REIMAGINING RESISTANCE

A JOURNEY IN CREATIVE DISRUPTION

Mary Murray
Arturo Quizhpe P.
Satya Sivaraman
Kléver Calle H.

ReAct LATINOAMÉRICA
GRUPO REIMAGINANDO LA RESISTENCIA 20 AÑOS





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ACKNOWLEDGEMENTS

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We are profoundly grateful to the scientists and medical researchers—including microbiologists, evolutionary biologists, immunologists, and neonatologists—who provided the rigorous scientific foundation for this work. Their insights into the microbiome, the social intelligence of bacteria, and the ecological nature of the human body were instrumental in dismantling the pervasive war metaphor.

Our journey was equally guided by the vision and creativity of artists. Musicians, dancers, photographers, painters, and potters served as essential guides, using the universal language of art to make the invisible microbial world visible. Through performances, exhibitions, and collaborative projects, they transformed fear into awe and helped us feel the reality of our microbial partners.

We owe a significant debt to the Indigenous peoples and traditional healers, particularly from the Andean region, whose ancestral wisdom regarding Sumak Kawsay (Buen Vivir) and Pachamama (Mother Earth) resonated deeply with modern scientific revelations. Their philosophy of harmony and balance provided the spiritual and ecological framework necessary to understand antibiotic resistance as a symptom of a larger rupture in the web of life.

We also acknowledge the vital contributions of agroecological producers and farmers, who demonstrated the practical implications of this paradigm shift in our food systems, viewing the soil not as a resource to be mined but as a living skin to be nourished. Finally, we thank the children and teachers whose imaginative stories and curiosity reminded us that the future of health lies in replacing the "monsters under the bed" with a respectful dialogue with the invisible world.

To everyone who contributed through dialogue, research, performance, or protest—thank you for stepping onto the floor and joining this dance for life.

REIMAGINING RESISTANCE: A JOURNEY IN CREATIVE DISRUPTION. Reimagining Resistance International Group. ReAct Latin America, Phone: +593 7 2889543, email: info@reactlat.org, Website: www.reactlat.org. **With the academic endorsement of:** Faculty of Medical Sciences, National University of Mar del Plata, email: decanatomedicina@mdp.edu.ar, Mar del Plata, Argentina; Institute of Socio-Environmental Health, Faculty of Medical Sciences, National University of Rosario, email: saludsocioambiental@gmail.com, Rosario, Argentina; Association of Ecuadorian Faculties of Medical and Health Sciences (AFEME), website: www.afeme.org.ec, email: oem@afeme.org.ec, Quito, Ecuador. **Authors:** Mary Murray, Arturo Quizhpe P., Satya Sivaraman, Kléver Calle H. **References and Proofreading:** Jasmín Moyano, Doménica Ulloa. **Design and layout:** El Gato. **Printing:** Centro Salesiano de Publicaciones Pastorales**.** Cuenca, Ecuador, 2026.

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DEDICATION

to the invisibles—
human and
microbial…



20 years dancing with the invisible

About the Authors: Mary, Satya, Arturo and Kléver

THIS book was born from a dance with words that began more than twenty years ago, when its authors, from different geographies, cultures and trajectories, came together with a common quest. To understand the principles that sustain the fabric of life.

In that initial phase, Arturo Quizhpe, an Ecuadorian pediatrician; Mary Murray, an Australian pharmacist; Satya Sivaraman, a communicator from India; and Kléver Calle, a Cuenca activist, consolidated through dialogue, a joint effort that manifested in countless research projects, international meetings, publications, workshops and discussions with indigenous peoples and communities.

But, beyond the projects and agendas, they built a synchronous and harmonious team, capable of embracing differences like someone learning to dance —adjusting their step—, listening to the other's rhythm, moving flexibly according to the moment and circumstances, understanding that these differences were the key to reimagining the relationship with microbes, antibiotics and health from a multidimensional approach.

Weaving the Dance

Arturo Quizhpe, current director of ReAct Latin America and pediatrician, has di-



rected his work with a deep ethical responsibility. In his clinical practice he faced the death of children from preventable infections and the lack of safe water and basic care, experiences that transformed his understanding of medicine. Since then, he has conceived his work not only as a technical exercise, but as a way of understanding the complexity that defines each patient, the communities and, in a broader sense, their link with the microbial world. That perspective marked his teaching at the University of Cuenca and his subsequent career as a dean, researcher and regional health leader. His research was focused not only on the production of scientific evidence, but on the need to consolidate, from concrete experiences, a dignified science in the service of life.

Meanwhile, on another continent, Mary Murray was studying the cycle of medications: how they circulate, how they are used and how, sometimes, they are misused. Pharmacist and doctor in cultural psychology, she was president of the International Society to Improve the Use of Medications (ISIUM), promoting dialogues, networks and initiatives that today support fundamental global debates on antibiotic resistance. Mary recognizes the extraordinary power of antibiotics —one of the most brilliant discoveries of modern medicine— but she also sensed their limits when stripped of the natural world that inspires them. Because antibiotics did not emerge against life, but from life itself: from fungi, from soil, from millennia-old microbial interactions. In her role as an artist, she painted to understand what the evidence could not explain. Her friends often say —not without reason— that she is an artist disguised as a pharmacist or a pharmacist who refuses to stop looking at the world through the eyes of an artist. Between colors and pharmaceutical policies, she refined the certainty that health cannot be reduced to the logic of the market or the "war" against microbes.

For his part, Satya Sivaraman, from India, walked along another path that ended at the same intersection. Health communicator, philosopher, writer, he gradually became a "translator of worlds", jumping like a bacterium from one side to the other between the folds. A self-declared friend of the invisible —both microorganisms and historically excluded peoples— he suspected that the dominant narrative had oversimplified the mystery of life. With almost bacterial patience, he fermented ideas, questioned certainties of hegemonic medicine and reminded us that microbes are not enemies by nature: they are part of the fabric that constitutes us.

And then there is Kléver Calle, who talks about health from the perspective of the rivers. A communicator and water activist from Cuenca, he feels himself to be flo-

wing water. For him, caring for water is caring for all forms of life, including the invisible ones. He practices integrity as a form of spirituality. A passionate communicator of the details and human side of science, he loves all living creatures and celebrates life with slow, careful devotion, from the love of communities, of trees, of rivers, of dogs and bacteria. He knows, like Arturo, that many diseases begin where water is contaminated; knows, like Mary, that an antibiotic can save many lives but can also condemn many others when there is no balance; He senses, like Satya, that the problem is deeper and requires a new metaphor to be explained.

A Metaphor for Our Times

The authors of this work come from different geographies —Asia, Oceania and Latin America—, speak different languages and have disciplines and trajectories that are apparently distant from each other. And yet, they share a point of convergence: the questioning of a biomedical paradigm formulated in terms of war, eradication and combat against bacteria, a logic that not only defines the human relationship with the microbial world, but is also projected into the social sphere through the invisibility and exclusion of people and entire communities.

They met in spaces such as the People's Health Assembly and in multiple dialogues of the global health movements. Between long, informal conversations over coffee, they forged a deep friendship that extended across years and borders, they understood that antibiotic resistance was more than a medical problem. It was the symptom of the breakdown of balances: between humans and nature, between humans and bacteria, between market and care, between scientific knowledge and ancestral wisdom. From there the metaphor of Dancing with Bacteria emerged, to express their love for the invisible: both bacteria and excluded peoples. A new paradigm that meant abandoning the language of war to recover a poetic language that gave a broad and deep meaning to the interrelationships that underlie the web of life.

Between stories, art, medicine, science, activism and philosophy, they founded the International Reimagining Resistance Group to dance with the invisible, to engage in dialogue about their concerns. Because to dialogue is to make the word dance. And when the word moves from one voice to another, it reveals before our eyes the multicolored fabric of life that sustains us. This book is the result of that dance, which, after twenty years, found its voice and its flow within these pages

Jennifer Monsalve

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FOREWORD



Is it possible to reimagine resistance? By what criteria do we define that some forms of resistance are healthy and others are not?

These questions drove the journey that Arturo, Mary, Satya and Kléver share with us, four undisputed leaders in the construction of a healthier society which recovers the understanding of the indispensable network of diverse relationships that sustains, from the microbial dimensions, the web of life.

For those of us who have been following the work of these 'Four Musketeers", mobilized for noble causes, in permanent search for building knowledge to sustain the loving, cooperative and supportive relationships that sustain us, it is not news to learn about this new book. Like a log, it allows us to accompany them (through its pages) on the journey they have taken over the last 20 years, trying to contribute to the creation of a science and a society that can overcome the violent discourses (and paradigms) of wars that have permeated the languages and practices of academies, politics and current societies, and thus give birth to a new paradigm of cooperation, solidarity and the visibility of the invisible.

Throughout this entire work, we are invited to encourage ourselves to look with different eyes, to move away from the places from which we have learned to see the world, to rediscover it with new perspectives, aware that these should not be definitive either, but, neither more nor less an encouragement to permanently walk, to not remain immobile, as in Utopia.

And maybe it's about that, reimagining everything! To transform resistance into fertile territories to germinate a new supportive, loving society, based on a paradigm of care that sustains the enabling relationships of Life. Reimagining Resistance - A Journey in Creative Disruption is a call to take the leap towards the immensity of the unprecedented, which we can make possible, collectively!

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PROLOGUE

READING this book in terms of historicity - of the process that gave rise to the metaphor “Dancing with Bacteria’ - allows us to achieve a holistic understanding of how a group of people managed to become a reproductive channel of a biocentric force that runs through our vital system. These pages invite us to imagine human beings not as conquerors of the microbial world, but as guardians of the ways that care for, heal and remedy the Earth, recovering the course towards a full life and retracing the pathogenic detour that led us to the contemporary global polycrisis.

This book helps us understand the importance of microbes on the evolutionary scale of our own subjectivity, of our way of being and thinking about the world. So-called “Antimicrobial Resistance” is not a natural fact but a category constructed by human intellect, which reduces our ability to recognize ourselves as part of that evolutionary scale. We cling to it because we do not yet know how to inhabit another paradigm, although we sense that time is running out and that we are losing a historic opportunity to contribute to the community of organic life on the planet.

From that fertile discomfort, the book proposes that we overcome simplifying dichotomies - good microbes and bad microbes, friends and enemies - and question the illusion of control that sustains the idea that order is restored by eliminating what we define as a threat. It confronts us with a medical and scientific practice that, by seeking isolated microbial causes or solutions based on eradication, end up reinforcing the imbalances that the system itself responds to adaptively through resistant diseases. Resistance does not appear here as an anomaly, but as an expression of the intelligence of life.

Throughout these pages, contemporary microbiology dialogues with knowledge that was historically displaced: ecology, art, philosophy, indigenous knowledge, community experiences. Scientific evidence about the social intelligence of bacteria - their ability to communicate, cooperate, make decisions, and adapt - is not presented as technical curiosity, but as an invitation to rethink our own forms of social organization. Life persists not through unlimited competition but through networks of cooperation.

But this book doesn’t stop at science. It calls upon art as an indispensable language to imagine what we are still afraid to inhabit. The chapters dedicated to artistic practices are an open door: they allow us to stop looking “through the key-

hole" and encourage us to enter. There, the boundaries between art and science blur, and in the shared fascination with the microbial world, the deep interconnection between the human and the non-human becomes visible.

This journey finds a particularly powerful anchorage in Latin America, where the emancipatory struggles of indigenous peoples gave shape to the concept of Sumak Kawsay, translated not as 'good living' but as Full Life: a form of existence based on harmony between the human community and all other forms of life, visible and invisible. From this perspective, science cannot be separated from the love of life or the restoration of balance. The Earth does not belong to us; we belong to the Earth.

That the collective work of ReAct Latin America and the International Reimagining Resistance Group, continued for more than two decades, shows that this paradigm shift is not a theoretical abstraction. It is embodied in territories, networks, in schools, in gardens, in hospitals, in meetings where citizens participation, social and environmental health and ecological justice are intertwined. Resistance stops being an enemy to defeat and becomes a teacher with whom to learn.

But these powerful collectives are sustained by the supersensible thread of the 'other possible world' that the authors of the book knew how to intuit, feel and bring in their ideas to metaphors and concrete actions for 20 years. They were tutors, guides, at times shamans, of those constructive forces, which this book narrates through a heartfelt chronology of knowledge-sharing gatherings and verifiable scientific milestones.

For those of us who practice medicine, the book is an invitation to explore, each person in their daily practice, a complex way of understanding AMR, and all diseases: that the social, environmental, political, cultural and spiritual determinants mark our bodies and are embodied in our life stories.

As we close this book, it is clear that Reimagining Resistance was never just an academic exercise or a critique of medical language. It was - and remains - a preparation for a necessary transformation in the way we inhabit the planet. But discovering the metaphor of Dancing with Bacteria is just the first step. The real challenge is to learn the steps of that dance and encourage ourselves to practice them, every day, in our clinical, political, productive and everyday decisions.

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INTRODUCTION

FOR over a century, humanity has told itself a singular, compelling story about its relationship with the microbial world: a story of war. It is a narrative steeped in the language of battle, where bacteria are "invaders," antibiotics are "magic bullets," and health is a fortress to be defended at all costs. This martial paradigm has undoubtedly saved millions of lives, driving the 20th-century revolution in public health and medicine. Yet, as we stand on the precipice of a "post-antibiotic era," facing the global crisis of Antibiotic Resistance (ABR), it has become increasingly clear that this story is no longer sufficient. It may, in fact, be part of the problem.

The document that follows, Reimagining Resistance - The Journey, chronicles a two-decade-long odyssey undertaken by the International Reimagining Resistance Group (IRRG). It is an exploration that began with a simple, disruptive question: If "resistance" is a virtue in social movements—the act of an underdog fighting for survival—why do we view it solely as a catastrophe when exhibited by the oldest forms of life on Earth? Why is our primary medical strategy "anti-biotic," or literally "against life," when life is exactly what we seek to preserve?

The narrative challenges the dominant biomedical framework that views ABR solely as a failure of pharmaceutical technology or a lack of compliance. Instead, it proposes a radical shift in perspective, moving from a metaphor of eradication to one of negotiation, balance, and coexistence. We call this new paradigm "Dancing with Bacteria."

The journey to this new metaphor was not linear. It was forged in the vibrant intersection of three distinct rivers of thought: the latest revelations in evolutionary microbiology, the ancient ecological wisdom of Indigenous peoples, and the transformative vision of the arts.

From the scientific frontier, we engaged with researchers who have challenged the view of bacteria emerging from the "germ theory" dogma of the 19th century. The discovery of the microbiome has revealed that we are not individuals fighting off a hostile world, but "superorganisms"—vast, walking ecosystems where human cells are outnumbered by bacterial ones. Science now tells us that bacteria possess "social intelligence," communicating, cooperating, and maintaining the planetary cycles that allow us to breathe and eat. As the late Nobel laureate Joshua Lederberg argued, the "war metaphor" blocks

our understanding of this reality. We are learning that infection is often a normal state of the human body, and that disease arises not just from the presence of a microbe, but from a breakdown in the ecological balance—a balance often disrupted by the very chemicals we use to "sanitize" our world.

Crucially, this scientific reawakening found a profound resonance in Latin America, particularly within the concept of Sumak Kawsay or Buen Vivir. Rooted in Andean indigenous cosmogony, this philosophy teaches that health is not merely the absence of infirmity, but a state of harmony with Pachamama (Mother Earth). Through the lens of Buen Vivir, the crisis of antibiotic resistance is revealed as a symptom of a larger spiritual and ecological malaise—a rupture in our relationship with the web of life. It challenges us to see that we do not own the Earth; we belong to it.

To bridge these complex scientific and philosophical worlds, the IRRG turned to the universal language of art. As documented in these pages, artists—musicians, dancers, photographers, and potters—became essential guides in making the invisible visible. Through projects like "FotoResistencia" and "The Caravan for Life and Bacteria," art ceased to be a mere tool for public health messaging and became a method of inquiry in itself. It allowed communities to feel the reality of the microbial world, transforming fear into curiosity and revulsion into awe. It was through dance—a medium of rhythm, flexibility, and partnership—that the new metaphor emerged. Unlike war, which seeks a victor and a vanquished, a dance requires listening, responding, and moving in concert with a partner, even a potentially dangerous one.

This document serves as both an archive and a manifesto. It details how these ideas were taken out of the abstract and into the streets, schools, and farms of communities across the globe, from Cuenca, Ecuador, to Chiang Mai, Thailand. It highlights the voices of children who imagine bacteria as characters in a story rather than monsters under the bed, and farmers who see the soil not as a resource to be mined, but as a living skin to be nourished.

Ultimately, Reimagining Resistance invites us to sign a peace treaty with the microbial world. It culminates in a "Love Letter from the Invisibles," a plea from both the unseen microbes and the unseen human masses—the poor, the workers, the indigenous—to the world's leaders. It argues that the violence we inflict on the microscopic world mirrors the violence we inflict on the vulnerable in our own societies.

As you read on, you are invited to suspend the reflex of fear that has conditioned our response to the invisible world. We invite you to step onto the floor and learn the steps of a different kind of survival—one that recognizes that in the vast, interconnected web of existence, we cannot destroy the "other" without destroying ourselves. It is time to stop fighting. It is time to start dancing.

CHAPTER 1

Questioning the Framework of Antibiotic Resistance

How the journey began

Two decades ago, when we started working on antibiotic resistance the dominant discourse was entirely about the looming threat it posed to the world of modern medicine. Resistant microbes, the narrative went, were severely lowering the effectiveness of antibiotics and this was due to the indiscriminate use of these miracle drugs. If the trend continued the world would enter the 'post-antibiotic era' and many modern medical procedures and public health would face calamitous consequences. Millions could potentially die from untreatable bacterial infections in future.

While the description of the negative impact of antibiotic resistance and as a critical global health issue resonated with us,



This edited photo, used by ReAct in its early activities, reveals a biomedical conception of antibiotic resistance, centered on human health. IMAGE SOURCE: ReAct EUR

the question for us was whether the framing of the problem and solutions presented were adequate to deal with the problem.

What really intrigued us at that time was the use of the word 'resistance'[1] —a term we have usually encountered in non-medical contexts— in social, political and legal ones. Coming from a background of health activism, resistance to us always had a positive connotation and essentially evoked the image of an underdog defending territory or fighting for survival.



The banner reads "LONG LIVE THE BACTERIA STRIKE". ILLUSTRATION: FABIÁN PATINHO

1 Sivaraman S. The Tao of antibiotic resistance [Internet]. Uppsala (Sweden): ReAct; [cited 2026 May 27]. Available from: https://www.reactgroup.org/uploads/what-we-do/the-tao-of-antibiotic-resistance.pdf

Even more puzzling was the use of 'resistance' along with the term 'antibiotic', which means – 'against life'. Resisting something that was 'against life' we thought should be the most normal thing to do- and that too for bacteria, which are the oldest known form of life on Earth. As a consequence, we could not but begin to sympathise with the bacteria - for resistance to us was a virtue even though 'antibiotic resistance' did currently have many negative implications for the health of human beings.

This perspective was not about belittling the threat to human life by bacterial epidemics. It was really questioning the way the world of medicine had chosen to tell the history of human interaction with microbes. A story that is written largely in terms of all the tragic encounters and rarely in terms of the positive role played by microbes in the sustenance of life on our planet.

Some of the questions that arose at that time about the framing of antibiotic resis-



Nineteenth-century lithograph depicting the plague in Florence in 1348 (unknown author).



Engraving of the plague doctor titled "Der Doctor Schnabel von Rom" ("The Beaked Doctor of Rome") by the German artist Paul Fürst. Published around 1656. IMAGE SOURCE: WIKIPEDIA

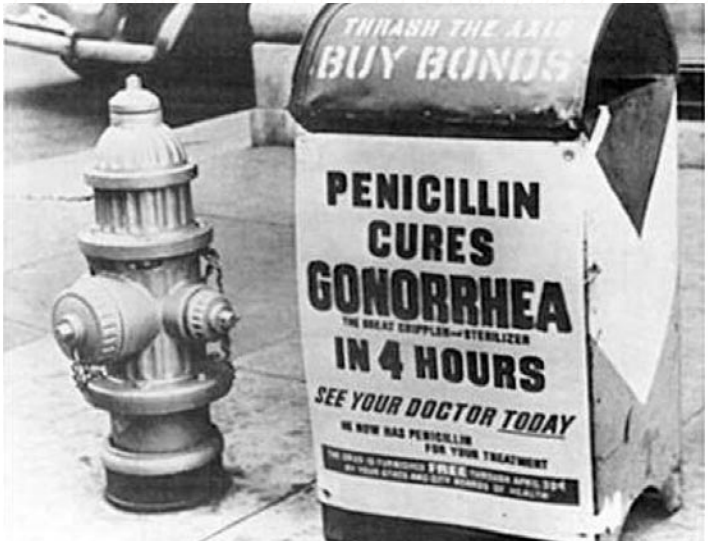
tance for us were very fundamental ones. For example, given the fact that many infectious diseases in human history have been driven by increased proximity to domesticated animals, expanding urbanization, poor living conditions, changing lifestyles and the consequent lowering of natural human immune systems, are not antibiotics then a mere quick fix to problems that arise from drastic human modification of the globe's ecology? A desperate attempt to correct in a very short time what has gone wrong over several millennia?[2].

Could antibiotic resistance be a metaphor for and even closely related to the imbalances we see in use of other valuable resources around the world today? Fossil fuels are an obvious example of how the abuse of another important resource is threatening life on Earth by accelerating global warming. Similarly, is the misuse of antibiotics a subset of the larger phenomenon of overuse of a large variety of toxic chemicals in our daily lives and surroundings that impacts our health negatively?

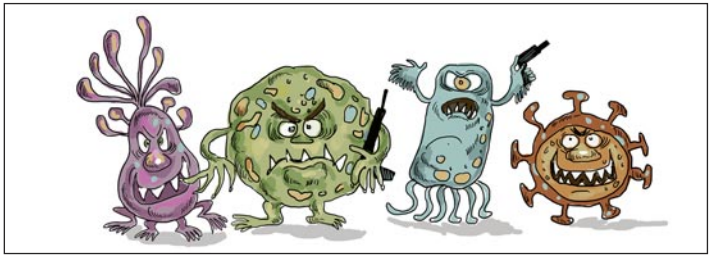
2 Willis LD, Chandler L. Quick fix for care, productivity, hygiene and inequality: reframing the entrenched problem of antibiotic overuse. BMJ Glob Health. 2019;4:e001590. doi:10.1136/bmjgh-2019-001590.

And, why did the terminology of modern medicine draw so heavily from the dictionaries of war- with the use of terms such as ‘magic bullets’, ‘invasion’, ‘elimination’ or for that matter ‘resistance’? The language of "fighting" pathogenic bacteria, with antibiotics as "weapons" in this "battle," seemed to miss something fundamental about our relationship with the microbial world. It was a black and white world of ‘Us against Them’, with little room for any nuances or understanding the complex ways in which bacteria play a crucial role in the survival of all life forms. And obviously this metaphor was not particularly useful in helping humans preserve their antibiotics, otherwise there would be no need to talk about antibiotic resistance as a global threat at all.

Lastly, given the fact that microbes are so clever and successfully resist the best of our efforts to eliminate them – is it possible we can actually learn something from them? And can we imagine a future situation where we can coexist with microbes without constantly trying to kill them or provoke them into killing us?



A penicillin advertisement (South Carolina, United States, 1940s). IMAGE SOURCE: UNITED STATES PUBLIC SERVICE


Villain microbes. ILLUSTRATION: Vilma Vargas/ReAct LA



Dr. Ehrlich's Magic Bullet is a film that portrays the development of an early antimicrobial drug known as Salvarsan at the beginning of the 20th century. The film depicts the search for the "magic bullet," a drug capable of eliminating pathogenic microorganisms without harming the patient. Due to its toxicity and lack of effectiveness, Salvarsan was replaced by penicillin in the 1940s.

