

determines the filtration fraction. Several factors, mostly hemodynamic, contribute to the regulation of filtration under physiologic conditions.

Although glomerular filtration is affected by renal artery pressure, this relationship is not linear across the range of physiologic blood pressures due to autoregulation of GFR. Autoregulation of glomerular filtration is the result of three major factors that modulate either afferent or efferent arteriolar tone; these include an autonomous vasoreactive (myogenic) reflex in the afferent arteriole, *tubuloglomerular feedback* (TGF), and angiotensin II–mediated vasoconstriction of the efferent arteriole. The myogenic reflex is a first line of defense against fluctuations in renal blood flow. Acute changes in renal perfusion pressure evoke reflex constriction or dilatation of the afferent arteriole in response to rising or falling pressure, respectively. This phenomenon helps protect the glomerular capillary from sudden changes in systolic pressure.

TGF changes the rate of filtration and tubular flow by reflex vasoconstriction or dilatation of the afferent arteriole. TGF is mediated by specialized cells in the thick ascending limb of the loop of Henle called the *macula densa* that act as sensors of solute concentration and tubular fluid flow rate. With high tubular flow rates, a proxy for an inappropriately high filtration rate, greater solute delivery to the macula densa ([Fig. 309-2B](#)) evokes vasoconstriction of the afferent arteriole causing GFR to return toward normal. One component of the soluble signal from the macula densa is adenosine triphosphate (ATP) released by the cells during increased NaCl reabsorption. ATP is metabolized in the extracellular space to generate adenosine, a potent vasoconstrictor of the afferent arteriole. During conditions associated with a fall in filtration rate, a lower rate of solute delivery to the macula densa attenuates TGF, allowing afferent arteriolar dilatation and restoring GFR to normal levels. Angiotensin II and reactive oxygen species enhance TGF, whereas nitric oxide (NO) blunts TGF. A distinct feedback mechanism may exist between the connecting tubule and GFR in which high Na⁺ delivery evokes afferent arteriolar dilation possibly mediated by prostaglandins.