What is the rate of decay of maternal antibodies against measles in infants born to mothers with vaccine-induced immunity compared to mothers with immunity acquired from disease?

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Introduction

There's a previous review article published in 2000 by Caceres VM, Strebel PM, Sutter RW "Factors Determining Prevalence of Maternal Antibody to Measles Virus throughout infancy: A review"

Objective

To conduct a literature review to determine the rate of decay of maternal antibodies against measles in infants born to mothers with vaccine-induced immunity compared to mothers with immunity acquired from disease

Materials and methods

- Search criteria similar as in the Caceres and *et al* review paper
- MEDLINE, Embase, CINAHL
- Period: 2000 to May 2015
- Key words: measles, maternal, antibody, and decay
  - Retrieved 126 abstracts
  - Eligible for review 5 articles
  - Only one reported decay rate in a prospective study

Definitions

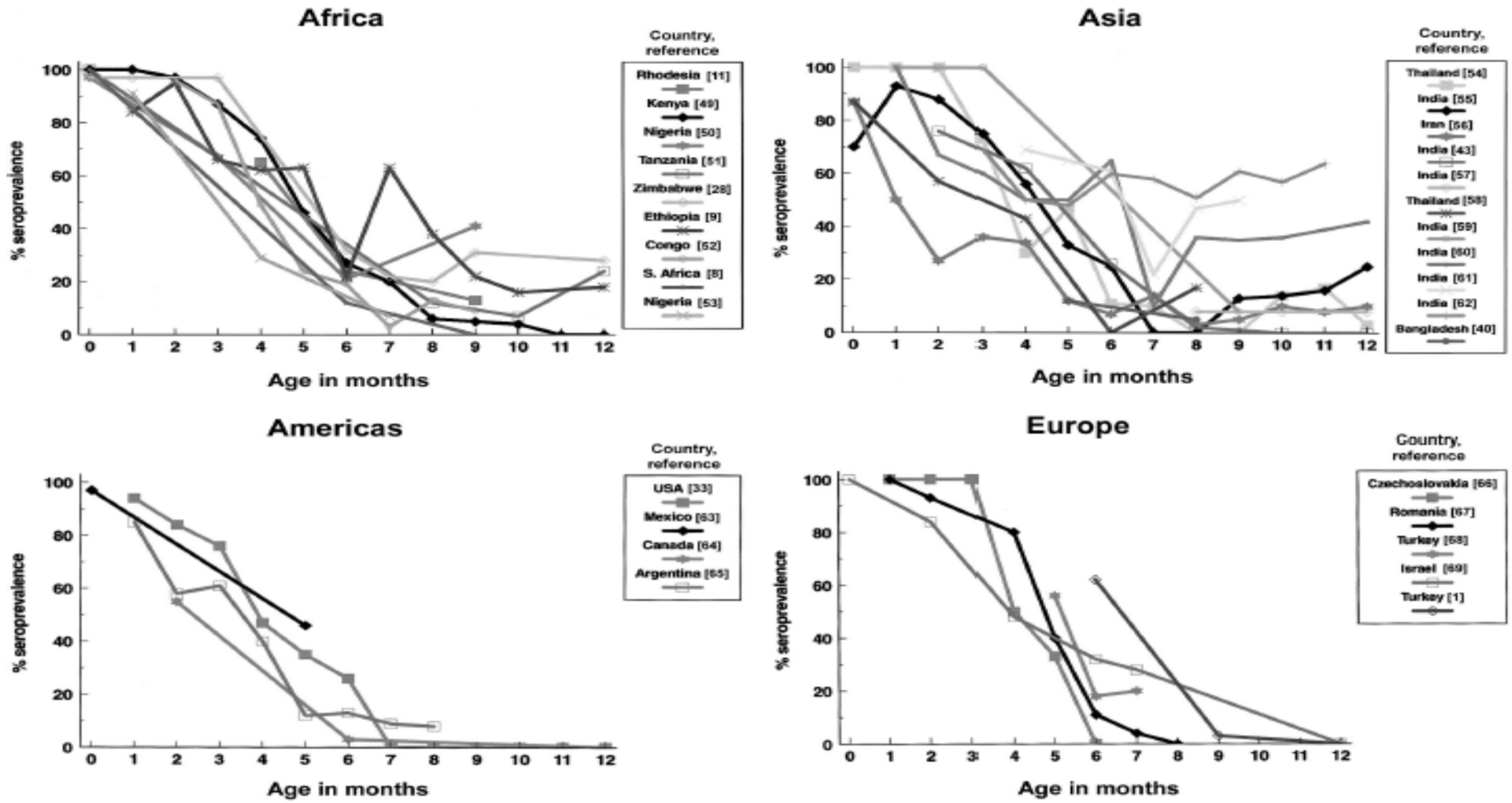
- Half-life of an antibody is the amount of time needed for antibody concentration to decrease by half compared to its initial concentration.

