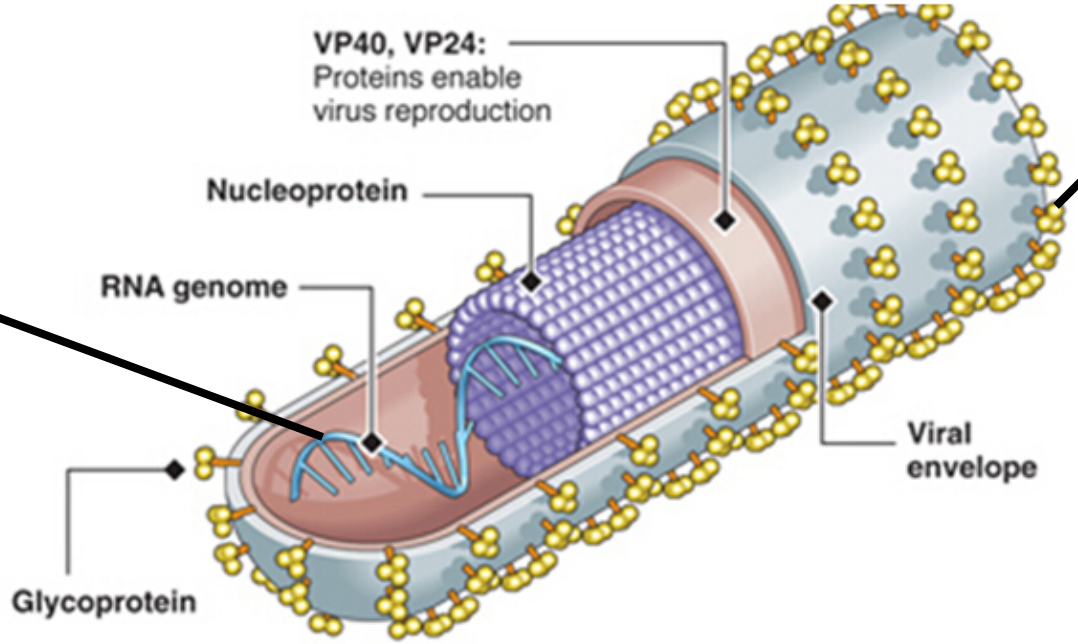
APROACHES FOR DIAGNOSIS OF COMMUNICABLE DISEASES

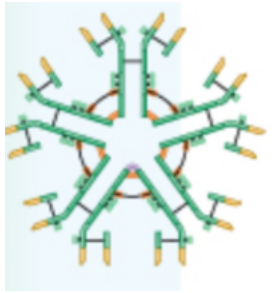
Genetic methods

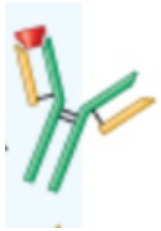


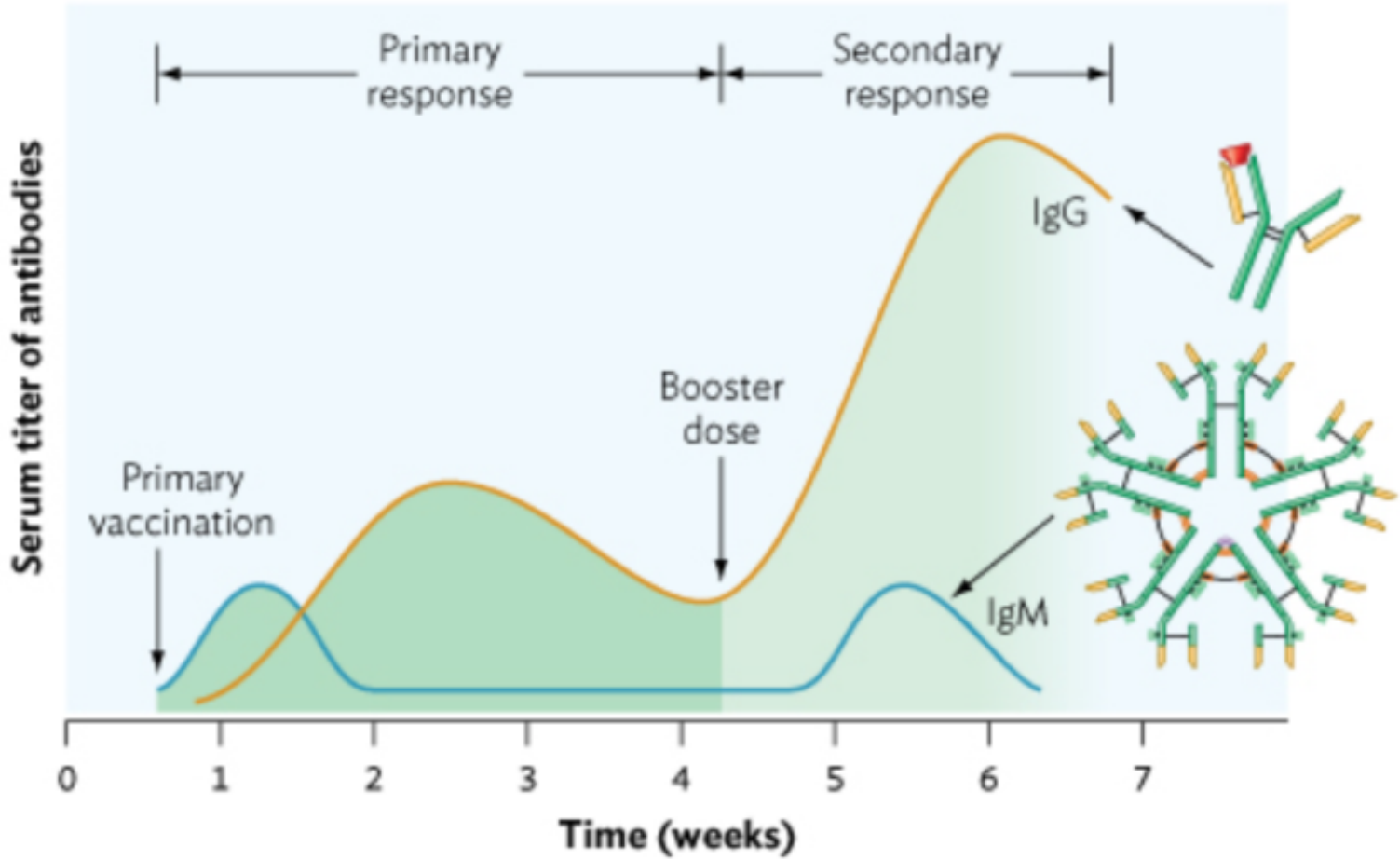
Immunological methods

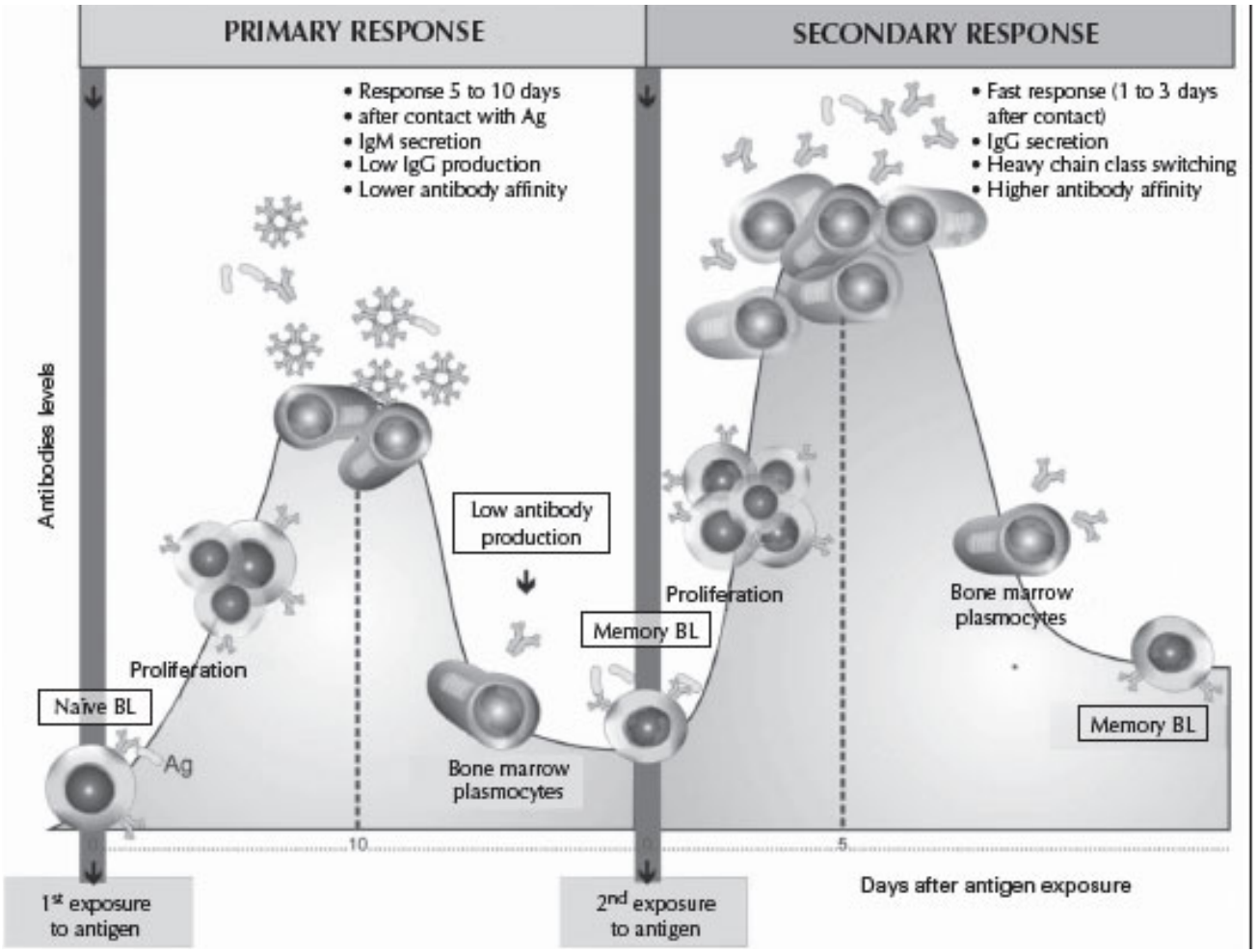
ANTIGEN DETECTION

IMMUNOLOGICAL RESPONSE

