Resveratrol stimulates the ATP-Pi exchange in isolated perfused rat liver: NMR saturation transfer study. Stephant A, Gallis JL, Gin H, Couzigou P, Beauvieux MC.
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Resveratrol (RSV) is a polyphenolic compound present in grape, red wine, some fruits and plants; RSV is known to inhibit mitochondrial ATP synthase while it activates AMP kinase implicated in glycolytic ATP production. The effect of RSV (20µM) on the rate of exchange between inorganic phosphate and ATP in the direction of ATP synthesis was measured in isolated perfused rat liver using $^{31}\text{P}$ NMR spectroscopy and saturation technique. When liver (5g) of fed male Wistar rat (100g) was perfused with Krebs-Henseleit solution (37°C, 95%O$_2$-5%CO$_2$), a measurable exchange was observed (time constant $k_s=0.45\pm0.018$sec$^{-1}$; ATP synthesis rate $R_s=38\pm2$µmol.min$^{-1}$.g$^{-1}$, n=4) and was abolished after the inhibition of glycolysis by iodo-acetate (IAA: 0.5mM, 2 min, inhibitor of glyceraldehyde-3-phosphate-dehydrogenase G3PDH). When liver was perfused with RSV (n=4), the exchange was increased ($k_s=0.85\pm0.053$sec$^{-1}$; $R_s=79\pm5$µmol.min$^{-1}$.g$^{-1}$) compared to Krebs alone and was only reduced after glycolysis inhibition ($k_s=0.40\pm0.025$sec$^{-1}$). That confirms that NMR detection of the conversion of Pi forward ATP concerns mainly the glycolytic ATP synthesis and that the rate of mitochondrial ATP synthase is too slow to be observed. In conclusion, RSV stimulates mainly the glycolytic ATP synthesis. Whether the target is AMPkinase or G3PDH remains to be questioned.