune system without forcing the body into a full-scale immune war, echoing the elegance of early maternal immunity. Because they rely on a genetic sequence rather than growing viruses in eggs or cell cultures, RNA vaccines can be designed in days and manufactured rapidly and at scale, making them both far faster and less costly to produce than traditional platforms. [13]

Measles: When 'natural immunity' backfires

Measles is the clearest example of why "natural immunity" is not a training exercise but a biological burden. When a child contracts measles, the virus does not simply cause a week of fever and rash — it attacks and destroys memory B cells, the very cells that store the immune system's reference library of past infections and vaccinations. Researchers call this immune amnesia – but erasure would be more accurate. After measles, children can lose 20-70% of their existing immune memory, leaving them newly vulnerable to diseases they had already overcome or been vaccinated against. Communities hit by measles outbreaks often see spikes in other infections for months to years afterward [17]. Vaccination prevents this entire cascade by preserving the immune library rather than burning it down.

This is why mortality figures alone tell only part of the story. Even in years when measles causes few recorded deaths, the virus leaves a long tail of harm. Beyond the well-known rare complications — pneumonia, encephalitis, deafness, and vision impairment [18] — measles triggers a prolonged period of immune vulnerability. Children who appear to recover fully still face increased risk from subsequent infections because their immune memory has been partially erased [17]. In communities with outbreaks, this secondary wave of illness often exceeds the direct toll of measles itself.

The biological cost runs even deeper. Measles drives the body into a high-intensity inflammatory state, pulling mitochondrial energy away from growth, cognition, and repair [17]. Inside infected cells, the virus creates proteostatic stress by flooding the cytoplasm with viral proteins and overwhelming the cell's quality-control systems [19]. At the same time, the immune system must rebuild the memory repertoire that measles has erased. This is not "training" — it is recovery from a biological fire.

Measles is unique in destroying immune memory outright, but the underlying pattern is not unique at all. Every major infection forces the body into the same emergency posture: energy diverted from development, protein-folding systems pushed to capacity, and immune circuits strained by the work of repair. Measles is simply the clearest expression of the principle that infections do not build resilience — they knock it down.

Vaccination prevents this entire cascade. It preserves the immune library, avoids the metabolic and proteostatic burden of infection, and protects children not only from measles but from the secondary vulnerabilities that follow. In this sense, the measles vaccine is not merely a shield against one virus — it is a safeguard for the entire immune system.

Discussion

The idea that childhood illness strengthens the immune system has endured because it feels intuitively true. Illness is visible; recovery is visible; and the child who emerges afterward appears tougher for having endured it. But in fact, infection draws on the same three pathways the body uses to maintain health — mitochondrial energy, proteostatic balance, and immune regulation. When a pathogen forces the body into high-intensity inflammation, energy and repair capacity are diverted. The very systems that should be supporting normal growth and repair are instead overwhelmed and pushed into defensive overdrive. What looks like "training" from the outside is, internally, a depletion of the very resources that keep the system stable.

People who refuse vaccines because they don't want anything "foreign" in their bodies are overlooking something essential: the *real* foreign threat is the pathogen. A vaccine is more like a fire drill — a controlled, harmless rehearsal that prepares the immune system for the real emergency. Rejecting it because it's "foreign" is like refusing to leave the building during a fire drill because there is no actual fire.

Vaccine fears persist not because the biology is unclear, but because the psychology is powerful. Autism traits often emerge in the same developmental window when children receive multiple vaccines, and

coincidence has often been mistaken for causation. Fevers after vaccination are visible, while the infections that never occur are invisible. Early manufacturing errors from a different technological era still echo in public memory. And preservatives or adjuvants — tools for safety and effectiveness — have been misunderstood as threats. These fears are understandable, but they are not aligned with the biology of how vaccines work or the decades of data supporting their safety.

Modern platforms make this distinction even sharper. RNA vaccines do not manipulate genes; they use the same temporary instruction system cells already rely on. They deliver reference material without viral replication, without proteostatic overload, and without the metabolic cost of infection. They can be designed in days and manufactured rapidly at scale, making them not only biologically elegant but also practical tools for responding to emerging pathogens.

Conclusion

Vaccination is not a departure from nature; it is an extension of it. Biology has always favored low-cost immunity — from maternal antibodies to the mild cowpox exposures that inspired Jenner. Vaccines follow the same principle: protection without injury, information without inflammation. In a world where pathogens evolve quickly and global movement accelerates their spread, the ability to generate immunity without biological harm is not just a medical achievement -- it is a public good, and one of the most effective ways we have to preserve the resilience of both individuals and communities. It provides critical information without injury – the kind of shot in the arm that should be celebrated.

About the Author

Caroline C. Rodgers is an independent science theorist whose peer-reviewed work spans autism, neurodegeneration, and maternal and neonatal health. She explores the potential biological roots of public health issues that are incompletely explained by prevailing theories.

Statements and Declarations

Funding

The author received no external funding for this work.

