



Big Six Non-O157 Shiga Toxin-Producing *Escherichia coli* (STEC) Research Materials

The recent outbreaks of illness caused by non-O157 STEC in Germany and Japan have heightened awareness of the importance of these *E. coli* strains and increased calls for government-mandated testing of food products for non-O157 STEC, particularly the six serogroups that are of the greatest concern to the Centers for Disease Control (CDC): O26, O45, O103, O111, O121, and O145.

Infections associated with these 6 serogroups of *E. coli* have been traced back to contaminated raw ground beef, lettuce and berries. The CDC has estimated that approximately 113,000 illnesses and 300 hospitalizations are caused by these six serogroups of STEC annually in the United States, including severe complications such as hemolytic uremic syndrome (HUS). The most commonly found serogroups of the six are O26, O103 and O111.

In response to growing concerns over non-O157 STEC, in 2009 the CDC issued a recommendation that stools from all patients with community-acquired diarrhea be cultured and tested with an assay such as a rapid enzyme immunoassays (EIA) or a polymerase chain reaction (PCR) assay that targets Shiga toxin antigens or genetic determinants to allow detection of non-O157 STEC. The CDC also requested that all non-O157 STEC isolates should be sent by public health laboratories to CDC for confirmation and further characterization. The number of non-O157 STEC isolates sent to CDC for serotyping has increased each year.

At the request of ATCC, CDC has deposited a selection of strains from the O103, O111, O121, O26, O45, and O145 serogroups recently received from public health laboratories for accessioning into our collection. A second group of strains lacking almost all STEC virulence genes and representative of five of the six serogroups was also deposited by the CDC for use as experimental controls. These strains below are now available for distribution only to researchers within the United States. Also included below are non-O157 STEC strains from the six serogroups isolated internationally.

The table below lists the results of ATCC quality control testing for most strain's serotype and virulence genes: Shiga toxin genes (*stx1* and *stx2*) and the gene that codes for intimin (*eae*), an adherence protein, in addition to each strain's location of isolation if known. Each strain's website product pages lists any additional information given to us by the depositor of that strain.

TABLE 1. O26 Strains

Description	Designation	ATCC® No.	Serotype	Presence of Select Virulence Genes	Isolation Location
<i>Escherichia coli</i>	2003-3023	BAA-2205	O26:H11	<i>stx1+</i> / <i>stx2</i> -/ <i>eae</i> +	Connecticut
<i>Escherichia coli</i>	2003-3014	BAA-2196	O26:H11	<i>stx1+</i> / <i>stx2+</i> / <i>eae</i> +	Michigan
<i>Escherichia coli</i>	2001-3234	BAA-2204	O26:H11	<i>stx1+</i> / <i>stx2</i> -/ <i>eae</i> +	Nebraska
<i>Escherichia coli</i>	00-3412	BAA-2181	O26:H11	<i>stx1+</i> / <i>stx2</i> -/ <i>eae</i> +	New Mexico
<i>Escherichia coli</i>	99-3301	BAA-2188	O26:H11	<i>stx1+</i> / <i>stx2</i> -/ <i>eae</i> +	Utah
<i>Escherichia coli</i>	99-3294	BAA-2186	O26:H11	<i>stx1+</i> / <i>stx2</i> -/ <i>eae</i> +	Massachusetts
<i>Escherichia coli</i>	EH1534	BAA-1653	O26:H11		Belgium
<i>Escherichia coli</i>	CDC	12795	O26:K60(B6)		

