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**Title: The World's Most Pernicious Crisis -  
Our Vanishing Civilian Soldiers**

## **The World's Most Pernicious Crisis - Our Vanishing Civilian Soldiers**

Dear World Leaders,

A crisis is upon us. A crisis as gripping as the Marawi insurgency or the Yemen civil war, but one which you have dedicated much less attention to: our microbiomes are rapidly vanishing by the day. I don't blame you if this is the first time you have come across the word "microbiomes". Indeed, one can fathom how insidious this global calamity is when the word "microbiome" triggers nothing more than the mental image of a Yakult bottle in the mind of the average consumer, or how the notion of trillions of microorganisms residing within our bodies is more likely to send a silent shiver down the spines of most *homosapiens* than a loud heave of relief.

Let me introduce to you the organisms that live in our guts, nasal cavities and almost every other nook and cranny of our bodies - the arsenal of teeny bacteria, viruses, protista and fungi that are, as a matter of fact, more complex than you and I combined - large scale metagenomic projects such as the Human Microbiome Project have reported 3.3 million unique protein-encoding genes<sup>1</sup> compared to the human genome, which possesses around 20,000 - 25,000 genes.<sup>2</sup> They are responsible for a plethora of essential ancillary functions, from the development of immunity to the balancing of hormones and the synthesis of vitamins.<sup>3</sup> Immunology-wise, you could think of microbiota as much akin to civilian soldiers, who serve as the first line of defence against potential invaders (or pathogens) before the professional armed forces (or white blood cells) step in. Microbiota achieve this by competing with pathogens for nutrients or cellular binding sites<sup>4</sup>, similar to how civilian soldiers assist in fortifying strongholds during peacetime and prevent opposing troops from gaining access to crucial resource supplies.

But our bodies' civilian soldiers - most of whom we have no idea exist till this day - are gradually being put out of action, with not a single warrant being put up for the perpetrators' arrest (which goes to evince our cavalier attitude towards these soldiers' contributions, huh?). Make no mistake, the disappearing microbiome hypothesis posits that our microbiota are much fewer in numbers and much less diverse in variety compared to our ancestors - and the man behind the theory has found concrete evidence to suggest so - microorganisms, such as *Helicobacter pylori*, have plunged in prevalence since the 20th century, which has been linked to the growing ubiquity of esophagus diseases and asthma.<sup>5</sup> Somewhat ironically, we ourselves may be the biggest culprit behind these civilian soldiers' disappearance, considering how the causes of their demise are uncannily more anthropogenic than natural. And yes, I'm telling you that your citizens need your astute leadership to combat this global threat - because oftentimes, we lack your wisdom and foresight to make the best decisions in the interest of public health.

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<sup>1</sup> <https://www.nature.com/articles/nature08821>

<sup>2</sup> [https://www.sciencedaily.com/terms/human\\_genome.htm](https://www.sciencedaily.com/terms/human_genome.htm)

<sup>3</sup> <https://ep.bmj.com/content/102/5/257>

<sup>4</sup> <https://courses.lumenlearning.com/microbiology/chapter/physical-defenses/>

<sup>5</sup> <https://www.sciencefriday.com/articles/the-bacterium-disappearing-from-our-stomachs/>

At the top of the wanted list is antibiotics - whose rampant usage in recent years to curb bacterial infections has also inflicted massive collateral damage, killing off the "good" bacteria in our guts. For example, a quantitative model developed by researchers from the University College of London this year suggests that the prolonged administration of antibiotics may result in permanent damage to the composition of our microbiomes, with antibiotics such as ciprofloxacin and clindamycin causing the biggest disturbance to the gut and oral microbiota.<sup>6</sup> It is not difficult to see why this is so - given our symbiotic relationship with microbiomes, the use of antibiotics is akin to employing saturation bombing to deal with an insurgency, a particularly crude method of attack that also leads to casualties amongst our armed civilian forces. Worse still, if not pursued to a resounding victory, the antibiotics may not only fail to kill off the underlying infection but also strengthen the revolt - also dubbed antibiotic resistance. Interestingly enough, we may also be poisoning our bodies' civilian soldiers through the widespread usage of antibiotics in livestock rearing and agriculture, which we then consume via the food chain. For example, the World Health Organisation has discovered that in some countries, the amount of antibiotics used in animals is four times the amount used in humans.<sup>7</sup> I therefore beseech you to implement stringent antimicrobial regulations from farm to fork and public awareness campaigns on antibiotic resistance in your countries so as to minimise the harm wreaked on our bodies' civilian armies by antibiotics.

