Pathologic contractile function of the heart

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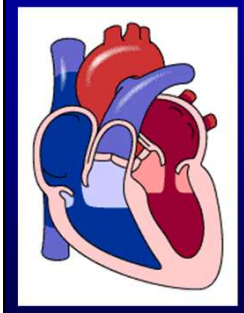
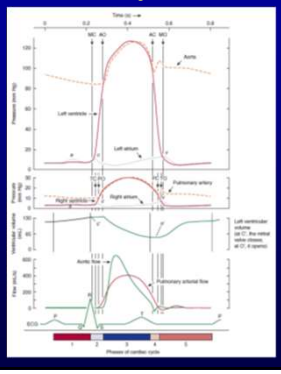
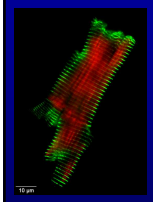
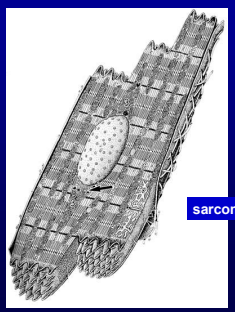
Events of the cardiac cycle

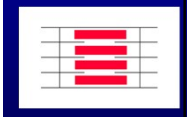




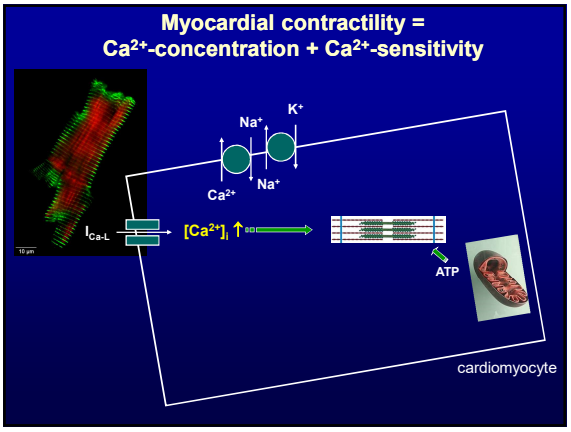
Contractile force is the result of sarcomere shortening

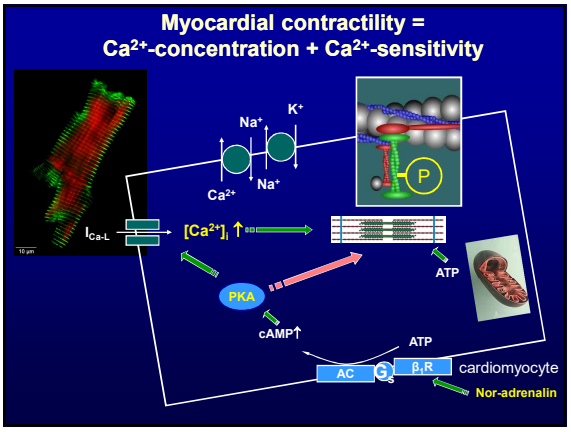


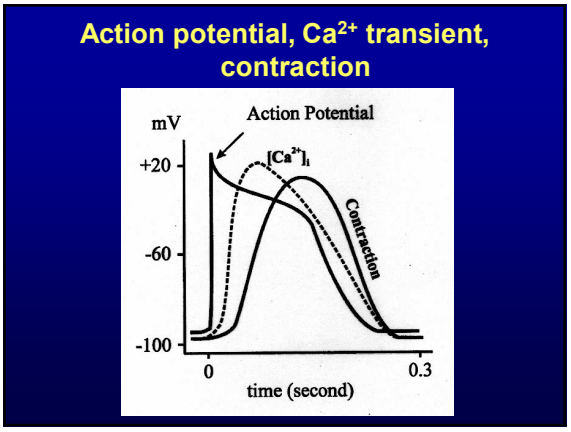




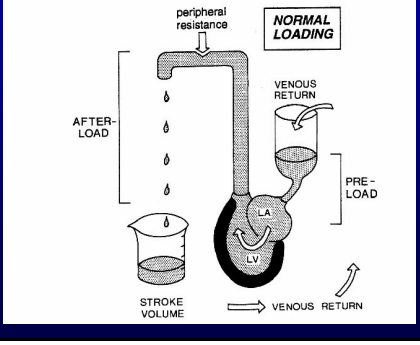
sarcomere


Myocardial contractility =
Ca2+-concentration + Ca2+-sensitivity
Na+
K+
Na+
Ca2+
ICa-L
[Ca2+]i ↑
ATP
cardiomyocyte