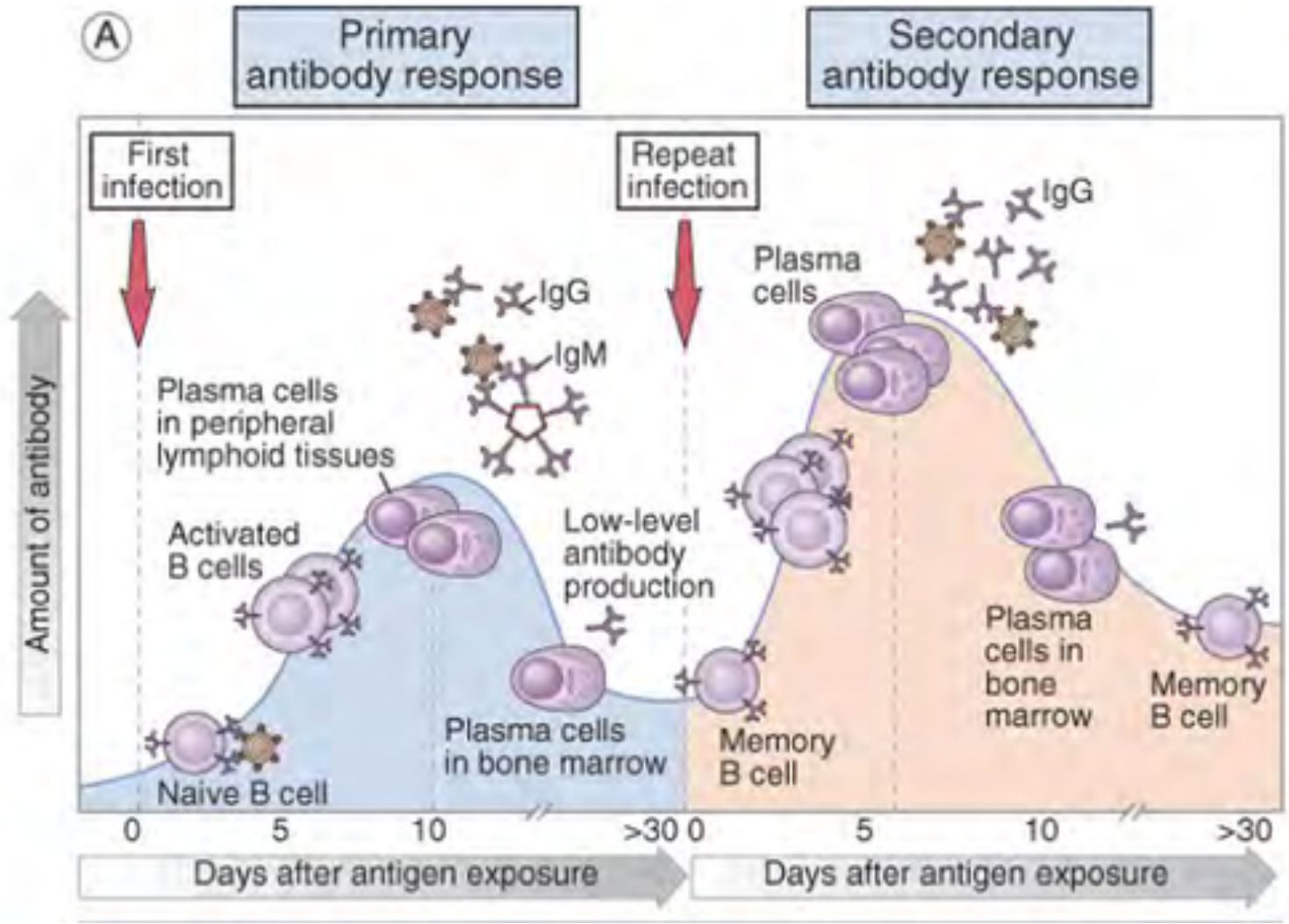





Primary response
Secondary response
Serum titer of antibodies
IgG
Booster dose
Primary vaccination
IgM
0
1
2
3
4
5
6
7
Time (weeks)



primary and secondary phases of adaptive humoral immune response. The naïve B cells in the peripheral lymphoid tissues are activated after the contact with the antigen, proliferate and differentiate in antibody-secreting cells and memory B-cells. The secondary response is faster and occurs after the activation of memory B-cells, promoting the production of larger amounts of antibodies.


A
Primary antibody response
Secondary antibody response
First infection
Repeat infection
Amount of antibody
IgG
IgM
Plasma cells in peripheral lymphoid tissues
Activated B cells
Naive B cell
Low-level antibody production
Plasma cells in bone marrow
Memory B cell
Plasma cells
IgG
Plasma cells in bone marrow
Memory B cell
0
5
10
>30
Days after antigen exposure
0
5
10
>30
Days after antigen exposure