Next up, we have our poor contemporary diets to blame - the increasingly Westernised diet which has swept across the modern world in general. This can be ascribed to the low fibre content of such a diet which may have caused us to miss out on the prebiotics that had promoted bacterial growth on the guts of our predecessors, manifesting itself in climbing obesity rates.<sup>8</sup> Clinical research has also established that the environment created in the gut by ultra-processed foods, a hallmark of the modern diet, is culpable for enacting inflammatory structural changes in our resident microbiomes,<sup>9</sup> while the loss of seasonality in our microbiomes may be the result of our burgeoning consumption of staple foods that can be easily obtained year-round from the supermarket.<sup>10</sup> To illustrate, comparative studies have revealed that the Hadzans, who live on subsistence diets, possess approximately 30% more diverse microbiomes than the citizens of Western nations, with benign cyclical changes unseen in their Western counterparts!<sup>11</sup> In martial lingo, imagine if the civilian soldiers protecting your countries were fed suboptimal diets at irregular intervals, driving them to the brink of malnourishment - how then, could they deter powerful aggressors in times of exigency? I therefore beseech you to promulgate salubrious diets as a way of life in your countries so as to ensure our bodies' civilian soldiers are nourished and capable of putting up a fight against our common enemy.

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<sup>6</sup><https://www.google.com/amp/s/www.technologynetworks.com/biopharma/news/amp/how-antibiotics-change-human-microbiome-diversity-long-term-317454>

<sup>7</sup> [https://www.who.int/foodsafety/areas\\_work/antimicrobial-resistance/amrfoodchain/en/](https://www.who.int/foodsafety/areas_work/antimicrobial-resistance/amrfoodchain/en/)

<sup>8</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5390821/>

<sup>9</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5872783/>

<sup>10</sup> <https://ubiome.com/blog/post/seasonal-eating-microbiome/>

<sup>11</sup><https://www.google.com/amp/s/www.newscientist.com/article/2145275-eat-a-seasonal-diet-and-your-gut-microbes-may-change-in-sync/amp/>

The third major culprit is the spike in the number of childbirths via elective Caesarean section. This is because traditionally, the inoculation of a newborn with the mother's microbiota happens when the baby travels through the mother's birth canal.<sup>12</sup> As a consequence, Caesarean section disrupts a primordial process, hindering the transfer of microbiota from mother to child. For example, a new study of more than 100 babies showed that those born vaginally had higher levels of "good" bacteria in their guts than Caesarean babies, in turn lowering their susceptibility to respiratory infections.<sup>13</sup> The plummet in breastfeeding rates across the developed world should also warrant your concern, in light of findings that there is a window of opportunity for breastmilk to shape the gut microbiome in the early stages of infancy, potentially preventing the development of allergies and other enduring maladies.<sup>14</sup> Let me try to explain it using the same analogy of civilian soldiers - you could think of these prevailing parturition trends as having the inimical effect of vastly reducing the number of citizens in a country wishing to defend their motherland, culminating in a grossly inadequate civilian army strength. And no, I am not imploring you to ban Caesarean section or to make breastfeeding mandatory; instead, I beseech you to put in place national postnatal programmes that support mothers who are keen on breastfeeding and medical guidelines that discourage Cesarean section in instances where it is not required as a form of medical intervention, so that our bodies will be able to recruit a sizeable battalion of civilian soldiers imbued with a ferocious fighting spirit.

I shall end off this letter with a stirring quote from two-time recipient of the Global Health Council's Excellence in Media award Michael Specter, "We are inhabited by as many as ten thousand bacterial species; these cells outnumber those which we consider our own by ten to one. Together they are referred to as our microbiome - and they play such a crucial role in our lives that scientists have begun to reconsider what it means to be human." Indeed, it is high-time we acknowledge the efforts of the civilian soldiers helping to defend our bodies - and I beseech you to accord the vanishing microbiome crisis the attention it rightfully deserves - before a silent shiver runs down our spines upon realising that it is all too late.

Yours faithfully,

Gabriel Lee

On behalf of all the citizens you serve

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<sup>12</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6085361>

<sup>13</sup> <https://www.google.com/amp/s/amp.theguardian.com/science/2019/apr/12/caesarean-babies-have-lower-level-of-good-gut-bacteria-study-shows>

<sup>14</sup> <https://www.frontiersin.org/articles/10.3389/fped.2019.00047/full>