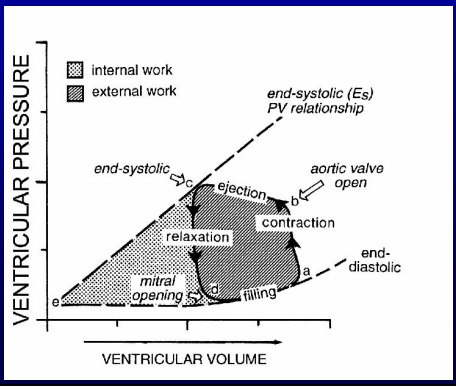

Myocardial contractility =
Ca2+-concentration + Ca2+-sensitivity
Na+
K+
Na+
Ca2+
P
ICa-L
[Ca2+]i ↑
ATP
PKA
cAMP↑
ATP
AC
β1R
cardiomyocyte
Nor-adrenalin


Action potential, Ca2+ transient,
contraction
mV
Action Potential
[Ca2+]i
+20
-60
-100
Contraction
0
0.3
time (second)

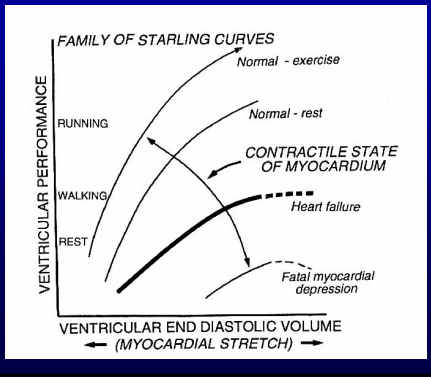
Cardiac preload and afterload



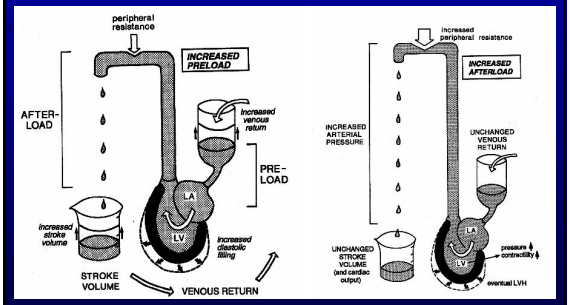
Cardiac cycle and cardiac work



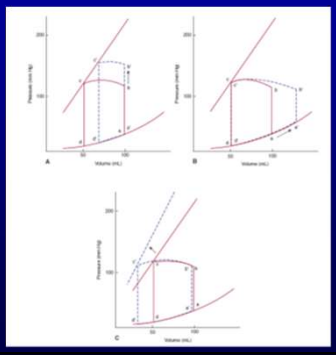
Ventricular function curves



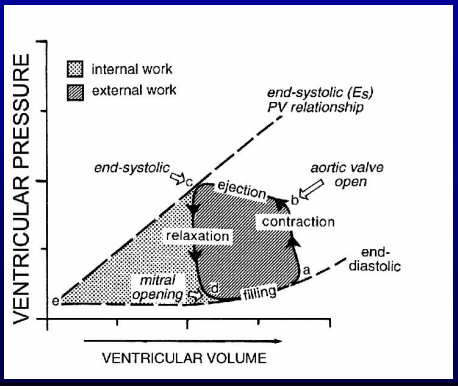
Increased preload and afterload



Responses on changes in loading conditions and contractility

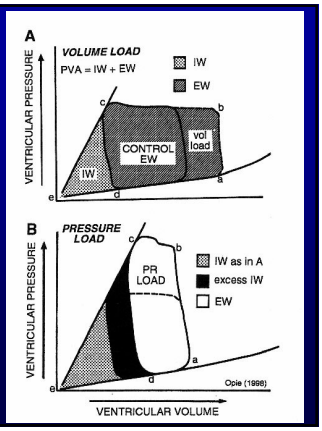


Cardiac cycle and cardiac work

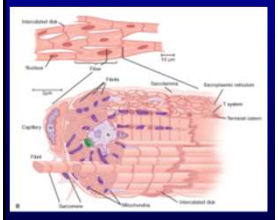