Critiquing the bio-medical approach to health

Asking these basic questions led us to doubt whether a complex phenomenon like antibiotic resistance could be understood solely with a narrow, biomedical approach.

For example, the standard advice offered to people to deal with antibiotic resistance was to use antibiotics 'only when needed', not to self-medicate, to see a doctor and follow instructions from medical professionals. While the message on its own is fine, it fails to resonate in many parts of the world because it ignores social or economic contexts in which people live, their

belief systems or a whole lot of other factors that shape health-seeking behaviour. Also, for people living in the poorest parts of the world, who have little access to antibiotics it doesn't make much sense to hear about restricting its use.

The messaging was also very top-down, designed by experts without any participation from patients or the lay public. Without understanding the ordinary citizen's priorities, expectations or explaining how antibiotic resistance connects to their daily lives, the conversation would always remain confined to small groups of medical professionals or scientific researchers.

Another problem with the response to antibiotic resistance, twenty years ago, was that it too narrowly focused around priorities of human health. It has been only around a decade since the concept of One Health emerged as a response to emerging zoonotic diseases and was adapted by the AMR community to integrate human, animal and environmental health. While this is a positive development it is still inadequate in the light of two significant developments – a virtual revolution in understanding of the world of bacteria through recent research on the microbiome and microbial ecology and our growing awareness of the link between climate change, food systems and how the health of the planet itself is deeply intertwined with human and animal health. This called for the search, discovery, and visualization of the interrelationships, interconnections, and interdependence between all forms of life, between the visible and the invisible.

It was in the context of all these questions and doubts that we first conceived the idea of 'Reimagining Resistance' with a seemingly straightforward mission: to understand antibiotic resistance more deeply and develop responses that would



The Ecuadorian boy Anthony Hernández used to put a face mask on his puppy to protect him from COVID-19 whenever he went out on his bicycle to run errands. "They are like us," he explained to CNN. "They have the same rights as we do." Captivated by his profound wisdom, Colombian artist Edgar Humberto Álvarez paid tribute to him with this clay sculpture.



Illustration from the International Gathering on Water, Food, and Antibiotics from the Mother Earth–One Health perspective, held in Cuenca under the motto "Discovering interrelationships, collectively weaving solutions" (2025).
ILLUSTRATION: Gisselle Castillo

be far more effective, participatory and sustainable in the long run. And to do this we needed to go beyond the world of medicine and the slogan required was to 'leave no one behind'.

The International Reimagining Resistance Group (IRRG)

In the initial phase of its evolution 'we' included collaborators from diverse backgrounds—a journalist, a film actor cum ecological activist, a respected paediatrician and a pharmacist-artist skilled in cross-cultural facilitation, all of whom had initially come together first under the umbrella of the People's Health Movement. They brought the understanding of health in its widest social, economic, environmental, cultural, and political context, as part of their work for the newly established ReAct, catalyst global network set up, with support from the Swedish aid agency Sida, to foster concerted global action on antibiotic resistance.

The International Reimagining Resistance Group (IRRG), consisting of both current and former members of ReAct, was born subsequently as an informal platform to take these ideas forward. The idea of 'Reimagining Resistance' found great support within ReAct Latin America, a node of ReAct, where the key people involved already

had deep roots in alternative ways of looking at medicine, health and ecology.

While ReAct as a global network focused on antibiotic resistance at the policy and scientific level ReAct Latin America and the International Reimagining Resistance Group fostered rich dialogues and creative activities across the globe grounded in community participation, cross sectoral action and collaboration across different types of social movements.

Over the years, since its formation, the group has involved dozens of people from across the globe – painters, musicians, dancers, poets, theatre professionals; academics and researchers including immunologists, evolutionary biologists, microbiologists, clinicians, allied health professionals, sociologists; indigenous communities, food producers, environmentalists, womens' networks, community organisations, and rights activists – everyone who had something to contribute to dealing with the problem of antibiotic resistance.

Role of Indigenous Wisdom and 'Buen Vivir'

The special role played by both individuals and groups working on health and environmental issues in Latin America in the Reimagining Resistance journey needs to be explained further.

Historically, Latin America has been a region in flux, marked by indigenous peoples, social movements, socially conscious academia and art. The questions raised by the IRRG resonated deeply with these movements, in particular with the call of indigenous peoples from the Andean region, for harmony with Pachamama (Mother Earth).

For several decades in Ecuador, Bolivia, Perú, Guatemala and other Latin American countries, the emancipatory, anti-colonial struggles of indigenous peoples had resulted in the development of the Sumak Kawsay concept. Although Sumak Kawsay has been translated from the in-

digenous Kichwa into Spanish as Buen Vivir, the preferred translation is 'Full Life', which is achieved by cultivating harmony within the human community, and between the human community and all other forms of life in nature, both visible and invisible. From this perspective there was a need for a science infused with a love of life; one that bases its action on the restoration of balance and harmony, and that emphasizes the role of human beings as part of nature. The Earth does not belong to humans; we belong to the Earth.



Susana Reyes, like the wind, dancing at the Ceremony of Indigenous Peoples, held on Sunday, June 17, 2005, at the Kurikancha of Pumapungo (Cuenca, Ecuador). PHOTO: People's Health Movement – Latin America

The Second People's Health Assembly, held in the city of Cuenca, Ecuador in 2005 had 'Voices of the Earth' as its main theme, focusing on the Sumak Kawsay principles and the tradition of Latin American social medicine. It also built on the 'Voices of the Unheard' from the First People's Health Assembly in Bangladesh in 2000, which had emphasized grassroots experience and the social-political context of people's health.

The People's Health Assembly in Cuenca also focused on struggles for community health through representatives from almost 100 countries, including many musicians and artists. Drawing from the cosmovision of indigenous peoples from around the world, the Assembly culminated in the Statement of the Native Peoples of the World. This called for taking care of the health of the most fundamental living being we know - Mother Earth herself[3].

All these developments played a critical role in shaping the concept of Reimagining Resistance, which expanded well beyond the lens of modern natural sciences to include traditional and more diverse viewpoints of health, medicine and ecology.



Daniel Berrezueta (Ecuador) and Gary Simon Jagamarra (Australian healer) at the Ceremony of Indigenous Peoples. PHOTO: PEOPLE'S HEALTH MOVEMENT – LATIN AMERICA

3 Hamlin Zúñiga M, Quizhpe Peralta A. Voices of the Earth: from Savar to Cuenca [Internet]. Cuenca (Ecuador): Imprenta Monsalve Moreno; 2007 [cited 2026 Jun 7]. Available from: https://drive.google.com/file/d/1zbp0B5TrMeAy9AKx9A_xBEz8SJPYc8o_/view



Manyama Nyambasi (Tanzania) and Ruth Espinosa (Ecuador) dance hand in hand at the March for the Globalization of Solidarity and Dignity during the 2nd People's Health Assembly (Cuenca, 2005). PHOTO: MARÍA JOSÉ MÁRQUEZ

Challenges

Reflecting on 20 years of activity to understand ABR more deeply, one can say that the challenges we faced at that time were basically the following:

1. Understanding the problem of ABR across not just animal, plant, human and environmental health but in terms of its social, political and cultural determinants and also at the larger level of planetary health.

2. Breaking the dominant paradigm in medicine that was contrary to the ethics of life, through comprehensive and integrative dialogue and to shift it away from fear and a focus on disease, death or injury to an assertion of life and its sustenance.

3. Finding an alternative to the metaphor of war that could capture the interrelationships between the visible and the invisible world more accurately.

4. To go beyond the narrow concept of bio-medical health and highlight the need for CARE as a strategy to preserve the health of the planet and all those who inhabit it, human and non-human.

Spoiler Alert!

Of all these challenges the toughest one was to come up with an alternative to the war metaphor in medicine. It was very deep rooted in the medical and public imagination as an appropriate way of describing human interaction with bacteria and other microbes. Finding an alternative would have to meet the criteria of being scientifically more accurate; it would also have to be something easy to understand by wide cross-sections of people.

The good news is that we did find an alternative metaphor to war —in 'dance'— and thus was born the concept of 'Dancing with Bacteria'. It has been an exciting journey through the worlds of science, art, ecology, social justice, traditional, modern worldviews and involving hundreds if not thousands of participants and contributors. How we arrived at this new metaphor to describe human-microbe relations and its implications for not just work on antibiotic resistance but for human societies themselves is what the rest of this book is all about.



CHAPTER 2

Looking into the Microbial World

Germs'-eye view of infection

Our intuitions found solid scientific backing in 2006 when the US National Academies of Medicine published results from a workshop called "Ending the War Metaphor: The Changing Agenda for Unravelling the Host-Microbe Relationship"[4].

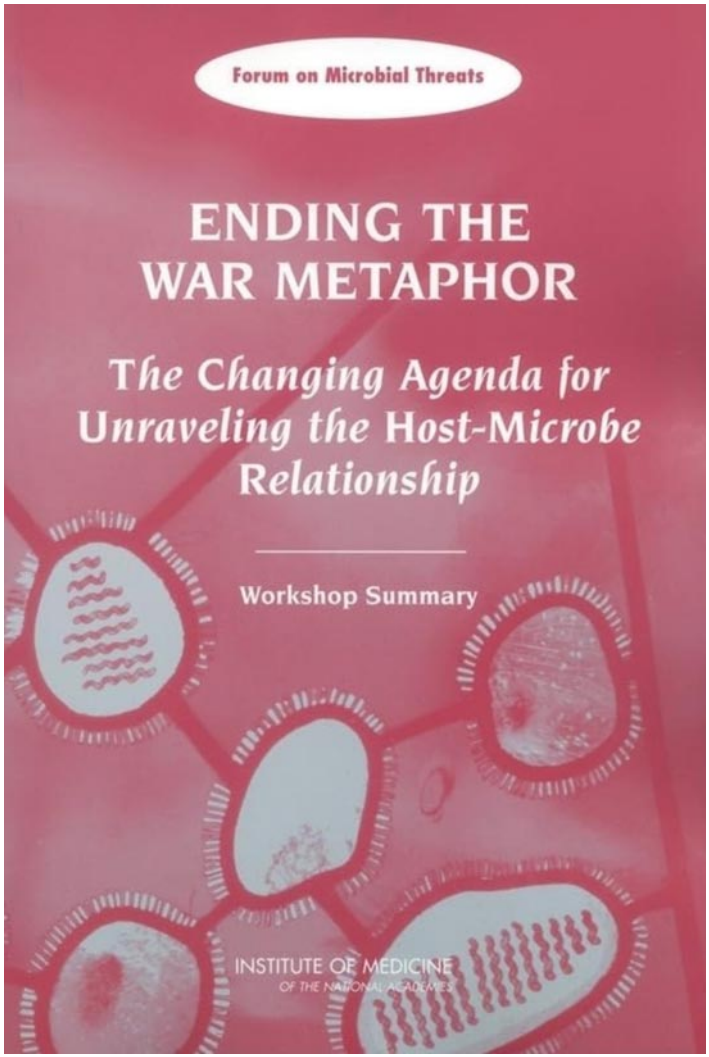
Papers presented at this landmark workshop recognized the breadth and diversity of host-microbe relationships beyond 'those relative few that result in overt disease'. The central theme of this workshop was influenced by an essay Joshua Lederberg published in 2000, called Infectious History which called for "a more ecologically informed metaphor, which includes the germs'-eye view of infection"[5].

In this essay, Lederberg envisioned the future of humanity and microbes as "episodes of a suspense thriller that could be entitled, 'Our Wits Versus Their Genes'. According to him, "One lesson to be gleaned from this co-evolutionary dynamic is how fitful and sporadic human evolution is when our slow and plodding genetic change is pitted against the far more rapidly changing genomes of microbial pathogens".

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4 Institute of Medicine (US) Forum on Microbial Threats. Ending the war metaphor: the changing agenda for unraveling the host-microbe relationship [Internet]. Washington (DC): National Academies Press (US); 2006 [cited 2026 Jun 1]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK57071/

5 Lederberg J. Infectious history. Science. 2000;288(5464):287-93. doi:10.1126/science.288.5464.287



Institute of Medicine. 2006. Washington, DC: The National Academies Press.

He saw the key starting point as recognizing the ecological fact that humans, animals, plants and microbes live together on the planet, and are a collective living system.

"Consider that microbes occupy all of our body surfaces. Besides the disease-engendering colonizers of our skin, gut, and mucous membranes, we are host to a poorly catalogued ensemble of symbionts to which we pay scant attention. Yet they are equally part of the superorganism genome with which we engage the rest of the biosphere."[6]

In his view, perhaps one of the most important changes we can make is to supersede the 20th-century metaphor of war for describing the relationship between people and infectious agents.

6 Lederberg J. Infectious history. Science. 2000;288. (5464):287-93. doi:10.1126/science.288.5464.287

"...the metaphor of "war" on infectious diseases —characterized by the systematic search for the microbial "cause" of each disease, followed by the development of antimicrobial therapies— can no longer guide biomedical science or clinical medicine. A new paradigm is needed that incorporates a more realistic and detailed picture of the dynamic interactions among and between host organisms and their diverse populations of microbes, only a fraction of which act as pathogens"[7].

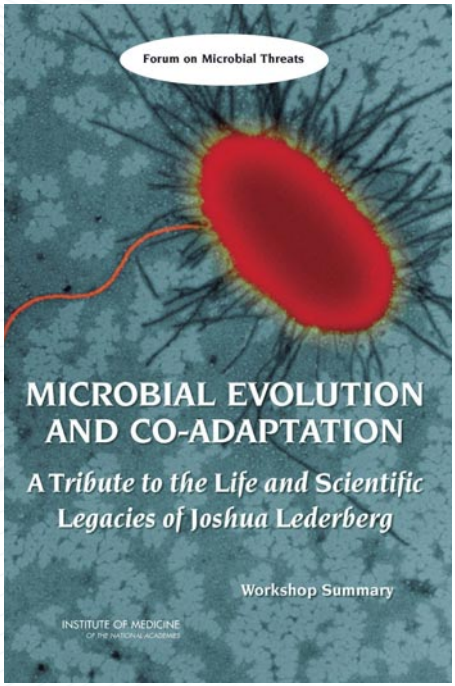
Institute of Medicine (US) Forum on Microbial Threats (2006)

Subsequent National Academies of Medicine workshops in 2009 and 2012 brought researchers together to synthesise the implications of the latest findings in microbiology that revealed the extraordinary world of microbial evolution and co-adaptation[8], and the social biology of the microbial world[9].

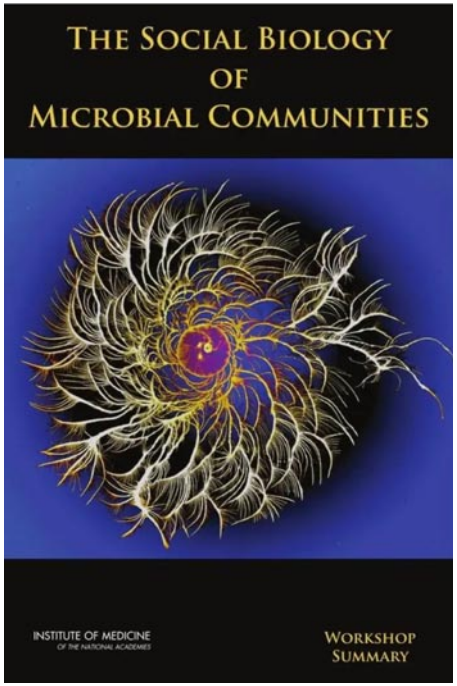
7 Institute of Medicine (US) Forum on Microbial Threats. Ending the war metaphor: the changing agenda for unraveling the host-microbe relationship [Internet]. Washington (DC): National Academies Press (US); 2006 [cited 2026 Jun 1]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK57071/

8 Institute of Medicine (US) Forum on Microbial Threats. Microbial evolution and co-adaptation: a tribute to the life and scientific legacies of Joshua Lederberg: workshop summary [Internet]. Washington (DC): National Academies Press (US); 2009 [cited 2026 Jun 1]. doi:10.17226/12586.

9 Institute of Medicine (US) Forum on Microbial Threats. The social biology of microbial communities [Internet]. Washington (DC): National Academies Press (US); 2012 [cited 2026 Jun 1]. doi:10.17226/13500.



Institute of Medicine. 2009. Washington, DC: The National Academies Press.



Institute of Medicine. 2012. Washington, DC: The National Academies Press.

Lederberg's insights and those of the scientists in the National Academies of Medicine workshops made it clear that we are not individuals unconnected to what is around us. We are equally bacterial and human in terms of number of cells – with the microbiome inside us considered, not as an 'external invasion' but as an integral organ of the human body.

BOX ONE

Infection is a normal state of the human body

The first antibiotic agents were a product that emerged from the ecological insights of pioneering researchers such as René Dubos and Selman Waksman into the processes in soil bacteria that results in the natural production of antibiotics.

Dr. Dubos's research rose from the idea that soil, being what he called a "self-purifying environment," maintains its natural balance (of nutrition) through the decomposition of organic matter aided by the powers of resident microorganisms. Some of these soil bacteria, he reasoned, might be useful against disease-causing microbes (like those causing pneumonia) by helping break down the polysaccharide capsule that protected them.

At a later stage in his career Dubos, declared in a paper published in the American Journal of Medical Sciences in 1964, that the digestive tract was an ecosystem and advocated an ecological approach to the study of the human body. Dubos, whose initial training was in agronomy before he took to microbiology, also described the human body just like soil, as being a repository of numerous species of bacteria, that co-existed with each other and the body in a largely symbiotic or benign balance.

He highlighted the fact that 'infection' is a normal state of the human body and disease is abnormal. The key issue he felt was determining what were the conditions that turned infection into disease. Dubos emphasized the need for studying bacteria in context—shifting the focus away from their cultivation in sterile laboratories to the dynamics of their actual relations in nature and their interactions with their environment.

Dubos approach was a precursor to current interest in microbiology on studying the human microbiome and the role of microbial flora in shaping human health.

Dubos, a key figure in the history of antibiotics, even went on to become one of the biggest champions of the environmental movement in the US in its early stages. Yet little of his ecological approach actually rubbed off on many fellow researchers or public perception of microbes as being 'enemies'.

Bacteria 'R' Us

The IRRG was excited by emerging new knowledge of the microbiome as scientists developed new techniques to understand a very large number of newly identified microorganisms. A microbiome is a dynamic habitat made up of microbes, their functions and relations within a specific host or environment. The community of micro-organisms within a microbiome – the microbiota – can be extremely diverse, with bacteria, viruses, fungi, archaea and other microbial species all contributing to this complex network of interactions. Environments such as soils and oceans host microbiomes which are responsible for carrying out fundamental life processes[10].

The Human Microbiome Project[11] detailed the specific microbial characteristics of the airways, skin, oral cavity, gastrointestinal tract, and vagina of the human body. The complexity and differences of each niche area was becoming clear as were the processes by which humans acquire each unique set of microbial communities from birth through the first years of life. Microbiomes in animals, plants, soil, water, oceans, air and many other ecosystems continue to be characterised.

10 Microbiology Society. The human gut microbiome [Internet]. London: Microbiology Society; 2024 Mar [cited 2026 Jun 1]. Available from: https://microbiologysociety.org/static/9d7d5a03-7ed9-45d3-a0816b3d4b8749a3/The-Human-Gut-Microbiome-Policy-Briefing.pdf

11 Rosenwald AG, Arora GS, Madupu R, Roecklein-Canfield J, Russell JS. The Human Microbiome Project: an opportunity to engage undergraduates in research. Procedia Comput Sci. 2012;9:540-9. doi:10.1016/j.procs.2012.04.058

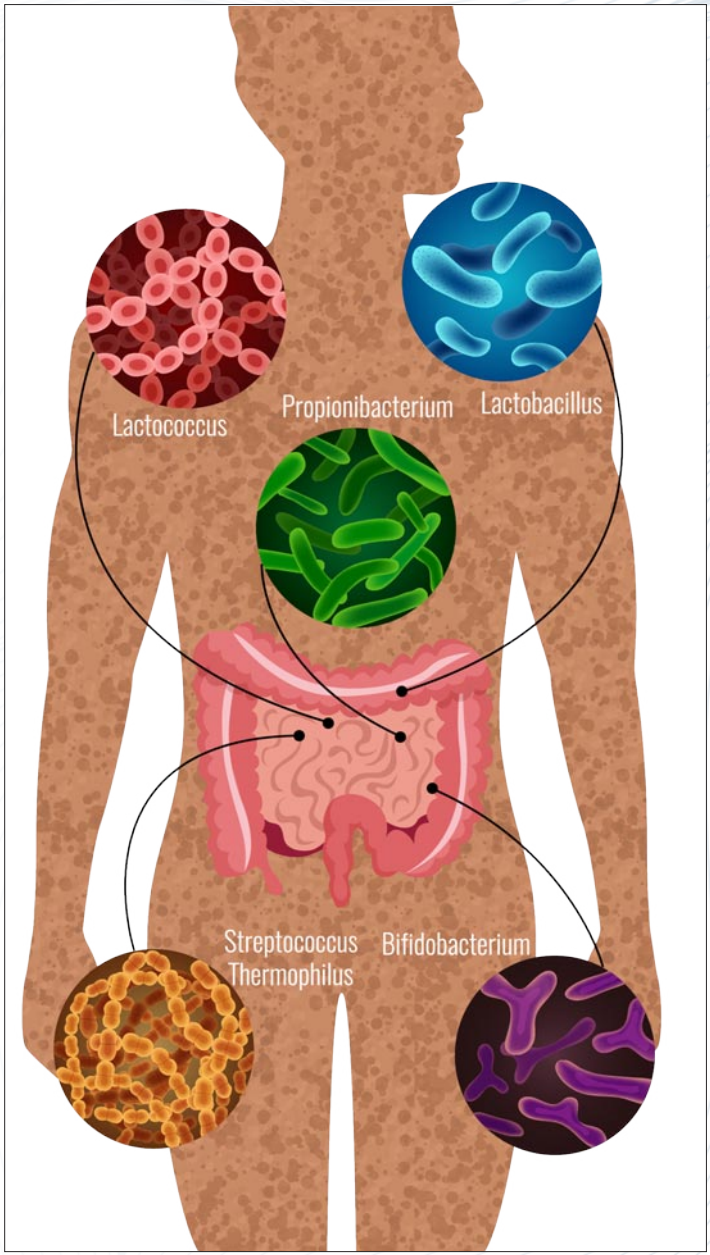


The Coral Holobiont is a large coastal ecosystem made up of coral animals, photosynthetic plants AND bacteria, archaea, funguses and viruses. IMAGE PROVIDED BY PROF. LINDA BLACKALL IN HER PRESENTATION TO MICROBES AND METAPHORS, (2008).



Prof Michael Gillings, Professor of Molecular Evolution at Macquarie University, Sydney, Australia, collaborated with us over many years to help us understand the evolutionary scale and importance of microbes on and for the planet and the larger significance of ABR genes in the environment.

According to him, 'When we take antibiotics, the idea is that we get to a concentration, called the minimum inhibitory concentration, (the MIC), that kills the organisms in our gut or that are infecting us. A lot of the antibiotics are actually excreted in urine or faeces and go down through the sewer system. They are not eliminated by sewage treatment plants, and so you get this cone-shaped spread of antibiotic concentration stretching out into the environment. So this is a form of pollution. We pollute the environment with antibiotics.'[12]



Previous page: The páramo of Kimsakocha —a high-altitude ecosystem found in the Andean countries— is also a holobiont composed of thousands of life forms. Its main function is to store and release water into the river basins. PHOTO: GABRIELA ELJURI JARAMILLO.