TABLE 2. O45 Strains

Description	Designation	ATCC® No.	Serotype	Presence of Select Virulence Genes	Isolation Location
<i>Escherichia coli</i>	2000-3039	BAA-2193	O45:H2	<i>stx1+/stx2-/eae+</i>	Maine
<i>Escherichia coli</i>	99-3303	BAA-2189	O45:H2	<i>stx1+/stx2-/eae+</i>	Virginia
<i>Escherichia coli</i>	99-3291	BAA-2185	O45:H2	<i>stx1+/stx2-/eae+</i>	Massachusetts
<i>Escherichia coli</i>	99-3075	BAA-2202	O45:H2	<i>stx1+/stx2-/eae+</i>	California
<i>Escherichia coli</i>	98-3215	BAA-2198	O45:H2	<i>stx1+/stx2-/eae+</i>	Virginia
<i>Escherichia coli</i>	98-3167	BAA-2191	O45:H2	<i>stx1+/stx2-/eae+</i>	Georgia

TABLE 3. O103 Strains

Description	Designation	ATCC® No.	Serotype	Presence of Select Virulence Genes	Isolation Location
<i>Escherichia coli</i>	2003-3112	BAA-2210	O103:H2	<i>stx1+/stx2-/eae+</i>	Wisconsin
<i>Escherichia coli</i>	2001-3304	BAA-2207	O103:H2	<i>stx1+/stx2-/eae+</i>	Connecticut
<i>Escherichia coli</i>	2006-3008	BAA-2215	O103:H11	<i>stx1+/stx2-/eae+</i>	Idaho
<i>Escherichia coli</i>	2001-3225	BAA-2200	O103:H11	<i>stx1+/stx2-/eae+</i>	Texas
<i>Escherichia coli</i>	2005-3546	BAA-2213	O103:H25	<i>stx1+/stx2-/eae+</i>	Virginia
<i>Escherichia coli</i>	2000-3281	BAA-2199	O103:H25	<i>stx1+/stx2-/eae+</i>	Ohio
<i>Escherichia coli</i>	NCDC H515b	23982	O103:K:H8		

TABLE 4. O111 Strains

Description	Designation	ATCC® No.	Serotype	Presence of Select Virulence Genes	Isolation Location
<i>Escherichia coli</i>	2002-3092	BAA-2201	O111:H8	<i>stx1+/stx2-/eae+</i>	Iowa
<i>Escherichia coli</i>	00-3237	BAA-2180	O111:H8	<i>stx1+/stx2+/eae+</i>	South Dakota
<i>Escherichia coli</i>	10C-3114	BAA-2217	O111:H8	<i>stx1+/stx2+/eae+</i>	Missouri
<i>Escherichia coli</i>	CDC 2000-3025	BAA-184	O111:H8		South Dakota
<i>Escherichia coli</i>	CDC 1999-3302	BAA-180	O111:H8		Utah
<i>Escherichia coli</i>	CDC 1999-3249	BAA-181	O111:H8		South Dakota
<i>Escherichia coli</i>	CDC 1997-3215	BAA-179	O111:H8		Alabama
<i>Escherichia coli</i>	B99BE001161	700840	O111:H8		Texas
<i>Escherichia coli</i>	CDC 3250-76	29552	O111a,111b: K58:H21		California
<i>Escherichia coli</i>	Stoke W	33780	O111:K58(B4):H-		Scotland
<i>Escherichia coli</i>	2001-3357	BAA-2209	O111:NONMOTILE	<i>stx1+/stx2+/eae+</i>	Ohio
<i>Escherichia coli</i>	2001-3010	BAA-2182	O111:NONMOTILE	<i>stx1+/stx2-/eae+</i>	Virginia
<i>Escherichia coli</i>	CDC B170	43887	O111:NONMOTILE	<i>stx1-/stx2-/eae+</i>	

TABLE 5. O121 Strains

Description	Designation	ATCC® No.	Serotype	Presence of Select Virulence Genes	Isolation Location
<i>Escherichia coli</i>	2003-3194	BAA-2184	O121:H19	<i>stx1-/stx2+/eae+</i>	California
<i>Escherichia coli</i>	2002-3211	BAA-2219	O121:H19	<i>stx1+/stx2+/eae+</i>	Virginia
<i>Escherichia coli</i>	2000-3370	BAA-2203	O121:H19	<i>stx1-/stx2+/eae+</i>	Michigan
<i>Escherichia coli</i>	99-3300	BAA-2187	O121:H19	<i>stx1-/stx2+/eae+</i>	Utah
<i>Escherichia coli</i>	10C-3041	BAA-2220	O121:H19	<i>stx1-/stx2+/eae+</i>	Iowa
<i>Escherichia coli</i>	09C-3857	BAA-2221	O121:H19	<i>stx1+/stx2+/eae+</i>	Nebraska