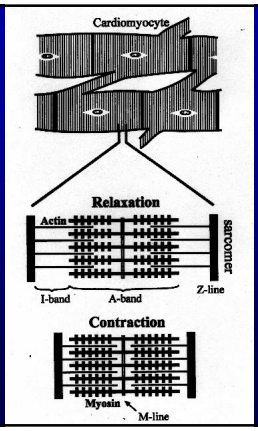
Increased preload

Increased afterload

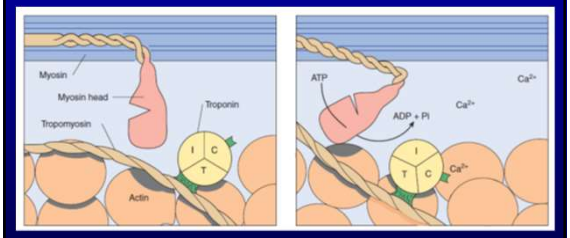


Contractile function and myofilaments

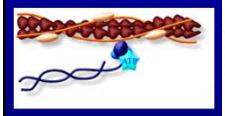


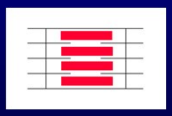


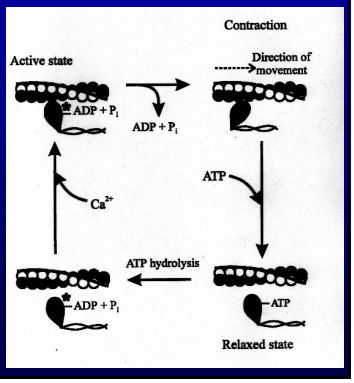
Contractile proteins



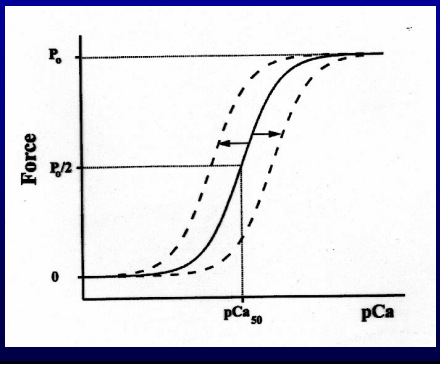
Actin-myosin cycle



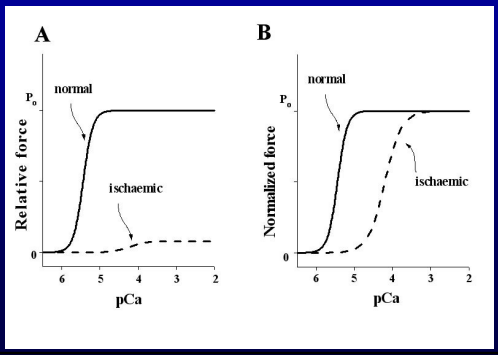




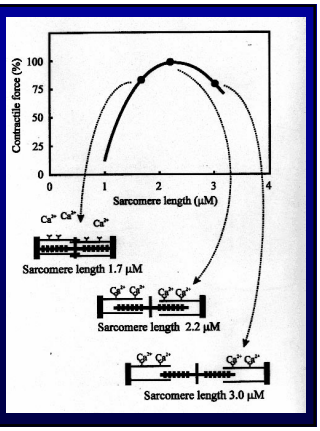
Ca^{2+} - force relationship



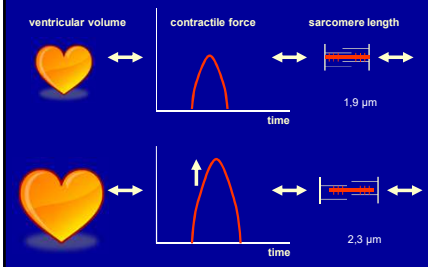
The effects of ischaemic metabolites (P_i and low pH) on the Ca^{2+} - force relationship



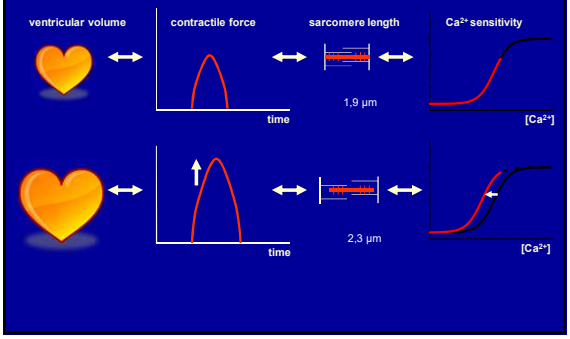
Length – tension relationship and its explanation



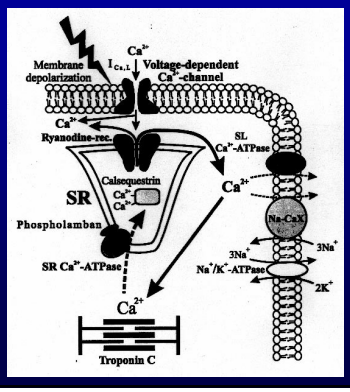
Frank-Starling-mechanism and sarcomere length