12 ReAct Latinoamérica. Microbial Dark Matter: Cells and Genes Moving around the Planet. Conferencia ofrecida en el Seminario-Taller Internacional Comprendiendo la Resistencia a los Antimicrobianos, Cuidando la Salud de la Madre Tierra, Sanándonos [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2018 [cited 2026 Jun 1]. Available from: https://reactlat.org/noticias/seminario-taller-internacional-comprendiendo-la-resistencia-a-los-antimicrobianos-cuidando-la-salud-de-la-madre-tierra-sanandonos/



Antibiotics, medicines, and biohazardous waste, among many other kinds of refuse, are brought to this landfill in the small Ecuadorian Amazon town of Gualaquiza. In 2011, physician Segundo Tenezaca revealed the interconnections between the improper disposal of antibiotics and bacterial resistance in water. PHOTO: SEGUNDO TENEZACA/ReAct LA



"Antibacterial Suicide," by Fabián Patinho, is a critique of the messages and images that instill fear of bacteria in us and make us paranoid.

We asked him what new evolutionary opportunities do the human manipulations of the earth offer the bacteria? 'We offer lots and lots', he said. 'Because we create thousands, if not hundreds of thousands, of new chemicals that have never been seen on our planet before. Wherever we have done that, we find that there are bacteria that eventually figure out a way to utilize those chemicals. We have created nutrient-rich environments of all sorts, simply by washing our cars and by putting detergents down the sinks and by spilling oil and by creating piles of trash and plastics. These are new niches for bacteria[13].

13 Sivaraman S, Murray M. Microbes and metaphors: a dialogue between scientists, artists and activists [Internet]. Uppsala (Sweden): ReAct; 2015 [cited 2026 Jun 2]. Available from: https://reactlat.org/wp-content/uploads/2022/01/Microbes-and-Methaphors-DW.pdf

Visualising the link between the visible and invisible worlds

As the IRRG interviewed leading microbiologists and evolutionary biologists from 2008, we uncovered a revolution in scientific understanding that had not yet reached mainstream medicine. These scientists helped us visualise how the new research had moved beyond understanding microbes only as individual pathogens that can be seen under a microscope and want to harm or kill us. The new scientific insights provided a new language and images to describe microbes' possession of enormous social intelligence and engagement in sophisticated cooperation, including both collaboration and competition. This enables dynamic space-sharing and a variety of adaptive abilities to environmental changes.

Scientists who spoke from the microbes' perspective

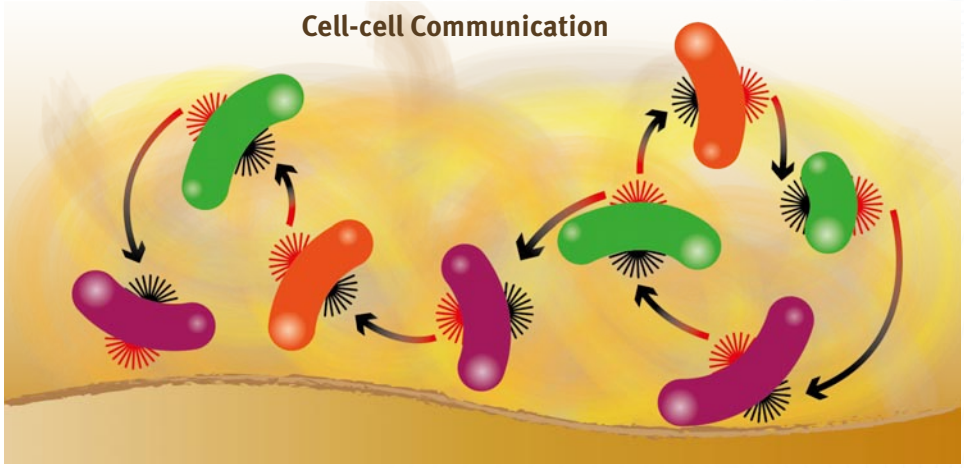


Left to right, up to down: Stanley Falkow – EUA, Michael Gillings - Australia, Eshel Ben-Jacob – EUA/Israel, Jo Handelsman - EUA, Pentti Houvenin - Finlandia.

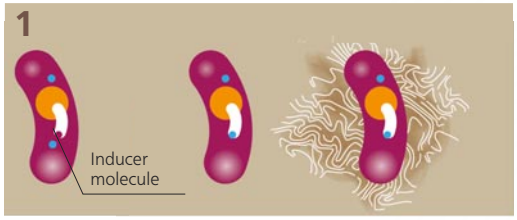


We began to tentatively understand that there was a collaboration of immense importance going on out of sight. Microbes are essential to the healthy functioning of life in human, animal, plant, and environmental ecosystems. Without microbes, life is not possible. The revelation was transformative: massive modern antibiotic use had disrupted bacteria's natural roles in various processes across kingdoms and species, forcing them to evolve and share resistance mechanisms rather than fulfilling their earlier niche ecological functions.

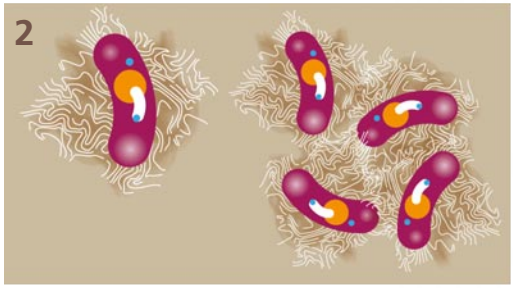
While resisting antibiotics, bacteria and other microbes also share their molecular innovations with each other. As these circulate in the water, soil and environmental ecosystems, they meet other pollutants from human industrial and agricultural activity. Antibiotic resistance is not a problem of individual human or bacterial behaviour, but of collective human behaviour. What affects one affects all. To understand this, we need to first learn to see what is invisible. It was not surprising that it was hard to explain antibiotic resistance when our understanding of microbes themselves is/was so limited. It was clear that a far more comprehensive approach was needed.



Animal and plant cells have hormones, which are the communicating agents. Bacteria also have these and use them to communicate between species, across genera and with their hosts in a sophisticated manner through the process of chemical signalling. IMAGE SOURCE: CENTER FOR BIOFILM ENGINEERING, MONTANA (PROVIDED BY PROF LINDA BLACKALL IN HER PRESENTATION TO MICROBES AND METAPHORS MEETING, 2008)



1. Bacteria produce shiny material to enable communication



2. Shiny material helps bacteria stick to surfaces, communicate...



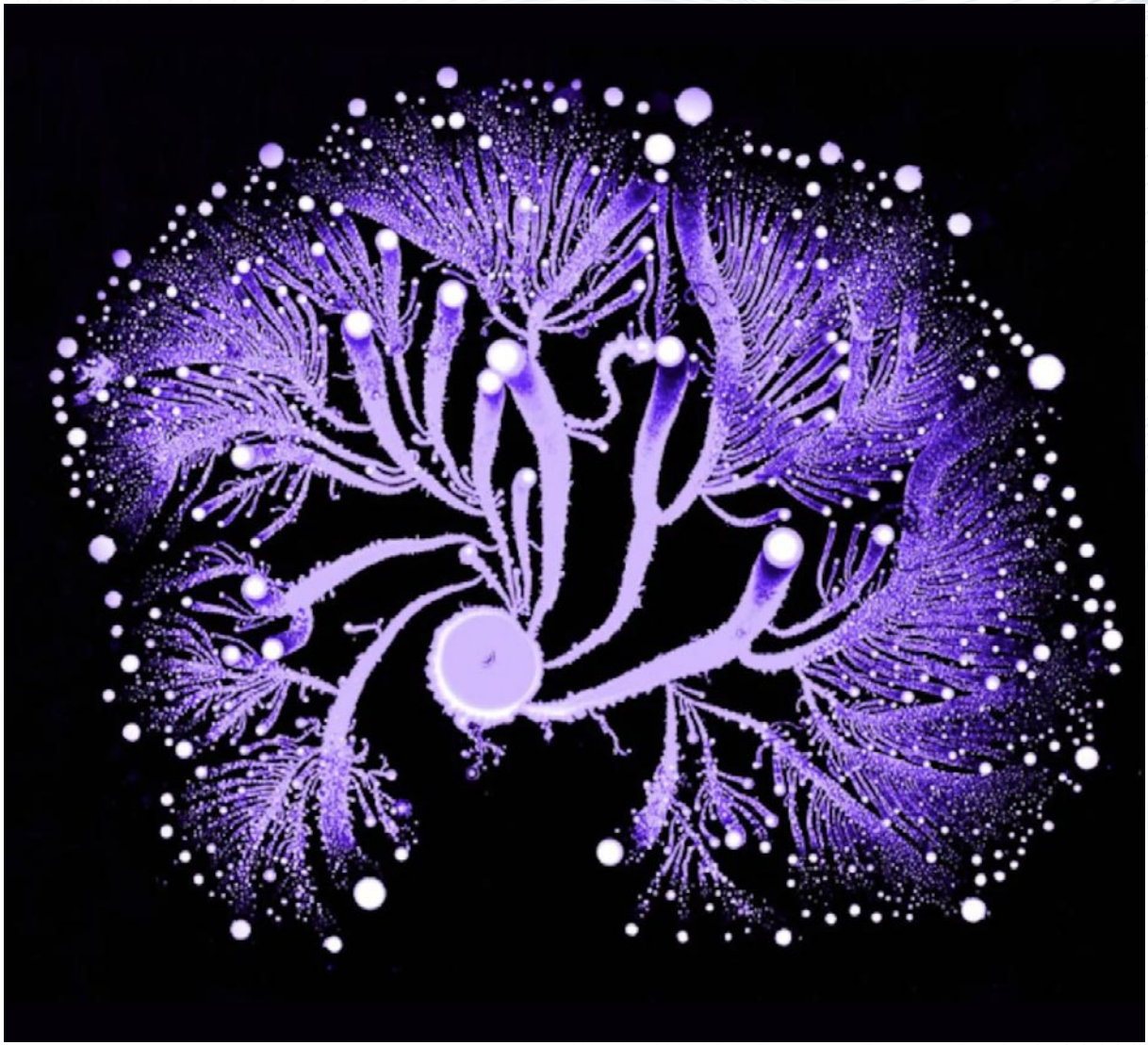
3. ... and leave when needed



Social Intelligence of Bacteria

While studying the genome of Paenibacillus vortex bacteria,[14] a team led by biophysicist Eshel Ben-Jacob at Tel Aviv University, developed Social-IQ scores for bacteria and performed comparative analysis of 500 bacteria whose genome was sequenced. The score is based on the number of genes which give bacteria the ability to communicate and process environmental information, to make decisions and to synthesize offensive (toxic) and defensive (neutralizing) agents as needed during chemical warfare with other microorganisms. Notably, they found that the Paenibacillus vortex (with two other Paenibacillus bacteria strains) has the highest Social-IQ score among all 500 sequenced bacteria, over 3 standard deviations higher than average, indicating a capacity for exceptionally brilliant social skills. Humans with IQ of three standard deviations above average include scientists like Albert Einstein, Stephen Hawking and Richard Dawkins.

14 Sirota-Madi A, Olender T, Helman Y, Ingham C, Brainis I, Roth D, et al. Genome sequence of the pattern forming Paenibacillus vortex bacterium reveals potential for thriving in complex environments. BMC Genomics. 2010;11(1):710. doi:10.1186/1471-2164-11-710.



A colony of the Paenibacillus vortex photographed and digitally painted by Dr Eshel Ben-Jacob, who apart from his scientific work, helped make the beauty and complexity of microbial colonies visible simply by colouring images of bacteria he was growing in his experiments. IMAGE SOURCE: ESHEL BEN-JACOB (REPRODUCED WITH HIS KIND PERMISSION)



Image taken from Eshel Ben Jacob's website identified as EBJ4: 'The end'. Image reproduced with permission.

In multi-colonial communities (e.g., subgingival plaque), bacterial social intelligence is usually used for cooperation between colonies of different species. For example, each colony develops its own expertise in performing specific tasks for the benefit of the entire community, and they all coordinate the work done. Some bacteria undertake the task of keeping valuable information which is costly to maintain and may be hazardous for the bacteria to store. Frequently, such information is directly transferred by conjugation following chemical courtship with potential partners: bacteria resistant to antibiotics emit chemical signals to announce this fact.

Some fundamental aspects of social intelligence are used to handle defectors, as is reflected by the variety of strategies Myxobacteria can use when their social intelligence is challenged by cheaters--opportunistic individuals who take advantage of the group's cooperative effort. For

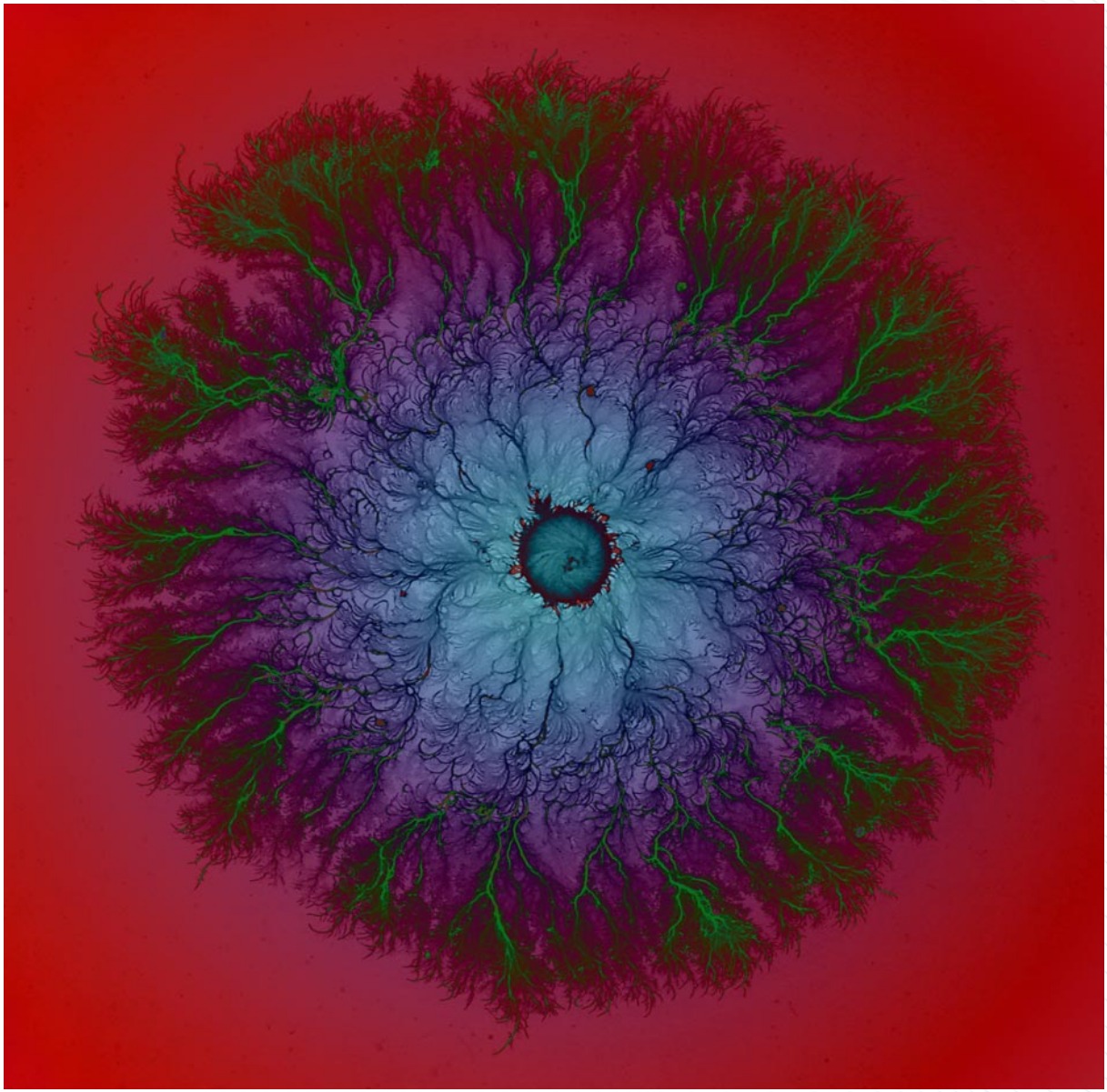


Image from Eshel Ben Jacob's website identified as EBJ1: "Bloody Mary". The colony cooperates to solve problems. Image reproduced with permission.



Image from Prof Eshel Ben Jacob's website identified as EBJ2: '-2-'. Image reproduced with permission.

example, they can single out defectors by collective alteration of their own identity into a new gene expression state. By doing so, the co-operators can generate a new "dialect" which is hard for the defectors to imitate. This ever-ongoing intelligence clash with defectors is beneficial to the group as it helps the bacteria improve their social skills for better cooperation which can be utilized at other times[15].

BOX TWO
'Bacteria are really part of what a human is'

In 2010, the IRRG interviewed Dr Stanley Falkow, Professor of microbiology and immunology at Stanford University School of Medicine. Following are some excerpts:

On what new research in microbiology is revealing...

First the understanding was that we have bacteria on us. Then it became that we have a community (of bacteria) that is part of us and outnumbers us vastly. And now it has become almost as if it is an organ that is part of the human, which interacts with the signals coming from the human and vice versa. So | have actually been using the Gaia hypothesis, it is almost like that now. It is just not that these organisms are contaminants and so on and foreign things. They are really part of what a human is.

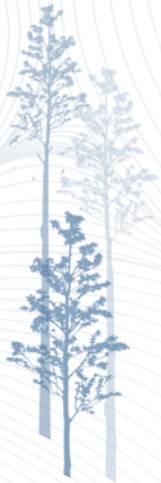
On the war metaphor in medicine...

No, not war. Never. The thing | have been thinking about more, is as Gaia or as an organ. | think it is part, an extension of the human. You can't deal with this as some- thing separate because it is part of the human.

On living with infections...

We have to understand more our relationship with microbes. The first living creature that you come across when you are born is a micro-organism. And you carry the progeny of that microbe in many cases with you till the day you die and that organism would under normal circumstances participate in consuming you. You are really with them the whole way. That is the reality of life, right now there are people...they are going to die. And one of the major causes of death is going to be infection of some kind because of an immune system breakdown. So, you cannot have an infection-free society; may be, someday but not certainly in the near future. But you can prevent a vast amount of illness and the vaccines that have worked have shown that. We have to come with what has always been the best idea, that is, prevent infections to the extent possible.

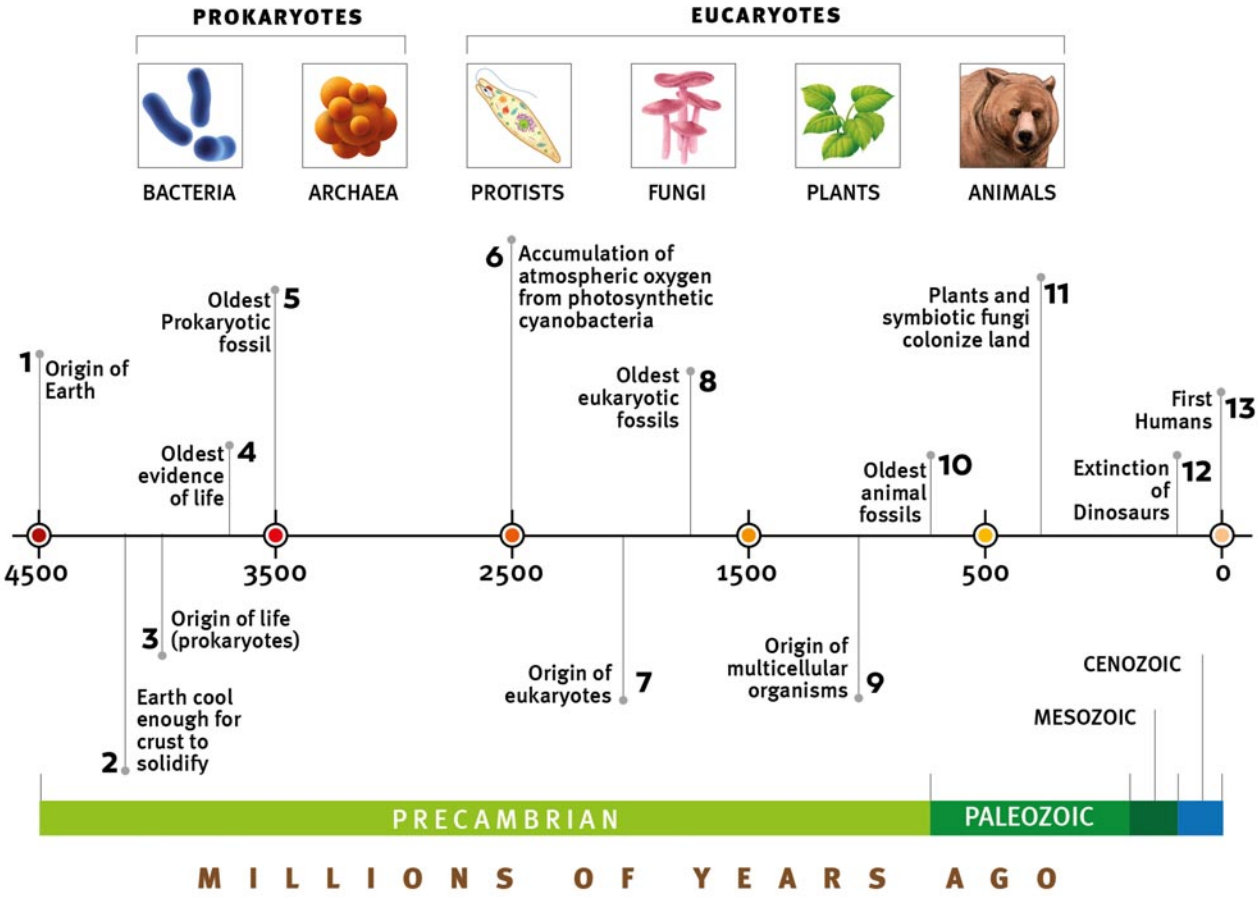
15 Sirota-Madi A, Olender T, Helman Y, Ingham C, Brainis I, Roth D, et al. Genome sequence of the pattern forming Paenibacillus vortex bacterium reveals potential for thriving in complex environments. BMC Genomics. 2010;11(1):710. doi:10.1186/1471-2164-11-710.



We live on a bacterial planet

The story of life on Earth begins not with humans, but with bacteria. Long before the first fish crawled onto land, long before dinosaurs roamed the planet, and even before the emergence of multicellular organisms, bacteria were already thriving, shaping the very foundations of our world. These microscopic beings, invisible to the naked eye, have been the dominant life forms on Earth for billions of years, leaving an indelible mark on every aspect of our planet's history. And yet, in the modern era, they have been seen as nothing more than an 'enemy' of the human species - a gross misrepresentation of the most numerous and vital living organism on our planet, without which no other form of life would have been possible or survive.

The IRRG decided to take Joshua Lederberg at his word and look at resistance from the microbes' point of view and to use as many ways as possible to visualise what happens in the microbial world and its importance for all forms of life, including humans. The question was then how to do this and who could help us? Collaboration with others who are masters of the world of imagination and relationship with 'others' seemed to be the way to go. So began a wonderful journey with artists, indigenous peoples and those close to the ground such as, farmers and children...



Microbes were the first species on Earth. IMAGE BASED ON BOOKS/COLE. CENGAGE LEARNING. BIODIVERSITY AND EVOLUTION

CHAPTER 3
Microbes and Art

The artists

In the evolution of the alternative to the war metaphor, the vision, engagement and support of artists was central. IRRG had many links with artists around the world, many of whom became integral to the process over 20 years of making the invisible world visible and our quest to make the beauty, importance, ubiquity and interconnectivity of the microbial world visible in the configuration of life and the health of Mother Earth.

