The Mysterious Rise in Severe Diseases in Children

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Since the pandemic young children are dealing with a mysterious increase in disease. Some may even have doubled in frequency, varying from infectious diseases, mental diseases (anxiety, depression, suicide increasing 25% worldwide) to hormonal diseases (early onset of puberty) to inflammation (Irritable Bowel Disease (IBD), obesity and now hepatitis (inflammation of the liver).

In the past week, the rise of hepatitis in immunocompetent children younger than ten years of age has been in the news. Seventeen out of 169 children with hepatitis needed liver transplantation and 1 child died. Children experiencing hepatitis had not been vaccinated for Covid. In 77% of the cases a positive PCR test for Adenovirus was found, though hepatitis caused by this virus is rare.

Experts suggest a waning immune system due to the lockdowns and less exposure to other microorganisms. A tip of the iceberg as many cases of hepatitis may not be recognized yet.

The world is facing a health crisis affecting young children by a focus on one infectious disease with repeated lockdowns, continued pandemic measures, frequent testing and a growing toxic environmental and air pollution problem.

The steep rise among a broad variety of diseases in young children can be explained by a waning innate immune system relating to a disrupted gut-liver-brain axis. Reluctance to investigate the causation in harm by an increased exposure to unknown toxic substances, nanoparticles, alcohol and microplastics can no longer hold. To save children's healthy lives a timely and adequate response is needed based on accurate risk benefit assessments.

A Disrupted Microbiome

Scientists are rapidly expanding knowledge that the human body is made primarily of trillions of microorganisms with the vast majority living in the gut providing an important role in the host physiology as metabolism, immunity, cardiovascular function and neuronal development. Half of all biological matter in our bodies is not human.

Even the central nervous system, which was thought to be sterile, is colonized by a diverse viral community. A dysregulation of their structure and function can lead to disruption of the microbial host homeostasis and may cause disease.

Disturbances in the primary colonization during the first two years of life can result in lifelong health consequences and an altered immune system. Among the kingdom of life bacteria, fungi and most numerous of all 380 trillion viruses colonize the microbiome. The bacterial component is by far the most studied and has been shown to be highly stable in healthy adults.

The gut bacterial community provides essential nutritional services to its host, is an important driver of mucosal immunity and provides protection against enteric pathogens. It maintains the homeostasis of the gastrointestinal tract and regulates intestinal cell restoration and the integrity of tight junctions, all of which are critical for maintaining the gut-barrier function.

Metabolic dysregulation together with dysbiosis of the gut microbiome are central in the pathogenesis of diseases of the gut-liver-brain axis. Children and elderly people are characterized by less variety in their microbiome and are more vulnerable to disruption.

Associations of viral infections with Irritable Bowel Disease ((inflammation of the gut like *Morbus Crohn* (affecting any part of the colon from the mouth to the anus) and *Colitis Ulcerosa* (affecting only the colon)) and a waning immune system are being made.

The composition of the human virome is influenced by diet, genetics, environment and geography. Many of them (bacteriophages) do not target human cells but look for the bacteria in the microbiome and use the bacteria to make copies of themselves. A smaller proportion infect cells in tissues directly. These viruses are in the minority because the immune system suppresses them. However, when the immune system is hampered, viruses can multiply immediately.

Dysfunction of the Gut-Liver-Brain Axis

The homeostasis of the gut microbiome is responsible for intestinal fitness and an appropriate liver function. The liver and intestine are connected via the portal vein which is the main route of enterohepatic circulation of metabolites, hormones, immunoglobulins and bile acids. Disrupting the homeostasis and an increased intestinal mucosa permeability activates hepatic inflammation.

Furthermore, the gut microbiome produces a great number of chemicals (like serotonin) that the brain uses to regulate neurological processes such as learning and mood. A network connected to the gut influences the neuroendocrine and neuroimmune cells of the central nervous system.

A large amount of existing data show that hepatic encephalopathy is a clear example of how an altered gut microbiota homeostasis can influence and impact on physiological functions outside the intestine, with implications at the host health at the systems level.