- Decay rate of maternal antibodies - is the constant ratio for the concentration of antibodies decay in a given period of time compared with the total amount of antibodies present at the beginning of that period.

Caceres, V.M., P.M. Strebel, and R.W. Sutter “Factors determining prevalence of maternal antibody to measles virus throughout infancy: A review.” (2000)

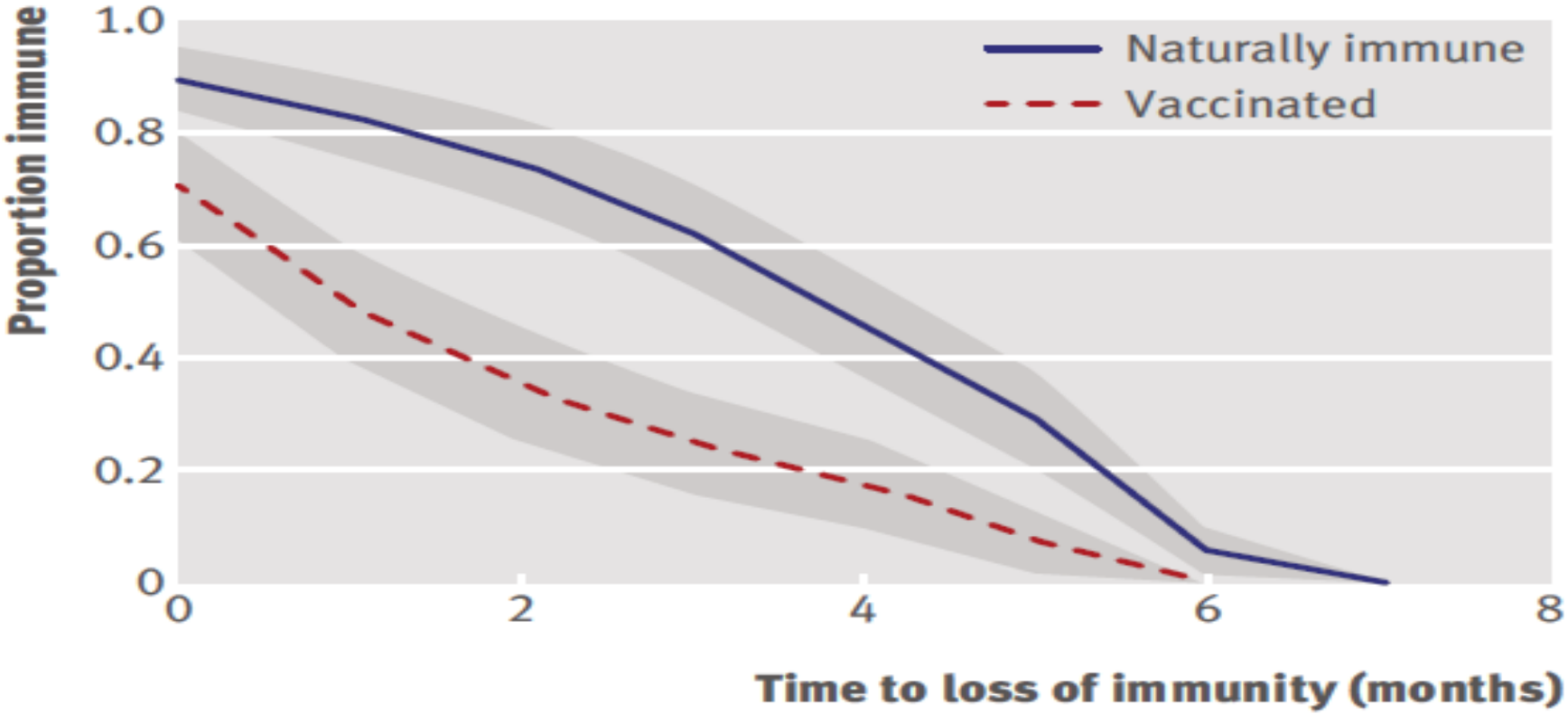
- Key determinants:
  - Placental transfer
  - Level of maternal measles antibodies at birth
  - The rate of decay of maternal antibodies
- Maternal measles antibody half-life 40-64 days
  - Two papers reported steeper decay curves in infants with higher maternal measles antibodies at birth
- Seroprevalence studies main objectives are to determining target age group, not antibody decay rates

