

## 14.3. GUIDELINES FOR CHOOSING HOST-VECTOR SYSTEMS

### 14.3.1. Overview

The success or failure of a process often depends on the initial choice of host organism and expression system. Such choices must be made in the context of a processing strategy.

Table 14.2 summarizes many of the salient features of common host systems. The most important initial judgment must be whether posttranslational modifications of the product are necessary. If they are, then an animal cell host system must be chosen. If some simple posttranslational processing is required (e.g., some forms of glycosylation), yeast or fungi may be acceptable. Whether posttranslational modifications are necessary for proper activity of a therapeutic protein cannot always be predicted with certainty, and clinical trials may be necessary.

Another important consideration is whether the product will be used in foods. For example, some yeasts (e.g., *S. cerevisiae*) are on the FDA GRAS list (generally regarded as safe), which would greatly simplify obtaining regulatory approval for a given product. In some cases edible portions of transgenic plants can be used to deliver vaccines or therapeutic proteins.

### 14.3.2. *Escherichia coli*

If posttranslational modifications are unnecessary, *E. coli* is most often chosen as the initial host. The main reason for the popularity of *E. coli* is the broad knowledge base for it. *E. coli* physiology and its genetics are probably far better understood than for any other

**TABLE 14.2** Characteristics of Selected Host Systems for Protein Production from Recombinant DNA

Characteristic	Organism				
	<i>E. coli</i>	<i>S. cerevisiae</i>	<i>P. pastoris</i>	Insect	Mammalian
High growth rate	E <sup>a</sup>	VG	VG	P–F	P–F
Availability of genetic systems	E	G	F	F–G	F–G
Expression levels	E	VG	E	G–E	P–G
Low-cost media available	E	E	E	P	P
Protein folding	F	F–G	F–G	VG–E	E
Simple glycosylation	No	Yes	Yes	Yes	Yes
Complex glycosylation	No	No	No	Yes <sup>b</sup>	Yes
Low levels of proteolytic degradation	F–G	G	G	VG	VG
Excretion or secretion	P normally VG in special cases	VG	VG	VG	E
Safety	VG	E	VG	E	G

<sup>a</sup>E, excellent; VG, very good; G, good; F, fair; P, poor.

<sup>b</sup>Glycosylation patterns differ from mammalian cells.