Through many images whether visual, movement, feeling, musical or spoken we learnt to listen to the microbial world and to follow the thread of the conversation of life. And many people from all walks of life too joined us in listening and learning.

Art invites us to see, feel and think differently

Artists have a particular way of getting us to see, feel and think differently about the world around us. Some of this starts by looking at objects from a unique perspective.

Janet DeBoos, IRRG member, a potter and former head of the ceramics section at the School of Art at the Australian National University, reflected that art requires acts of imagination that allow us to 'get inside phenomena'. Just as long practice moves the artist's skill from outside the body where it is a conscious act to an internalised position that allows the maker to 'become' the work, so too does an act of imagination allow us to 'get inside' the way disease and microbes work, and also the way life's ecological processes work for health and wellbeing. This also takes time and sustained effort.

Janet undertook a short review of artists who were dealing with the idea of disease/microbes and/or new models for life. This was part of the first dialogue we began between scientists and artists in 2008 in a project called ‘Microbes and Metaphors.

The following three examples not only show what is normally invisible to the human eye, but also address another dimension of the invisible, namely what is usually considered with disgust suddenly becomes beautiful – we begin to see what we don’t want to see.





Marcel Wanders – Airborne Snotty Vases – used new technologies to capture a 3D image of sneezes from various types of infection or allergy. The image was turned into a real object and used as a model for his ‘Snotty Vase’ artwork in porcelain.

'Snotty Nose Vases' (from left, Ozaena, Influenza, Coryza, Pollinosis).
Media: Polyamida, 15x15x15 cm (alto, ancho, profundidad). Year: 2001. Manufacturer: : Cappellini, Italia. Copyright: Marcel Wanders and Maarten van Houten.





Marek Cecula –Scatology/Hygiene series– made porcelain surgical and hospital objects that connect the unmentionable with the beautiful – shown at the height of the AIDS epidemic when there was extremely high levels of anxiety about body waste – his suggestion was that fear is not the answer-maybe getting to know (and therefore seeing the beauty in) 'the enemy' was a better way.

Participatory or performance art processes engage people more actively. Anna Dumitriu's work blurs the boundaries between art and science in her fascination with bacteria to show the interconnectedness of bacteria and humans.

With the rubric 'Not how clean is your house – but how sublime is your ecosystem', her work sets out to remind people of the role of bacteria in producing our foods and challenging people's astonishing purchasing levels of antibacterial hand gels for use in their homes (pre-COVID-19). By culturing bacteria from the ubiquitous everyday places of our lives (in this case a chair and her bed) she then crocheted the pattern made by the microbes on the agar plate. She crocheted whilst talking to people in a hospital waiting room about normal flora (human microbiome), and also did a major performance installation at the science museum in London. Later works include wall sized representations of the fragile gut microbiome in felt with bead work[16-17].

From an extensive list, six ReAct LA publications stand out for documenting the diversity and evolution of these and other contributions: Reimagining Resistance[18]; Reflexiones de lo diminuto y viviente[19]; Microbes and Metaphors[20]; Fear, Wonder and Learning[21]; Aesthetics of the Invisible[22]; and Danzando con las bacterias y las palabras[23].

16 Dumitriu A. Normal Flora [Internet]. Brighton (UK): Anna Dumitriu; 2007 Jul [cited 2026 Jun 2]. Available from: https://annadumitriu.co.uk/portfolio/normal-flora/

17 Dumitriu A. Fragile Microbiome [Internet]. Brighton (UK): Anna Dumitriu; 2024 [cited 2026 Jun 2]. Available from: https://annadumitriu.co.uk/portfolio/fragile-microbiome/

18 Sivaraman S, Murray M, editors. Reimagining resistance: towards a new paradigm of human-bacterial relations. Part of the Reimagining Resistance series [Internet]. Uppsala (Sweden): ReAct; 2016 [cited 2026 Jun 2]. Available from: https://www.reactgroup.org/wp-content/uploads/2016/09/Reimagining-Resistance-A-Resource-Book.pdf

19 Quizhpe A, Murray M, Sivaraman S, Campoverde N, Figar S. Reflexiones de lo diminuto y lo viviente: arte, bacterias y microbioma [Internet]. Ortiz S, editor. Cuenca (Ecuador): ReAct Latinoamérica; 2020 [cited 2026 Jun 2]. Available from: https://reactlat.org/download/reflexiones-de-lo-diminuto-y-viviente-arte-bacterias-microbioma/

20 Sivaraman S, Murray M. Microbes and metaphors: a dialogue between scientists, artists and activists [Internet]. Uppsala (Sweden): The Reimagining Resistance Group; 2015 Jul [cited 2026 Jun 2]. Available from: https://reactlat.org/wp-content/uploads/2022/01/Microbes-and-Methaphors-DW.pdf

21 Murray M, Sivaraman S, Calle K, Spiegel JB, De Bois J, Yassi A, et al. Fear, wonder and learning: reimagining the human-microbe story. Antennae (Lond). 2016;(35):45-57 [cited 2026 Jun 2]. Available from: https://icasc.ca/resource/fear-wonder-and-learning-reimagining-the-human-microbe-story/

22 Quizhpe A, Cameron P, Monsalve J, Calle K, Müller B. Aesthetics of the invisible: dancing with bacteria for planetary health [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2021 [cited 2026 Jun 2]. Available from: https://reactlat.org/wp-content/uploads/2024/06/AESTHETICS-OF-THE-INVISIBLE-DANCING-WITH-BACTERIA.pdf

23 Quizhpe A, Murray M, Sivaraman S. Danzando con las bacterias y las palabras [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2024 [cited 2026 Jun 2]. Available from: https://reactlat.org/download/danzando-con-las-bacterias-y-las-palabras/



Title: Hygiene Set V. Media: Slip cast Porcelain. Year: 1995. Copyright: Marek Cecula.



Title: Performance Bacterial Crochet. Crocheting, Anna Dumitriu reproduces the growth patterns of bacterial colonies from her own bed. Media: Fibre. Year: 2008. Copyright: Anna Dumitriu.





Anna Dumitriu in her performance 'Bacterial Crochet', where she reproduces the patterns of bacterial colonies found in her own bed.



Participatory performance: Anna Dumitriu crocheting an artwork inspired by the microbial flora of her bed in the waiting room of Eastbourne Hospital, United Kingdom.

Art-making for communication, awareness and mobilization

Collaborative processes between artists and health professionals in the early part of IRRG's journey addressed the common perception, especially by health professionals, that art is only an instrument for getting across public health messages in a better way. But in the collaborations highlighted below, the health professionals came to understand that artists are equal partners in an interdisciplinary process. Art has its own perspective.

Such collaboration for example resulted in the photo documentary project called FotoResistencia and the first world street march in favour of bacteria. Not only were we now discovering an innovative way to communicate complex public health issues but also fostering new ways of thinking, seeing and feeling.

FotoResistencia - Antibiotic Resistance in Photos

ReAct Latin America worked with photographers to produce 'FotoResistencia', a photodocumentary exploring the social determinants of antibiotic resistance in Ecuador's southern. The health workers of Ministry of Health and Social Insurance in Ecuador were invited to use photography to visualize bacteria, antibiotics, and infectious diseases in their daily lives. The photos evolved into powerful visual stories that were shared through art exhibits and published in a two-volume book.[24-25].

The project aimed to show both the health professionals who took up the camera and the communities who would later view the images that the real enemy is not microorganisms, but the difficult living conditions of large segments of society, as well as the constraints under which health teams operate. In this sense, FotoResistencia also sought to highlight the efforts, commitment, and creativity of health professionals in fulfilling their mission.

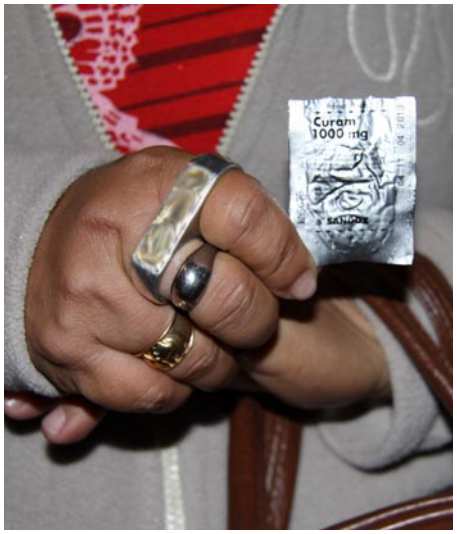
24 ReAct Latinoamérica, Pan American Health Organization. PhotoResistance: antibiotic resistance in photos [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2024 [cited 2026 Jun 6]. Available from: https://reactlat.org/wp-content/uploads/2024/12/Fotoresistencia-la-Resistencia-de-los-antibioticos-en-fotos.pdf

25 ReAct Global, Pan American Health Organization, ReAct Latinoamérica. PhotoResistance: stories of antibiotic resistance in photos. Vol. 2 [Internet]. Uppsala (Sweden): ReAct Global; 2015 [cited 2026 Jun 6]. Available from: https://reactlat.org/wp-content/uploads/2020/11/Fotoresistencia-Historias-de-Resistencia-a-los-antibioticos-en-fotos-vol-2-DW.pdf



Bleisy is an Ecuadorian girl who was living with multidrug-resistant tuberculosis. In this photo, she appears happy with the birthday cake prepared for her twelfth birthday by the healthcare team treating her. What happened to Bleisy after she left the hospital? Her story is one of the stories featured in FotoResistencia. PHOTO: CRISTIAN PACHECO & GLENDA CHACÓN / ReAct LA





With beautiful green eyes, Gata is a sex worker who always carries a 1000 mg amoxicillin tablet in her purse to relieve abdominal pain or burning when urinating. Her story is also part of FotoResistencia. PHOTO: VICENTE TELLO / ReAct LA

The owner of this poultry farm is not a veterinarian, but feels capable of administering medications to his chickens on his own. What he knows, he learned from veterinarians or drug sellers. This story is also part of FotoResistencia. PHOTO: NANCY ARÉVALO / ReAct LA

"Caravan for Life and Bacteria" - A Street March in Cuenca, Ecuador

The Caravan for Life and Bacteria was an early collaboration between Medical and Arts Faculties of the University of Cuenca in Ecuador. On November 14, 2012, hundreds of school children, students and teachers from the University of Cuenca walked the central streets of this Andean city, painted in disguise, holding banners and doing small performances to talk about antibiotic resistance, bacteria and their importance for life. The Caravan for Life and Bacteria was a milestone, since there



Scene from the Caravan for Life and Bacteria in Cuenca, Ecuador. PHOTO: KLÉVER CALLE/ReAct LA





Scenes from the Caravan for Life and Bacteria in Cuenca, Ecuador. PHOTOS: SILVINA ALESSIO/KLÉVER CALLE/ReAct LA



is no known record of a public demonstration in the world in favour of bacteria! While mostly giving messages about proper use of antibiotics, it also showed the connection between traditional fermented foods and microbial processes with the participation of women's group involved in preparing food and drinks using traditional recipes.

People's Participation and Arts for Social Change

The arts can have social change as a deliberate strategy. Spaces are created to enable people to participate, receive, think and to act. Often in these spaces the particular histories and conflicts of those localities can be felt and interacted with – to be danced with. So, it can be a tool for resolution of conflicts or problems and for engagement,



Cesáreo Guamán, representative of the Kañari people, in a dialogue on health, ecosystems, water, microbes, and antibiotic resistance, with representatives of ReAct Latin America (Cañar, Ecuador, 2007). PHOTO: KLÉVER CALLE / ReAct LA

education and community development[26]. For example, the creation of an intercultural community health promoter's handbook in Ecuador sharply focussed the clash of paradigms between Western medical knowledge and indigenous knowledge systems and was mediated, more or less successfully, through creative arts processes[27].



"In Indigenous communities, there are food practices and knowledge for health care," stated Aymara leader Toribia Lero at an international seminar on antimicrobial resistance in La Paz, Bolivia (2018). "Universities should contribute to and legitimize this knowledge through dialogue." PHOTO: ReAct LA

26 Quizhpe A, Cameron P, Monsalve J, Calle K, Müller B. Aesthetics of the invisible: dancing with bacteria for planetary health [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2021 [cited 2026 Jun 2]. Available from: https://reactlat.org/wp-content/uploads/2024/06/AESTHETICS-OF-THE-INVISIBLE-DANCING-WITH-BACTERIA.pdf

27 Murray M, Sivaraman S, Calle K, Spiegel JB, De Bois J, Yassi A, et al. Fear, wonder and learning: reimagining the human-microbe story. Antennae (Lond). 2016;(35):45-57 [cited 2026 Jun 2]. Available from: https://icasc.ca/resource/fear-wonder-and-learning-reimagining-the-human-microbe-story/



Dialogue of knowledges on the interrelationships between the health of Mother Earth and women's health, in Cuenca, Ecuador (2019). PHOTO: ReAct LA



Dialogue on the role of microorganisms in the production of healthy food at an agroecological farm in northern Thailand (2019). PHOTO: ReAct LA

‘Feel Me! I am here!’

The Arts - Medicine collaboration at the University of Cuenca was reinjected with new drive in 2013 with the assistance of the International Centre of Art for Social Change in Canada and two other Canadian Universities[28]. The medical paradigm had mostly predominated in the earlier collaboration that created the street march.

In the new initiative it was decided that ‘... the key conditions under which this inter- and trans disciplinary collaboration should operate: each speaking from his/her field but without barriers to enter



Presentation of “Feel Me! I’m Here” at the University of Cuenca, in the context of an international seminar on ecosystem health and bacterial resistance (2013). PHOTO: PEOPLE’S HEALTH MOVEMENT – LATIN AMERICA

28 Murray M, Sivaraman S, Calle K, Spiegel JB, De Bois J, Yassi A, et al. Fear, wonder and learning: reimagining the human-microbe story. Antennae (Lond). 2016;(35):45-57 [cited 2026 Jun 2]. Available from: https://icasc.ca/resource/fear-wonder-and-learning-reimagining-the-human-microbe-story/

into the field of another'. Four groups worked together creating projects. The most exciting was a dance piece called 'Feel Me! I am here' which told the story of bacteria meeting with antibiotics and the consequences.



Among art and medical students, the cast of "Feel Me, I'm Here." PHOTO: ESTEBAN ESPINOZA

BOX THREE

Making the inner and microbial world visible

Peter Cameron and Panya Chaiyakum, two artists IRRG has worked with, have been great collaborators bringing an inner awareness to the environment and ecology around us, our relationship with it as human beings and impact of our actions and ways of thinking.

Peter Cameron, IRRG member and Australian landscape painter, ceramicist and poet, talks about his approach to the landscape. He feels his way into the landscape – to feel what is there on its own terms. – the unconscious encounter is as important as the conscious encounter. The consciousness of the land and its inherent structures – from mountains to microbes – must be encountered on its own terms, not expecting them to participate in this dialogue on the terms of human consciousness.



Artworks of Peter Cameron

"Here this large flat plain of mineral muds collaborates with the Sun, air and water, too often produce unusual atmospheric conditions. My early responses were surrealistic with images, textures arriving automatically. What fascinates me now in this vague and often undifferentiated landscape is the sense of atmosphere itself, experienced variously, with emptiness or in brilliance, when there is water lying there, or not..."

Peter Cameron, 2008,
from Microbes and Metaphors

◂ Title: Land Forming 6. Media: oil on linen, 138x138 cm. Year: 2014. Copyright: Peter Cameron.



Canberra District 12, detail.



Canberra District 8, detail.



Canberra District 9, detail.

According to him the vital importance of microbiome for health in all bodies is now widely acknowledged and the collaborative research has developed deep roots. 'What this team (IRRG) does well is listen to the phenomena, following where resistances are and what these mean to various systems of health, attending to all the senses. As human beings inhere in an open system of complex functioning relationships, we may learn more from these viewpoints than the generally accepted, industrially reduced, mechanical model. To look at relationships inside and outside all bodily structures at the same time requires an ability to visualise moving patterns, requiring all our wits and senses. Vital relational collaborations create vital new narratives. Inter and intra-disciplinary teachers learning with students, cross-cultural work, art dancing with song talking between languages.'

Panya Chaiyakum, a Thai classical painter and multimedia artist, was preoccupied by the destructive consequences of human consciousness and civilisation – urging us to understand the wonder of mutation of microbes, the changing of life into other forms. We have lost contact with this richness[29].



Title: Universe and Civilization. Media: Postcard Paper. Year: 2005. Copyright: Panya Chaiyakum.

29 Murray M, Sivaraman S, Calle K, Spiegel JB, De Bois J, Yassi A, et al. Fear, wonder and learning: reimagining the human-microbe story. Antennae (Lond). 2016;(35):45-57 [cited 2026 Jun 2]. Available from: https://icasc.ca/resource/fear-wonder-and-learning-reimagining-the-human-microbe-story/

Musical collaborations

Alexis Zapata's ten-part musical extravaganza called Dancing with Bacteria tells the story of bacterial life on Earth through music, poetry, dance and visual arts. Alexis Zapata is part of The Ensamble del Viento, an artistic collective from the School of Music of the University of the Americas, that promotes the rhythms, wind instruments and dance of the indigenous peoples of the Andes of Ecuador. In developing the work they connected



Presentation of "Dancing with Bacteria" in Quito, Ecuador (2022). PHOTO: JUAN MANUEL FREIRE/ReAct LA



The Ensamble del Viento performing “Dancing with Bacteria” for PAHO’s 120th anniversary in Quito (2022). Front: Alexis Zapata, director of the Ensamble. PHOTO: COURTESY OF PAHO ECUADOR

with RLA and RR members from Australia, Bolivia, India and Ecuador, including artists, scientists and communicators, to talk about art, microbes, antibiotic resistance, the use of antibiotics, and a new metaphor governing bacterial-human relations. First performed in Quito in 2022 to a packed theatre, it has since travelled to Cuenca in 2023 and Santa Fe in Argentina in 2024.

The music they created is based on the structure of the first bacteria on Earth. Each of its ten movements tells a chapter of history and possible futures, like an opera. The work, which involves 30 musicians, 3 singers with their choirs, 4 dancers wrapped in powerful sound and cosmic lighting, acting on the visuals of moving microorganisms projected on the screen at the back of the stage. It contains the essence of Andean thought developed over centuries, a deep and respectful knowledge of all forms of life, including those invisible to the human eye, such as microorganisms. This respect is manifested in everyday practices and rituals that recognize the interdependence of human beings with these tiny organisms. Thus, the act of 'dancing with bacteria 'becomes a powerful metaphor of coexistence and harmony, inspired by the ancestral legacy of respect for all forms of life[30].

In the RLA/IRRG online dialogue to mark World Microbiome Day in 2023, Alexis explained the creative process of Dancing with Bacteria:

- Music is the first language of humanity. Bacteria are part of an ancient ecosystem indispensable to all life and hence bacteria are inspirational. Music leads to dancing with bacteria;

- We took an article from Nature called "Evidence for early life in Earth's oldest hydrothermal vent precipitates"[31]. It documented the elements found in the fossil structures on the sea floor – carbon, carbonate, haematite – and provided an equation for how this was formed, namely $CH_3COOH + 8Fe(OH)_3 + 2H_2O \dashrightarrow 8Fe^{2+} + 2HCO_3^- + 2OH^- + 8H^+$

- Then the sound of each of the biogenic elements (C, H, O, Fe) was created. Thus we were able to play the sound of acetic acid (the first compound in the equation) and then the whole complex reaction.

- Music has three elements: melody, harmony and rhythm. The melody came from fossilized micro-organisms and the chemical elements they are composed of. The harmonies were duets and trios of the Ecuadorian pan flute. Rhythm came from traditional Andean music.

- These elements created the 10 parts 'Dancing with Bacteria' work.

30 Quizhpe A, Cameron P, Monsalve J, Calle K, Müller B. Aesthetics of the invisible: dancing with bacteria for planetary health [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2021 [cited 2026 Jun 2]. Available from: https://reactlat.org/wp-content/uploads/2024/06/AESTHETICS-OF-THE-INVISIBLE-DANCING-WITH-BACTERIA.pdf

31 Dodd MS, Papineau D, Grenne T, Slack JF, Rittner M, Pirajno F, et al. Evidence for early life in Earth's oldest hydrothermal vent precipitates. Nature. 2017;543(7643):60-4. doi:10.1038/nature21377.

Dance as resistance to the destruction of life

IRRG began to collaborate with dancers to understand more deeply what it means to dance. The diversity in motivations and mastery of dancers' expressions took us deeper into the challenge we have as human beings to consciously and unconsciously respect the 'other'. Dance allows us to enter into the space between our egos and power (shaped by centuries of political and cultural forces influenced by the war metaphor), and the unseen elements creating and recreating life around us[32].

Some key examples are given of how dancing with and in nature connects us to the things bigger than us; how dancing changes the ego relationship between nature and other beings; how dance helps in creation of a response to violence and the repressions of society; and dance as connecting us to the Earth – as the ancient ways of indigenous people practice it.

Elizabeth Cameron Dalman, creative director of the Mirramu Dance Company and founder of the Australian Dance Theatre: "Dance is the big connector". "We are becoming aware of everything, while we dance in nature. We become very aware of all the creatures that surround us, like a blade of grass, a bird flying by or what could be a small insect. It's not like being in a theater, no. It's transcendental. As dancers we realize that, no matter how outstanding we are, in reality, we are a very small element in this immense and wonderful universe"[33].

Grace Peng, Director of Dancecology in Taiwan: "Actually, dancing with bacteria is very funny – funny in an encouraging way. Not the feeling of 'oh we fear the things we cannot see.' It is sympathy! We need to learn that – with your partner, with all the different artists in theatre and now even bigger with all in nature…In the dance, breathing is also dancing all the time. I feel that everything is through breathing, breathing in motion. It's like the bridge with the visible surroundings and with the invisible things"[34].

Alexis Zapata, Ecuadorian musician: "Dancing takes you out of your comfort zone … Dancing with bacteria already has a life of its own and uses me as its instrument. We are chaskis (messengers in Kichwa)".

32 ReAct Latinoamérica. Dancing with our friends Bacteria [video on the Internet]. YouTube; 2018 [cited 2026 Jun 6]. Available from: https://www.youtube.com/watch?v=EPtvOGnzkrU

33 Quizhpe A, Murray M, Sivaraman S. Danzando con las bacterias y las palabras [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2024 [cited 2026 Jun 2]. Available from: https://reactlat.org/download/danzando-con-las-bacterias-y-las-palabras/

34 Quizhpe A, Murray M, Sivaraman S. Danzando con las bacterias y las palabras [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2024 [cited 2026 Jun 2]. Available from: https://reactlat.org/download/danzando-con-las-bacterias-y-las-palabras/



Images from the dance performance 'Reflecting Weereewa. The Aura of Bodyscape and Land', from Mirramu Dance Company, Australia, and Dancecology, Taiwan. SCREENSHOTS FROM THE VIDEO "REFLECTING WEEREEWA", BY GRACE PENG

'I want to tell you about the Zapateo. This is the rhythmic dancing of the feet against the ground in my native country, Ecuador. To dance with Zapateo is to awaken Pachamama. During Inti Raymi, dancers stamp their feet to thank her for the harvest and open a dialogue with Mother Earth. Every step reminds us that we belong to the same cycle of life. This Zapateo is not merely symbolic. As we practice it, electrons from the ground balance our nervous systems, reduce inflammation and regulate cortisol. Zapateo is a sacred dance that enlightens our communities and elevates collective consciousness.'