Seroprevalence of maternal antibody to measles virus in infancy by country



Source: Caceres, V.M., P.M. Strebel, and R.W. Sutter, Factors determining prevalence of maternal antibody to measles virus throughout infancy: a review. Clinical Infectious Diseases, 2000. 31(1): p. 110-9.

Proportion of infants of vaccinated women and naturally immune women still immune as a function of time to loss of immunity *



Proportion of infants of vaccinated women and naturally immune women still immune as a function of time to loss of immunity. Shaded area is 95% confidence interval

**Source: Leuridan, E., et al., Early waning of maternal measles antibodies in era of measles elimination: longitudinal study. BMJ, 2010. 340: p. c1626.*

Proportion of infants of vaccinated women and naturally immune women still immune as a function of time to loss of immunity * *(continued)*

- The median time to loss of immunity:
  - 3.78 months for infants of naturally infected mothers
  - 0.97 months for infants of vaccinated mothers

- By 6 months of age, >99% of infants of vaccinated women and 95% of infants of naturally immune women had lost MMA according to the model

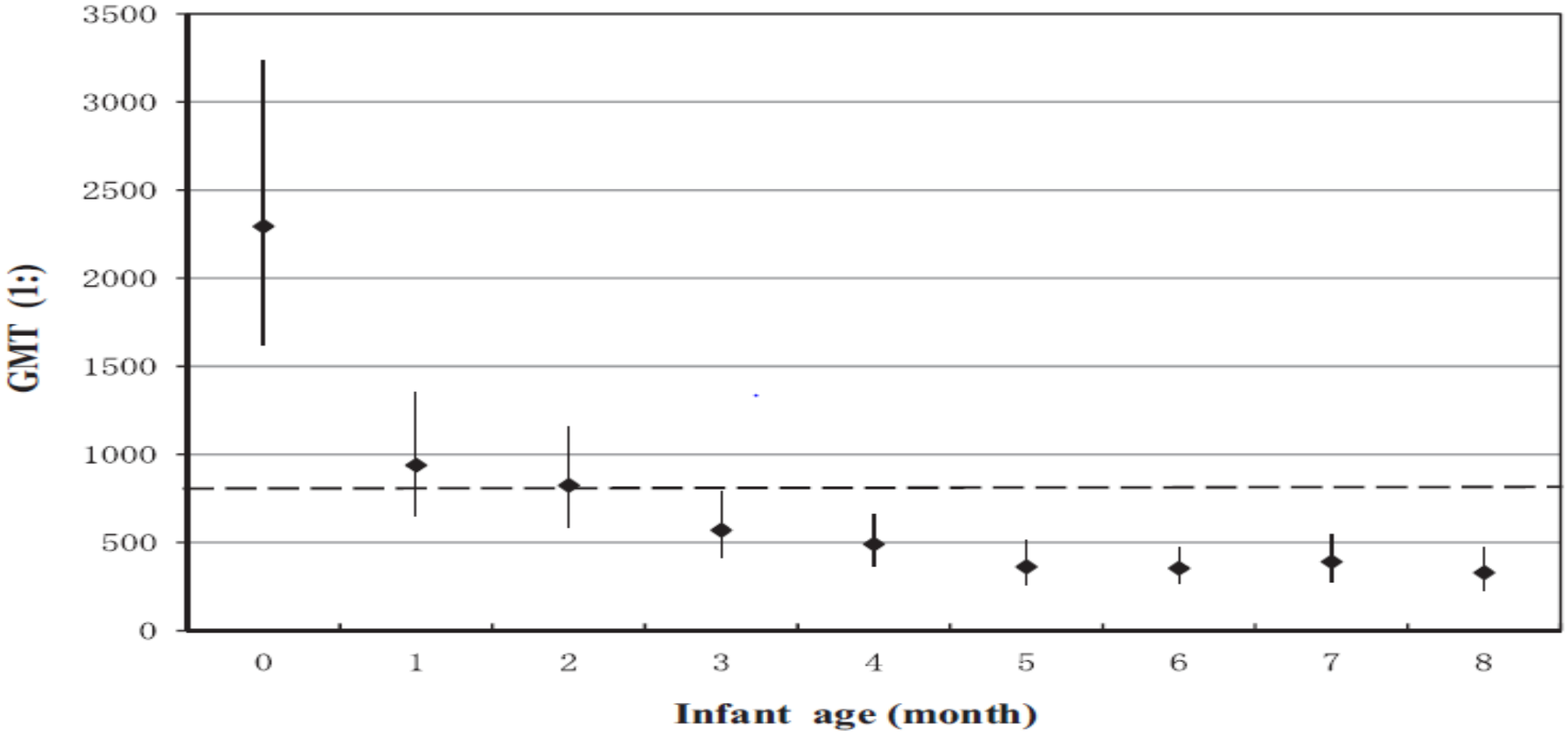
**Source: Leuridan, E., et al., Early waning of maternal measles antibodies in era of measles elimination: longitudinal study. BMJ, 2010. 340: p. c1626.*

