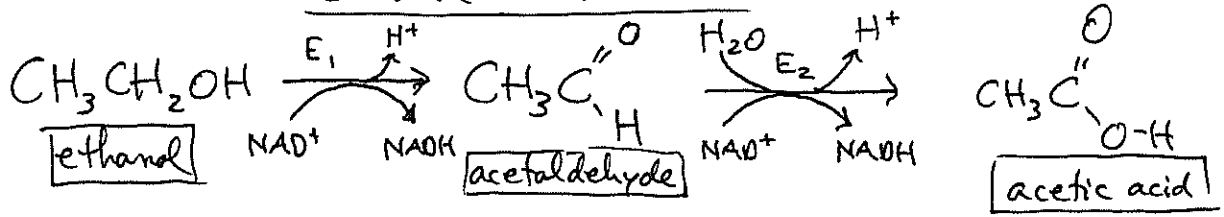
Ethanol Detoxification



E_1 = alcohol dehydrogenase (also found in retina as well as in liver)

E_2 = aldehyde dehydrogenase

Deficiency

1) Increases risk of alcoholism
2) Decreases desire to drink, increases aversion to EtOH

Acetaldehyde is noxious to virtually all cells ⇒ leads to nausea, flushing, covalent modification of proteins, inability to sense cold temperatures well

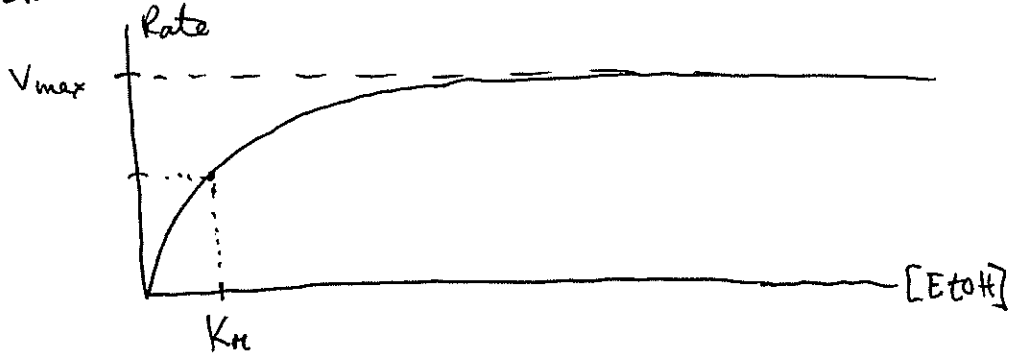
Some models of addictive behaviors are hypothesized to arise from biosynthesis of dihydroxy isoquinoline DHIQ which acts as an opiod/endorphin mimicing agent.

E_1 is rate-limiting, $V_{max} = \frac{8\text{g EtOH}}{\text{hour}}$

EXAMPLE: Estimate of detoxification of one six-pack of 3.2%(v/v) beer taken approximately seven(7) hours!

$$V_{TOTAL,\,EtOH} = 6 \times (12\text{oz beers}) \times \left(\frac{30\text{ mL}}{1\text{ oz}}\right) \times \left(\frac{3.2\text{ mL EtOH}}{100\text{ mL beer}}\right) = 69.1\text{ mL EtOH consumed}$$

$$m_{EtOH} = V \times \text{density} = 69.1\text{ mL} \times \left(0.789\ \tfrac{g}{mL}\right) = 54.5\text{ g EtOH}$$



time, t, to metabolize

$$t \simeq \frac{\text{mass}}{V_{max}} = \frac{54.5\text{ g}}{8\ g/hr} = 6.8\text{ hrs}$$

NOTE: K_M is approximately the serum [EtOH] derived from consuming $\sim \frac{1}{2}$ oz of EtOH (~15 oz of 3.2%(v/v) beer)