

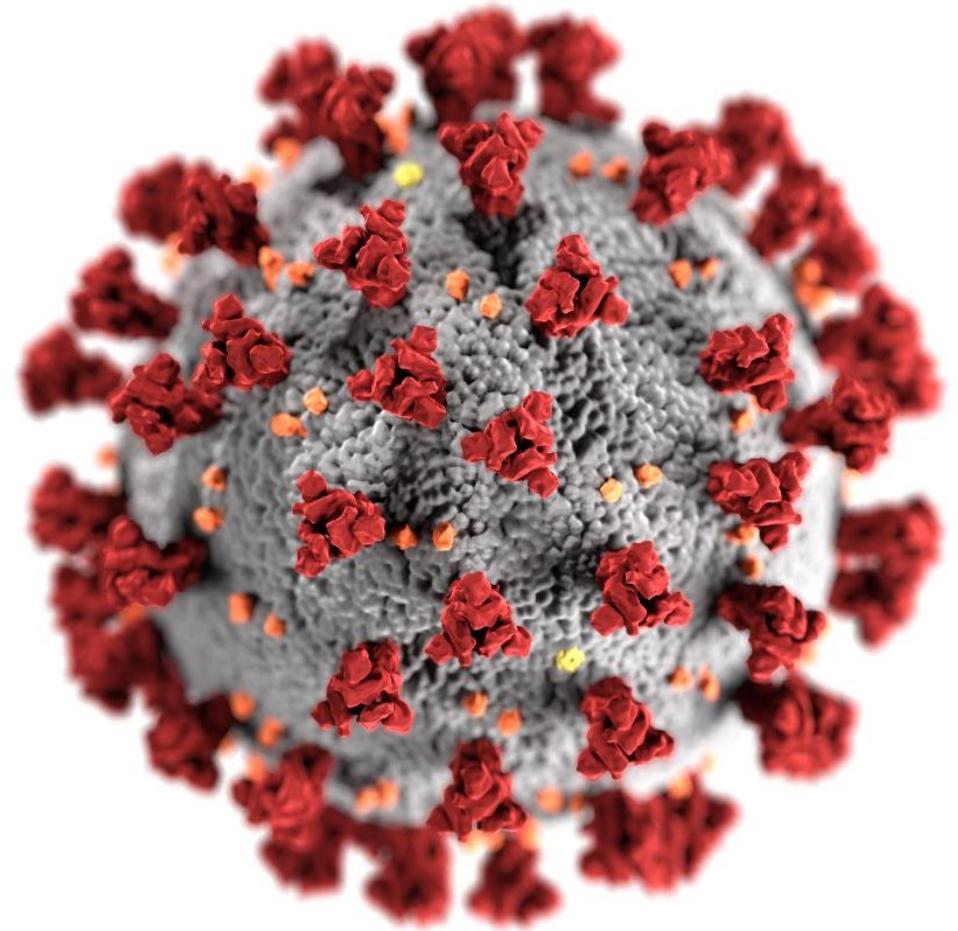
Overview of Myocarditis and Pericarditis

