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Does The Hygiene Hypothesis Contribute to Autoimmune And Allergic Disease In Children With Focus on Type 1 Diabetes Mellitus and Asthma

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Abstract

The Hygiene Hypothesis first introduced in 1989 by an epidemiologist, Dr Strachan, as he observed an increased prevalence of allergic diseases in society. Further clinical studies and research have included autoimmunity and inflammatory disease under the umbrella of the Hygiene Hypothesis. Article searches were done in the electronic medical database, Pubmed, for articles related to the Hygiene Hypothesis and autoimmunity related to Type 1 Diabetes Mellitus (T1DM) and hygiene hypothesis and childhood asthma. Articles written in the last five years were utilized for the project. The subject group is male and female children ages birth to 18 years old with subject populations throughout the world. Research has shown that the decreased burden on the immune system due to declining family sizes, improved household amenities, higher standards of personal cleanliness, vaccinations and antibiotic use have begun to alter how the immune system responds to pathogenic stimulus as well as nonpathogenic stimulus. These are factors leading to increased autoimmunity and atopy found in children of modern society. Further study is indicated for understanding about what causes some of these conditions in modern societies. This has applications towards antibiotic use, trendy hygiene practices and further understanding of the environmental causes of these and other more common conditions.

Introduction

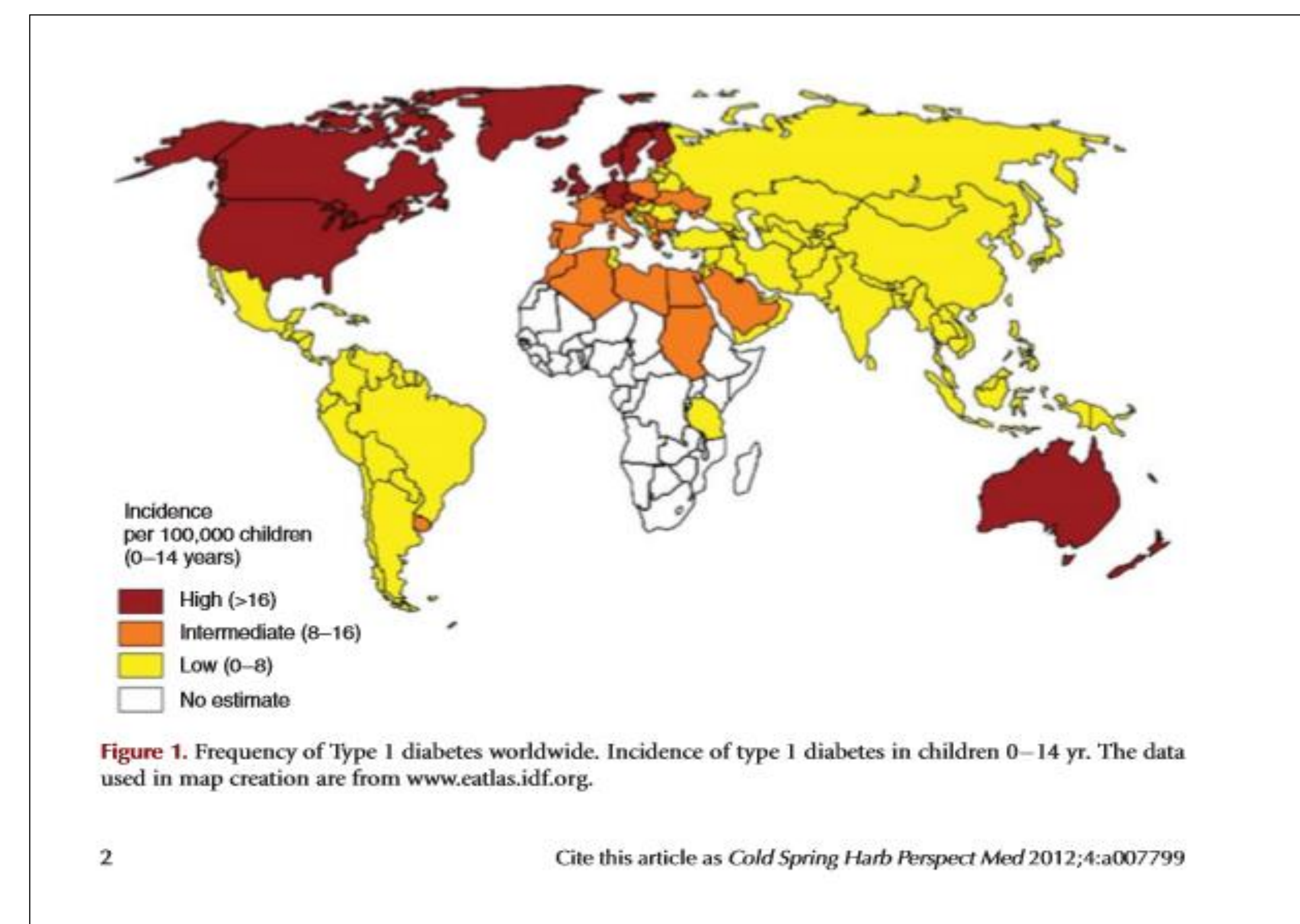
Autoimmune and atopic disease which are caused by hyperresponsiveness of the immune system against the host, have become more common in developed and developing societies. This response by the immune system leads to diabetes mellitus type 1, asthma and other disorders. The causes of this increased autoimmunity in developing and developed societies is under investigation. The causes of the body's attack on itself may first begin to develop in childhood when the immune system is beginning to take shape and learning how to respond to stimuli. The Hygiene Hypothesis, which has been under investigation since the 1980's attempts to explain this hyperresponsiveness in children.

