Laboratory diagnosis of measles

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Test Methods for Diagnosis of Measles

- Virus isolation
- Serology
  a) Anti-measles IgM antibody
  b) Complement Fixation Test using paired serum samples
- RT-PCR

Samples required

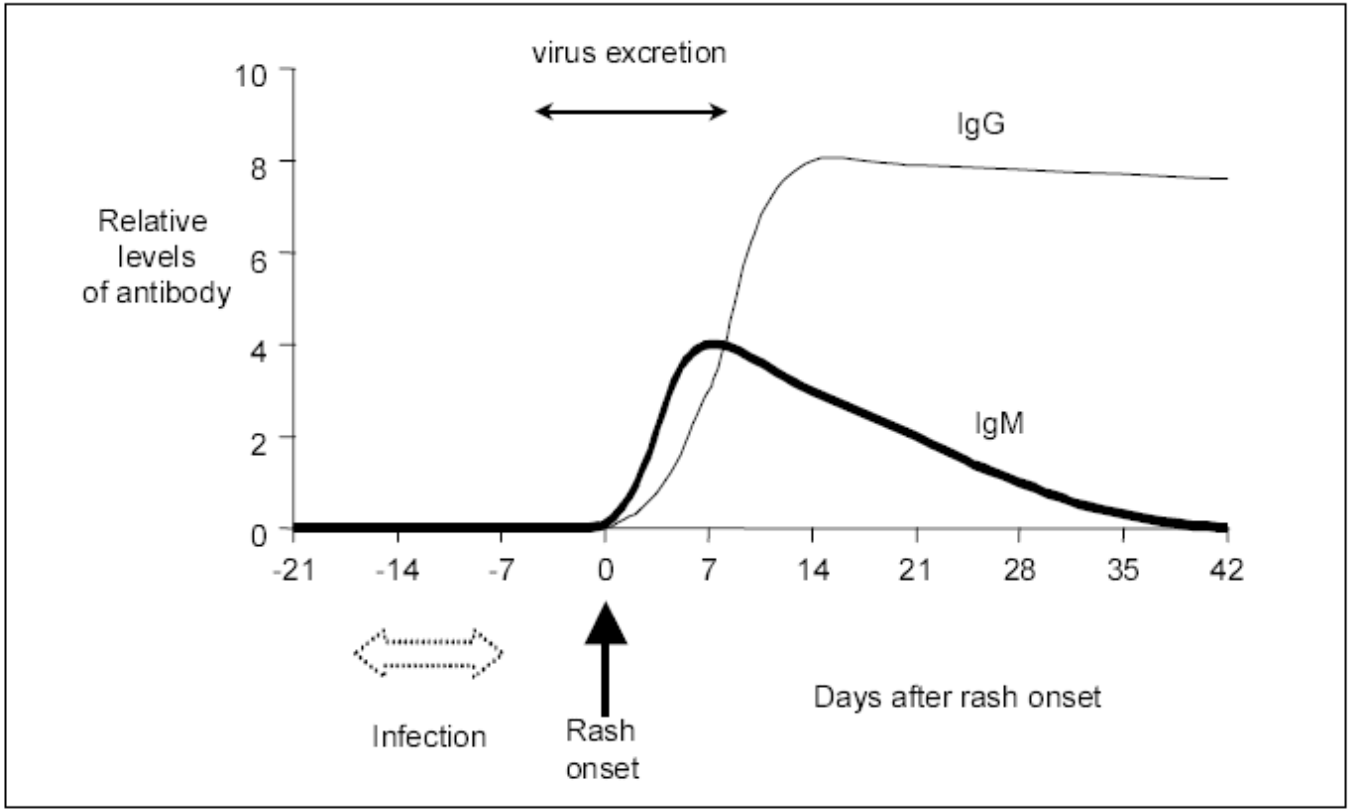
For PCR / virus culture

- NPA
- Throat swab
- Nasopharyngeal flocked swab
- Urine

For serology: Measles IgM or paired sample for CFT

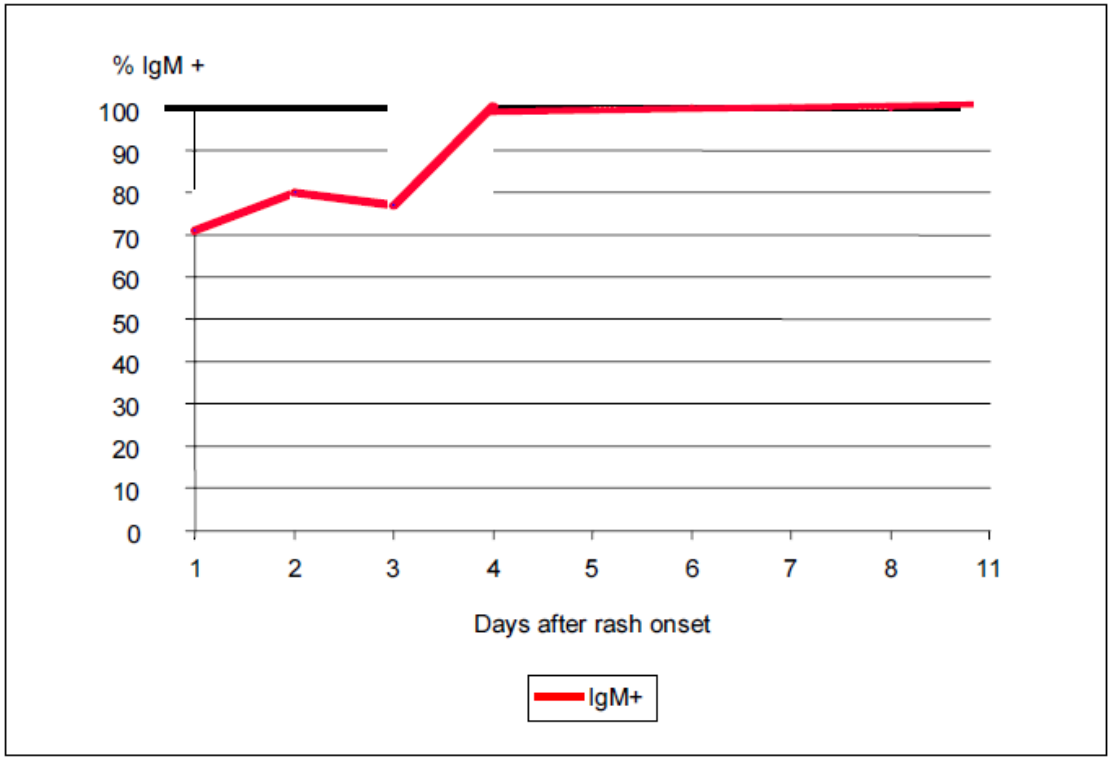
- Clotted blood

Figure 1: Antibody response to measles virus infection



Serology: Measles IgM

Figure 4: IgM results of 153 specimens tested using antibody capture IgM ELISA by day of collection after rash onset.[9]



IgM capture tests for measles are often positive on the day of rash onset. However, in the first 72 hours after rash onset, up to 30% of tests for IgM may give false-negative results. Tests which are negative in the first 72 hours after rash onset should be repeated; serum should be obtained for repeat testing *more than 72 hours after rash onset*. IgM is detectable for at least 28 days after rash onset and frequently longer.

Serology

Measles IgM

- High sensitivity
- False negative: up to 30% if sample taken within 4 days of rash onset. Repeat sample is required
- Positive IgM: acute infection or vaccination

Serology

Complement fixation test (CFT)

- Paired sample taken 10-14 days apart
- ≥ 4 fold rise in measles antibody titre confirmed diagnosis