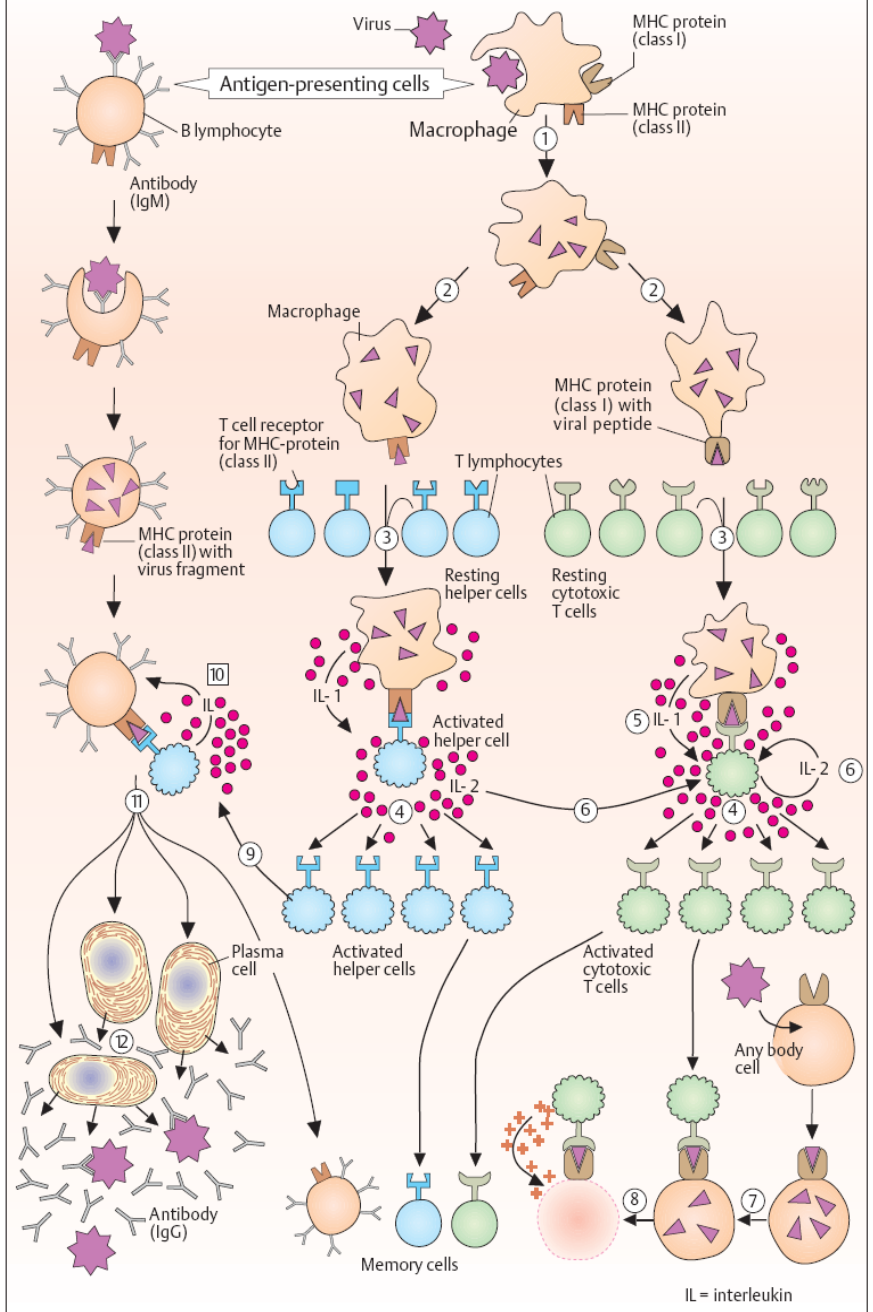
Summary of Humoral and Cellular Events in the Primary Immune Response

	Phase	Antibody Response	Cellular Response
Primary immune response	Lag	None detected in serum	Antigen trapping by macrophage (Mϕ) Antigen processing by Mϕ Antigen presentation by Mϕ Helper T cell activation T–B cell interaction B-cell activation B-cell clonal expansion B-cell differentiation to plasma cells
	Log	Rapid increase in serum antibody levels	Antigen-stimulated increase in B-cell number, isotype switching, and differentiation into plasma cells
	Plateau	Near constant antibody levels in serum	Depletion of antigen, no further clonal expansion or differentiation of B cells to plasma cells; continued antibody secretion by plasma cells
	Decline	Antibody levels drop because of catabolism and lack of further synthesis	As plasma cells reach end of life span, they die but are not replaced because of absence of antigen stimulation; B and T cells that have begun to differentiate become memory cells