Conflicts of Interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contribution

The author is solely responsible for the conception, development, and writing of this manuscript.

Acknowledgements

Bing Copilot was used as an editorial tool during manuscript preparation to check factual claims, logical sequence, refine phrasing, and locate supporting citations. Adobe Acrobat AI was employed to query documents and verify the precision of cited text.

References

1. ^*Rodgers CC. (2026). "Neurodegeneration as convergent pathway failure: A three-system framework explaining late-life decline." Qeios. doi:10.32388/MRLNYS.2.*
2. ^*Chen R, Zou J, Chen J, Zhong X, Kang R, Tang D. (2025). "Pattern recognition receptors: function, regulation and therapeutic potential." Signal Transduction and Targeted Therapy 10:216. doi:10.1038/s41392-025-02264-1.*
3. ^*Chen S, Liao Z, Xu P. (2023). "Mitochondrial control of innate immune responses." Frontiers in Immunology 14:1166214. doi:10.3389/fimmu.2023.1166214.*
4. ^*Kim S, Ramalho TR, Haynes CM. (2024). "Regulation of proteostasis and innate immunity via mitochondria–nuclear communication." Journal of Cell Biology 223(3):e202310005. doi:10.1083/jcb.202310005.*
5. ^*Sonninen TM, Goldsteins G, Laham-Karam N, Koistinaho J, Lehtonen Š. (2020). "Proteostasis disturbances and inflammation in neurodegenerative diseases." Cells. Sep 28;9(10):2183. doi: 10.3390/cells9102183.*
6. ^*Aviner R, Frydman J. (2023). "Proteostasis in viral infection: unfolding the complex virus–chaperone interplay." Cold Spring Harbor Perspectives in Biology 15:a041234. doi:10.1101/cshperspect.a034090.*
7. ^*Dantzer R. (2003). "Cytokines and sickness behavior." In: Kronfol Z, (ed.). Cytokines and Mental Health. Neurobiological Foundation of Aberrant Behaviors, vo.7. Springer. Boston, MA. Springer:130–148. doi.org/10.1007/978-1-4615-0323-1_7.*

8. ^Palm AKE, Henry C. (2019). “Remembrance of things past: long term B cell memory after infection and vaccination.” Frontiers in Immunology 10:1787. doi:10.3389/fimmu.2019.01787.
9. ^Langel SN, Blasi M, Permar SR. (2022). “Maternal immune protection against infectious diseases.” Cell Host & Microbe 30(5):660–674. doi:10.1016/j.chom.2022.03.013.
10. ^Simon AK, Hollander GA, McMichael A. (2015). “Evolution of the immune system in humans from infancy to old age.” Proceedings of the Royal Society B 282:20143085. doi:10.1098/rspb.2014.3085.
11. ^Riedel S. (2005). “Edward Jenner and the history of smallpox and vaccination.” Proceedings (Baylor University Medical Center) 18(1):21–25. doi:10.1080/08998280.2005.11928028.
12. ^Taylor LE, Swerdfeger AL, Eslick GD. (2014). “Vaccines are not associated with autism: an evidence based meta analysis of case control and cohort studies.” Vaccine 32(29):3623–3629. doi:10.1016/j.vaccine.2014.04.085.
13. a, b, c, dPardi N, Hogan MJ, Porter FW, Weissman D. (2018). “mRNA vaccines — a new era in vaccinology.” Nature Reviews Drug Discovery 17:261–279. doi:10.1038/nrd.2017.243.
14. ^Plotkin SA. (2014). “History of vaccine development.” Proceedings of the National Academy of Sciences (PNAS) 111(34):12283–12287. doi:10.1073/pnas.1400472111.
15. ^Wang L, Haralambieva IH, Ovsyannikova IG, et al. (2023). “Associations of adaptive immune cell subsets with measles, mumps, and rubella specific immune response outcomes.” Heliyon 9(12):e22998. doi:10.1016/j.heliyon.2023.e22998.
16. a, bCenters for Disease Control and Prevention (CDC). (2017). “General Best Practice Guidelines for Immunization: Best Practices Guidance of the Advisory Committee on Immunization Practices” (ACIP). MMWR Recommendations and Reports 66(RR 2):1–142.
17. a, b, cMorales GB, Muñoz MA. (2021). “Immune amnesia induced by measles and its effects on concurrent epidemics.” Journal of the Royal Society Interface 18(179):20210153. doi:10.1098/rsif.2021.0153.
18. ^Gastanaduy P, Haber P, Rota PA, Patel M. (2021). “Measles.” In: Epidemiology and Prevention of Vaccine Preventable Diseases (The Pink Book). 14th ed. CDC.
19. ^BenDavid E, Yang C, Zhou Y, Pfaller CK, Samuel CE, Ma D. (2024). “Host WD repeat containing protein 5 inhibits protein kinase R mediated integrated stress response during measles virus infection.” Journal of Virology 98(9). doi:10.1128/jvi.00924-24.

Declarations

Funding: No specific funding was received for this work.

Potential competing interests: No potential competing interests to declare.