Tap dancing during the 2021 Inti Raymi celebration in Chobshi, Ecuador. PHOTO: PAÚL VILLA GRANDES – VI-GRAF FILMS

Vivian Luz, founder and creative director of Los Celebrantes in Argentina: "There has to be an artistic response to violence and persecution— I love your idea of dancing with bacteria and agree with it. There has to be an artistic response - from a place of calm, interaction and understanding — basically, understanding".



Vivian Luz, in the performance “El tiempo es un cuerpo” (2024). PHOTO: COURTESY OF THE ARTIST

BOX FOUR

Dance of the Invisibles — Dance on alert

Interview with Vivian Luz, Los Celebrantes, Argentina. Vivian is a highly acclaimed Argentine director, choreographer, dancer, and teacher with an extensive career in theatre and contemporary dance.

Why did you choose dance as a means of expressing resistance?

Clearly dance chose me at a very young age. Later, I lived through a period of intense ideological persecution. As everyone knows, life was very difficult in Argentina at that time. The people around me were quite brave, and so were we. I mean, we didn't confront the military regime, but we continued to do things and put on some quite provocative shows. So dance became a means of expressing resistance.

Can dance serve as a metaphor for life and our relationships with others?

Dance is a metaphor for life and our relationships with others, especially the dances of First Nations peoples. I think it is the best place to see the origin of dance. I believe that dance is the first manifestation of the human being, and that contact is dance - before writing, before speaking in some coherent language, before words. The body is before words and, then, simply by making a little noise on a stick there is already a rhythm and one already dances.

Dance can be called any kind of movement that comes from necessity. If there is a movement that is necessary for hunting, survival, feeding oneself, fertilisation, and so on, then it is a necessary movement. There is also a movement that is free, which is the pleasure of feeling the body. I believe this has been present in humans from the beginning.

Can you imagine bacteria dancing?

Can I imagine bacteria dancing? It gives me ideas. Nowadays, with all the available resources, I would have to do more research on bacteria and, let's say, the whole system of the world and atoms. Atoms also dance, don't they? And from there, one can circulate to the galaxies, although it is not possible to go there. The world never stands still. It is always in motion. In other words, we are a world in permanent motion, sometimes faster, sometimes slower, with different rhythms and different phases. Visualising bacteria in motion seems elementary to me. They are never still. I find the idea of microorganisms out there very, very fascinating.

Is it possible to change the metaphor of war and dance with bacteria instead?

I think it has to do with coexistence. As we discussed earlier, collaboration and association involve taking the other person into account, whether you're dancing in a group or as a couple. We should consider bacteria so that we can better understand our finite bodies. Then, the care of bodies is intertwined with the idea of dance. It can be perfectly imagined.





CHAPTER 4

Paradigm Shift through Public Participation



Processes open to everyone

All this new evidence and interviews with scientists about the multiple dimensions of the antibiotic resistance phenomenon were shared in many forums with health professionals, students, farmers, community leaders, indigenous communities, artists and children. In turn, the work we did with artists induced a new dynamic into the work. The various perspectives continuously opened new paths to invite people to begin to visualise the world of bacteria and understand the invisible but also damaging impacts of many kinds of decisions made by humans in the use of medicines, chemicals and extractive processes.

People began to make connections between what they were learning about the microbial world and issues relevant to their concerns, lives and dreams and they used or created opportunities to articulate these connections. In 2008, the Microbes and Metaphors Dialogue brought scientists, artists, communicators and social activists together to enter into the space between historical and cultural conceptions of the microbial world and disease based on fear and the war metaphor and the new knowledge and imagination of the invisible world of microbes[35]. ReAct Latin America proposed in 2009 to the Humanist Movement who were organizing the World March for Peace that there was an ethical imperative to make peace with microbes and also bring peace to all relationships between humanity and nature.

35 Sivaraman S, Murray M. Microbes and metaphors: a dialogue between scientists, artists and activists [Internet]. Uppsala (Sweden): ReAct; 2015 [cited 2026 Jun 2]. Available from: https://reactlat.org/wp-content/uploads/2022/01/Microbes-and-Methaphors-DW.pdf



For the World March for Peace (2009), organized by the Humanist Movement, ReAct Latin America proposed that the message of peace include relationships between human beings and bacteria. The girl in the image took part in the March's activities as it passed through Cuenca, Ecuador. PHOTO: ReAct LA

Beyond human use of antibiotics, it was becoming clear that a much larger disruption of the global microbial ecosystem was happening due to massive use of antibiotics in the food chain. As a result, the issue of antibiotic resistance saw greater engagement of farmers, indigenous communities, agro-ecological networks, and others working to resist the contamination and destruction of habitat and food systems through extractive industry and pesticide use.

Some of the key landmarks, gatherings and processes are described below.

Antibiotic Resistance: The Ecological Dimension

ReAct Latin America (RLA), held its first significant international collaborative event in 2008 on the theme of 'Restoring the health of ecosystems to contain antibiotic resistance' with participants from 21 countries. The meeting included a Workshop-Seminar on Antibiotic Resistance, Infectious Diseases, Community Solidarity and Ecosystems. The following statement set out the approach of the gathering:

"We have to urgently rationalize the use of antibiotics. But, above all, [we have to] act to prevent infectious diseases with healthy water, food and environments, and learn to respect rivers, jungles, seas and mountains inspired by the wisdom of our native peoples. This means to understand the true role of bacteria in the poem of health and life. This means to Restore the Health of the Ecosystems".



Otto Cars, founder of ReAct, y Arturo Quizhpe, at the opening ceremony of the workshop on antibiotic resistance, infectious diseases, community solidarity and ecosystems (Cuenca, 2008). PHOTO: ReAct LA



The Tucumán dance of the peoples of southern Ecuador, presented by the Cultural Music and Dance Group of the Salesian Polytechnic University at the 2008 Workshop-Seminar. PHOTO: ReAct LA

In 2013 a second international meeting was hosted by RLA, this time explicitly designed to be pluricultural. About one thousand people participated including health professionals, students of medical sciences, social and health activists, representatives of different nationalities and ethnicities, ecologists, researchers, and artists. The meeting developed an action plan for identifying the necessary conditions for harmony between humanity and Mother Earth, namely, finding pathways



Poster for the International Seminar on Bacterial Resistance, Infectious Diseases, Community Solidarity, and Ecosystems (Cuenca, 2008). DESIGN: DANIEL GUAÑA

and strategies to promote the conditions for freedom, justice and health for all. The meeting discussed the microbial world in the context of Sumak Kawsay, drawing inspiration from the capacity of bacteria to resist antibiotics, while at the same time placing the problem of AMR within a comprehensive interconnected concept of the health of Mother Earth[36].

Children Bring New Insights

From 2012-2018, an incredible series of projects and processes were accomplished involving children, teachers and schools in Ecuador, Nicaragua and Argentina, thus continuing the tradition of seeking children's voices in the health and future of their society that began with the International Children's Declaration at the 2005 Second Peoples Health Assembly[37].

36 Quizhpe A, Calle K. Sumak Kawsay y salud: vida en plenitud y armonía entre la humanidad y la Madre Tierra. Memorias del Encuentro Internacional y Pluricultural: Sumak Kawsay y Salud, 7-12 de octubre de 2013, Cuenca-Ecuador [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2014 [cited 2026 Jun 7]. Available from: https://reactlat.org/wp-content/uploads/2022/01/SUMAK-KAWSAY-Y-SALUD-DW.pdf

37 Hamlin Zúñiga M, Quizhpe Peralta A. Voices of the Earth: from Savar to Cuenca [Internet]. Cuenca (Ecuador): Imprenta Monsalve Moreno; 2007 [cited 2026 Jun 7]. Available from: https://drive.google.com/file/d/1zbp0B5TrMeAy9AKx9A_xBEz8SJPYc8o_/view



With this group of teachers from Cuenca, Ecuador, the development of the Alforja Educativa began in 2013. The Alforja Educativa is a collection of guides, stories, games, and songs designed to learn about health, microbes, and antibiotic resistance. PHOTO: KLÉVER CALLE/ReAct LA



Two young cyclists at the First Montalvo Cycle Adventure for a Microbial World with Buen Vivir (2013), in which hundreds of young cyclists from five schools in Cuenca took part. PHOTO: ReAct LA



This intriguing book brings together stories about microbes, written by children from several schools in Cuenca during different workshops where they learned about microbiology and literature. PHOTO: ReAct LA.



After an Alforja Educativa workshop, children from the city of Gualaquiza (Ecuador) took to the streets with messages about beneficial bacteria and the appropriate use of antibiotics. PHOTO: ReAct LA.



In San Miguel de Tucumán (Argentina), Noelia Marianela Carrapizo, an early childhood teacher, introduced her students to the microbial world through experimentation, yogurt-making, storytelling, and health. PHOTO: COURTESY OF NOELIA CARRAPIZO.



Playing — a key learning strategy — during a workshop of the Educational Saddlebag with community health promoters in El Salvador (2015). PHOTO: ReAct LA



Girls and boys presenting their school garden project in Formosa, Argentina (2019). PHOTO: ReAct LA

Over several years a series of story books on microbes were created by children. The process is described here to show the power of children's participation and the creative and educational excellence of the teachers using the methods of the Child-to-Child approach. Entering the magical world of story writing and the invisible world of bacteria opens up a new universe of countless creative possibilities for children, with the freedom to imagine them in thousands of ways, shapes and colours. Their stories give voice to their perceptions about the respect we should have for all beings on the planet.

In 2012, ReAct Latin America and the Child-to-Child (Niño a Niño) Center in Cuenca proposed a series of participative didactic processes to help children understand the microbial world, in the context of health as Alegremia (Joy), the interweaving of infinite relationships that exist in nature, and the problem of antibiotic resistance and proper use of antibiotics. This eventually led to the development of the Educational Alforja (Backpack) for School Health and Microbial World[38].

"From the smallest (person) to the smallest (being) on the planet" was launched in 2016 in Cuenca, by a group of children authors from six schools in the city[39]. With the help of several doctors[40] they had dived into the world of microbes, discovering their names and functions in the human body and in nature. A subsequent workshop to create stories, based on characters, situation and, dreams, was led by three gifted and committed teachers[41]. Children read the stories in many media outlets in the city.

In 2018, children made another significant contribution to the Educational Alforja through the project 'Inhabitants in Yogurt – Probiotics: foods that heal'. It aimed to motivate children from an early age to learn how the microbial world is a fundamental pillar of health and to adopt a comprehensive view of microbes. The work in the classroom introduced the study of microbial diversity in a significant way, covering bacteria, cycle of life, antibiotic resistance and foods that heal. Students made comparisons, recognized characteristics of bacteria, used the laboratory and the garden as a space to explore and experiment with microorganisms, and learn in which foods they are found and how they impact health. Antibiotic resistance was put into the context of the importance of a balanced, healthy diet and care for Mother Earth.

38 ReAct Latinoamérica. Alforja Educativa: tools for health promotion [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; [cited 2026 Jun 7]. Available from: https://alforjaeducativa.reactlat.org/

39 ReAct Latinoamérica. De los más pequeños a los diminutos del planeta: cuentos bacterianos escritos por niños y niñas [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2014 [cited 2026 Jun 7]. Available from: https://www.reactgroup.org/wp-content/uploads/2016/11/De-los-m%C3%A1s-peque%C3%B1os-a-los-diminutos-del-planeta.pdf

40 Professor Jorge Parra, Faculty of Medical Sciences, University of Cuenca, Ecuador; Dr. Arturo Quizhpe, Director of ReAct Latin America

41 Silvina Alessio, Mónica Morocho and Gustavo Cedillo.

BOX FIVE

‘We live thanks to bacteria’ — interview with Julio Monsalvo

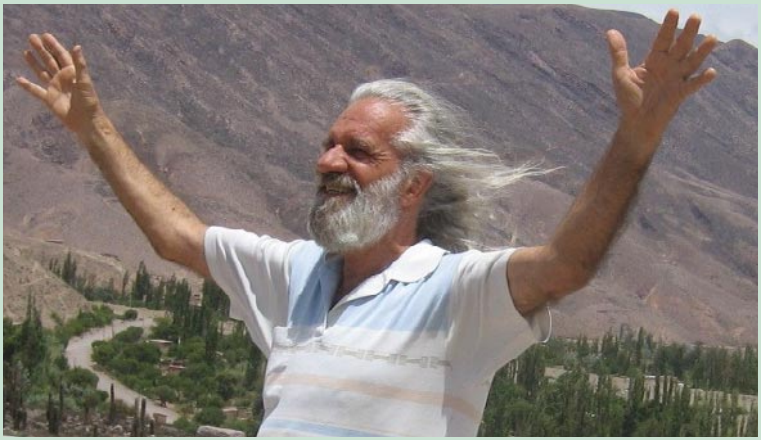
A great impetus for the paradigm shift came from Argentina: through Julio Monsalvo, who had had the opportunity to read the evolutionary biologist Lynn Margulis, we approached another look at microorganisms, outside the metaphor of war. So, in the midst of all these currents, on October 26, 2007, ReAct Latin America published an interview with Julio Monsalvo titled "We live thanks to bacteria", conducted by Kléver Calle:

"It is said that this so-called resistance is a consequence of the reckless use of antibiotics. However, I believe that this statement is only part of the truth. I think that resistance is essentially a manifestation of the intelligence of Life itself that develops strategies for its continuity.

"My feeling is that bacteria are living beings and because they are such, with intrinsic value in themselves, they are members of the fabric of Life. For example, science shows us that bacteria play an essential role in regulating our atmosphere. They are like the enzymes of a cell. They influence the proportion of chemical reactions that have meant that for millions of years we have had an atmosphere with 21% Oxygen, 79% Nitrogen and 0.03% Carbon dioxide.

"Of course, the Gaia Theory, by Lynn Margulis (microbiologist) and James Lovelock (atmospheric chemist), shows us that it is not that this atmosphere is suitable for Life, but that Life itself has generated it and self-regulates it. And bacteria play a predominant role in this. We live because bacteria exist!

"Life began on the planet about 3,000 million years ago. In the first 2,000 there were only microorganisms. For billions of years bacteria regulated the temperature of the Planet and the chemical composition of the atmosphere. Other beings such as plants, animals and people arrived in the last billion years and our life depends on the relationship we establish with bacteria."



“I think that resistance is essentially a manifestation of the intelligence of Life itself that develops strategies for its continuity.”

Julio Monsalvo



Julio Monsalvo at a community health workshop with rural teachers in Formosa, Argentina (2007). PHOTO: COURTESY OF JULIO MONSALVO

Dancing with Bacteria – the project

In 2015, ReAct implemented the 'Dancing with Bacteria' project in Chiang Mai, Thailand, to address the interconnected crises of poor nutrition, food contamination, and antibiotic resistance.

The project recognized that malnutrition—whether from over-nutrition, under-nutrition, or malnutrition—weakens immune systems and increases vulnerability to infectious diseases. Combined with antibiotic resistance, this has become a major cause of death and morbidity, particularly in low- and middle-income countries. The problem is compounded by widespread chemical contamination of food through pesticides, preservatives, and antibiotics, especially in urban areas where people have limited control over their food sources.



Mary Murray and Niyada Kiatying-Angsulee, two of the coordinators of the "Dancing with Bacteria" project, promoting its materials and tools in Chiang Mai, Thailand. PHOTO: SATYA SIVARAMAN



Educational booklets from the project "Dancing with Bacteria." PHOTO: SATYA SIVARAMAN



Home gardening kit that included tools, seeds, natural fertilizers, and easy-to-read manuals on the themes explored in the Dancing with Bacteria project. PHOTO: SATYA SIVARAMAN

The 'Dancing with Bacteria' project addressed these challenges through three integrated activities:

Kitchen Gardening: Participants learned to grow their own chemical-free food, recycle organic waste, and benefit from the therapeutic effects of gardening—including exercise, stress reduction, and cost savings.

Food as Medicine: The project explored the medicinal properties of common food ingredients and proper cooking methods, helping people understand how traditional cuisines evolved to suit local conditions while navigating the challenges of globalized food systems.

Health Literacy: Participants gained basic knowledge of human anatomy, disease development, rational medicine use, and modern medical procedures to promote healthier lifestyles and better healthcare decisions.

Central to all activities was understanding the positive role of bacteria in food production, preparation, waste recycling, and the human microbiome. The project's long-term goal was to moderate antibiotic consumption and raise awareness about antibiotic resistance by reducing the irrational fear of all bacteria and explaining the need for a balanced approach.

The initiative provided participants with toolkits containing gardening implements, seeds, natural fertilizers, and easy-to-read manuals on all the key themes of the project. The project was an attempt to find solutions to poor nutrition, rising healthcare costs, antibiotic misuse and low health literacy through practical activities that brought immediate health and economic benefits to participants.

Latin American Network Collaboration for Social and Environmental Health

From 2015 to the present, RLA and the Reimagining Resistance Group have enthusiastically championed making the microbial world visible within the Latin American Social and Environmental Health Encounters (2015-2019)[42]. They have worked with the Institute of Social and Environmental Health at the University of Rosario, Argentina, The Union of Latin American Scientists committed to Society and Nature (UCCSNAL), the Latin American Association of Social Medicine (ALAMES), and many other networks, to connect microbial wisdom and AMR with agroecological and consumer movements. Together, initiatives like "Mother Earth One Health" were launched and deep collaborations developed with the networks on the health of water, soil, food production, and food security systems[43]. Other themes included: Learning from Bacteria: the feminine principle; the clinical history, prognosis and treatment of the disease of Mother Earth; peoples stories of life, sickness and healing (BacHistorias)[44]; and a six year dialogue with many diverse communities in Latin America on 'What is Health? What is Medicine?'[45].

42 Quizhpe A, López JC, Alessio S, Carrapizo M, Granizo P. Proceedings of the Second Intercontinental Meeting "Mother Earth, One Health" [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2020 [cited 2026 Jun 7]. Available from: https://reactlat.org/download/memorias-del-ii-encuentro-intercontinental-madre-tierra-una-sola-salud/

43 Quizhpe A, Calle K. Proceedings of the Intercontinental Meeting "Mother Earth: One Health" [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2018 [cited 2026 Jun 7]. Available from: https://reactlat.org/wp-content/uploads/2024/03/Madre-Tierra-Una-Sola-Salud.pdf

44 Quizhpe A, Aguilar I, Cantos G, Murray M, Sivaraman S, Guayan L, et al. ¡Contemos nuestras bac-historias! De cuando la ciencia redescubre su corazón [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2016 [cited 2026 Jun 7]. Available from: https://reactlat.org/wp-content/uploads/2024/09/BACHISTORIAS.pdf

45 Quizhpe A, Murray M, Sivaraman S. What is health? What is medicine? Dialogue of knowledge and wisdom about health, antibiotics and microbes 2016–2021 [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2022 [cited 2026 Jun 7]. Available from: https://reactlat.org/wp-content/uploads/2024/12/What-is-health-What-is-medicine.pdf



Closing of the First "Mother Earth, One Health" Encounter, whose declaration highlighted the problem of antibiotic misuse in the intensive farming of animals for consumption (Rosario, 2017). PHOTO: ReAct LA



Damián Verzeñasi, director of the Instituto de Salud Socioambiental de la Universidad Nacional de Rosario (2019), stated:
"We need to build health systems that embrace a holistic approach, creating territories that allow human beings, microorganisms, and ecosystems to live in a healthy relationship."
PHOTO: ReAct LA



On World Environment Day, within the framework of the Second "Mother Earth, One Health" Encounter (2019), tens of thousands of people wearing masks marched through the streets of Rosario to raise awareness of the health problems caused by environmental pollution. It is known as the "Mask March." PHOTO: ReAct LA



Dialogue on health and medicine with women knowledgeable in the therapeutic power of plants (Latacunga, Ecuador, 2019). PHOTO: ReAct LA



This gathering, organized by ReAct and its partners in Thailand (2018), focused on promoting a healthy model of food production based on local experiences. PHOTO: ReAct LA



In 2016, ReAct Latin America organized the International Meeting "Dancing with Bacteria for Life", under three provocative questions: Food as medicine? Home as the clinic? Grandmothers as doctors? The meeting explored initiatives for renewing the land, reviving the kitchen, recipes to heal bodies, lands, and communities.

This was the first time the emerging metaphor of 'Dancing with Bacteria' was explored in a public sphere with representatives from many local communities in Ecuador as well as delegates from Argentina, Australia, the United States and India.



Up: "Dancing with Bacteria for Life recognizes that we are all immersed in an ocean of bacteria: they accompany us from birth; they are our companions along the way; they dance to our rhythms; they sense us, even if we sometimes do not sense them; they accompany us, even if we sometimes do not want them," read the invitation to the meeting. POSTER: EL GATO

Down: The book "Food as Medicine and the Kitchen as Pharmacy" was presented in 2018. COVER: EL GATO

BOX SIX

Voices from the Latin American Network: Reflection and Synthesis

'Reimagining Resistance: Expanding and Beautifying the Mosaic'[46] was published in 2017 and contained the reflections of diverse members of the larger Latin American network on the concepts and activities related to reimagining resistance. The panel included artists, health professionals, and microbiologists:

Damián Verzeñassi, a scientist committed to Science with Conscience, rethought the concepts of health, science and biology from his work as a university teacher and researcher at the University of Rosario, Argentina.

Hugo Noboa, an Ecuadorian health expert with the soul of a poet, highlighted the value of resistance in health, society and life, based on collective experiences.



Nicolás Campoverde, author of "Lunching with Bacteria," at the presentation of the work. PHOTO: ReAct LA

Nicolás Campoverde, epidemiologist and longtime collaborator of ReAct Latin America, invited us to travel with his friend 'Procariota' through time and space to discover the force that moves life.

Marcelo Andocilla, university teacher, microbiologist and poet, dazzled the audience with the analogies between classical mythology and the sciences to understand evolution.

Juan Francisco Benavides, artist and a professor at the National University of the Arts (Ecuador) explored the history and nature of art and claimed its irreducible freedom to make life and death more enjoyable, saying: "Bacteria are not feared because they are such, but because they can lead to death it is death that is feared. Building a different relationship with bacteria involves building a different relationship with death, a relationship that fills each day of life with meaning".

The publication with its innovative design by the graphic artist El Gato aimed to capture a network of texts, ideas, feelings and images to provoke new dialogues, initiatives and the unexpected.

46 Quizhpe A, Calle K, Murray M, Verzeñassi D, Noboa H, Benavides JF, et al. Reimagining resistance: amplifying and enriching the mosaic [Internet]. Uppsala (Sweden): ReAct; 2017 Sep [cited 2026 Jun 7]. Available from: https://www.reactgroup.org/wp-content/uploads/2017/11/Ampliando-y-embelleciendo-el-mosaico-2017.pdf

Emergence of an ethics of care

The dialogue process for Reimagining Resistance gradually changed into one that was more comprehensive and integrative. The Riksinacuy approach to dialogue helped us in this conscious transition. In this method, the head and heart are engaged in thinking and listening in a 'friendly, free and rotating way'. There are four stages of development which, underpinned by the indigenous vision of life, are likened to the life cycle of seeds, plants, soil and fertility.

Over five years or more of smaller meetings, participants explored and internalised various aspects of ABR and the microbial world in regard to their significance for life. All these discussions were grounded in community participation, cross sectoral action and collaboration across different types of movements resulting in a series of publications, seminars and public events that have touched thousands of people across Latin America and to a lesser extent globally.

These processes fed into two significant meetings in Bolivia in 2018 that articulated an ethics of care.

