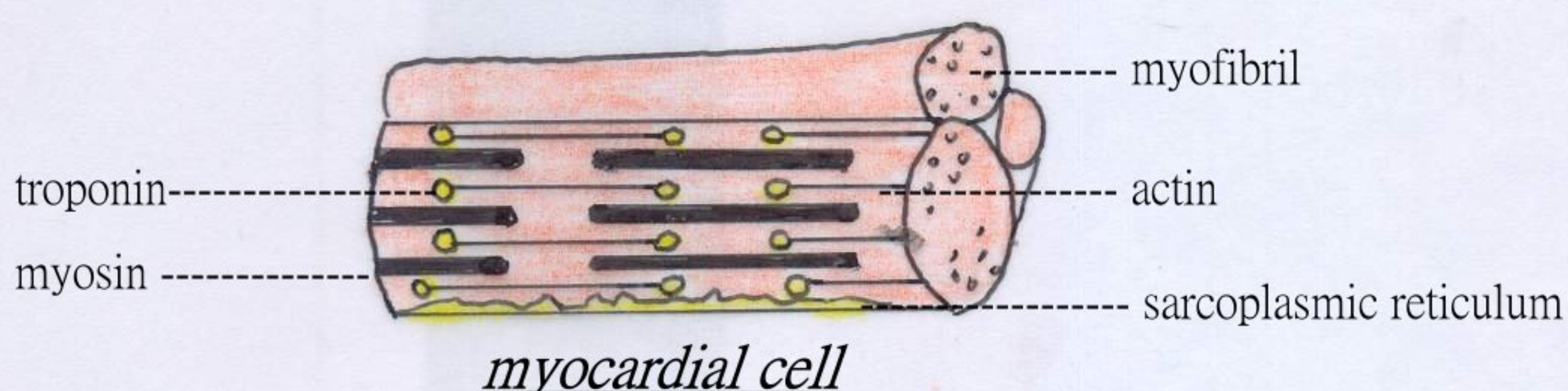


# *Heart failure*

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## *Structure of heart muscle and contraction*

Heart muscle (myocardial) cells consist of myofibrils. Myofibrils consist of contractile proteins (myosin and actin filaments), and troponin (which can inhibit contact of myosin and actin) rendering heart muscle relaxation. There is also sarcoplasmic reticulum releasing calcium ions upon stimulation, which can combine with troponin thereby rendering contact of myosin and actin, then heart muscle contraction.



## *Pumping action of heart*

The pumping action of heart depends on pooling of blood to the heart (= venous return = preload), arterial resistance (= blood pressure = afterload) and cardiac contractility.

- For examples:
1. increase preload --> increase diastolic volume of heart --> increase cardiac contractility --> increase cardiac output (= Frank Starling mechanism)
  2. increase preload --> distend atrium --> stimulate sinus node --> increase heart rate
  3. autonomic nervous system --> control heart rate and heart contractility

## *Causes of heart failure*

Dysfunction of pumping action of heart --> decrease cardiac output and systemic circulation --> heart failure. Main causes are:-

1. Ventricular inflow obstruction (compromised preload) eg. mitral or tricuspid stenoses, constrictive pericarditis, restrictive cardiomyopathy, pericardial tamponade
2. Ventricular outflow obstruction (compromised afterload) eg. aortic or pulmonary stenoses, pulmonary hypertension
3. reduced contractility (myocardial dysfunction) eg. ischemic heart disease, hypertension, cardiomyopathy
4. volume overload eg. valvular regurgitation, atrial or ventricular septal defects, anemia, thyrotoxicosis
5. cardiac arrhythmias

## Compensatory changes in heart failure

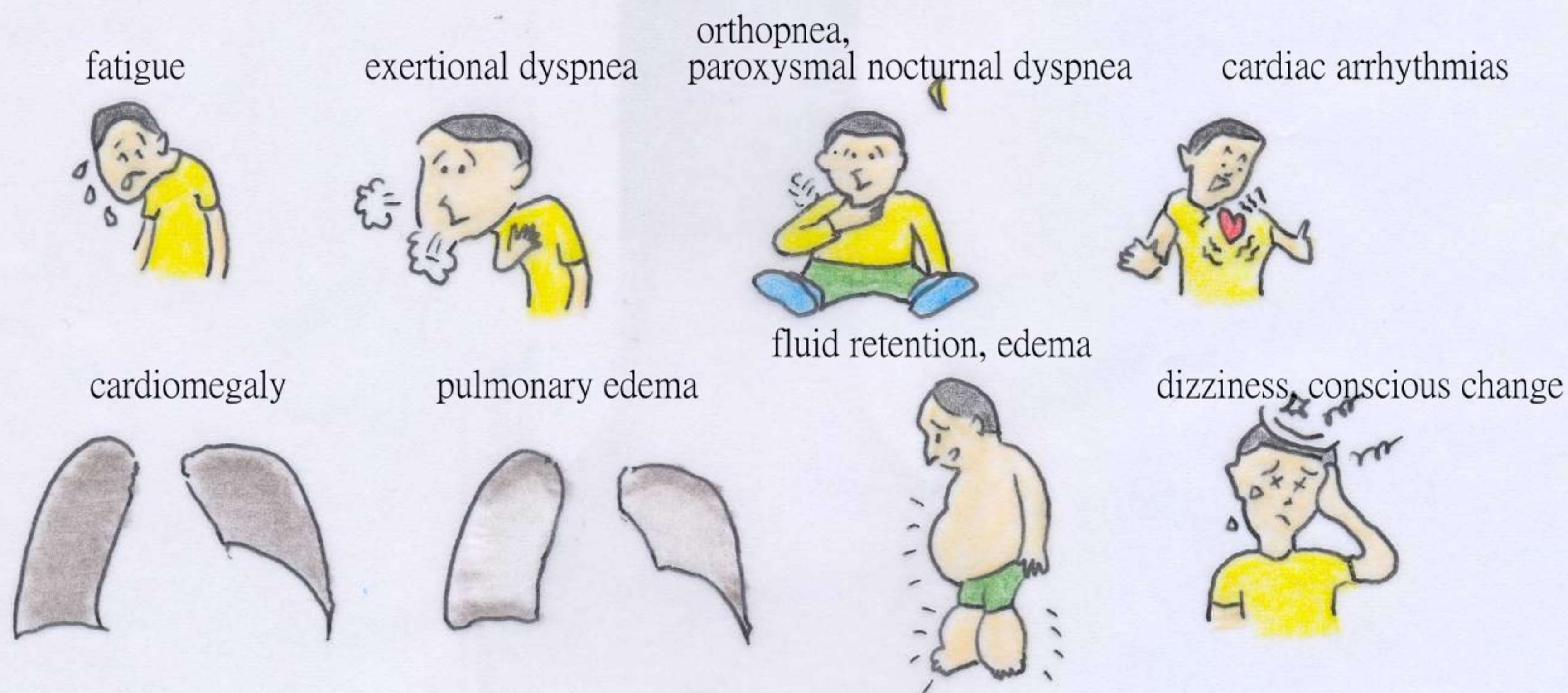
local changes : chamber enlargement  
myocardial hypertrophy  
increased heart rate

systemic changes: activation of sympathetic nervous system  
activation of renin-angiotensin-aldosterone system  
release of antidiuretic hormone  
release of natriuretic peptides

## Factors precipitating or aggravating heart failure

myocardial ischemia or infarction  
intercurrent illness eg. infection  
cardiac arrhythmias  
increased metabolic demand eg. pregnancy, thyrotoxicosis, anemia  
fluid overload

## Symptoms of heart failure



## Complications of heart failure