Therefore, the microbiota gut-liver-brain axis seems to play an important regulatory role in the pathogenesis of low-grade inflammatory diseases. The main participants are the gut microbiota, its bacterial products (i.e. endotoxins, ammonia, ethanol, Short Chain Fatty acids) and their interactions with receptors that can stimulate or inhibit signaling pathways, the intestinal barrier and the innate immune system which can be either beneficial or detrimental for the host health.

A Waning Innate Immune System

The integrity of the gut microbiome is a prerequisite for an effective immune response preventing disease. Most pathogens try to invade through the gut mucosa. The initial defense by the innate immune system starts by the mucosal membrane of which the gastrointestinal tract is the largest being characterized by the presence of special types of lymphocytes (macrophages, dendritic cells, natural killer cells) and secretory products (secretory IgA) able to maintain the steady state in the gut.

Macrophages and neutrophils can trigger tissue repair and switching over to the adaptive immune response to activate B and T cells to develop specific neutralizing antibody responses and B and T cell memory. Interactions between Dendritic cells and Natural Killer T cells and bacteria may crucially contribute to both physiologically and pathologically immune response in the intestinal mucosa.

Corman et al. showed that a disrupted gut-microbial community composition with symptoms such as diarrhea and vomiting is associated with Adenovirus infection in non-human primates. Commensal flora required for a healthy gut microbiome decreased whereas genera containing pathogens like Neisseria increased in abundance. Although this work is still under development, different viral infections are linked to alterations and disruptions of the intestinal microbiome.

Therefore, diseases affecting the intestinal mucosa as IBD that can be triggered by diet and environmental factors are of a major concern, now being detected at rapidly increasing levels globally. Lifelong treatment with drugs is often needed. Moreover, the digesting and uptake of sufficient nutrients is poor due to a disrupted digestion, frequent cramps, diarrhea and vomiting.

Pollutions and inflammation

The human exposure to pollution of microplastics, nanoparticles and other toxic substances is rapidly increasing. Alcohol disrupts the gut-liver-brain axis at multiple interconnected levels including the gut microbiome, mucus and epithelial barrier. Exposure to chemicals present in tests is a danger for human health as well.

Recently, researchers found microplastics in blood, lungs and feces. Microplastics can damage human cells and cross the blood/brain barrier. Nanoparticles as Titanium Dioxide can cause gut dysbiosis and show a translocation into the central nervous system through eye to brain pathways which can induce neuroinflammation.

Graphene oxide-derived products which may form complex structures with microplastics can disrupt the gut barrier increasing the ability to penetrate the body, form biocorona, spread and influence physiological processes affecting the integrity of the intestinal mucosa, catching other toxic substances being transported via the blood and stored in fatty tissues.

A study found similar plastics in masks as in patients' lungs. Chinese researchers found 1,5 times more microplastics in the feces of people with IBD. Whether microplastics cause IBD or exacerbate the disease is not yet clear. There is evidence that microplastics and their additives are potential obesogens.

A new peer reviewed article has demonstrated that mask usage correlated with a higher death rate, an alarming signal which adds up to the mysterious rises in diseases in children.

In the UK, the biggest increase in obesity and being morbidly overweight has been seen during the pandemic. Children from poor families are twice as often affected. Public health policy makers need to be concerned about the risks for disrupted immune systems widening health inequalities.

Focused Nutrition to Repair the Homeostasis of the Microbiome

The true regulator of health and disease is the innate immune system. From the start of the pandemic scientists have been warning that lockdowns and pandemic measures could result in a waning immune system with a risk for more diseases.

Facing inflation and dramatic rises in gas and food prices can exacerbate the disrupted gut-liver-brain axis with more diseases to expect affecting students and working people soon. Of increasing concern is a lack of healthcare professionals resulting in long waiting lists for

diagnosis and treatments.

Only an effective innate immune system is capable of preventing infectious and chronic diseases and functions to break down foreign and toxic substances. To prevent inflammatory processes in the body the exposure to toxic materials and microplastics by measures with no strong proven effects to prevent infectious diseases should be stopped for all ages. A focused nutrition guidance of vitamin D would be a first easy and cheap step to restore the innate immune system and repair inflammatory diseases like IBD, viral associated liver diseases and depression.

Author

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