Statement of the Problem

There is increasing occurrence of autoimmune and allergic disease in children of developing and developed countries. The causes of this increased autoimmunity and allergic disease needs to be further investigated.

Research Question

Does the Hygiene Hypothesis Contribute to Autoimmune and Allergic Disease in Children with Focus on Type 1 Diabetes Mellitus and Asthma?



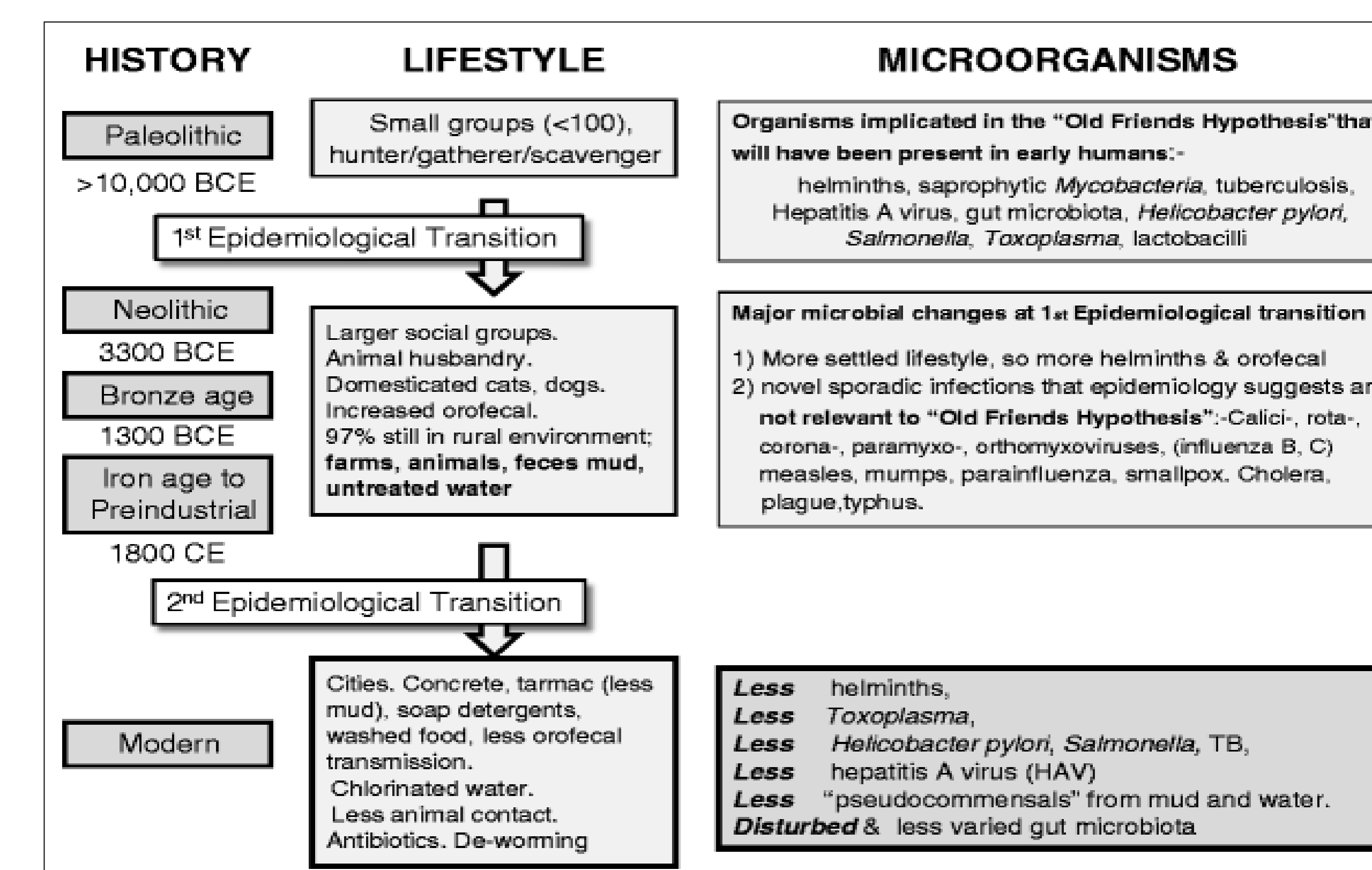
Frequency of Type 1 Diabetes worldwide in children 0 – 14 Years (Bach & Chatenoud, 2012)

