PTO Form 1930 (Rev 9/2007)
OMB No. 0651-0050 (Exp. 05/31/2014)

Request for Reconsideration after Final Action

The table below presents the data as entered.

Input Field	Entered
SERIAL NUMBER	77878491
LAW OFFICE ASSIGNED	LAW OFFICE 111
MARK SECTION (no change)	
ARGUMENT(S)	
Please see the actual argument text attached within the Evidence section.	
EVIDENCE SECTION	
EVIDENCE FILE NAME(S)	
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DESCRIPTION OF EVIDENCE FILE	Applicant's Request for Reconsideration, TESS trademark records, encyclopedic and dictionary information, and webpages concerning the Cited Marks.
GOODS AND/OR SERVICES SECTION (005)(current)	
INTERNATIONAL CLASS	005
DESCRIPTION	
diagnostic preparations for medical purposes; diagnostic preparations for medical and veterinary purposes; diagnostic reagents for in-vitro use	
FILING BASIS	Section 1(b)
FILING BASIS	Section 44(d)

FOREIGN APPLICATION NUMBER	008316796
FOREIGN APPLICATION COUNTRY	European Community
FOREIGN FILING DATE	05/22/2009
FILING BASIS	Section 44(e)
FOREIGN REGISTRATION COUNTRY	European Community
GOODS AND/OR SERVICES SECTION (005)(proposed)	
INTERNATIONAL CLASS	005
TRACKED TEXT DESCRIPTION	
diagnostic preparations for medical purposes; diagnostic preparations for medical and veterinary purposes; ~~diagnostic reagents for in-vitro use~~; diagnostic reagents for in-vitro use, specifically for blood analysis	
FINAL DESCRIPTION	
diagnostic preparations for medical purposes; diagnostic preparations for medical and veterinary purposes; diagnostic reagents for in-vitro use, specifically for blood analysis	
FILING BASIS	Section 1(b)
FILING BASIS	Section 44(d)
FOREIGN APPLICATION NUMBER	008316796
FOREIGN APPLICATION COUNTRY	European Community
FOREIGN FILING DATE	05/22/2009
FILING BASIS	Section 44(e)
FOREIGN REGISTRATION COUNTRY	European Community
GOODS AND/OR SERVICES SECTION (009)(current)	
INTERNATIONAL CLASS	009
DESCRIPTION	
scientific apparatus for diagnostic testing of biological samples (other than for medical use); parts and fittings therefor	

FILING BASIS	Section 1(b)
FILING BASIS	Section 44(d)
FOREIGN APPLICATION NUMBER	008316796
FOREIGN APPLICATION COUNTRY	European Community
FOREIGN FILING DATE	05/22/2009
FILING BASIS	Section 44(e)
FOREIGN REGISTRATION COUNTRY	European Community
GOODS AND/OR SERVICES SECTION (009)(proposed)	
INTERNATIONAL CLASS	009
TRACKED TEXT DESCRIPTION	
~~scientific apparatus for diagnostic testing of biological samples (other than for medical use)~~; scientific apparatus for diagnostic testing of biological samples (other than for medical use or cytometry use); parts and fittings therefor	
FINAL DESCRIPTION	
scientific apparatus for diagnostic testing of biological samples (other than for medical use or cytometry use); parts and fittings therefor	
FILING BASIS	Section 1(b)
FILING BASIS	Section 44(d)
FOREIGN APPLICATION NUMBER	008316796
FOREIGN APPLICATION COUNTRY	European Community
FOREIGN FILING DATE	05/22/2009
FILING BASIS	Section 44(e)
FOREIGN REGISTRATION COUNTRY	European Community
GOODS AND/OR SERVICES SECTION (010)(current)	
INTERNATIONAL CLASS	010
DESCRIPTION	

Apparatus for diagnostic purposes for testing blood and other bodily fluids and tissues; apparatus for medical diagnostic purposes for testing blood and other bodily fluids and tissues; medical apparatus for performing in-vitro diagnostic tests; testing apparatus for medical and diagnostic purposes for testing blood and other bodily fluids and tissues; scientific apparatus for medical diagnostic testing of biological samples; disposable microfludic cartridges for medical use; apparatus for sale in kit form for medical diagnostic purposes for testing blood and other bodily fluids and tissues; test plates for use in medical diagnostic tests of biological samples; in-vitro diagnostic testing apparatus; biosensors for use in medical diagnostic tests of biological samples; parts and fittings therefor