Summary of Humoral and Cellular Events in the Secondary Immune Response

	Phase	Antibody Response	Cellular Response
Secondary immune response	Lag (short!)	Little detected in serum	Antigen trapping by macrophage (Mϕ) or dendritic cell Antigen processing by Mϕ Antigen presentation by Mϕ Memory helper T cell activation T–B cell interaction Memory B-cell activation Memory B-cell clonal expansion Rapid memory B-cell differentiation to plasma cells
	Log	Very rapid increase in serum antibody levels	Antigen-stimulated increase in memory B-cell number; differentiation into plasma cells
	Plateau	Near constant (higher) antibody levels in serum	Depletion of antigen; no further clonal expansion or differentiation into plasma cells; continued antibody secretion by plasma cells
	Decline	Antibody levels drop because of catabolism and lack of further synthesis	As plasma cells reach end of life span, they die but are not replaced because of absence of antigen stimulation; memory B and T cells renewed

A. Simplified scheme of the immune response



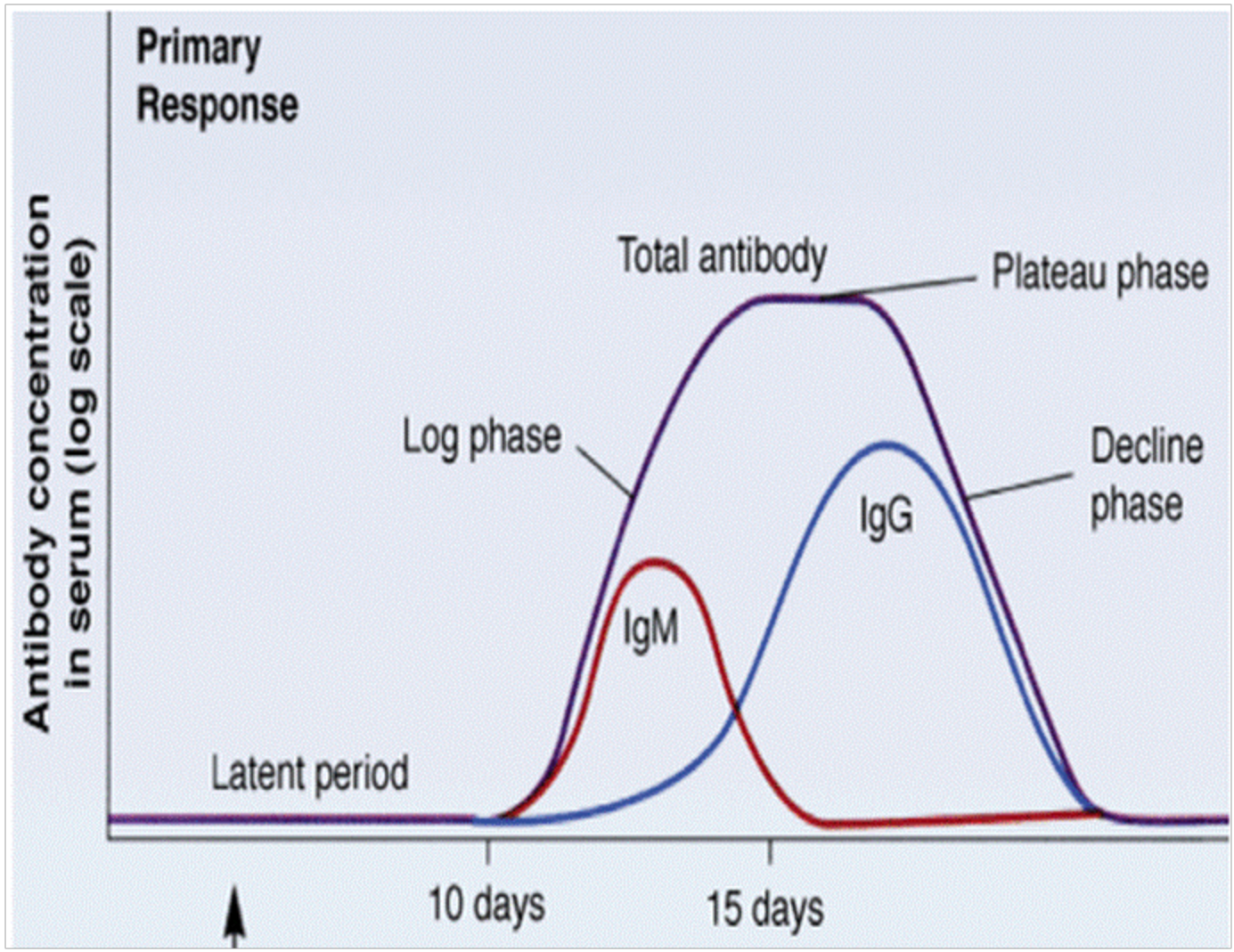

Primary
Response
Antibody concentration
in serum (log scale)
Total antibody
Plateau phase
Log phase
Decline
phase
IgG
IgM
Latent period
10 days
15 days

TABLE 2 - Interpretation of serological results for dengue through the dengue duo cassette Panbio rapid test.

Status	Results		Interpretation
	IgM	IgG	
1	(+)	(-)	recent primary infection
2	(+)	(+)	recent secondary infection
3	(-)	(+)	recent secondary infection
4	(-)	(-)	no recent infection

IgM: immunoglobulin M; **IgG:** immunoglobulin G; (+): reactive; (-): non-reactive.
Source: Panbio. New dengue duo cassette. Dengue brochure. Cited on September 14, 2010.

Congenital Tests

