

dehydrogenase (see Figure 6.17) into chloroplasts. Because of the strong amplification effects obtained by chloroplast cloning, the plants produced glycine betaine at a much higher level and could grow even in the presence of 400 mM NaCl. These are very promising results indeed, although it is still unclear whether we can achieve the ultimate tolerance without the participation of many other factors involved in the natural reaction of salt-resistant plants.

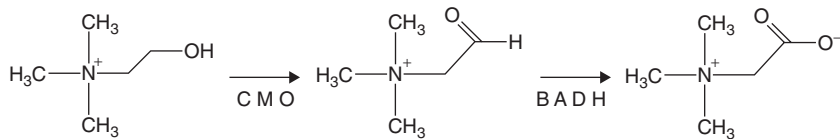


FIGURE 6.17

Biosynthesis of glycine betaine in plants. The synthesis starts from choline (left), which is converted by choline mono-oxygenase (CMO) into betaine aldehyde (center), which in turn is converted by betaine aldehyde dehydrogenase (BADH) into glycine betaine (right). *E. coli* uses a similar pathway, except that the first step is catalyzed by a conventional NAD⁺-linked dehydrogenase. *Arthrobacter*, a Gram-positive bacterium, converts choline in one step into glycine betaine by choline oxidase.