ACIP COVID-19 Vaccines Work Group

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cdc.gov/coronavirus



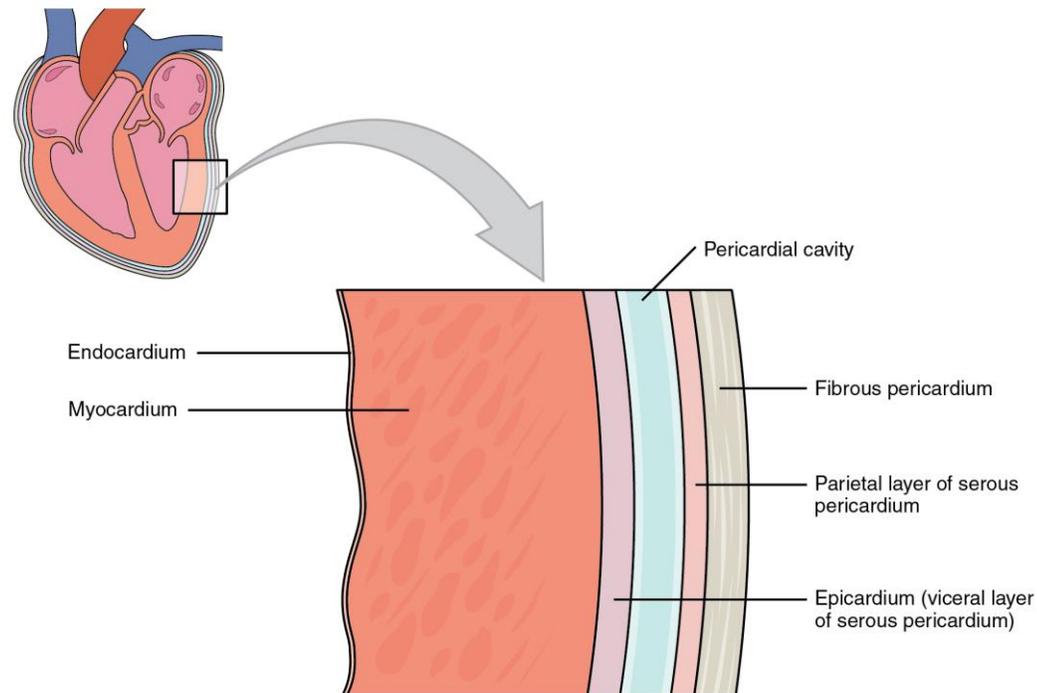
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What are Myocarditis and Pericarditis?

- Myocarditis: Inflammation of the myocardium (the heart muscle)
- Pericarditis: Inflammation of the pericardium (the lining around the heart)
- Myopericarditis: When both myocarditis and pericarditis are present



Myocarditis diagnosis

Probable

1. Symptoms
 - Chest pain/pressure/discomfort
 - Dyspnea/shortness of breath
 - Palpitations
2. Abnormal testing
 - Elevated troponin
 - Electrocardiogram (ECG or EKG) findings
 - Decreased function on echo or MRI
 - MRI findings consistent with myocarditis
3. No other identified cause

Confirmed

1. Symptoms
 - Chest pain/pressure/discomfort
 - Dyspnea/shortness of breath
 - Palpitations
2. Abnormal testing
 - Biopsy
 - Elevated Troponin AND MRI findings consistent with myocarditis
3. No other identified cause



Cases with individuals who lack the listed symptoms but who meet other criteria may be classified as subclinical myocarditis (probable or confirmed)

Pericarditis diagnosis

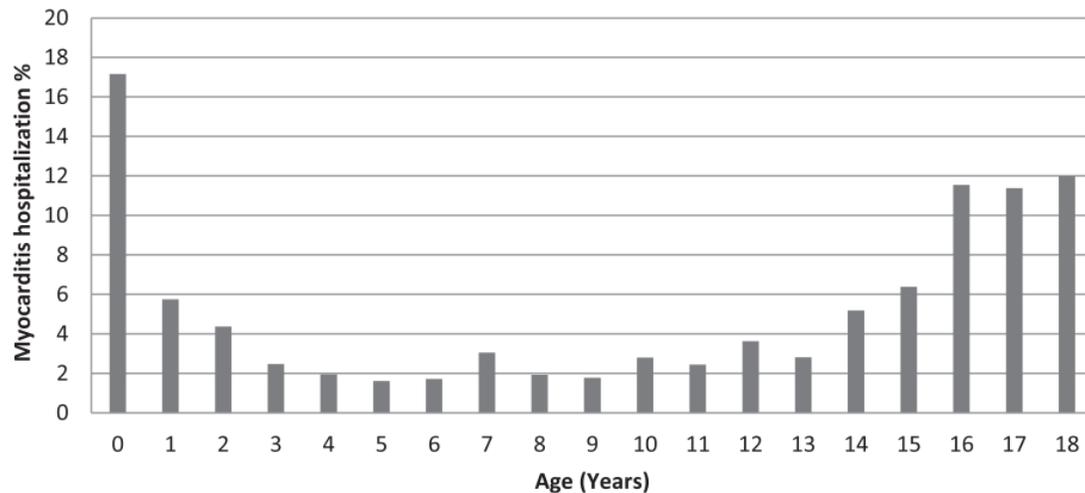
- Must have 2 of:
 - Chest pain
 - Pericardial rub audible by stethoscope
 - Abnormal ECG findings (New ST-elevation or PR-depression)
 - Pericardial effusion on echocardiogram or MRI



