

### 1.5.3

## Mean Arterial Pressure

Intrinsic control (increasing force of contraction) and extrinsic control (adjusting heart rate through activation of the autonomic nervous system and endocrine system) as described above, will both have an impact on the mean arterial blood pressure. Mean arterial pressure (MAP) is the average pressure in the aorta during one cardiac cycle.

$$\text{MAP} = \text{CO} \times \text{TPR}$$

There are two main ways to change MAP. Increase cardiac output (CO) or increase total peripheral resistance (TPR). Peripheral resistance is affected by blood vessel diameter, with smaller vessels increasing resistance, causing back up and increased pressure “upstream” and larger vessel diameter decreasing resistance and lowering pressure upstream. As will be shown in the next section, certain blood vessels (arterioles) have the ability to alter their diameters, which in turn alters peripheral resistance. If arterioles constrict, the increased resistance will lead to an increase in mean arterial pressure because the heart (which is upstream) has to push harder to pump the blood through the constricted arterioles. In addition, if total blood volume entering the heart increases (for example increased venous return) it leads to an increase in cardiac output which in turn increases the volume of blood entering the aorta, thereby increasing mean arterial pressure. Since MAP is crucial to ensure proper blood flow to the body’s tissues, there are three regulatory components involved in maintaining a constant MAP. The first two are the baroreceptors and chemoreceptors which are designed for immediate short-term regulation and the third are the kidneys, designed for slower but long-term regulation.

For an excellent video on MAP, see this resource: *Human Physiology – Introduction to the Regulation of Mean Arterial Pressure* by Janux [https://youtu.be/cW71zR29v\\_M](https://youtu.be/cW71zR29v_M)



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