

**TABLE 6.2.** Descriptions of some of the major bacterial phyla that have cultured isolates

Phyla	Biology, Physiology, and Evolution	Species and Genera
<b>Aquificae</b>	Most species are hyperthermophiles, growing with an optimal growth temperature of ~85°C. Most are aerobic chemolithoautotrophs fixing carbon by the reductive TCA cycle. The membranes are made up of diethers, instead of phospholipids, although the diethers are distinct from those of archaea. Some studies suggest that this group is the deepest branching of the bacteria.	The phylum is composed of two main genera, <i>Hydrogenobacter</i> and <i>Aquifex</i> .
<b>Thermotogae</b>	Most species are hyperthermophiles with optimal growth temperatures exceeding 80°C. Most have an unusual “toga-like” structure that wraps around one end of the rod-shaped cell. The membranes are made up of diethers, like those in the Aquificae.	The best-characterized member of this phylum is <i>Thermotoga maritima</i> , a species that was originally isolated from a volcano on the seafloor near Italy.
<b><i>Deinococcus-Thermus</i></b>	Most are aerobic heterotrophs. All species in the <i>Deinococcus</i> branch of this group are radiation resistant. The <i>Thermus</i> group includes some of the first- and best-characterized thermophilic species.	<i>Deinococcus radiodurans</i> is the most radiation-resistant species known. <i>Thermus aquaticus</i> is the source of the thermostable “Taq” DNA polymerase protein used for PCR.
<b>Chloroflexi/green nonsulfur bacteria</b>	Many species are photosynthetic, filamentous, and motile, using a specialized gliding mechanism to move. The photosynthetic species fix CO <sub>2</sub> by the hydroxypropionate pathway. They grow best using electrons from organic compounds and thus are called nonsulfur bacteria to contrast with the green sulfur bacteria.	<i>Chloroflexus aurantiacus</i> , a photosynthetic species, is one of the best-studied species in this group.
<b>Chlorobi/green sulfur bacteria</b>	All species in this group are strictly anaerobic phototrophs. In contrast to the green nonsulfur bacteria, these species prefer to use sulfur compounds as the source of electrons. Carbon is fixed by the reverse TCA cycle.	<i>Chlorobium tepidum</i> and relatives are model systems for this group.

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