- Rarely performed now

RT-PCR measles

- High sensitivity especially within first 3 days of rash onset
- Can supplement gap in serology testing

Comparison of laboratory diagnostic methods for measles infection

TABLE II. Sensitivity of Various Measles Diagnostic Tests With Different Specimen Types

Days after rash onset	Serum		NPA		TS/TNS		Urine	
	IgM	RT-PCR	Culture	RT-PCR	Culture	RT-PCR	Culture	RT-PCR
<0–3	91.2% (82.9–95.9%) n = 91	81.0% (70.6–88.4%) n = 84	82.2% (67.4–91.5%) n = 45	93.5% (77.2–98.9%) n = 31	63.0% (42.5–79.9%) n = 27	100% (82.2–99.6%) n = 23	66.7% (43.1–84.5%) n = 21	94.1% (69.2–99.7%) n = 17
4–7	98.5% (90.7–99.9%) n = 66	77.8% (64.1–87.5%) n = 54	73.7% (48.6–89.9%) n = 19	100% (71.7–99.3%) n = 13	40.0% (23.2–59.3%) n = 30	100% (81.5–99.6%) n = 22	50.0% (25.5–74.5%) n = 16	100% (67.9–99.2%) n = 11
>7	100% (86.7–99.7%) n = 32	50.0% (26.8–73.2%) n = 18	NA	NA	0% (1.5–48.3%) n = 6	100% (51.7–98.5%) n = 6	0% (4.9–80.2%) n = 2	100% (19.8–95.1%) n = 2
Overall	95.2% (90.9–97.7%) n = 189	76.3% (68.7–82.6%) n = 156	79.7% (67.4–88.3%) n = 64	95.5% (83.3–99.2%) n = 44	46.0% (33.6–59.0%) n = 63	100% (91.3–99.8%) n = 51	56.4% (39.8–71.8%) n = 39	96.7% (80.9–99.8%) n = 30

Equivocal result was regarded as positive when calculating sensitivity of detection of anti-measles IgM by ELISA; numbers in brackets represent 95% confidence interval.
NA, not available; n, number of samples tested.