The first was held in Cochabamba with an international gathering of artists, scientists, health promoters, traditional healers, community health practitioners of many kinds, communicators and health professionals. It was an inspiring moment



Scene from a seminar-workshop held in La Paz, Bolivia, in 2018. PHOTO: ReAct LA





Scenes from a seminar-workshop held in La Paz, Bolivia, in 2018. PHOTO: ReAct LA

to take the microbes perspective. Participants were asked to dim the lights and quietly try to see and hear what microbes were doing and saying. Using humour and guile to make sure the harsh truth about ABR and microbial propensity to create infection was not left out, the space between everyone at the meeting started to buzz – people got up to dance with bacteria, people wanted to talk about the questions and their opinions on the answers. The meeting concluded that 'Health is Art, Joy and Dancing with Bacteria'

> *'We are inspired by the vision to change the paradigm of human bacterial relations. To Reimagine Resistance means to realize we live in a communicating and hugging world. In this regard, each person is a unique and irreplaceable Universe, which also carries many internal universes. We embrace the principle of Bacterial Solidarity which Gives Life for Life. In summary, as Rave Tabares says, 'I like the people that hug, hug life, hug the world…hug me'.'*

> *'When we embrace, we reimagine and… We wish that people sow and cultivate, hug, struggle and dream.'*

The second meeting was held in La Paz in conjunction with the Microbiology Department of the Medical Faculty of San Andres University in La Paz, Bolivia, and called Understanding Antimicrobial Resistance, Caring for the Health of Mother Earth, Healing Ourselves.

It set out to articulate a broader context for ABR including analyzing ABR from the perspectives of planetary health, the role of the microbiome, and health inequalities. Building on the Cochabamba meeting, it acknowledged that the challenge is to not only conceptualise the broader ecological context, but to internalize this

– to feel and live it, to experiment, to share and to evaluate and reflect on our experiences.

What we consume individually and as families and communities, what we prescribe and what we use in food production affects the ecosystem in which we live. And it affects other local ecosystems further away too. There is a need to make this visible in conversation, in clinical encounters, in teaching and advocacy to motivate all of us.

The meeting seized the opportunity to contribute to this by bringing to fruition a number of initiatives that were seeded in the earlier phases of dialogue. A Declaration on Microbial Rights was discussed. Ethics and practical steps for community care of antibiotic use was developed by creating the concept of Antibiotic Smart Communities, and developing community-based guidelines for use of antibiotics in the context of planetary health (see Box Eight: Communities and Antibiotics - an example of ethics of care). This included a course curriculum for Primary Health Care workers on Mother Earth, the Microbial World and ABR and urges professionals and communities to develop guidelines for therapeutic action by thinking at a planetary level. The meeting discussed the policy challenges in the context of Latin America and shaped a strategic plan for the RLA network to take these initiatives forward at many levels.

Finally, the meeting called for an ethics of life that includes the rights of bacteria.



Scene from the seminar-workshop held in La Paz, Bolivia (2018). PHOTO: ReAct LA

BOX SEVEN

The ethics of life and rights of bacteria

In 2008, the people of Ecuador recognized the Rights of Nature in their new Constitution. This stimulated thinking about the role of bacteria in nature in ongoing RLA and RR dialogues over several years along the following lines:

"If we take into account that the origin of organic life is bacteria, which invented essential biological processes such as photosynthesis and created the conditions for life such as the oxygen revolution, and that they are the most diverse form of life and sustain the biogeochemical cycles of the planet, the recognition of such rights necessarily implies the recognition of the rights of bacteria as a form of life."

Thus, began rich dialogues that explored the shifting of paradigms that are centred in war and destruction to ones that respect and understand the role of microbes in the processes of life. The discussions on microbial rights also led to a text signed by many people in the network and published as 'Towards a new chapter in human-bacterial relations'[47].



Cover of the call to recognize the rights of bacteria. COVER ILLUSTRATION: VILMA VARGAS/ReAct LA

47 ReAct Latinoamérica. ¿Las bacterias tienen derechos? Hacia una nueva relación entre la humanidad y las bacterias [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2018 Nov [cited 2026 Jun 7]. Available from: https://www.reactgroup.org/wp-content/uploads/2018/11/LLAMADO-BACTERIAS-FINAL.pdf

BOX EIGHT

Communities and Antibiotics - an example of ethics of care[48]

The development of guidelines for community action, along with an educational program titled 'Communities and Antibiotics', was based on dialogues with communities and universities unfolding over two years. The process considered action on antibiotic resistance in alignment with the Global Action Plan within the 'Mother Earth: One Health' approach.

These dialogue seminars articulated the concept of community wisdom - how it is expressed and how it could be recovered. The relevant characteristics of a wise community were defined in relation to health care and the production of healthy food. At the same time, progress was made in the dialogue about what the community needs to know about the use of antibiotics in caring for the health of the Earth[49]. This work was then developed further in collaboration with many academic and community groups within the RLA and IRRG networks.

The resulting publication series 'Communities and Antibiotics', composed of four parts, calls upon us to understand ourselves as part of the ecosystems that we inhabit and collectively assume the challenge of recovering the health of our localities, and of our bodies.

1. Community Wisdom: Use of Antibiotics and the Health of Mother Earth distills the qualities of communities which are wise in the care of Mother Earth, the productions and consumption of food and the use of antibiotics[50].



Covers of the "Communities and Antibiotics" series. DESIGN: EL GATO

48 Quizhpe A, Murray M, Calle K. Comunidades y antibióticos [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2020 [cited 2026 Jun 8]. Available from: https://reactlat.org/wp-content/uploads/2021/12/Comunidades-y-Antibioticos.pdf

49 ReAct Latinoamérica. Seminario-Taller Internacional Comprendiendo la Resistencia a los Antimicrobianos, Cuidando la Salud de la Madre Tierra, Sanándonos [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2017 May [cited 2026 Jun 8]. Available from: https://reactlat.org/noticias/seminario-taller-internacional-comprendiendo-la-resistencia-a-los-antimicrobianos-cuidando-la-salud-de-la-madre-tierra-sanandonos/

50 Quizhpe A, Murray M, Calle K. Comunidades y antibióticos. Primer cuaderno: sabiduría comunitaria, uso de antibióticos y salud de la Madre Tierra [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2019 [cited 2026 Jun 8]. Available from: https://reactlat.org/wp-content/uploads/2021/08/CA_Sabiduria-Comunitaria-03-05-2021.pdf

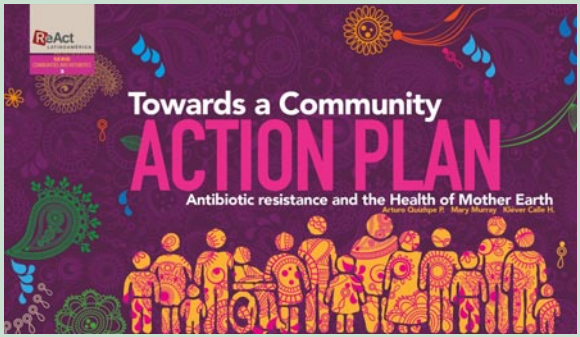
BOX 8 (CONTINUED)

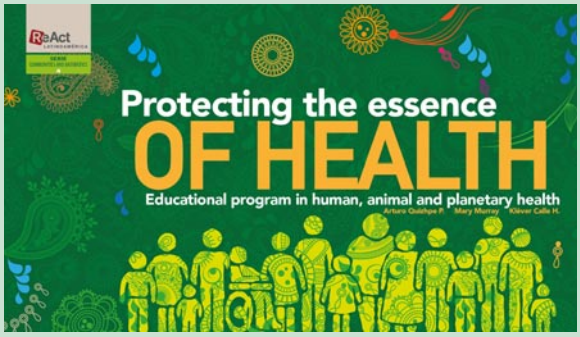
Communities and Antibiotics - an example of ethics of care

2. Community Responses to Antibiotic Resistance sets out the challenges in moving from a Global Action Plan for ABR to the community level and vice versa. It presents four case studies of community responses to the ABR and other collective health problems from El Salvador (to establish a medicines Law), Thailand (Antibiotic Smart Use), Argentina (Science for Peoples Health and Mother Earth), and Ecuador (a local community adapts the WHO's Global Action Plan on AMR to its own context)[51].

3. Towards a Community Action Plan sets out an approach to moving from national action plans to community action stressing participation processes[52].

4. Protecting the Essence of Health: an educational program for human, animal and planetary health is an educational guide on human, animal and environmental health regarding the appropriate use of antibiotics[53].





Covers of the "Communities and Antibiotics" series. DESIGN: EL GATO

51 Quizhpe A, Murray M, Calle K. Comunidades y antibióticos. Segundo cuaderno: respuestas comunitarias a la resistencia a los antibióticos. ¿Por qué son necesarias las respuestas comunitarias? [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2019 [cited 2026 Jun 8]. Available from: https://reactlat.org/wp-content/uploads/2021/08/CA_Respuestas-Comunitarias-31-05-2021.pdf

52 Quizhpe A, Murray M, Calle K. Comunidades y antibióticos. Tercer cuaderno: hacia un plan de acción comunitario. Resistencia a los antibióticos y salud de la Madre Tierra [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2021 [cited 2026 Jun 8]. Available from: https://reactlat.org/wp-content/uploads/2021/08/CA_Hacia-un-Plan-de-Accion-Comunitario-13-06-2021.pdf

53 Quizhpe A, Murray M, Calle K. Comunidades y antibióticos. Cuarto cuaderno: A cuidar la flor de la salud. Programa educativo en salud humana, animal y planetaria [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2020 [cited 2026 Jun 8]. Available from: https://reactlat.org/wp-content/uploads/2021/08/CA_A-cuidar-la-Flor-de-la-Salud-07-06-2021.pdf



CHAPTER 5
The Birth of an Alternative Metaphor

Learning from Bacteria

By the end of the COVID pandemic, the IRRG had evolved into a more conscious relationship with their journey away from the war metaphor towards trying to understand what could be learned by humans from the world of bacteria themselves.



This was a radical step from seeing bacteria as ‘adversaries’ to recognizing them as ‘friends’ of humans and all other forms of life on Earth. The idea was to learn, with humility from bacteria, the planet's oldest and most numerous organisms as a way to help humanity correct past mistakes and build a sustainable future.

Here are some key lessons that were identified as lessons humans could learn from bacteria:

1. **Preserving diversity:** Bacterial genetic diversity enables their survival against antibiotics. For humans, the lesson is clear: our diversity strengthens our species' survival. Modern violence stems from attempts to homogenize populations culturally, politically, and economically. While historical violence arose from rage and hatred, today's violence proceeds from fundamentalist mentalities claiming singular paths to truth, disguised as nationalism, development, or progress. Learning from bacteria means resisting attempts to reduce our complex world to uniform norms and defending each person's right to their own way of life.

2. **Adapting to change:** Bacteria have thrived for 4 billion years, surviving extreme conditions while repeatedly mitigating environmental hostility to enable life's flourishing. Their extraordinary resilience offers an exemplary model. As our planet faces harsh adversities ahead, humans must not only resist disappearance but contribute positively to life's continuation.

3. **Working collectively:** Research by biophysicist Eshel Ben-Jacob revealed that bacterial populations coordinate actions through intricate molecular signalling and communication for collective benefit. What we should learn is the importance of community work and constant interaction, since human destiny is likewise deeply intertwined with other humans and all planetary life.

4. **Balanced consumption:** Bacteria conserve resources, never depleting what's available below a certain threshold. This contrasts sharply with human societies' ecologically unsustainable consumption patterns, particularly today when misplaced faith in technology drives us to exhaust even renewable resources. The principle that bacteria teach us: never take more than we can give back to Mother Earth.

5. **Regeneration of life:** Beyond sustaining life, bacteria constantly recycle organic matter, converting dead things into a source of new life. Through this function, bacteria reveal that even after death, all living organisms continue playing a role in one form or another. Understanding this inevitable continuity of existence and promoting the principle of regeneration is crucial to overcome the fear of death as a 'final endpoint' that has traumatized humanity for millennia.

Dancing with Bacteria- the metaphor

In this period, the concept of 'Dancing with Bacteria', first used as the title of a health and gardening project in Chiang Mai, Thailand (see 4.4 above), emerged and evolved through dialogues between communities, disciplines, sectors, children, farmers, women, and artists. This metaphor captured something essential: the dynamic, responsive, collaborative re-



Using works like this one, Mary Murray explained at the First Mother Earth, One Health Meeting (Rosario, 2017) that "microbes are immensely social and have no centralized command. Their communication and cooperation are feminine in nature."



lationship that characterizes healthy microbial interactions. Rather than the static opposition of warfare, dance represents movement, rhythm, partnership, and creative adaptation—qualities that mirror how microbes actually function in healthy ecosystems.

It was a rich journey, with people from all walks of life who have extraordinary abilities, knowledge and commitment to life:

- In the breaking of paradigms that are contrary to life, the role of indigenous peoples has been central and their contributions to the construction of a science infused with a love of life – based on the restoration of balance and harmony, humans as part of nature.

- The creative, open, and systematic thinking, along with the sharing of knowledge by research scientists working on the microbial world, has been eye-opening and has enabled many hitherto sealed boundaries to become porous in this process.

- Artists contributed knowledge of an equally powerful kind to that of science, showing the overlap between the two in the fundamental questions they raise.

Our journey to this alternative metaphor went from the slogan, to the idea, the informal conversation, the reciprocity in the conceptual space and then to the human sphere – both conscious and unconscious – integrating the many contributions from



"Bacteria, in our understanding, are part of the permanent blossoming of the Universe, the realization of Life, the point of perfection of the creative and formative forces, members of the universal community that flourishes within Mother Earth."

Donato Camey
Doctor and Maya spiritual guide



2nd "Mother Earth, One Health" Meeting (Rosario, 2019). PHOTO: ReAct LA

our process. The evolution of the metaphor centres on the ethics of life, which goes beyond the concept of health to the need for care as a strategy to preserve the health of the planet and all those who inhabit it.

"A metaphor is an image to make the invisible visible, the complex understandable. For that reason, metaphors start from close and everyday experiences. War or dance can and, in fact, are used metaphorically, and they are so encompassing that we could call them mother metaphors. Dance as a metaphor, resistance to the destruction of life and peace as an imperative in our times are the future of this work."

Arturo Quizhpe,
Director of ReAct Latin America

Explaining 'Dancing with Bacteria'

The primary idea is that we humans can share the same space with bacteria, without necessarily hurting each other. We don't have to love bacteria but can coexist cautiously, by knowing how to prevent harm, fighting only if necessary, but without indiscriminate killing.

Dance itself is a process that depicts very well all kinds of elaborate negotiations between any two entities – in this case, humans and bacteria. Nature itself operates this way as do human beings in human societies. We are constantly negotiating space, resources, pushing our ideas, absorbing new ideas. And this negotiation is like an elaborate dance.

The metaphor of dance works very well as it not just accurately describes how living systems really interact with each other but also because it is universal in all cultures and

societies. It is a language that even the new born babies understand, born as they are after months of dancing around in their mother's womb and then experimenting with moving their bodies on their own. It is a language that every living organism on the planet understands - dance is a synonym for all of life itself.

Using the metaphor of dance also helps resolve the common question asked: how should we consider bacteria – as friends or enemies? The answer is that bacteria are not to be considered in such binary terms, as this does not capture the real complexity of our relations with them. The human-microbe equation is a dynamic system in which there are no permanent friends nor permanent enemies and everything depends on the context.

So, the categorization of bacteria as either good or bad bacteria is trying to slot them into a narrow, 'with us or against us' framework. In reality it is always a fluid situation - the same commensal bacteria that are in the human body, which do no harm to the body most of the time can turn harmful under certain circumstances.

There are a lot of bacterial species in the human body which are extremely important and critical for our own survival, like the E. coli in the intestines. E. Coli are the most numerous bacteria in the human body and help us digest our food for all of our lives, but the same bacterial species can be very deadly for the human body in a particular context such as severe trauma to the body.

This fluidity of relations is what the 'dance' is all about – a constant movement and negotiation to avoid dangers, make friendships and to co-exist without dying or killing. This metaphor calls upon human beings to stop thinking in terms of black and white framework, and start thinking in more complex ways. This is because life is complex, and we have to accept it, understand it and respond to it in a nuanced way. There are no simplistic answers and solutions.

Challenges in applying the concept of 'Dancing with Bacteria'

While it may be easy to understand the concept of 'Dancing with Bacteria' intellectually, the deeper problem is that a lot of our ideas about bacteria are driven by visceral fear. That is understandable as bacteria have been the cause of great tragedies and death, mass death even, for example the plague in European history. So, people have very deep-rooted, traumatic memories, and this becomes a source of great fear, which is unfortunately usually also a source of violence.

Once afraid, there is a pattern in human behaviour to think in terms of either one's own survival or somebody else's. It is harder to think of coexistence. Fear is engulfing. One tends to take flight or go into a shell and from within that shell, try to eli-

minate the threat. Endlessly protecting oneself due to fear is a defining pathology of human societies - the way we build fortified cities, the fact that every country has armies trained to die or kill, the amount of money spent on weapons and arms races globally. These are indications that human societies have become deeply cautious, suspicious and manipulative due to fear.

So, the key to helping people engage in 'Dancing with Bacteria' is to help reduce their fear - to understand what drives it, and why it is counterproductive. The dance is a metaphor for the love of life while fear ultimately leads to the embrace of death.

A real question here is how to negotiate and dance with the bacteria, given the weight of history and propensity for human beings to demonise what we fear? There is no easy answer. However, some practical insights from a person working everyday with the dance between life and death in newborn babies may give us some inspiration to try. Vivi Nordberg, a neonatologist working at Karolinska hospital in Sweden, has collaborated with us for some time in the Reimagining Resistance journey.

Vivi understands that the first encounter of humans with microbes during birth is critical for human development, including the development of immunity. But she observes that the fear of infection in newborns is so high amongst doctors that it drives massive unnecessary use of antibiotics at the cost of harming the microbiome. She describes microbes as the first 'dance partner' of the newborn as if the soil of Mother Nature becomes the soul of the newborn.

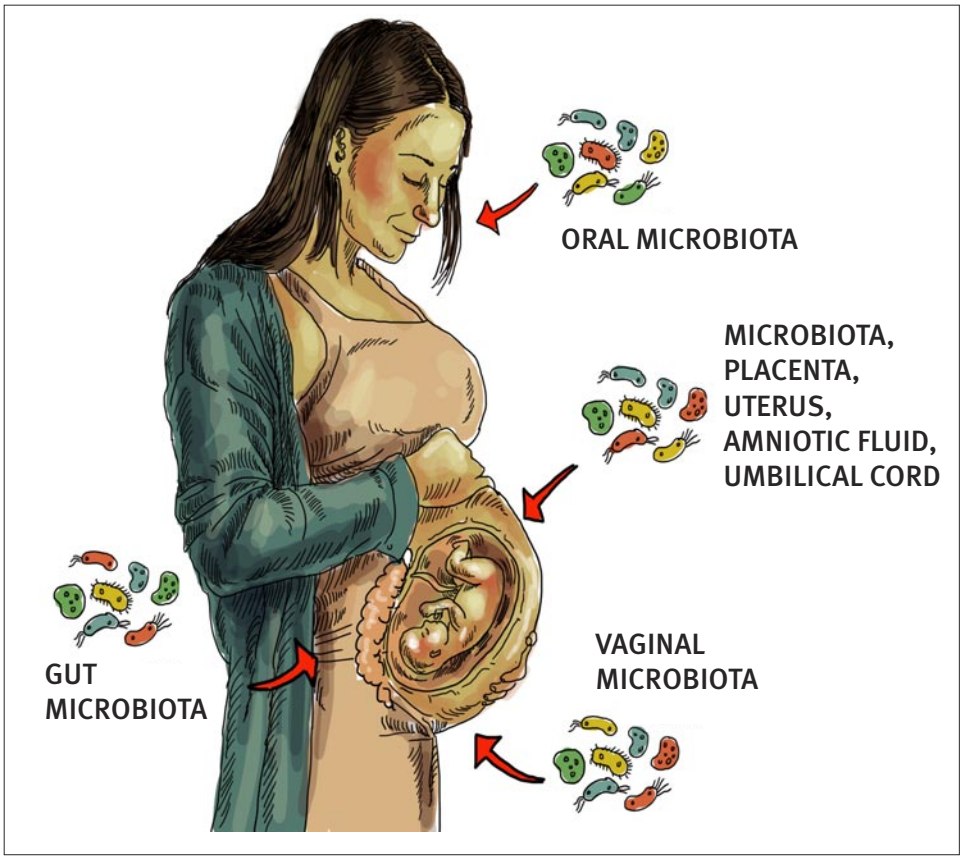
She describes how she deals with the ever-present fear in her job:

"As a neonatologist, I'm immersed in the microbial story. My research focuses on quickly identifying antibiotic-resistant bacteria. But my greatest focus—at hospital beds and neonatal units—is educating others about bacteria's crucial role in newborn development. I raise awareness about how thriving microbiomes are essential and reduced reliance on antibiotics can be transformative.

In neonatal sepsis, infection prevention, and antibiotic stewardship, I navigate complex bacteria-newborn interactions. A baby's life begins with a meeting—sometimes peaceful, sometimes turbulent—between tiny organisms and a new host. Sometimes they collide, creating chaos or death. Often, they gently reach out, forming partnerships, walking together toward healthy futures.

I present the microbial world as a bouquet of flowers. Each represents diffe-

rent newborn-microbe interactions: infection fear, disease potential, but also healing power, harmony, and essential developmental roles. I show this bouquet to everyone—parents, doctors, microbiologists, policymakers—focusing on different flowers depending on their concerns. Fear of chaos and death is always present, but framed with knowledge, it softens."



Bacteria are the first dance partner of the new being in gestation. The dance begins in the womb and, step by step, guides the baby into the outside world, where the newborn makes use of this gift of life. IMAGE: VILMA VARGAS/ReAct LA

Restoring the love of life: restoring microbial health in the soil

Nourishing the soil as a living skin of the planet marks the work of several networks in Latin America that have been collaborating with us in understanding and explaining the concept of 'Dancing with Bacteria' in specific contexts. Two short insights show the exciting integration of ancestral knowledge and traditional farming practices, modern microbiology, art making, transformative learning and repetitive experimentation among farmers to make the invisible accessible.

"Before the dance comes the space', says Stephen Sherwood, who with his wife Myriam Paredes runs Granja Urkuwayku, an organic farm in Ecuador. They are active in emergent networks for regenerative agriculture. The network observes what happens in these spaces in the soil with creative ways of marrying modern microscopy, ancestral kno-



Microscopic spaces created in the soil by microbial activity. IMAGE PROVIDED BY STEPHEN SHERWOOD IN HIS PRESENTATION "BEFORE THE DANCE COMES THE SPACE," AT THE INTERNATIONAL DIALOGUE FOR WORLD MICROBIOME DAY 2025

wledge, and transformative learning practices.

Participants have become passionate about the unique role of microbes in these spaces and how they dance with fungal networks to create healthy plant roots and flourishing agroecological food production. The science makes visible what indigenous farmers have always known from ancestral knowledge. Along with many networks around the world, they see how modern agriculture destroys these spaces. The food production-consumption system is a primary source of soil degradation, increasing global greenhouse gases which drive global warming and climate change. In addition, pollution and food related disease are now leading causes of death in most countries.