Epidemiology of myocarditis

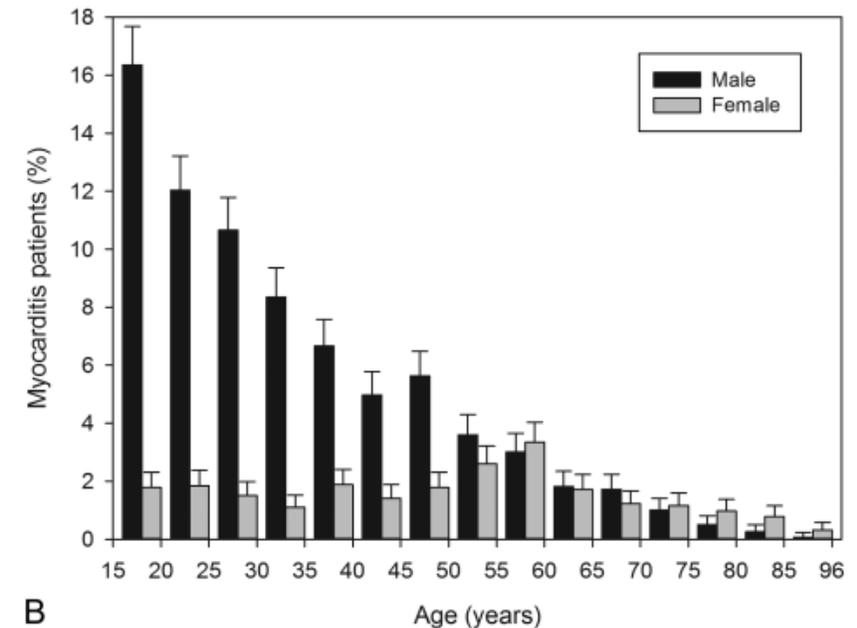
■ Children

- Annual incidence 0.8 per 100,000
 - In 15-18yo, 1.8 per 100,000 in 2015-2016
- 66% male
- Median LOS 6.1 days



■ Adults

- Gradual decrease in incidence with age
- 76% male



Vasudeva et al. *American J Cardiology*. 2021.

Kyto et al. *Heart*. 2013.

