

Identification and Characterization of *Sejorgia lycomia* sp. nov., a Unique Isolate from Loyalsock Creek



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Introduction:

- The aim of this study is to identify and characterize a potentially novel organism that was isolated from the Loyalsock Creek in Lycoming County, Pennsylvania.
- In lotic ecological systems (as is the case with Loyalsock Creek), bacteria primarily fill a variety of roles, such as decomposing organic material, biofilm communities, nutrient cycling, and/or in commensal relationships with stream organisms.
- Identifying a novel bacteria species from the Loyalsock Creek can provide more insight into the microbial communities that exist within that ecosystem.
- If an undiscovered bacterium has a particularly important role to play, then this could impact the environmental system and how it is viewed.
- Our hypothesis is that *Sejorgia lycomia* JJC, one of the organisms that was isolated for Lycoming College's Microbiology course, is indeed a novel species based upon preliminary studies utilizing Bergey's Manual of Determinative Microbiology as well as comparison and alignment of the 16S rRNA sequence.

Results:

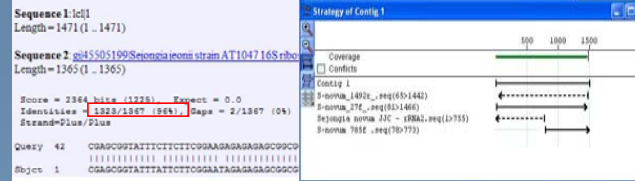


Figure 1: (L) BLAST Alignment of *Sejorgia lycomia* JJC and *Sejorgia jeonii*. (R) Strategy view of the assembled 16S rRNA sequence used in the RDP Search and BLAST2 Alignment.

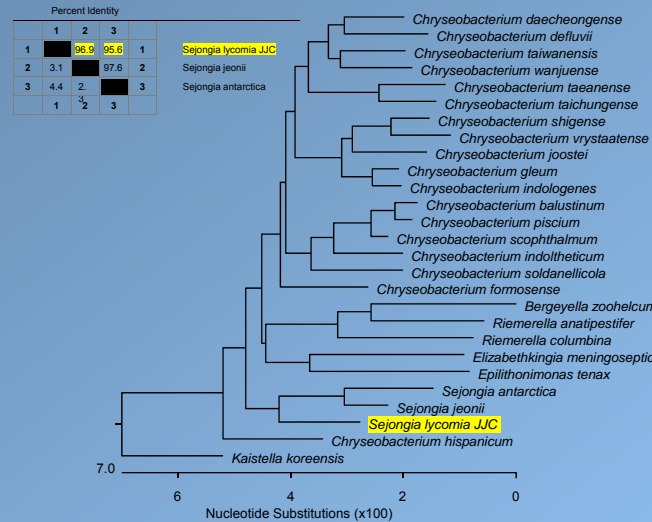


Figure 2: Phylogenetic cladogram of *Sejorgia lycomia* JJC and the most closely related species. To the left of the tree is a sequence distance matrix, which compares *Sejorgia lycomia* (highlighted in red), *Sejorgia jeonii*, and *Sejorgia antarctica*.

| Fatty Acid | <i>Sejorgia lycomia</i> | <i>Sejorgia antarctica</i> | <i>Sejorgia jeonii</i> |
|-------------------|-------------------------|----------------------------|------------------------|
| 13:0 iso | 8.92 | 2.50 | 2.90 |
| 13:0 anteiso | 0.76 | 3.20 | 3.60 |
| 15:0 iso | 39.01 | 13.60 | 12.20 |
| 15:0 anteiso | 8.42 | 15.20 | 24.20 |
| 15:0 iso 3OH | 4.21 | 1.00 | 1.30 |
| 15:1 anteiso A | 0.00 | 6.60 | 0.00 |
| 16:0 iso | 0.36 | 2.80 | 5.70 |
| 16:0 10-Methyl | 15.79 | 0.00 | 0.00 |
| 16:0 iso 3OH | 0.00 | 5.10 | 5.70 |
| 16:1 ω7c/16:1 ω6c | 6.57 | 2.70 | 2.60 |
| 16:1 iso H | 0.00 | 3.60 | 9.10 |
| 17:0 iso 3OH | 8.86 | 5.60 | 4.40 |
| 17:1 iso ω9c | 0.00 | 21.30 | 8.60 |
| 17:1 anteiso ω9c | 0.00 | 2.50 | 1.90 |