Comparison of laboratory diagnostic methods for measles infection and identification of measles virus genotypes in Hong Kong

Journal of Medical Virology 82:1773–1781 (2010)

Virus isolation

- Takes a long time
- Not the mainstay of diagnosis now
- Obtain isolate for further genotyping and epidemiological study

Laboratory criteria for confirmed measles case

Communicable Disease Surveillance
Case Definitions

Laboratory criteria

Any one of the following:

- Positive serologic test for measles IgM antibody
- ≥ four-fold increase in measles antibody titre
- Isolation of measles virus from a clinical specimen
- PCR positive for measles virus in clinical specimen

Figure 8 (A-C). Flowchart for laboratory testing for suspected measles or rubella case in an elimination setting.

Panel 8A. Virologic specimen testing by RT-PCR

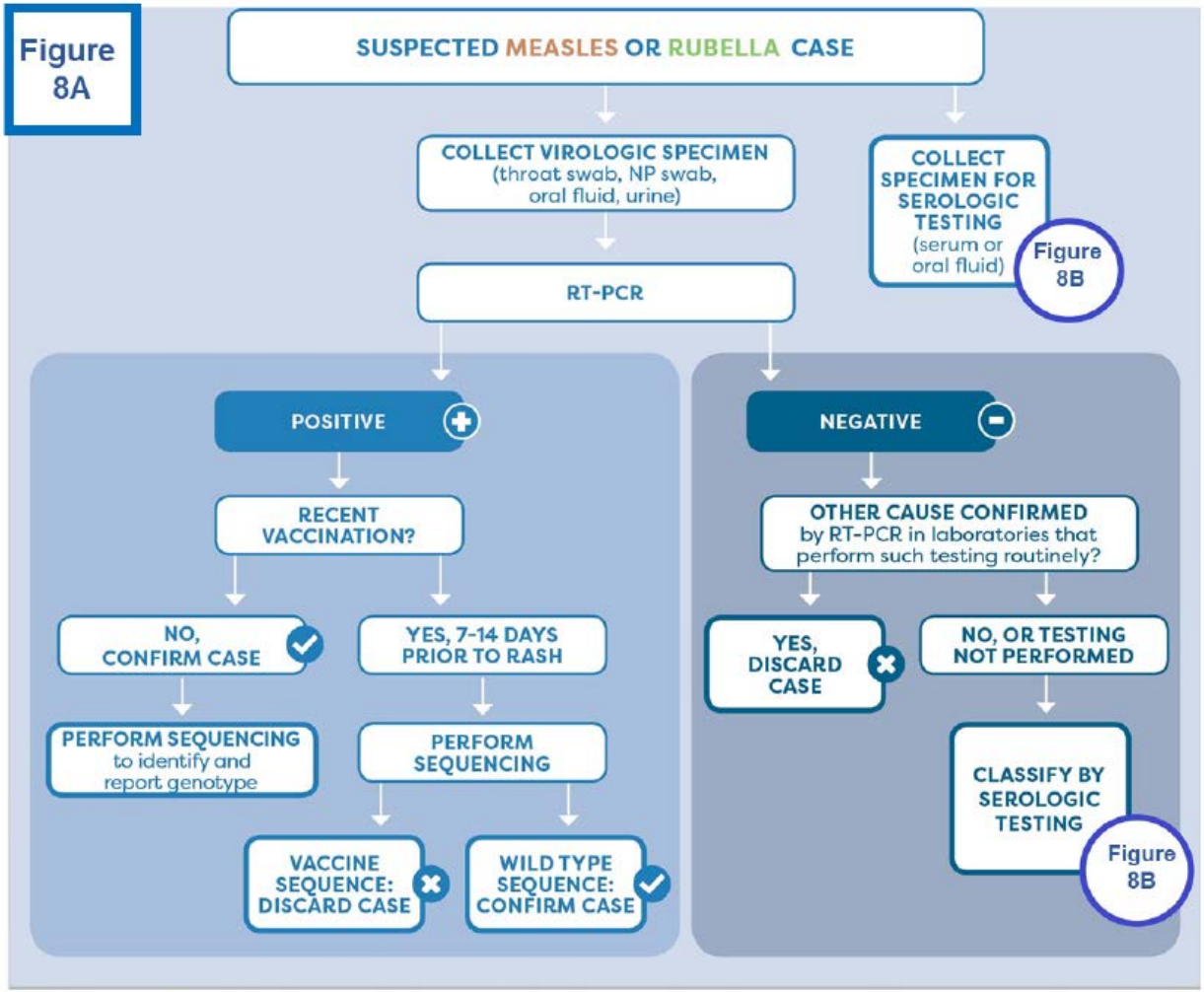


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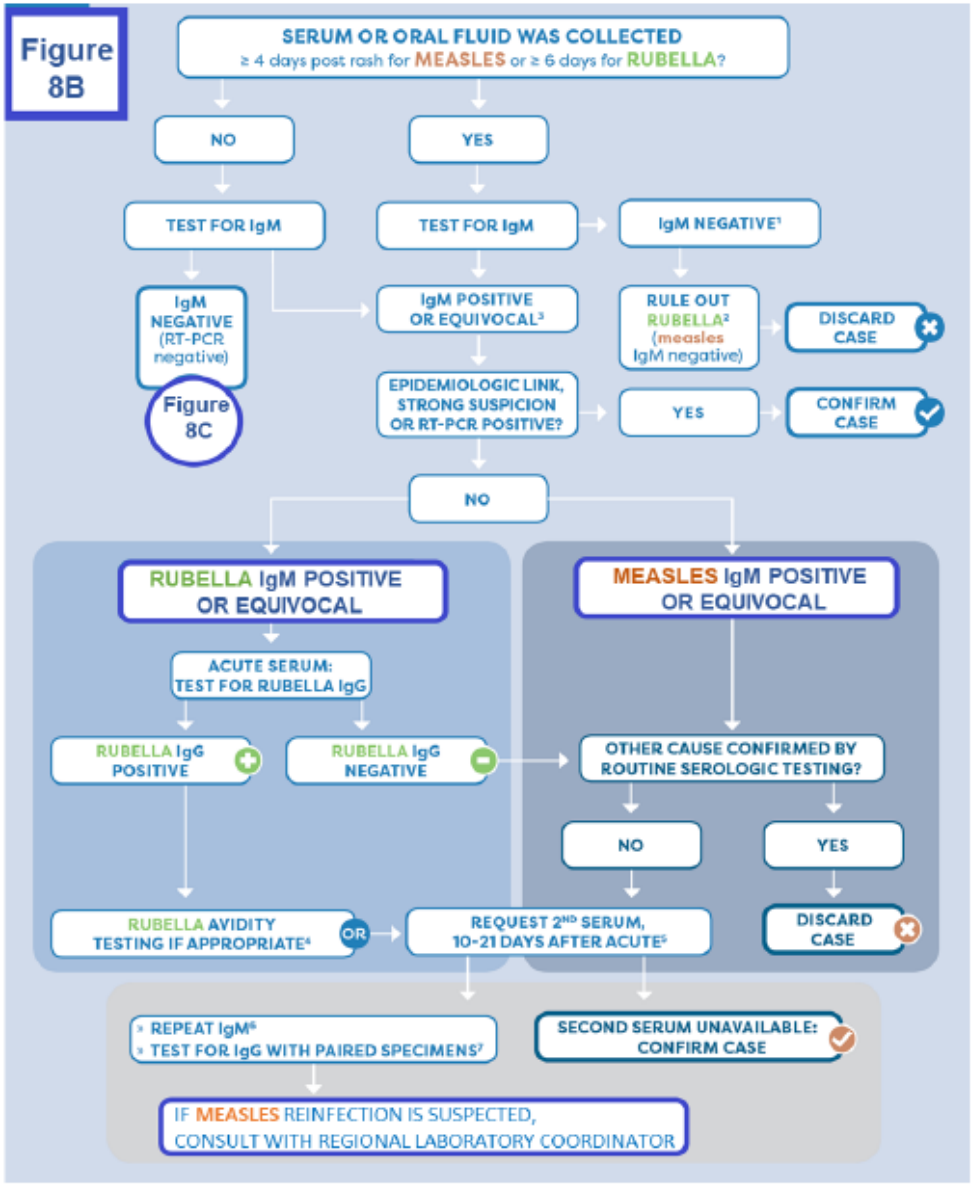
Figure 8 (A-C). Laboratory testing for suspected measles or rubella case in an elimination setting.