The acquisition of certain infectious agents during pregnancy can result in the intrauterine transmission of disease from the pregnant woman to the developing fetus. Transmission of a primary CMV infection, an acute toxoplasmosis, or a primary Rubella infection, especially during the first trimester, can cause significant fetal morbidity and mortality. Patients with impaired immune systems due to AIDS, cancer therapy, and those undergoing immunosuppressive therapy following transplantation are also at risk of morbidity due to these infectious agents.

Tests are available to detect specific antibodies in response to these infectious agents as shown in Table 4-5. A positive test result for IgG antibodies indicates previous exposure to the virus or parasite. A positive test result for IgM antibodies may indicate a primary or acute infection is present but further confirmatory testing by an IgG avidity assay is required in order to assess the stage of infection and potential risk to the fetus. The IgG avidity assay measures the functional binding affinity of the IgG class of antibody in response to infection and helps distinguish between acute or primary infection versus non-primary infection.

TABLE 4-6 Tests for Congenital Factors

Test	Factor that is measured	Medical conditions which can be caused by infection
Rub IgG and Rub IgM	IgG or IgM antibodies to Rubella	Causes measles that is usually mild in children and adults; infection during pregnancy can be detrimental to the fetus and result in miscarriage, death, and birth defects
Toxo IgG, Toxo IgM **Toxo IgG Avidity**	IgG or IgM antibodies to *Toxoplasma gondii*	Lymphadenopathy, chorioretinitis, congenital birth defects including hydrocephalus, chorioretinitis, mental retardation
CMV IgG, CMV IgM **CMV IgG Avidity**	IgG or IgM antibodies to Cytomegalovirus	Interstitial pneumonia, mononucleosis, abortion, congenital birth defects including mental retardation, blindness and deafness

CONGENITAL INFECTIONS

IgG	IgM	*Toxoplasma gondii* Infection Stage
Neg	Neg	Seronegative
Pos	Pos	Acute
Pos	Pos	Subacute
Pos	Neg	Subacute
Pos	Border	Subacute
Pos	Neg	Chronic