FILING BASIS	Section 1(b)
FILING BASIS	Section 44(d)
FOREIGN APPLICATION COUNTRY	European Community
FILING BASIS	Section 44(e)
FOREIGN REGISTRATION NUMBER	008316796
FOREIGN REGISTRATION COUNTRY	European Community
FOREIGN REGISTRATION DATE	01/21/2010
FOREIGN EXPIRATION DATE	05/22/2019

GOODS AND/OR SERVICES SECTION (010)(proposed)

INTERNATIONAL CLASS	010

TRACKED TEXT DESCRIPTION

Apparatus for diagnostic purposes for testing blood and other bodily fluids and tissues; apparatus for medical diagnostic purposes for testing blood and other bodily fluids and tissues; ~~medical apparatus for performing in-vitro diagnostic tests~~; medical apparatus for performing in-vitro diagnostic tests, specifically for blood analysis; testing apparatus for medical and diagnostic purposes for testing blood and other bodily fluids and tissues; scientific apparatus for medical diagnostic testing of biological samples; disposable microfludic cartridges for medical use; apparatus for sale in kit form for medical diagnostic purposes for testing blood and other bodily fluids and tissues; test plates for use in medical diagnostic tests of biological samples; ~~in-vitro diagnostic testing apparatus~~; in-vitro diagnostic testing apparatus, specifically for blood analysis; biosensors for use in medical diagnostic tests of biological samples; parts and fittings therefor; all not for use in cytometry

FINAL DESCRIPTION

Apparatus for diagnostic purposes for testing blood and other bodily fluids and tissues; apparatus for medical diagnostic purposes for testing blood and other bodily fluids and tissues; medical apparatus for

performing in-vitro diagnostic tests, specifically for blood analysis; testing apparatus for medical and diagnostic purposes for testing blood and other bodily fluids and tissues; scientific apparatus for medical diagnostic testing of biological samples; disposable microfludic cartridges for medical use; apparatus for sale in kit form for medical diagnostic purposes for testing blood and other bodily fluids and tissues; test plates for use in medical diagnostic tests of biological samples; in-vitro diagnostic testing apparatus, specifically for blood analysis; biosensors for use in medical diagnostic tests of biological samples; parts and fittings therefor; all not for use in cytometry	
FILING BASIS	Section 1(b)
FILING BASIS	Section 44(d)
FOREIGN APPLICATION COUNTRY	European Community
FILING BASIS	Section 44(e)
FOREIGN REGISTRATION NUMBER	008316796
FOREIGN REGISTRATION COUNTRY	European Community
FOREIGN REGISTRATION DATE	01/21/2010
FOREIGN EXPIRATION DATE	05/22/2019
SIGNATURE SECTION	
RESPONSE SIGNATURE	/J. Robert LeBlanc/
SIGNATORY'S NAME	J. Robert LeBlanc
SIGNATORY'S POSITION	Attorney of record, Texas bar member
SIGNATORY'S PHONE NUMBER	214-651-5106
DATE SIGNED	10/17/2013
AUTHORIZED SIGNATORY	YES
CONCURRENT APPEAL NOTICE FILED	YES
FILING INFORMATION SECTION	
SUBMIT DATE	Thu Oct 17 16:05:41 EDT 2013
TEAS STAMP	USPTO/RFR-165.97.22.214-20131017160541997560-77878491-5006b6428da6e3e96779d

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PTO Form 1930 (Rev 9/2007)
OMB No. 0651-0050 (Exp. 05/31/2014)

Request for Reconsideration after Final Action

To the Commissioner for Trademarks:

Application serial no. **77878491** has been amended as follows:

ARGUMENT(S)
In response to the substantive refusal(s), please note the following:

Please see the actual argument text attached within the Evidence section.

EVIDENCE
Evidence in the nature of Applicant's Request for Reconsideration, TESS trademark records, encyclopedic and dictionary information, and webpages concerning the Cited Marks. has been attached.
Original PDF file:
evi_1659722214-154607123_._BIOSURFIT_Final_OAR.pdf
Converted PDF file(s) (10 pages)
Evidence-1
Evidence-2
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Original PDF file:
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Evidence-7
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Evidence-9
Evidence-10
Evidence-11
Evidence-12
Evidence-13
Evidence-14

CLASSIFICATION AND LISTING OF GOODS/SERVICES
Applicant proposes to amend the following class of goods/services in the application:
Current: Class 005 for diagnostic preparations for medical purposes; diagnostic preparations for medical and veterinary purposes; diagnostic reagents for in-vitro use
Original Filing Basis:
Filing Basis: Section 1(b), Intent to Use: The applicant has had a bona fide intention to use or use through the applicant's related company or licensee the mark in commerce on or in connection with the identified goods and/or services as of the filing date of the application. (15 U.S.C. Section 1051(b)).

Filing Basis: Section 44(d), Priority based on foreign filing: Applicant has had a bona fide intention to use the mark in commerce on or in connection with the identified goods and/or services, and asserts a claim of priority based on [European Community application number 008316796 filed 05/22/2009]. 15 U.S.C.Section 1126(d), as amended.

Filing Basis: Section 44(e), Based on Foreign Registration: Applicant has a bona fide intention to use the mark in commerce on or in connection with the identified goods and /or services, and submits a copy of [European Community registration number _____ registered _____ with a renewal date of _____ and an expiration date of _____], and translation thereof, if appropriate. 15 U.S.C. Section 1126(e), as amended.

Proposed:
Tracked Text Description: diagnostic preparations for medical purposes; diagnostic preparations for medical and veterinary purposes; ~~diagnostic reagents for in-vitro use~~; diagnostic reagents for in-vitro use, specifically for blood analysis

Class 005 for diagnostic preparations for medical purposes; diagnostic preparations for medical and veterinary purposes; diagnostic reagents for in-vitro use, specifically for blood analysis
Filing Basis: Section 1(b), Intent to Use: The applicant has a bona fide intention to use or use through the applicant's related company or licensee the mark in commerce on or in connection with the identified goods and/or services as of the filing date of the application. (15 U.S.C. Section 1051(b)).

Filing Basis: Section 44(d), Priority based on foreign filing: Applicant has a bona fide intention to use the mark in commerce on or in connection with the identified goods and/or services, and asserts a claim of

priority based on [European Community application number 008316796 filed 05/22/2009]. 15 U.S.C.Section 1126(d), as amended.

Filing Basis: Section 44(e), Based on Foreign Registration: Applicant has a bona fide intention to use the mark in commerce on or in connection with the identified goods and /or services, and will submit a copy of [European Community registration number _____ registered _____ with a renewal date of _____ and an expiration date of _____], and translation thereof, if appropriate, before the application may proceed to registration. 15 U.S.C. Section 1126(e), as amended.

Applicant proposes to amend the following class of goods/services in the application:
Current: Class 009 for scientific apparatus for diagnostic testing of biological samples (other than for medical use); parts and fittings therefor
Original Filing Basis:
Filing Basis: Section 1(b), Intent to Use: The applicant has had a bona fide intention to use or use through the applicant's related company or licensee the mark in commerce on or in connection with the identified goods and/or services as of the filing date of the application. (15 U.S.C. Section 1051(b)).

Filing Basis: Section 44(d), Priority based on foreign filing: Applicant has had a bona fide intention to use the mark in commerce on or in connection with the identified goods and/or services, and asserts a claim of priority based on [European Community application number 008316796 filed 05/22/2009]. 15 U.S.C.Section 1126(d), as amended.

Filing Basis: Section 44(e), Based on Foreign Registration: Applicant has a bona fide intention to use the mark in commerce on or in connection with the identified goods and /or services, and submits a copy of [European Community registration number _____ registered _____ with a renewal date of _____ and an expiration date of _____], and translation thereof, if appropriate. 15 U.S.C. Section 1126(e), as amended.