Panel 8B. Flowchart for serologic specimen testing ≥4 days post rash for measles or ≥ 6 days for rubella suspected cases (footnotes to 8B on following page).



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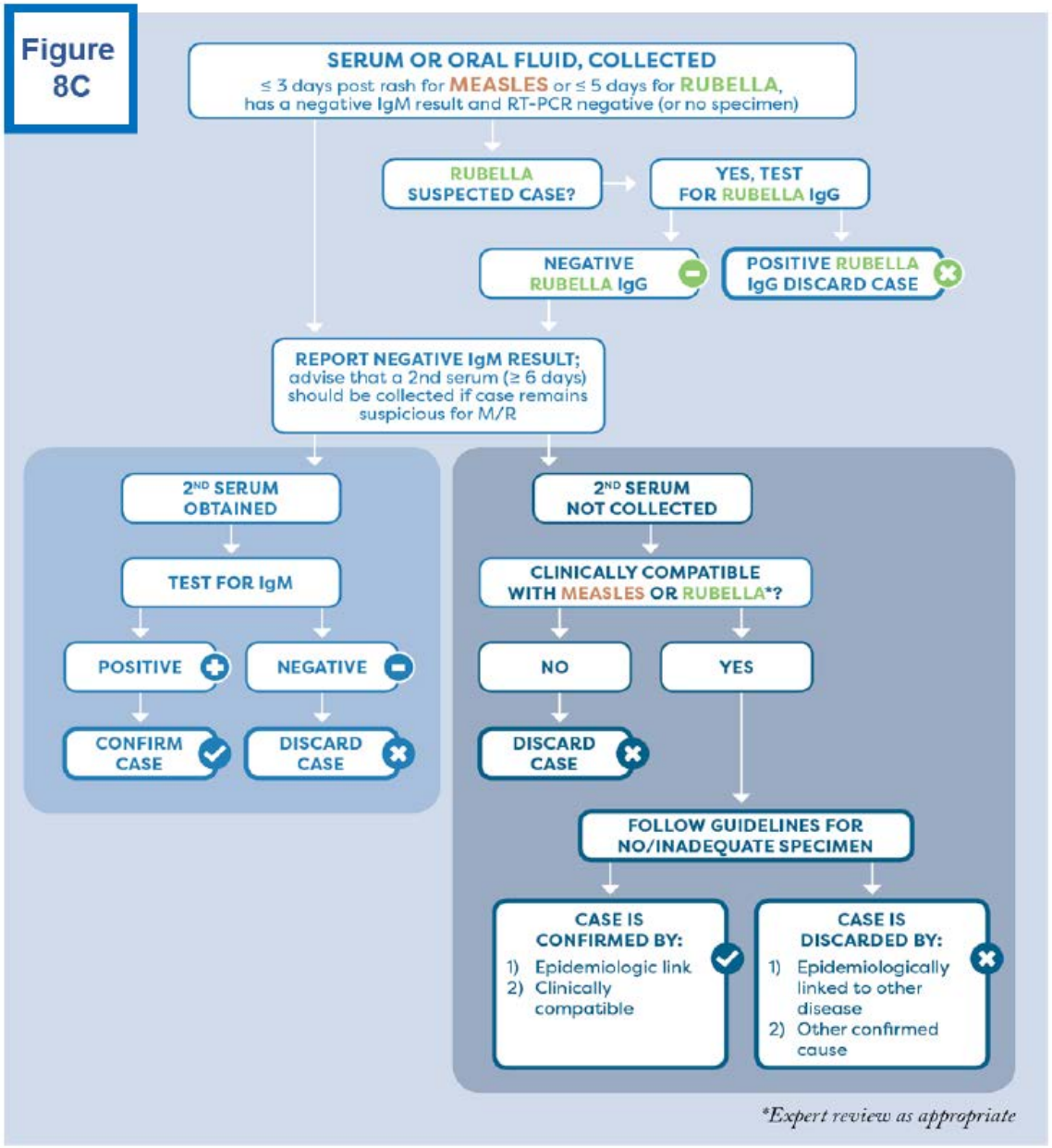
Panel 8C. Flowchart for serologic specimen testing ≤3 days post rash for measles or ≤5 days for rubella suspected cases, when result for IgM (and RT-PCR) is negative



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Summary

- For laboratory confirmation of measles, collect respiratory sample (NPA or NPS) AND blood for measles IgM
- Negative IgM collected within 4 days of rash onset should be repeated to rule out measles
- Negative IgM collected ≥ 4 days of rash onset can safely exclude measles