Table 1: Dominant Membrane Fatty Acids as detected using MIDI system. Each figure is a percentage of the total fatty acids found in the membrane. Differences between species are highlighted in yellow. Data from *Sejorgia antarctica* and *Sejorgia jeonii* is from Yi, et al. 2005. Profiling of *Sejorgia lycomia* was performed by Microbial ID, Inc. of Newark, Delaware.

| Parameter | <i>Sejorgia lycomia</i> | <i>Sejorgia antarctica</i> | <i>Sejorgia jeonii</i> |
|-------------------|-------------------------|----------------------------|------------------------|
| 5°C | - | + | + |
| 30°C | + | var | var |
| Lipase | + | + | + |
| Nitrate Reduction | - | - | - |
| Nitrite Reduction | - | - | - |
| H ₂ S | - | - | - |
| Indole | - | + | + |
| Maltose | + | + | + |
| D-Xylose | + | - | - |
| D-Glucose | + | + | + |

Table 2: Biochemical and phenotypic test results. Var denotes a variable result as found by Yi, et al. (2005). The differences between the species are highlighted in yellow.

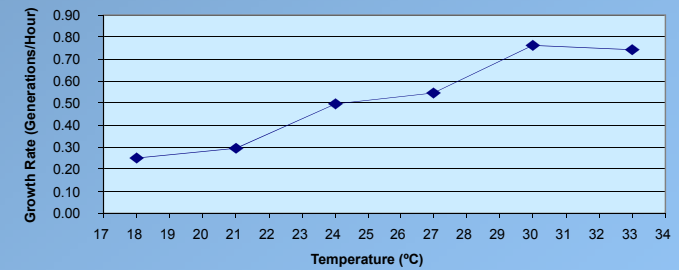


Figure 3: Graph of the Growth Rates of *Sejorgia lycomia* at various temperatures. Growth Rate is the inverse of doubling time, which was measured using absorbance at 600 nm. Growth Rates were calculated using exponential trend line equations. The clear trend is that the optimum temperature tested was 30°C, although the true optimum most likely lies between 30° and 33°.

Description of Species: *Sejorgia lycomia* (Se.jong'i.a. ly.com.ia.) is an aerobic, gram-negative, mucoid, yellow-pigmented, rod-shaped organism. Optimally grows at approximately 30°C. Metabolizes lecithinase and starch. Produces acid aerobically from D-Xylose, D-Glucose, and Maltose. Does not reduce nitrate or produce indole. Predominant fatty acids include 13:0 iso, 15:0 iso, 15:0 anteiso, 10 Methyl 16:0, and 17:0 iso 3OH. The strain was initially isolated from Loyalsock Creek near Montoursville, Pa.

Conclusions:

- Sejorgia lycomia* JJC is a novel organism belonging to the *Sejorgia* genus in the Flavobacteriaceae family.
- This conclusion is based upon 16S sequence homology of less than 97% and a unique membrane fatty acid composition.
- Future work includes an Honors Thesis Project in Spring 2008, where further characterization will take place using Phenotypic Arrays as well as further biochemical and growth testing.
- Overall focus of Honors Thesis is to publish organism in the International Journal of Systematic and Evolutionary Microbiology as well as make 16S sequence available for use by other researchers.

References:

- Yi, H, H I. Yoon, and J Chun. "Sejorgia antarctica Gen. Nov., Sp. Nov. and *Sejorgia Jeonii* Sp. Nov., Isolated From the Antarctic." International Journal of Systematic and Evolutionary Microbiology 55 (2005): 409-416.

Methods:

