



(51) International Patent Classification:

C12N 1/21 (2006.01) *C12P 7/56* (2006.01)
C12N 15/74 (2006.01) *C12R 1/07* (2006.01)
C12N 15/52 (2006.01)

(21) International Application Number:

PCT/US2011/061807

(22) International Filing Date:

22 November 2011 (22.11.2011)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/416,002 22 November 2010 (22.11.2010) US

(71) Applicant (*for all designated States except US*): **UNIVERSITY OF FLORIDA RESEARCH** [US/US]; Foundation, Inc., 223 Grinter Hall, Gainesville, FL 32611 (US).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **WANG, Qingzhao** [CN/US]; 5400 NW 39th Avenue #184, Gainesville, FL 32606 (US). **SHANMUGAM, Keelnatham, T.** [US/US]; 3215 N.W. 47th Place, Gainesville, FL 32605 (US). **INGRAM, Lonnie, O'neal** [US/US]; 3132 N.W. 57th Terrace, Gainesville, FL 32606 (US).

(74) Agents: **LLOYD, Jeff** et al.; Saliwanchik, Lloyd & Eisenschenk, P.O.Box 142950, Gainesville, FL 32614-2950 (US).

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- without international search report and to be republished upon receipt of that report (Rule 48.2(g))
- with sequence listing part of description (Rule 5.2(a))

(54) Title: ENGINEERING OF THERMOTOLERANT BACILLUS COAGULANS FOR PRODUCTION OF D(-)-LACTIC ACID

(57) Abstract: Genetically modified microorganisms having the ability to produce D(-)-lactic acid at temperatures between 30°C and 55°C are provided. In various embodiments, the microorganisms may have the chromosomal lactate dehydrogenase (*ldh*) gene and/or the chromosomal acetolactate synthase (*alsS*) gene inactivated. Exemplary microorganisms for use in the disclosed methods are *Bacillus spp.*, such as *Bacillus coagulans*.