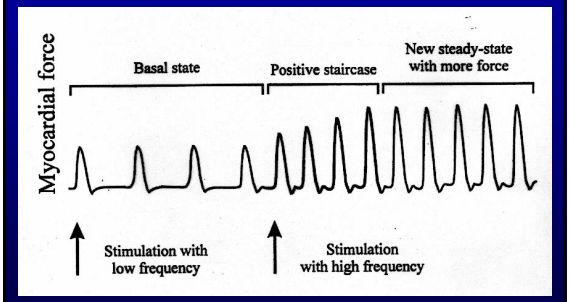
Frank-Starling-mechanism and sarcomere length



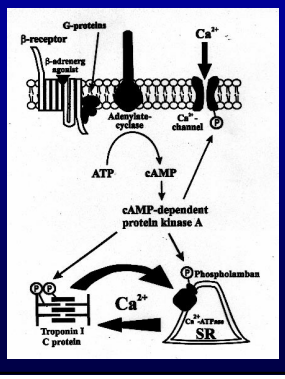
Intracellular Ca^{2+} balance



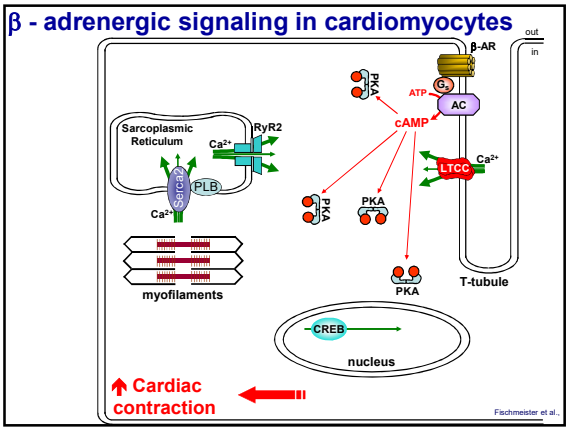
Force – frequency relationship



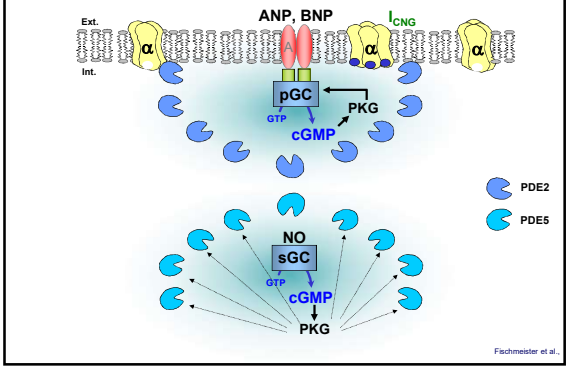
β - adrenergic regulation of contractility



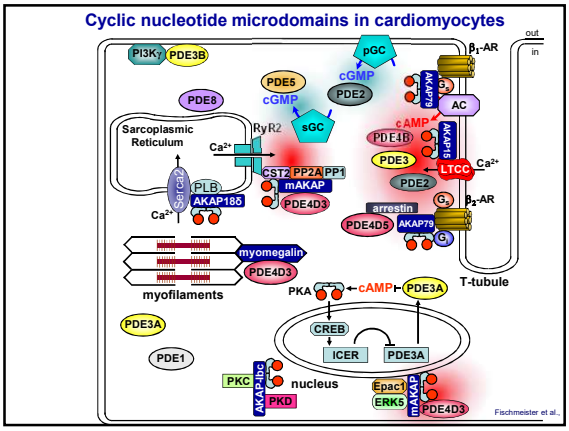
β - adrenergic signaling in cardiomyocytes



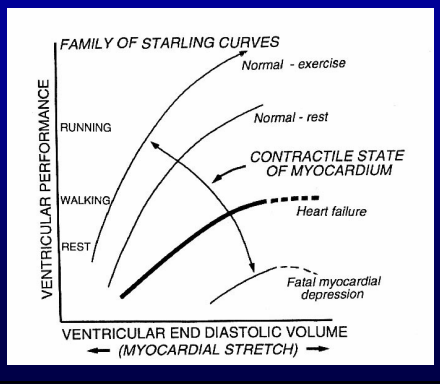
Cyclic nucleotide (cGMP) compartmentation in cardiomyocytes



Cyclic nucleotide microdomains in cardiomyocytes



Ventricular function curves



Measures of myocardial contractile state