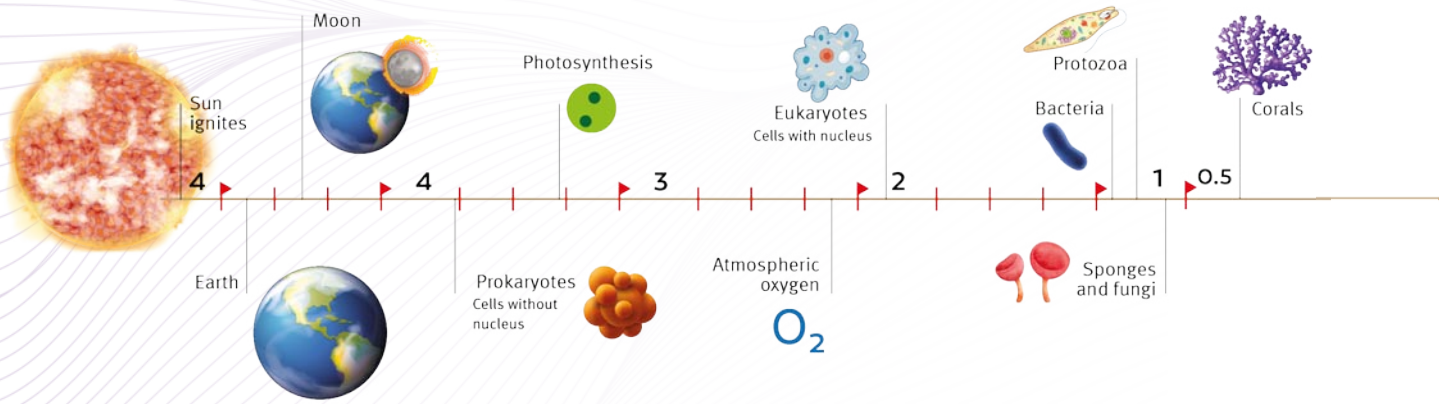
Working with artists and scientists, they have a creative way to tell the story of microbial life on the planet by undertaking a 5 km walk[54] each step taking participants back through time to the origins of life on Earth. Understanding the origins of the landscape they live in from many sources



Microbes can increase the reach of a root up to six hundred times. IMAGE PROVIDED BY STEPHEN SHERWOOD IN HIS PRESENTATION "BEFORE THE DANCE COMES THE SPACE," AT THE INTERNATIONAL DIALOGUE FOR WORLD MICROBIOME DAY 2025

54 The activity, entitled "A Walk through Pacha, a Conversation with Luca," consists of a 5-kilometer walk lasting approximately four hours, during which each step represents 10 million years of evolutionary history. Through this experiential journey, participants travel across 4.9 billion years of life on Earth ("Pacha"), tracing the evolution of life from the earliest protobacteria and the Last Universal Common Ancestor ("LUCA") to contemporary times.

Billions years ago



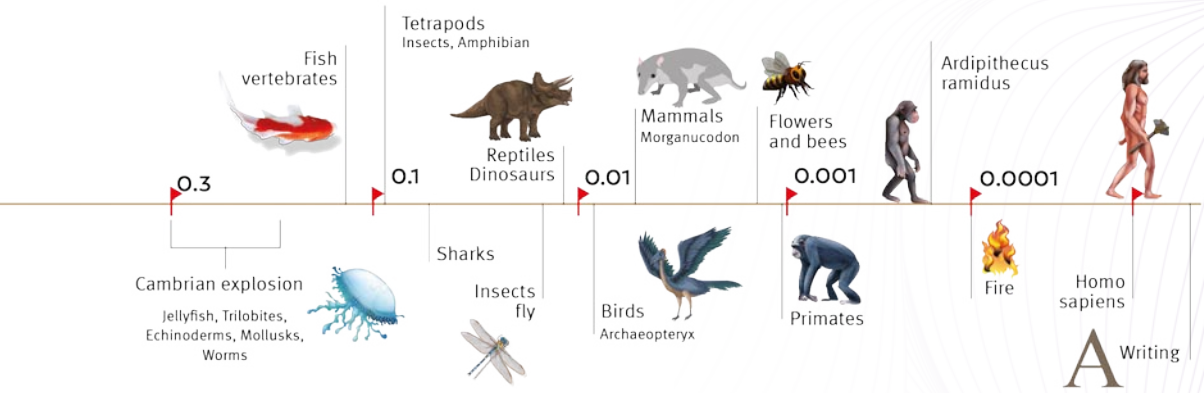
of knowledge, many are enthusiastically engaged in regenerating the landscape sterilised by decades of human over-exploitation back towards healthy forest[55].

The Soil Assembly —Tinku Uku Pacha in the Kichwa language— brought together, in May 2025 in La Chimba, an Indigenous community nestled in the Ecuadorian Andes, multiple networks of social, scientific, environmental, artistic, and spiritual organizations to discuss the soil care and the numerous invisible lives that inhabit it. The event focused on listening, memory and resistance.



Stephen Sherwood explains, from the degraded soils of Ilaló (northern Ecuador), that through the chakra system the soil shifts from being a carbon source to a carbon sink. SCREENSHOT

55 This work is illustrated in the video entitled "It Is Time to Dance with Soil Microbes!", available at: https://drive.google.com/file/d/1GieBGaNzebL3x7W96s6gzvsZ6Pha4eDu/view



Timeline of the evolution of life on Earth. IMAGE BASED ON THE ILLUSTRATION BY STEPHEN SHERWOOD IN HIS PRESENTATION "BEFORE THE DANCE COMES THE SPACE," AT THE INTERNATIONAL DIALOGUE FOR WORLD MICROBIOME DAY 2025



Compost bins at the Urkuwayku farm, with the help of microbes, know how to bring life back to the soil. SCREENSHOT

Art served as a means of connection and transformation in the process of the Assembly. Performances, installations, music, dance, and poetry revealed aspects of life that often go unnoticed. Artist Ronny Borja presented an exhibition where she collected soil samples from different communities and analysed them through chromatography, visualizing their microbial richness as a watercolour representation of urban life. One of her works stated, “To see the soil is to see where the light does not enter.” Through this insight, many began to shift their understanding of agriculture, the relationship with bacteria, the body, and time.

Pedro Soler, artist and organiser, says: "Art did not come to teach or to intervene. It came to listen and to express, with sincerity, what the land feels. Because the future -if there is one- is on the ground. And to get there, we have to change the way we look and cultivate".



This page and next: 2nd Soil Assembly in La Chimba, Ecuadorian Andes (2025). PHOTO: ReAct LA



CHAPTER 6
Reimagining Health, Medicine and Society

What is Health? What is Medicine?

Over the years, as part of the Reimagining Resistance dialogues, a fundamental question that kept surfacing was – what exactly is 'health' and what is 'medicine'? It was not clear to many of us whether the mainstream definitions of these terms were valid or not, in the face of new knowledge in both the sciences and the humanities, as also strong assertions in recent decades of the worldview of indigenous peoples around the globe.

According to the WHO's definition, adopted as part of its founding Constitution in 1948, health is 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'.

But then this begs the question, how do we measure 'well-being'? Is there only one interpretation possible or are there many that are equally valid?

For most purposes, in the world of modern medicine 'health' and 'well-being' are assumed to be related mostly to indicators of human physiology like height, weight, blood pressure, sugar and cholesterol levels, the condition of bodily organs like heart, liver or the kidneys and so on. For a physician it is often only these parameters that really matter while determining whether a patient is healthy or not.

More than six decades ago, the French-American microbiologist René Dubos differed radically from the WHO definition of health. In his book 'Mirage of Health: Utopias, Progress and Biological Change', he defined health as "the expression of the extent to which the individual and the social body maintain, in readiness, the resources required to meet the exigencies of the future". He saw the World Health Organisation's notion of good health as a technological fix that is applicable only for a narrow set of conditions in which humans find themselves.

The story of health has to be seen as not just its natural science aspects or the technologies that go with it. Instead, a good grasp of health conceptually requires understanding people and their contexts, which is where the humanities are invaluable. Anthropology, sociology, economics and political science among other things shed light on how people see, practice and act to be healthy within the reality they live with including circumstances beyond individual or community control.

Similarly, to answer the question 'what is medicine' requires knowledge of cultural markers, beliefs and practices in each context as medicines take on other meanings and roles in different arenas, beyond just their direct, physical or biological impact on the human body.

Next page: Argentina's Popular Health Movement, Laicrimpo, "is a deeply healing space," says Marcela Bobatto, "because pain and suffering are shared with others, with the group that is predisposed to listening, to accompanying the other with affection and tenderness. In this way, individual pain, when shared, becomes community pain. And it is no longer the same. The healing process begins." PHOTO: MARCELA BOBATTO





Gathering for the revaluation of the culture, knowledge, and wisdom of Aymara women (Bolivia). PHOTO: TORIBIA LERO

Anthropological work from many places in the world in the last century has also intensively studied the relations of humans with or their perceptions of nature and other species on the planet, including with microbes in some cases. These studies also try to understand the impact of such worldviews on practices and behaviours relating to cuisine, hygiene, use of common resources and health-seeking.

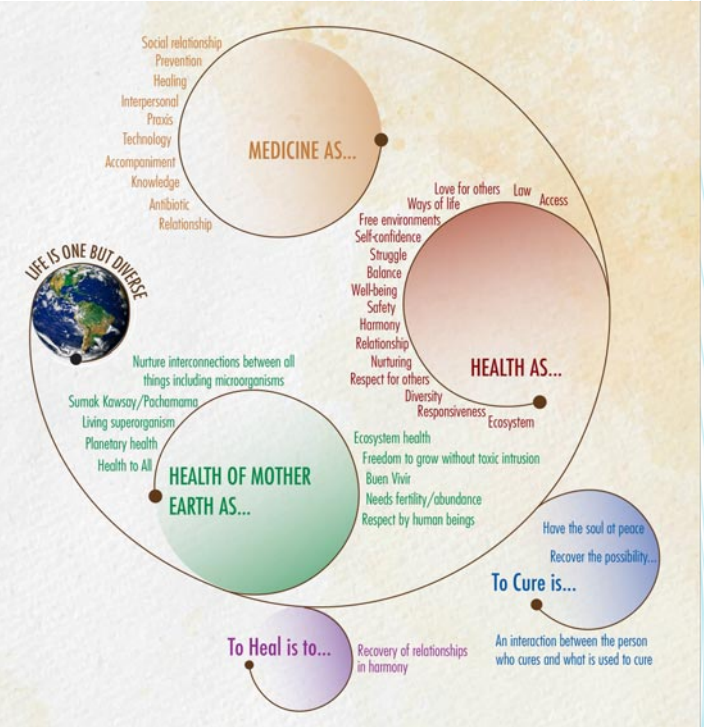
Seeking answers through dialogue

We gained some insights into how people in many varied settings in Latin America see health and medicine during a six-year dialogue process as part of the journey to reimagine resistance[56]. People from small and large communities, urban and rural, academic and professional, shared their wisdom, knowledge, and practices about health and medicine in small groups. Included were teachers, researchers from academia, indigenous people, health professionals from many traditions, artists, farmers, children, mothers and grandmothers, fathers and grandfathers.

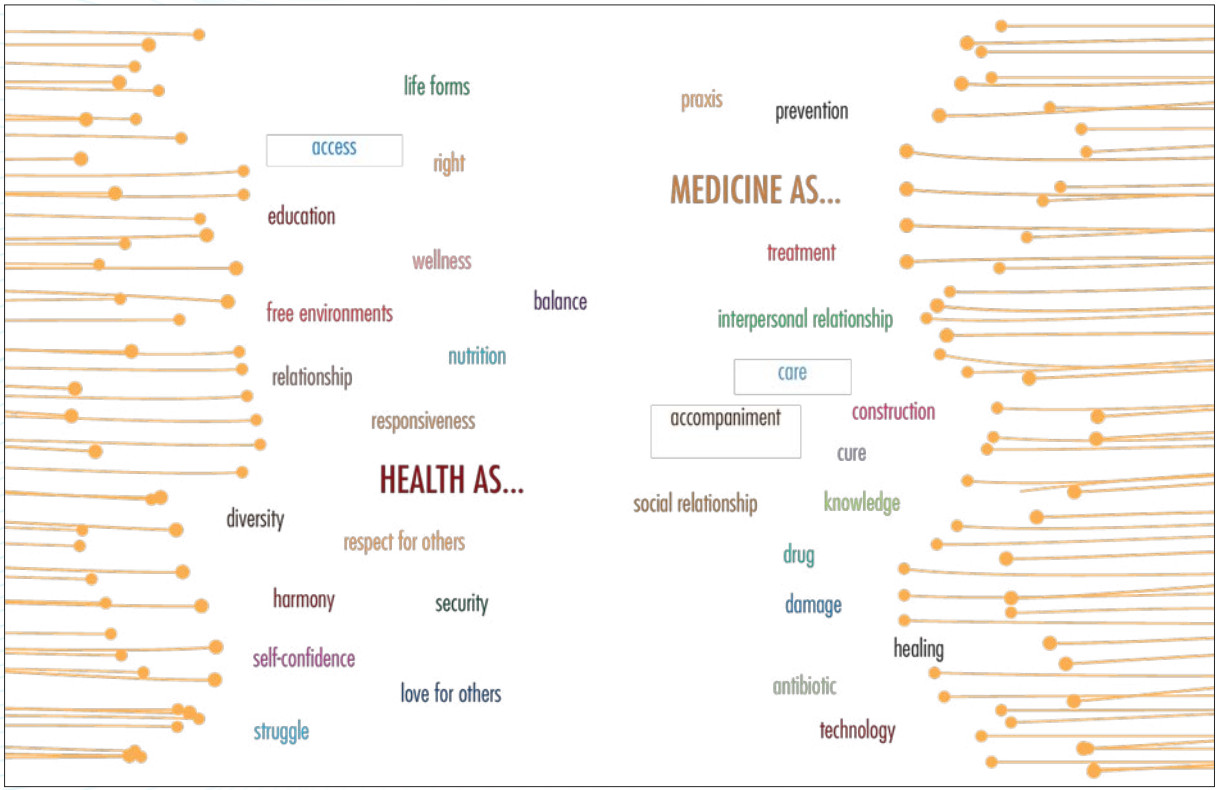
The diagrams below show the range of understandings and comprehensive views of what health and medicine are. These include the technical and biological but also the importance of social relationships and relationship and care for the Earth.

The result integrated the multiplicity of knowledge in different voices from academia and communities expressing hope and making proposals capable of driving paradigm transformations, rethinking how we see ourselves in relation to the planet, and the role of the human species in the fabric of life. It was pointed out by participants at the meeting that the current framework and conception of medicine was making the Earth sick. To repair the harm, we need to maintain, promote an integral, universal and holistic vision of health.

The participant's conclusion identified the key question we all face: 'Do we each need to rethink and recreate the way we live?'



56 Quizhpe A, Murray M, Sivaraman S. What is health? What is medicine? Dialogue of knowledge and wisdom about health, antibiotics and microbes 2016–2021 [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2022 [cited 2026 Jun 7]. Available from: https://reactlat.org/wp-content/uploads/2024/12/What-is-health-What-is-medicine.pdf



"There is an urgent need to recover the profound meaning of health. Phenomena such as antimicrobial resistance, increasing multi-morbidity and the emergence of new diseases all have their roots in the rapid deterioration of the Earth's ecosystems, the increasing inequality within societies, and a way of living based on overexploitation and overconsumption of natural resources."

What is Health? What is Medicine?[57]

57 Quizhpe A, Murray M, Sivaraman S. What is health? What is medicine? Dialogue of knowledge and wisdom about health, antibiotics and microbes 2016–2021 [Internet]. Cuenca (Ecuador): ReAct Latinoamérica; 2022 [cited 2026 Jun 7]. Available from: https://reactlat.org/wp-content/uploads/2024/12/What-is-health-What-is-medicine.pdf

Connecting Health, Medicine and Antimicrobial Resistance to Planetary Health

This brings us to the point that, in the era of climate change, going beyond individual behaviour or choices, we are also confronted with the fact that how we interact with the world around us has implications for global health. What we do as societies collectively, the choices we make, the technology we use and our consumption patterns drive health outcomes and many of these are happening at the planetary level.

The emerging concept of planetary health in recent years recognises this reality and has elaborated on the link between the health of the planet and individual health. Ignored for much of the 20th century, this concept was part of traditional wisdom for centuries – with all major religions of the world exploring the true relation between humans and Nature. It is impossible today to speak of any 'rational use of medicines' without insisting on a similarly rational approach to planetary issues – of resource consumption, social justice and a balanced human-Nature interaction.

The Lancet Commission on Planetary Health, published in 2017, is an important initiative from within modern 20th Century medicine in response to the Anthropocene and has potential to open up minds to a new paradigm. The core argument of this landmark report was that while humanity has achieved unprecedented success in extending life and reducing mortality, these successes have been fuelled by the unsustainable consumption of the very resources that support life. The Earth's life-support systems are destabilizing including climate stability, biodiversity, fresh water and many other markers. Human health is dependent on the environment – we can no longer see it as an isolated objective.

The report called on the world to address a number of conceptual challenges, namely:

- Account for depreciation of natural capital and various subsidies provided by Nature;
- Scale up resilient food and agricultural systems in order to address market failures;
- Complement the curative, biomedical, molecular approach to health by addressing environmental and social roots of ill health through a preventive approach; and
- Develop more resilient health systems particularly at the front-line primary level.

58 Whitmee S, Haines A, Beyrer C, Boltz F, Capon AG, de Souza Dias BF, et al. Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation-Lancet Commission on planetary health. Lancet. 2015;386(10007):1973-2028. doi:10.1016/S0140-6736(15)60901-1.

Crucially, what was missing from the Lancet report was the functioning of the microbial world as a critical zone of Earth's life systems. More recently however, other researchers have called for acknowledgement of the role of microbial diversity as part of the planetary boundaries that regulate the stability of the Earth's system that define a safe operating space for humanity. In this perspective, antimicrobial resistance should be seen as a symptom of ecosystem stress[59].

The Social Dimensions of the War Metaphor in Medicine

Where does the war metaphor in medicine emerge from? Why do we imagine the bacteria, despite their invisibility, as ugly creatures with horns, deformed teeth, clumsy, awkward, and scary and justify killing them in large numbers, using antibiotics or disinfectants of different kinds? The answer is, as we have explored in the last chapter, fear of infectious disease - that some pathogenic bacteria are responsible for- has led to prejudices about all bacteria in general.

However, if we want to know the real origins of the war metaphor they spring from the conflicts and differences within human societies themselves, which for centuries has constantly divided the world into 'us' versus 'them'.

The 'them' could be anyone – foreign populations, people of different ethnicity or religious beliefs, immigrants, the poor. In short, anyone who is 'different' from the mainstream idea of what is 'normal'. These 'others' are not just demonised, they are also rendered invisible to take away their human characteristics, which makes it easier to justify violence against them - workers, farmers, indigenous people, women and so on.

Unfortunately, given the great credibility of modern health professionals the pervasive use of the war metaphor in medicine feeds back into human society's already existing proclivity for resolving complex problems through the use of violence and blunt force.

In that sense, challenging the war metaphor in medicine with an alternative like dance is also about helping humans resolve their differences through negotiations and co-exist in the same space without constantly trying to wipe each other out. Let us not, however, underestimate the difficulty in the dance as the harsh reality of climate change impacts our planet, with higher likelihood of new emerging infectious microbes with epidemic potential, massive disruptions to food systems and human migration.

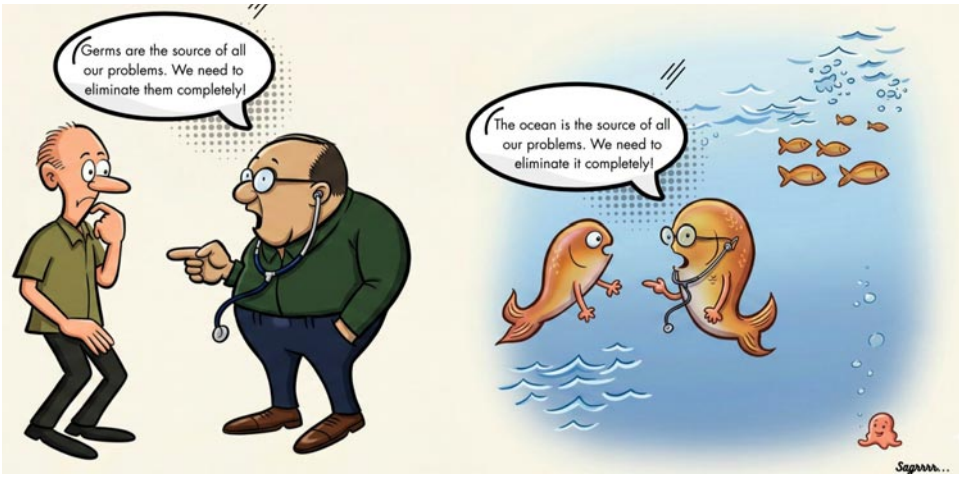
59 Kirchhelle C, Roberts AP. Beyond breakpoint: reconceptualising AMR as a symptom of planetary stress. npj Antimicrob Resist. 2025;3(1):57. doi:10.1038/s44259-025-00128-w.

Assembly of the Invisibles

Our journey continues, but this telling of the story ends, for now, with the initiative to "make visible" two distinct but connected groups: the microbes that sustain life and the human communities that have been historically rendered invisible. By drawing this parallel, we suggest that the hostility and neglect often directed toward the microbial world mirrors the systemic marginalization faced by the poor, peasants, workers, women, indigenous, and Afro-descendant populations.



The Canberra Women's Choir was founded in 2003 to sing for peace in Iraq. Later, they expanded their songs to include peace on Earth. As the ecological crisis deepened, they also began singing for peace with the Earth. They took part in the dialogue "Dancing Against Our Friends, the Bacteria" (2024), performing a song about Ubuntu, the African philosophy of "I am because you are, and we are what we are thanks to others." SCREENSHOT



Cartoon from 2008. Artist: K.P. Sasi. Concept: Satya Sivaraman.

In this context, the World Social Forum of Transformative Economies (FSMET) 2024 was a significant gathering of non-governmental organizations, social movements, and collectives that took place in October 2024 in Cali, Colombia. Held in parallel with the COP 16 on Biodiversity, the forum served as a space for international dialogue to resist the "violence of capital" and explored alternative ways of relating to nature, the economy, and health. Through "Circles of the Word" and "Living Classrooms," participants engaged in exchanging knowledge on diverse topics ranging from care economies and food sovereignty to the civilizational crisis.

ReAct Latin America (RLA) leveraged this forum to position antimicrobial resistance as a critical component of the environmental and biodiversity agenda. RLA viewed the FSMET as an opportunity to continue to integrate community processes and emphasized the importance of understanding microbial biodiversity within the broader "web of life."

Central to their participation was the dissemination and promotion of the "Love Letter from the Invisibles to the World's Leaders" (also referred to as the Charter of the Invisibles), which created a powerful thematic link between the microscopic and the social. The letter, written on behalf of the 'invisibles' – both human and microbial – to world leaders calls attention to the violence perpetrated against them by policies and actions of the rich and powerful. A shortened version of the original letter, written on behalf of the 'invisible billions on Planet Earth', is reproduced here below.



Esteemed Leaders of the World,

“We represent two sets of the invisible. One consists of humans who you deliberately ignore - the workers, farmers, women, the urban poor, rural laborers, indigenous people of the world - who make the sustenance of human societies possible on our planet. We are the backbone of your economies, the hands that feed you, the voices that are seldom heard in the corridors of power.

The policies you pursue now are fuelling the conditions for misery, despair, and hopelessness in a world that increasingly knows how to respond only with violence. You speak of progress and development, but from where we stand, we see only the widening of gaps - between the rich and the poor, between the powerful and the powerless, between humanity and nature.

All we need are the basic rights to food, shelter, education, health care, and respectful treatment of each other regardless of gender, race, or religion, and a life of dignity -- equal to any other human being. Policies that guarantee these things for everyone will also

be one of the greatest contributions to health in the widest sense of the planet and for the myriad communities of us around the world.