Literature Review

- Presence of cytokines IL-12 and IFN- γ stimulates Th1 differentiation and generating auto inflammation and autoimmune disease,
- Presence of cytokines IL-4 leads to Th2 differentiation causing atopy, increased IgE (immunoglobulin E), mast cell and eosinophil production which facilitate allergic reactions
- Presence of cytokines IL-2 and TGF-B causes Th17 differentiation involved in a pathway which increases tissue inflammation.
- Okada et al (2010) concluded that families which move to countries with high incidence of T1DM frequency of disease increases in the first generation of immigrants.
- Kondrashova et al (2012), conducted a scholarly review on the incidence of autoimmune and allergic diseases between the countries of Russian Karelia and Finland which are geographic neighbors. Found that the incidence of T1DM in Russia (low hygiene) is much lower than that found in Finland (modern hygiene). Russia has a 6x lower incidence than Finland. Finland has a T1DM incidence of 60 per 100000 children under 15 years old.
- "The risk of asthma by age 7 is reduced by approximately 50% in children with two or more reported episodes of common cold in the first year of life" Kondrashova (2012)

Discussion

- "Bacterial and viral infection during early life shift the balance of the maturing immune system toward Th1, away from pro-allergic Th2 responses, and the reduction in the microbial burden leads to weaker Th1 immune response, thus weakening the control of Th2 responses that cause allergy" (Figueiredo et al., p3 2013)..
- "Genetic basis has not undergone any major changes in such a short period of time, environmental factors are highly suspected to be responsible for recent outbreaks" (Versini et al., pp1 2015).
- "In 1998, about one in eight children in industrialized countries suffered from allergic diseases such as asthma, allergic rhinitis or atopic disease. This proportion has tended to increase over the past 10 years, asthma becoming epidemic phenomenon" (Okada, Kuhn, Feillet, & Bach, 2010).
- The incidence of asthma ranges from 2-3% in developing countries to 20-40% in developed countries
- "This immunomodulation (from parasitic invaders), by avoiding an excessive activation of the immune system contributes to host protection against inflammatory disorders" (Versini et al., 2015).
- "Only 10% of those who are genetically predisposed to type 1 DM actually develop the disease" (D'Angeli et al., 2010).
- "The rise in Type 1 Diabetes Mellitus in western Europe and the USA during the twentieth century correlates strikingly with the decline in helminth infections" (Rook, 2012)
- Subjects growing up on a livestock farm were significantly less likely to suffer from asthma than subjects growing up in a city. The study population included 1181 cases of asthma (10.6%) and 2133 cases with wheeze (19.1%). Corresponding to an incidence of 2.14 per 1,000 persons-years for asthma and 3.94 for wheeze. (Timm, 2015)



Demonstrating the different eras of human evolution, what the social aspects were like and how this affects the development of the immune system. (Rook, 2012)

Applicability to Clinical Practice

- There is great benefit to environmental exposure and has multiple positive impacts on how the immune system will respond to stimulus throughout life.
- Trends today of hand gels on every wall and every purse and parents who are hyper concerned about their children becoming sick are a factor contributing to increased autoimmunity and atopy in their children.
- Probiotic use is the reintroduction of healthy bacteria into the colon to induce a healthy balance of the digestive system and immune system

References

- Bach, J. F., & Chatenoud, L. (2012). The hygiene hypothesis: An explanation for the increased frequency of insulin-dependent diabetes. *Cold Spring Harbor Perspectives in Medicine*,
- D'Angeli, M. A., Merzon, E., Valbuena, L. F., Tirschwell, D., Paris, C. A., & Mueller, B. A. (2010). Environmental factors associated with childhood-onset type 1 diabetes mellitus: An exploration of the hygiene and overload hypotheses. *Archives of Pediatrics & Adolescent Medicine*, 164(8), 732-738.
- Figueiredo, C. A., Amorim, L. D., Alcantara-Neves, N. M., Matos, S. M., Cooper, P. J., Rodrigues, L. C., & Barreto, M. L. (2013). Environmental conditions, immunologic phenotypes, atopy, and asthma: New evidence of how the hygiene hypothesis operates in latin america. *The Journal of Allergy and Clinical Immunology*, 131(4),
- Kondrashova, A., Seiskari, T., Ilonen, J., Knip, M., & Hyoty, H. (2013). The 'hygiene hypothesis' and the sharp gradient in the incidence of autoimmune and allergic diseases between russian karelia and finland. *APMIS : Acta Pathologica, Microbiologica, Et Immunologica Scandinavica*,
- Okada, H., Kuhn, C., Feillet, H., & Bach, J. -. (2010). The hygiene hypothesis for autoimmune and allergic diseases: An update. *Clinical & Experimental Immunology*, 160(1)
- Timm, S., Frydenberg, M., Janson, C., Campbell, B., Forsberg, B., Gislason, T., Schlunssen, V. (2015). The urban-rural gradient in asthma: A population-based study in northern europe. *International Journal of Environmental Research and Public Health*, 13(1)
- Versini, M., Jeandel, P. Y., Bashi, T., Bizzaro, G., Blank, M., & Shoenfeld, Y. (2015). Unraveling the hygiene hypothesis of helminthes and autoimmunity: Origins, pathophysiology, and clinical applications. *BMC Medicine*

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