Causes of traditional myocarditis

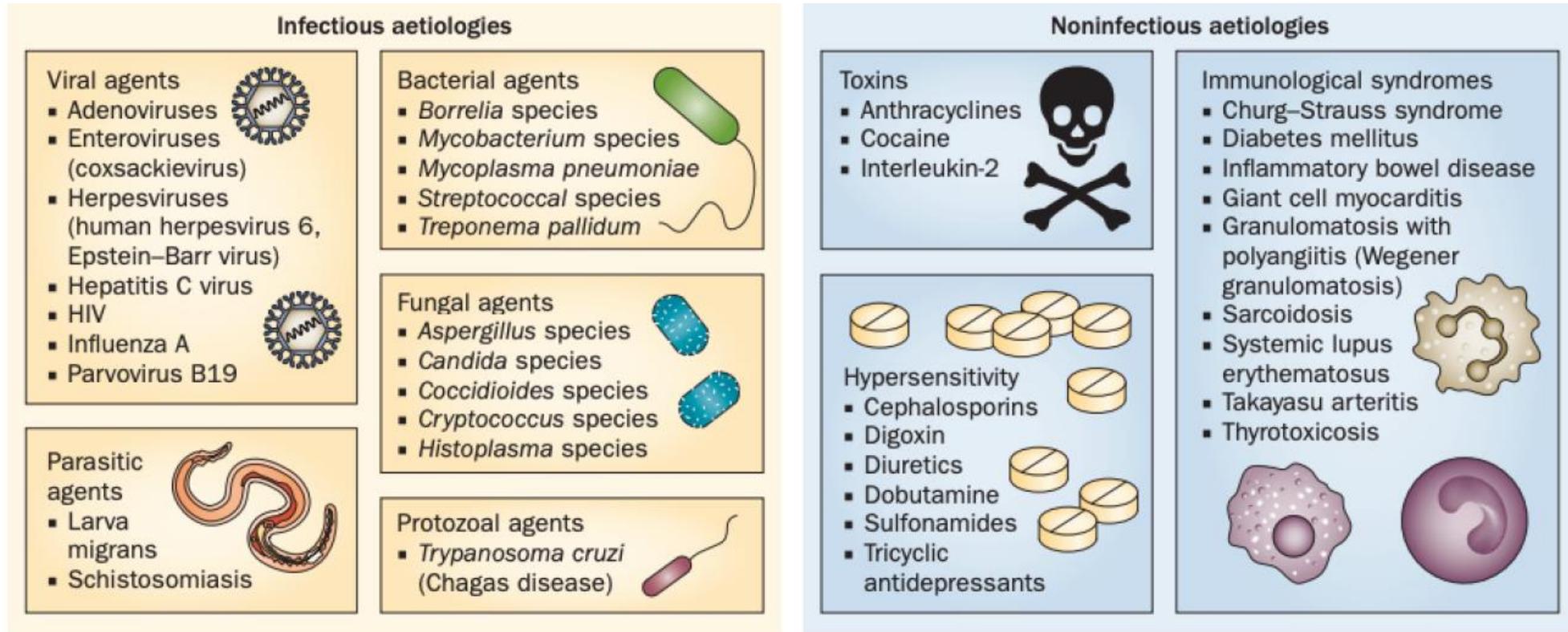


Figure 1 | Common causes of myocarditis. Viral infection is the most common aetiology, but several other aetiologies of myocarditis have also been implicated.

Treatment of myocarditis

- Supportive care is mainstay of therapy
- Directed care for arrhythmias, decreased heart function, congestive heart failure
- Role of anti-inflammatory medicines unclear
- In severe cases (rare), can consider mechanical support or heart transplant
- Exercise restriction while the heart recovers



Early reports of myocarditis after mRNA COVID-19 vaccine: United States

- Marshall et al – 7 healthy males 14-19yo within 4 days of 2nd mRNA vaccine
 - All with abnormal troponin, ECG, and MRI
 - Treatment with NSAIDs alone in 3, IVIG/steroids in 4
 - All discharged to home after 2-6 days in the hospital (median 4)
- Rosner et al* – 5 males 19-39yo within 4 days of 2nd dose of vaccine, 1 24yo male 7 days after 1st dose
 - All with abnormal troponin and MRI findings, varying ECG findings
 - Treatment with NSAIDs or colchicine in 4, beta-blockers in 2, steroids in 1
 - All discharged to home after 2-4 days in the hospital (median 3)
 - Note: Spike protein antibodies **negative** in patient who presented after 1st dose



Marshall et al. *Pediatrics*. 2021.

Rosner et al. *Circulation* 2021

*Rosner et al. also reported a 28yo with myocarditis after Johnson & Johnson's Janssen COVID-19 vaccine

Early reports of myocarditis after mRNA COVID-19 vaccine: International

- Larson et al – 8 males 22-56yo (4 in U.S., 4 in Italy); 7 within 4 days of dose 2, 1 with onset 2 days after dose 1 (had hx of prior SARS-CoV-2 infection)
 - All with abnormal troponin, echo, and MRI; 7/8 with abnormal ECG
 - Treatment with NSAIDs or colchicine in 4, steroids in 2, no treatment in 3
 - All discharged home with resolution of symptoms and preserved ejection fraction
- Israeli Ministry of Health - 148 myocarditis cases occurring within 30 days of mRNA vaccine
 - 27 cases out of ~5.4 million first doses
 - 121 cases out of ~5 million second doses
 - Mostly in men aged 16-30 (particularly 16-19)
 - Most were in the hospital up to 4 days
 - 95% of cases considered mild



Summary

- Myocarditis is rare, but is not a new disease
- Treatment largely supportive
- Myocarditis after mRNA vaccines:
 - Most commonly males, <30 years old, within a few days after 2nd dose
 - Early data of acute outcomes of myocarditis after mRNA vaccines have been good
 - No long-term data available yet



Thank you!

Acknowledgments:

- CDC Covid-19 Vaccine Task Force, Vaccine Safety Team
- Clinical Immunization Safety Assessment Project

For more information, contact CDC
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