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## Measurement of Left Ventricular Performance in Langendorff Perfused Mouse Hearts V.2 [↗](#)

E. Dale Abel<sup>1</sup><sup>1</sup>University of Iowa

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Works for me

[dx.doi.org/10.17504/protocols.io.7tfhnjn](https://dx.doi.org/10.17504/protocols.io.7tfhnjn)

Diabetic Complications Consortium

Tech. support email: [rmcindoe@augusta.edu](mailto:rmcindoe@augusta.edu)

Lili Liang

### ABSTRACT

#### Summary:

This protocol describes the procedure used by the DiaComp for measuring left ventricular performance in isolated retrogradely perfused mouse hearts.

#### Diabetic Complication:



Cardiovascular

### EXTERNAL LINK

<https://www.diacomp.org/shared/document.aspx?id=44&docType=Protocol>

#### Langendorff Heart Perfusion Protocol

- 1 Hearts are isolated and the aorta is cannulated using a 20g steel cannula. Hearts are perfused at a constant pressure of 60 mmHg by an aortic cannula delivering warm (37°C) Krebs buffer containing (in mM) 118 NaCl, 4.7 KCl, 25 NaHCO<sub>3</sub>, 1.2 MgSO<sub>4</sub>, 1.2 KH<sub>2</sub>PO<sub>4</sub>, 2 CaCl<sub>2</sub> gassed with 95% O<sub>2</sub>, 5% CO<sub>2</sub>. Hearts are perfused with glucose 11mM as sole substrate or in combination with 1 or 1.2 mM palmitate. The pulmonary artery is transected to facilitate coronary venous drainage. A left ventricular polyethylene apical drain is inserted through a left atrial incision to allow thebesian venous drainage. Left ventricular pressure is monitored from a water-filled balloon placed through the left atrial appendage and connected to a Millar transducer. The volume of the balloon is adjusted to obtain a left ventricular diastolic pressure of 7 mmHg. Heart rates are adjusted to 360 beats/min by pacing at 6 Hz at the level of the atria.

## Inotropic stress protocol

- 2 After 30 min stabilization, data are acquired under baseline conditions (buffer calcium concentration = 2 mM). The hearts are then switched to a second buffer containing 4 mM CaCl<sub>2</sub>. Contractile parameters are again measured after 20 min of stabilization. The Langendorff protocols yield the following parameters:

- (1) Left ventricle systolic pressure (LVSP): Units mmHg.
- (2) Left ventricle developed pressure (LVDP or LVDevP), which is LVSP – LV Diastolic pressure: Units mmHg.
- (3) Heart Rate (HR): Units beats per minute
- (4) Rate Pressure Product (RPP), which is LVDP x HR. Units mmHg/sec
- (5) dP/dt<sub>min</sub> and dP/dt<sub>max</sub>, which are the maximal rates of LV pressure decay and LV, pressure development respectively. Units mmHg/msec.
- (6) Coronary Flow (ml/min). This is determined by measuring the coronary effluent from the perfused heart.

## Myocardial oxygen consumption (MVO<sub>2</sub>).

- 3 Coronary effluent is sampled from the pulmonary artery using a capillary tube. Oxygen content was measured using an Oxygen probe (OceanOptics) and calculated using the formula:

$$MVO_2 = \% O_{2\text{ perfusate}} - \% O_{2\text{ pulmonary artery}} \times \text{Coronary Flow} \times \text{Atmospheric Pressure} / 760 \times O_2 \text{ Solubility} \times O_2 \text{ Density}$$

Where O<sub>2</sub> solubility and O<sub>2</sub> density are 23.9 µl/ml and 0.03933 µmol/µl respectively in a solution at 37°C respectively. Cardiac efficiency is calculated as the ratio of RPP/MVO<sub>2</sub> expressed as a percentage.



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