

Am J Physiol. 1996 Dec;271(6 Pt 2):F1114-22.

Effect of age on blood acid-base composition in adult humans: role of age-related renal functional decline.

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In 64 apparently healthy adult humans (ages 17-74 yr) ingesting controlled diets, we investigated the separate and combined effects of age, glomerular filtration rate (GFR, index of age-related renal functional decline), renal net acid excretion [NAE, index of endogenous acid production (EAP)], and blood PCO₂ (PbCO₂, index of respiratory set point) on steady-state blood hydrogen ion ([H⁺]_b) and plasma bicarbonate concentration ([HCO₃⁻]_p). Independent predictors of [H⁺]_b and [HCO₃⁻]_p were PbCO₂, NAE, and either age or GFR, but not both, because the two were highly correlated (inversely). [H⁺]_b increased with increasing PbCO₂, NAE, and age and with decreasing GFR. [HCO₃⁻]_p decreased with increasing NAE and age but increased with increasing PbCO₂ and GFR. Age (or GFR) at constant NAE had greater effect on both [H⁺]_b and [HCO₃⁻]_p than did NAE at constant age (or GFR). Neither PbCO₂ nor NAE correlated with age or GFR. Thus two metabolic factors, diet-dependent EAP and age (or GFR), operate independently to determine blood acid-base composition in adult humans. Otherwise healthy adults manifest a low-grade diet-dependent metabolic acidosis, the severity of which increases with age at constant EAP, apparently due in part to the normal age-related decline of renal function.