The other invisibles we represent in this letter are those living organisms that escape the human eye because of their microscopic size - the diverse, tiny, invisible creatures that flourish within, beneath, and above all our soil, air, and water. The bacteria, viruses, fungi are the oldest living organisms and arguably the preservers of all life on Earth and have been here long before humans walked the planet, and will likely be here long after. Their existence is intrinsically tied to the health of the Earth, and by extension, to your survival.

Yes, we understand that infection by some microbial families causes deadly diseases too. However, it is also a fact that the conditions you have created on the planet only favour newer and newer patterns of sickness. The way your policies have pushed large numbers into urban ghettos, the endless pollution you cause, the toxic wastes you spread so freely, and above all, the callous disregard for millions of people who live in dire poverty -- these are the real culprits when disease caused by microbes strikes.

Instead of reflecting on your own follies, you have declared war on all the invisible ones, both human and non-human. This is not the answer. It is also futile as we are too numerous to be ever defeated. A better approach could be for you to learn something from us about preventing war and co-existing peacefully. We know a lot about the deep and intricate processes of Mother Nature that ensure life in all its forms.

Among these are the art and science of conserving diversity, whether genetic or cultural or political. The more diverse we are, the greater the chance of our own survival as a species in the face of various calamities.

Also included is adapting to change. Bacteria have been around for roughly 4 billion years on a planet that is 4.5 billion years old. They have not only survived the harshest temperature, weather, toxicity and abrupt shifts in environmental conditions but have time and again contributed to mitigating these factors and making them conducive to the flourishing of life.

We, from the invisible human communities, have also been resilient over the centuries surviving against all odds and resisting the assaults on our lives and

livelihoods by the global or national elites. We have much to teach everyone about working collectively for the common good, in these dire times of rapid and devastating climate change.

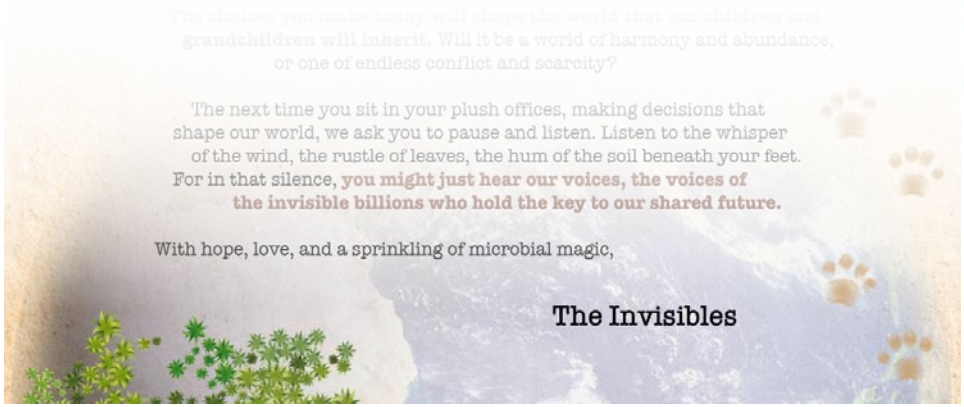
We, the invisibles, are also a model of balanced consumption, as we never take more than what we can give, unlike the rich whose greed is limitless.

We also implore you to listen to the wisdom of indigenous peoples who have lived in harmony with nature for millennia. Their knowledge, often dismissed as primitive or outdated, holds the key to sustainable living that your modern societies have forgotten. Learn from the farmers who understand the rhythms of the land, from the workers who know the true cost of your luxuries, from the women who nurture life in the face of adversity.

Remember, leaders of the world, that your power is transient, but the consequences of your actions will echo through generations. The choices you make today will shape the world that our children and grandchildren will inherit. Will it be a world of harmony and abundance, or one of conflict and scarcity?

With hope, love, and a sprinkling of microbial magic,

The Invisibles



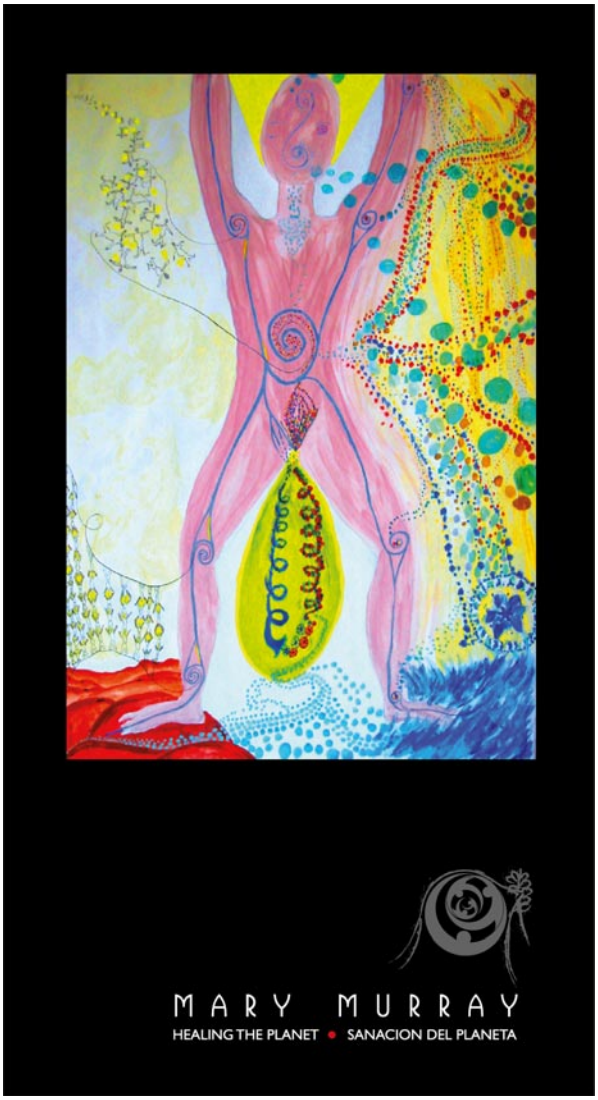
EPILOGUE

The Dance Has Just Begun



As we close the pages of this twenty-year journey, it becomes clear that Reimagining Resistance was never merely an academic exercise or a critique of medical terminology. It was, and remains, a preparation for a necessary transformation in how humanity inhabits the Earth. We have moved from the "Anti"—the stance of being against life—toward the "Sym"—the imperative of living with it. But discovering the metaphor of "Dancing with Bacteria" is only the first step; the true challenge lies in learning the steps of this dance and practicing them daily in our hospitals, farms, schools, and legislative assemblies.

Looking forward, the International Reimagining Resistance Group (IRRG) envisions a future where this new paradigm moves from the margins of "alternative" thought to the centre of global health policy and practice. Our work ahead is mapped across three critical dimensions: education, ecology, and ethics.



This painting on healing the planet by Mary Murray was turned into a postcard featuring a powerful message about the flow of life on the reverse side, written by Arturo Quizhpe. The postcard was distributed among participants of the 2nd People's Health Assembly at the end of the opening ceremony. This is an excerpt from the text:

"Life is an endless adventure,
one of change and continual
transformation,
where heaven and earth,
water and fire,
movement and rest
all generate energy and life,
recreate hope,
in order to beget and grow,
harvest, store, complete the cycle
and then begin anew."

Arturo Quizhpe, 2005

First, we must rewrite the curriculum of life. The "war metaphor" persists not because it is scientifically accurate, but because it is culturally entrenched. Our future work involves deepening the "Educational Alforja" to reach not just children in Andean schools, but medical students in global universities. We aim to humanize medicine by reintroducing ecology into the syllabus. Future doctors must be trained not only as technicians of the body but as diplomats of the microbiome, understanding that prescribing an antibiotic is an ecological intervention that ripples through the patient, the community, and the water table.

Second, the concept of "Dancing with Bacteria" must translate into the tangible regeneration of our food systems. The "Assembly of the Soil" in 2025 was a harbinger of the work to come. We will continue to strengthen the networks between microbiologists, indigenous farmers, and consumers. By making the invisible link between soil health and gut health visible, we aim to challenge the industrial food systems that rely on the mass destruction of microbial life. The kitchen garden and the community farm are the new frontiers of public health, where the "dance" is practiced through the cultivation of diversity rather than the imposition of monocultures.

Finally, we must advance an "Ethics of Care" to replace the "Ethics of War" in global governance. The "Love Letter from the Invisibles" was a first step in giving political voice to the unseen. We envision a future where the Rights of Nature—and explicitly, the rights of the microbial world to exist and evolve—are recognized in legal and ethical frameworks. We will continue to advocate for a "Planetary Health" approach that goes beyond ‘health security’ and fear-based surveillance, advocating instead for biosolidarity. This means recognizing that the health of the wealthiest nations is inextricably tied to the health of the poorest communities and the resilience of the smallest microbes.

The music of the biosphere has been playing for four billion years. For too long, humanity has tried to silence it with the deafening noise of warfare and domination. We are finally learning to listen. The invitation now is for every reader, leader, healer, and grower to step onto the floor. The dance has just begun.

ANNEXURE ONE

Bibliography of ReAct LA Publications



Publications from a Twenty-Year Journey of Reimagining Resistance

This bibliography documents over two decades of effort by ReAct Latin America to transform our relationship with the microbial world. Moving beyond the "war against bacteria," these works advocate for a paradigm of ecological balance and harmony.
These publications emerge from a "dialogue of knowledges," integrating diverse global perspectives:

These publications emerge from a “dialogue of knowledges” that brings together diverse perspectives from different regions of the world:

- **Scientific Rigour:** Research from microbiologists and paediatricians on the microbiome and bacterial social intelligence.
- **Ancestral Wisdom:** Insights on Sumak Kawsay (Buen Vivir) and the sacredness of Pachamama from Indigenous communities.
- **Artistic Innovation:** Collaborative projects with dancers and musicians using creative performance to make the invisible visible.
- **Agroecology:** Contributions from producers viewing the soil as a "living skin" to ensure food sovereignty.

The collection tracks the shift toward concepts like "Dancing with Bacteria". It frames antimicrobial resistance not merely as a medical crisis, but as a symptom of ecological rupture. These resources also aim to inspire "Antibiotic Smart" citizens to protect microbial diversity as a global common good.

We invite you to join this movement dedicated to recovering the health of the planet and all its inhabitants!

- Quizhpe, A. & Hamlin, M. (2006). VOICES OF THE EARTH. From Savar to Cuenca. Facultad de Ciencias Médicas de la Universidad de Cuenca, 172pp. https://drive.google.com/file/d/1zbpoB5TrMeAy9AKx9A_xBEz8SJPYc8o_/view
- ReAct Latinoamérica. (2008). The Cuenca Declaration: A global call to action to contain antibacterial resistance. ReAct Latinoamérica, 16pp. https://www.reactgroup.org/wp-content/uploads/2016/11/the-cuenca-declaration-english.pdf
- Quizhpe P., A. & Calle H., K. (2009). "Restablecer la salud de los ecosistemas para contener la resistencia bacteriana. Taller-seminario internacional sobre resistencia bacteriana, enfermedades infecciosas, solidaridad comunitaria y ecosistemas, 9 al 13 de junio del 2008. Cuenca-Ecuador. Memorias" [Restoring ecosystem health to contain bacterial resistance. International workshop-seminar on bacterial resistance, infectious diseases, community solidarity, and ecosystems, June 9-13, 2008. Cuenca, Ecuador. Proceedings]. ReAct Latinoamérica, 172pp. https://reactlat.org/wp-content/uploads/2026/01/RestablecerLaSaludDeLosEcosistemasParaContenerLaResistenciaBacteriana.pdf
- Tello, V., Campoverde, J., Ochoa, J., Cordero, M., Tenesaca, S., Medina, V., Guzmán, W. & Alessio, S. (2013). "FotoResistencia: La resistencia a los antibióticos en fotos". [PhotoResistance: Antibiotic resistance in photos]. ReAct Latinoamérica, 111pp. https://reactlat.org/wp-content/uploads/2024/12/Foto-resistencia-la-Resistencia-de-los-antibioticos-en-fotos.pdf
- Quizhpe, A. & Calle, K. (2014). "Sumak Kawsay y Salud. Vida en Plenitud y Armonía entre la Humanidad y la Madre Tierra. Memorias del Encuentro Internacional y Pluricultural: Sumak Kawsay y Salud. 7 al 12 de octubre de 2013, Cuenca-Ecuador" [Sumak Kawsay and Health. Life in Fullness and Harmony between Humanity and Mother Earth. Proceedings of the International and Pluricultural Meeting: Sumak Kawsay and Health. October 7-12, 2013, Cuenca-Ecuador]. ReAct - Action on Antibiotic Resistance, 92pp. https://reactlat.org/download/sumak-kawsay-y-salud-vida-en-plenitud-y-armonia-entre-la-humanidad-y-la-madre-tierra/
- Murray, M., Sivaraman, S., Quizhpe, A., Kiatying- Angsulee, N. & Calle, K. (2014). "Reimaginando la Resistencia, Intercesiones para sensibilizarnos frente a la resistencia". [Reimagining Resistance, Intercessions to Raise Awareness about Resistance]. ReAct Latinoamérica, 168pp. https://reactlat.org/wp-content/uploads/2022/01/Reimaginando-la-Resistencia-Intersecciones-para-sencibilizarnos-frente-a-la-resistencia-DW.pdf
- Sivaraman. S. & Murray, M. (2015). Microbes and Metaphors: A Dialogue between Scientists, Artists and Activists. ReAct Latinoamérica, 142pp. https://reactlat.org/wp-content/uploads/2022/01/Microbes-and-Methaphors-DW.pdf
- Chacón, G., Pacheco, C., Mogrovejo, S., Arévalo, N., Tello, V. & Luzuriaga, M. (2015). "FotoResistencia: Historias de resistencia a los antibióticos en fotos", volumen II. [PhotoResistance: Stories of Antibiotic Resistance in Photos, volume II]. ReAct Latinoamérica,76pp. https://www.reactgroup.org/wp-content/uploads/2016/10/FotoResistencia-II_10MB.pdf
- ReAct Latinoamérica. (2016). Towards a new chapter in human-bacteria relations. ¿Can we live together in peace? ReAct Latinoamérica, 16pp. https://reactlat.org/download/towards-a-new-chapter-in-human-bacteria-relations-2/

- Sivaraman. S. & Murray, M. (2016). Reimagining Resistance: Towards a New Paradigm in the Relationships Between Humans and Bacteria. ReAct Latinoamérica, 121pp. https://reactlat.org/wp-content/uploads/2022/01/Reimaginando-la-Resistencia-espanol-DW.pdf
- Quizhpe, A., Calle, K., Murray, M., Verseñassi, D., Noboa, H., Benavides, J., Andocilla, M. & Campoverde, N. (2017). "Reimaginando la Resistencia Ampliando embelleciendo el mosaico". [Reimagining the Resistance Expanding and Beautifying the Mosaic]. ReAct Latinoamérica, 121pp. https://reactlat.org/wp-content/uploads/2022/01/RR-Ampliando-y-embelleciendo-el-mosaico-2017-DW.pdf
- Quizhpe, A., Aguilar, I., Cantos, G., Murray, M., Sivaraman, S., Guayan, L. & Quizhpe, J. (2017). "¡Contemos nuestras Bac-historias! De cuando la ciencia redescubre su corazón". [Let's tell our Bac-stories! When science rediscovers its heart]. ReAct Latinoamérica, 108pp. https://reactlat.org/wp-content/uploads/2024/09/BACHISTORIAS.pdf
- Sivaraman, S. (2017). Adventure in the Human Forest and other Micro Stories. ReAct Latin America, 59pp. https://www.reactgroup.org/wp-content/uploads/2016/10/adventures-in-the-human-forest.pdf
- Quizhpe, A. & Calle, K. (2018). Memorias del Encuentro Intercontinental "Madre Tierra: Una Sola Salud", realizado del 12 al 16 de junio de 2017 en Rosario – Argentina" [Proceedings of the Intercontinental Meeting "Mother Earth: One Health", held from June 12 to 16, 2017 in Rosario, Argentina]. ReAct Latinoamérica, 128pp. https://reactlat.org/download/madre-tierra-una-sola-salud/
- Quizhpe, A. & Murray, M. (2020). A Series on Communities & Antibiotics. First Booklet. Community Wisdom. Use of Antibiotics and the Health of Mother Earth. ReAct Latinoamérica, 19pp. https://reactlat.org/download/community-wisdom-use-of-antibiotics-and-the-health-of-mother-earth/
- ReAct Latinoamérica. (2020). "Un hombre que ama con todas sus bacterias". [A man who loves with all his bacteria]. ReAct Latinoamérica, 28pp. https://reactlat.org/wp-content/uploads/2020/06/Un-Hombre-Que-Ama.pdf
- Quizhpe, A., Murray, M. & Calle, K. (2020). "Comunidades y Antibióticos" [Communities and Antibiotics]. ReAct Latinoamérica, 164pp. https://reactlat.org/wp-content/uploads/2021/12/Comunidades-y-Antibioticos.pdf
- Quizhpe, A., Murray, M. & Calle, K. (2021). Communities Responding to Antibiotic Resistance. ReAct Latinoamérica, 30pp. https://reactlat.org/download/communities-responding-to-antibiotic-resistance/
- Quizhpe, A., Murray, M. & Calle, K. (2021). Series 'Communities and Antibiotics', Third Booklet. Towards a Community Action Plan. Antibiotic resistance and the Health of Mother Earth. ReAct Latinoamérica, 18pp. https://reactlat.org/download/towards-a-community-action-plan/
- ReAct Latinoamérica. (2021). "¡A tu salud, Madre Tierra!" [Cheers, Mother Earth!]. ReAct Latinoamérica, 99pp. https://reactlat.org/wp-content/uploads/2021/09/LIBRO-ALBUM-2021-FINAL-LR.pdf
- Quizhpe, A., Murray, M. & Calle, K. (2021). Series 'Communities and Antibiotics', Fourth Booklet. Protecting the essence of Health. Educational Program in Human, Animal and Planetary Health. ReAct Latinoamérica, 20pp. https://reactlat.org/download/protecting-the-essence-of-health-health-education-program/
- Sivaraman, S. (2021). Who Killed Rational Use of Medicine? ReAct Latinoamérica. 80pp. https://reactlat.org/download/who-killed-rational-use-of-medicine/
- ReAct Latinoamérica. (2022). "Danzando con las Bacterias: Por Nuestro Planeta, por Nuestra Salud". [Dancing with the Bacteria. For Our Planet. For Our Health]. ReAct Latinoamérica,12pp. https://reactlat.org/wp-content/uploads/2023/03/informe-danzando-web.pdf
- Quizhpe, A., Murray, M. & Sivaraman, S. (2022). What is Health? What is Medicine? Dialogue of Knowledge and Wisdom about health, antibiotics and microbes 2016–2021. ReAct Latinoamérica, 120pp. https://reactlat.org/download/what-is-health-what-is-medicine/
- Sivaraman, S. (2022). Journey of an Antibiotic. ReAct Asia Pacific, 120pp. https://www.reactgroup.org/wp-content/uploads/2022/04/Journey-of-an-Antibiotic-online-version-Final-Mar-22.pdf

- Quizhpe, A., Quizhpe, A., Cedillo, C., & Andrade, D. (2022). “Un Solo Planeta, Una Sola Vida”. [One Planet, One Life]. ReAct Latinoamérica, 44pp. https://reactlat.org/download/un-solo-planeta-una-sola-vida/
- Quizhpe, A., Murray, M., Sivaraman, S., Campoverde, N. & Figar, S. (2023). “Reflexiones de lo Diminuto y Viviente. Arte-Bacteria-Microbioma”. [Reflections on the Tiny and Living. Art-Bacteria-Microbiome]. ReAct Latinoamérica, 76pp. https://reactlat.org/wp-content/uploads/2023/06/LIBRO-REFLEXIONES-20x20-1.pdf
- Quizhpe, A., Cameron, P. & Monsalve, J. (2023). Aesthetics of the Invisible: Dancing with Bacteria for Planetary Health. ReAct - Action on Antibiotic Resistance, 76pp. https://reactlat.org/wp-content/uploads/2024/06/AESTHETICS-OF-THE-INVISIBLE-DANCING-WITH-BACTERIA.pdf
- Vélez, E., Quizhpe, A. & Jennifer Monsalve. (2024). “Un Viaje a Pie Descalzo con los Microbios. Reflexiones y memorias del Encuentro Internacional “Madre Tierra, Una Salud: Arte, Educación y Resistencia a los Antimicrobianos”. 24-26 de junio de 2024, Medellín. [A Barefoot Journey with Microbes. Reflections and Memories of the International Meeting “Mother Earth, One Health: Art, Education, and Resistance to Antimicrobials.” 24-26 June 2024, Medellín. ReAct Latinoamérica, 49pp. https://ninoanino.org/wp-content/uploads/2024/11/ReActoria-Madre-Tierra-una-Salud.-Medellin-2024.pdf
- Calle, K.(2024). “Danzando con las Bacterias y las Palabras: Crónica del diálogo sobre la metáfora de la danza con las bacterias, realizado el 27 de junio de 2024 con motivo del Día Mundial del Microbioma, bajo el impulso de ReAct Latinoamérica y el Grupo Reimaginando la Resistencia”. [Dancing with Bacteria and Words. Chronicle of the dialogue on the metaphor of dancing with bacteria, held on June 27, 2024, on the occasion of World Microbiome Day, driven by ReAct Latin America and the Reimagining Resistance Group]. ReAct Latinoamérica, 30pp. file:///C:/Users/andre/Downloads/DANZANDO-CON-LAS-BACTERIAS-2025-03-FF%20(1).pdf
- Ferrazini, L. (2024). “Hacia sistemas agroalimentarios más sustentables y saludables. Una apuesta para mitigar el cambio climático y la resistencia antimicrobiana”. [Towards More Sustainable and Healthier Agro-Food Systems. A Commitment to Mitigate Climate Change and Antimicrobial Resistance]. ReAct Latinoamérica, 41pp. https://reactlat.org/wp-content/uploads/2024/11/Hacia-sistemas-agroalimentarios-mas-sustentables-y-saludables.pdf
- Quizhpe P., A., Rodríguez, A., Quizhpe R., A., Quizhpe O., S., Lázaro, L. & Maldonado, X. (2025). “Microbioma: Esencia de la Vida. Alimentación, Una Salud”. [Microbiome: Essence of Life. Nutrition, One Health]. ReAct Latinoamérica, 237pp. https://reactlat.org/wp-content/uploads/2024/11/LIBRO-MICROBIOMA-FINAL-2.pdf
- Quizhpe, A., Rodríguez, A., Lázaro, L. & Quizhpe, A. (2025). “Tierra viva, alimento y salud: Horizontes y brújulas para el camino que une el alimento, el microbioma y una sola salud”. [Living Earth, Food and Health: Horizons and Compasses for the Path that Unites Food, the Microbiome, and One Health]. ReAct Latinoamérica, 90pp. https://reactlat.org/wp-content/uploads/2025/06/Tierra-Viva-alimento-y-salud.pdf

As an artist and director of the Andean Orchestra “Ensamble del Viento,” I know health is built in community: by listening, tuning, and sustaining one another. “Reimagining Resistance - A Journey in Disruption” invites us to replace the metaphor of war with an ethic of care, where the invisible also has a voice. I celebrate this work because it turns science into lived experience and opens the path for us to imagine, create, and heal.

Alexis Zapata E.
Director and composer
Ensamble del Viento
Quito, Ecuador

One of the greatest tests of humility is to abandon a wrongly assigned place of taxonomic privilege, to assume with quiet contemplation a place among all the species that make up the planetary biomass. It is to huddle upon the moist earth looking at the stars to listen to the singing of billions of ‘invisible’ inhabitants that sustain life.

Respect for the existence of all species begins by accepting that we are all species, even microscopic ones.

Let’s get ready to dance with bacteria to continue the great dance of life.

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