Maternal measles antibodies in communities with high and low vaccination coverage**

	General population	Orthodox community
Concentration of measles antibodies at birth	4.13 times lower	
Decay rate for MMA	7.77 IU/ml per year (i.e. each month, the concentration of maternal antibodies halves)	
Duration of protection against measles	3.3 months	5.3 months

** Source: Waaijenborg, S., et al., Waning of maternal antibodies against measles, mumps, rubella, and varicella in communities with contrasting vaccination coverage. Journal of Infectious Diseases, 2013. 208(1): p. 10-16.*

Distribution of GMTs of measles IgG in infants by age Qinghai, China, 2009



Source: X. Zhang et al. Vaccine 30 (2012) 752-757. "Duration of maternally derived antibody against measles: A seroepidemiological study of infants aged under 8 months in Qinghai, China"

Seroprevalence of measles antibodies in infants by age, Eskişehir, Turkey, 2001

Age of the infants	Seropositive*	Seronegative*	Total
0 month	40 (74.1%)	14 (25.9%)	54
4 months	14 (37.8%)	23 (62.2%)	37
5–6 months	10 (19.2%)	42 (80.8%)	52
7–9 months	8 (19.5%)	33 (80.5%)	41
Total	72 (39.1%)	112 (60.9%)	184

*$\chi^2 = 42.979$; $P = 0.000$.

Source: S. Metinaş et al "Decay of maternally derived measles antibody in central Turkey." Public health, 2012, 116

Limitations

- Testing methods and definitions of protection used varied among studies
  - Heamagglutination inhibition test, plaque reduction neutralization test, ELISA
- Mothers vaccination status documentation, possible boosting
- Many studies focused on seroprevalence vs decay

Summary

- Half-life of maternal measles antibodies ranges from 35 to 64 days in the recent studies
- Duration of protection: from 3.5 in infants born to mothers with vaccine induced immunity, and 5.5 months – born to mothers with natural induced immunity*
- Rate of decay reported as 7.77 IU/(ml year) (the concertation of maternal antibodies halves every months)
- Infants born to women with measles vaccine induced immunity receive fewer MMA and therefore have shorter protection than infants born to women with naturally acquired immunity