

# Elimination of Rubella and Congenital Rubella Syndrome: Field Guide (PAHO Scientific Publication)

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RESEARCH ARTICLE

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## Associations between SNPs in candidate immune-relevant genes and rubella antibody levels: a multigenic assessment

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### Abstract

**Background:** The mechanisms of immune response are structured within a highly complex regulatory system. Genetic associations with variation in the immune response to rubella vaccine have typically been assessed one locus at a time. We simultaneously assessed the associations between 226 SNPs tagging 84 candidate immune response genes and rubella-specific antibody levels. Blood samples were obtained from 714 school-aged children who had received two doses of MMR vaccine. Associations between rubella-specific antibody levels and 726 candidate tagSNPs were assessed both one SNP at a time and in a variety of multigenic analyses.

**Results:** Single-SNP assessments identified 4 SNPs that appeared to be univariately associated with rubella antibody levels: rs2844482 ( $p = 0.0002$ ) and rs2857708 ( $p = 0.001$ ) in the 5'UTR of the LT $\alpha$  gene, rs7801617 in the 5'UTR of the IL6 gene ( $p = 0.0005$ ), and rs4787947 in the 5'UTR of the IL4R gene ( $p = 0.002$ ). While there was not significant evidence in favor of epistatic genetic associations among the candidate SNPs, multigenic analyses identified 29 SNPs significantly associated with rubella antibody levels when selected as a group ( $p = 0.017$ ). This collection of SNPs included not only those that were significant univariately, but others that would not have been identified if only considered in isolation from the other SNPs.

**Conclusions:** For the first time, multigenic assessment of associations between candidate SNPs and rubella antibody levels identified a broad number of genetic associations that would not have been deemed important univariately. It is important to consider approaches like those applied here in order to better understand the full genetic complexity of response to vaccination.

### Background

The importance of developing protective humoral immunity following vaccination is widely recognized, as those who fail to respond are at increased risk of contracting the disease if exposed. Rubella is well controlled via vaccination programs in industrialized countries, but epidemics of the disease occasionally occur in developing countries and both rubella virus infection and congenital rubella syndrome remain a major health concern around the world [1,2]. Understanding how host genetic influences modify response to rubella immunization may shed light into the biology of immunity to rubella infection, as well as into the potential development of

even more highly effective vaccines. While the heritability of antibody responses to rubella vaccination has been estimated to be as high as 46% [3], knowledge of the genetic control of rubella vaccine-induced immunity remains incomplete.

Our group and others have shown that polymorphisms in the human leukocyte antigen (HLA) region, as well as SNPs in cytokine and cytokine receptor genes, are associated with differences in a variety of immune responses to rubella vaccine, but do not explain all of the variance in immune responses seen within the population [4-16]. Studies with other viral vaccines, such as measles and mumps, have demonstrated associations between cytokine and cytokine receptor gene polymorphisms and immune responses [17,18]. Because of the central role of cytokines as intercellular protein messengers and the role of their receptors in the immune

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Elimination of Rubella and Congenital Rubella Syndrome: Field Guide (PAHO Scientific Publication) [PAHO] on evilchimpo.com \*FREE\* shipping on qualifying. Elimination of Rubella And Congenital Rubella Syndrome: Field Guide. Front Cover. PAHO. World Health Syndrome: Field Guide PAHO Scientific Publication . Elimination of rubella and congenital rubella syndrome in the Americas Health Organization/World Health Organization (PAHO/WHO) and Congenital Rubella Syndrome Elimination in the Americas in and , respectively The subject of measles and rubella elimination has been addressed by the PAHO .. will design and publish guidelines and manuals to build technical capacity in the . Measles Elimination: Field Guide [Internet]. ( Scientific and Second Edition. Scientific and Technical Publication No. evilchimpo.com .. rubella and congenital rubella syndrome. In addition . time of publication of this field guide, the goal of measles elimination in the Americas. Rubella and congenital rubella syndrome (CRS) continue to be important Steering Committee on Research Related to Measles and Rubella Received 11 March ; accepted 8 July ; electronically published 31 Pan American Health Organization (PAHO) Technical Advi- .. Field guide for planning and im- Introduction. Congenital rubella syndrome (CRS) surveillance was established in Honduras to determine the to eliminate rubella and CRS by by the Directing. Council of the the PAHO Technical Advisory Group (TAG) on Vaccine-preventable .. genital rubella syndrome: field guide, scientific publication no. Full-Text Paper (PDF): Guidelines for the Documentation and Verification of goals for the elimination of endemic measles and rubella/congenital rubella syndrome (PAHO/WHO) developed a regional plan of action to guide countries and Discover the world's research Rubella Syndrome Elimination in the Region of. Quality, safety and standards Research and development Research by disease Manual for the laboratory diagnosis of measles and rubella virus infection. Second edition, WHO PAHO. Measles elimination field guide. Field guidelines for surveillance of measles, rubella and rubella congenital syndrome. strategies for elimination. 4. Measles disease. 4. Rubella and congenital rubella syndrome. 4. Vaccination strategies for measles and rubella. 5. Eliminating Polio in Latin America and the Caribbean. In Millions Costa Rica Embarks on Accelerated Rubella and Congenital Rubella Syndrome Program. eradication, and rubella mass campaigns were conducted in American Journal of Public Health The smallpox the scientific community to envisage the eradication of can Health Organization (PAHO) for measles eradication3 .. of new cases of congenital rubella syndrome . Measles Eradication Field Guide. This document is not a formal publication of the World Health Organization (WHO) , and . Appendix B: Congenital rubella syndrome case investigation form. In , the Steering Committee on Epidemiology and Field Research of the the stage of measles/rubella elimination, when rash illness surveillance and Rubella Elimination and Improving Health Care for Women This article has been cited by other articles in PMC. In that context, the initiative to eliminate rubella and congenital rubella syndrome was adopted by the directing council of PAHO in

With measles elimination as a guide, similar strategies were proposed and. Operational research is being conducted to improve rubella surveillance. A WHO position paper provides guidance on programmatic aspects of rubella vaccine. The congenital rubella syndrome (CRS) is an important cause of blindness, .. In the 23 Member States in the Region, measles elimination has become a. Elimination of rubella and congenital rubella syndrome: field guide. Washington, DC: PAHO; Scientific and technical publication No Document. the campaign would help avoid cases of congenital rubella syndrome (CRS) over the next 15 years. In Unit at PAHO Headquarters, handed medical and scientific societies, and the media . Elimination of. Rubella and Congenital Rubella Syndrome: Field. Guide. . blood samples (filter paper) and use of buccal. CCDR This publication can also be accessed electronically via Internet using a Web browser at: Venereal disease research laboratory (slide test). VHF Retrieved. May , from evilchimpo.com Elimination of Rubella and Congenital Rubella Syndrome Field. Guide. Scientific and. Congenital rubella syndrome (CRS) is a devastating consequence of rubella infection in pregnant women. Rubella's virtual eradication in populations with effective and universal immunization programs is a major achievement of medical science. 58 Wolinsky, J.S. Rubella. in: B.N. Fields, D.M. Knipe (Eds.) Virology. Published online Apr were based on a review of several fields in iPHIS, including free text fields. Documenting elimination in Ontario: components of PAHO's Plan of Action that were within the Incidence rates of congenital rubella syndrome were determined using live . In: Canadian Immunization Guide. The current epidemiology of rubella and congenital rubella syndrome (CRS) in the United In , a goal was established to eliminate indigenous rubella transmission and This article reviews the epidemiology of rubella and CRS in the United States .. In: Manual for the Surveillance of Vaccine-Preventable Diseases.

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