TABLE 6. O145 Strains

Description	Designation	ATCC® No.	Serotype	Presence of Select Virulence Genes	Isolation Location
<i>Escherichia coli</i>	2003-3375	BAA-2211	O145:H25	<i>stx1</i> -/ <i>stx2</i> +/ <i>eae</i> +	Minnesota
<i>Escherichia coli</i>	2006-3013	BAA-2197	O145:H28	<i>stx1</i> +/ <i>stx2</i> -/ <i>eae</i> +	California
<i>Escherichia coli</i>	TW07865	BAA-2129	O145:H28		Germany
<i>Escherichia coli</i>	EH1533	BAA-1652	O145:H48		Belgium
<i>Escherichia coli</i>	2006-3142	BAA-2222	O145:Nonmotile	<i>stx1</i> +/ <i>stx2</i> -/ <i>eae</i> +	Minnesota
<i>Escherichia coli</i>	2005-3287	BAA-2223	O145:Nonmotile	<i>stx1</i> +/ <i>stx2</i> +/ <i>eae</i> +	
<i>Escherichia coli</i>	2003-3054	BAA-2208	O145:Nonmotile	<i>stx1</i> -/ <i>stx2</i> +/ <i>eae</i> +	Wisconsin
<i>Escherichia coli</i>	2002-3034	BAA-2195	O145:Nonmotile	<i>stx1</i> +/ <i>stx2</i> -/ <i>eae</i> +	Georgia
<i>Escherichia coli</i>	2001-3022	BAA-2194	O145:Nonmotile	<i>stx1</i> -/ <i>stx2</i> +/ <i>eae</i> +	Missouri
<i>Escherichia coli</i>	2000-3413	BAA-2206	O145:Nonmotile	<i>stx1</i> -/ <i>stx2</i> +/ <i>eae</i> +	New Mexico
<i>Escherichia coli</i>	99-3311	BAA-2192	O145:Nonmotile	<i>stx1</i> +/ <i>stx2</i> +/ <i>eae</i> +	South Dakota
<i>Escherichia coli</i>	TW08087	BAA-2130	O145:Nonmotile		

TABLE 7. O Antigen strains lacking STEC virulence genes

Description	Designation	ATCC® No.	Serotype	Presence of Select Virulence Genes	Isolation Location
<i>Escherichia coli</i>	2003-3055	BAA-2212	O26:H4	<i>stx1</i> -/ <i>stx2</i> -/ <i>eae</i> -	Wisconsin
<i>Escherichia coli</i>	2005-3342	BAA-2214	O103:NONMOTILE	<i>stx1</i> -/ <i>stx2</i> -/ <i>eae</i> -	Virginia
<i>Escherichia coli</i>	99-3071	BAA-2216	O145:H34	<i>stx1</i> -/ <i>stx2</i> -/ <i>eae</i> +*	Minnesota
<i>Escherichia coli</i>	2000-3140	BAA-2218	O45:H31	<i>stx1</i> -/ <i>stx2</i> -/ <i>eae</i> -	Georgia
<i>Escherichia coli</i>	98-3306	BAA-2190	O121:NONMOTILE	<i>stx1</i> -/ <i>stx2</i> -/ <i>eae</i> -	Republic of South Africa
<i>Escherichia coli</i>	98-3167	BAA-2191	O45:H2	<i>stx1</i> +/ <i>stx2</i> -/ <i>eae</i> +	Georgia

*Strain is positive for intimin

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