Proposed:
Tracked Text Description: ~~scientific apparatus for diagnostic testing of biological samples (other than for medical use)~~; scientific apparatus for diagnostic testing of biological samples (other than for medical use or cytometry use); parts and fittings therefor

Class 009 for scientific apparatus for diagnostic testing of biological samples (other than for medical use or cytometry use); parts and fittings therefor
Filing Basis: Section 1(b), Intent to Use: The applicant has a bona fide intention to use or use through the applicant's related company or licensee the mark in commerce on or in connection with the identified goods and/or services as of the filing date of the application. (15 U.S.C. Section 1051(b)).

Filing Basis: Section 44(d), Priority based on foreign filing: Applicant has a bona fide intention to use the mark in commerce on or in connection with the identified goods and/or services, and asserts a claim of priority based on [European Community application number 008316796 filed 05/22/2009]. 15 U.S.C.Section 1126(d), as amended.

Filing Basis: Section 44(e), Based on Foreign Registration: Applicant has a bona fide intention to use the mark in commerce on or in connection with the identified goods and /or services, and will submit a copy of [European Community registration number _____ registered _____ with a renewal date of _____ and an expiration date of _____], and translation thereof, if appropriate, before the application may proceed to registration. 15 U.S.C. Section 1126(e), as amended.

Applicant proposes to amend the following class of goods/services in the application:
Current: Class 010 for Apparatus for diagnostic purposes for testing blood and other bodily fluids and tissues; apparatus for medical diagnostic purposes for testing blood and other bodily fluids and tissues; medical apparatus for performing in-vitro diagnostic tests; testing apparatus for medical and diagnostic purposes for testing blood and other bodily fluids and tissues; scientific apparatus for medical diagnostic testing of biological samples; disposable microfludic cartridges for medical use; apparatus for sale in kit form for medical diagnostic purposes for testing blood and other bodily fluids and tissues; test plates for use in medical diagnostic tests of biological samples; in-vitro diagnostic testing apparatus; biosensors for use in medical diagnostic tests of biological samples; parts and fittings therefor
Original Filing Basis:
Filing Basis: Section 1(b), Intent to Use: The applicant has had a bona fide intention to use or use through the applicant's related company or licensee the mark in commerce on or in connection with the identified goods and/or services as of the filing date of the application. (15 U.S.C. Section 1051(b)).

Filing Basis: Section 44(d), Priority based on foreign filing: Applicant has had a bona fide intention to use the mark in commerce on or in connection with the identified goods and/or services, and asserts a claim of priority based on [European Community application number _____ filed _____]. 15 U.S.C.Section 1126(d), as amended.

Filing Basis: Section 44(e), Based on Foreign Registration: Applicant has a bona fide intention to use the mark in commerce on or in connection with the identified goods and /or services, and submits a copy of [European Community registration number 008316796 registered 01/21/2010 with a renewal date of _____ and an expiration date of 05/22/2019], and translation thereof, if appropriate. 15 U.S.C. Section 1126(e), as amended.

Proposed:
Tracked Text Description: Apparatus for diagnostic purposes for testing blood and other bodily fluids and tissues; apparatus for medical diagnostic purposes for testing blood and other bodily fluids and tissues; ~~medical apparatus for performing in-vitro diagnostic tests~~; medical apparatus for performing in-vitro diagnostic tests, specifically for blood analysis; testing apparatus for medical and diagnostic purposes for testing blood and other bodily fluids and tissues; scientific apparatus for medical diagnostic testing of biological samples; disposable microfludic cartridges for medical use; apparatus for sale in kit form for medical diagnostic purposes for testing blood and other bodily fluids and tissues; test plates for use in medical diagnostic tests of biological samples; ~~in-vitro diagnostic testing apparatus~~; in-vitro diagnostic testing apparatus, specifically for blood analysis; biosensors for use in medical diagnostic tests of biological samples; parts and fittings therefor; all not for use in cytometry

Class 010 for Apparatus for diagnostic purposes for testing blood and other bodily fluids and tissues; apparatus for medical diagnostic purposes for testing blood and other bodily fluids and tissues; medical apparatus for performing in-vitro diagnostic tests, specifically for blood analysis; testing apparatus for medical and diagnostic purposes for testing blood and other bodily fluids and tissues; scientific apparatus for medical diagnostic testing of biological samples; disposable microfludic cartridges for medical use; apparatus for sale in kit form for medical diagnostic purposes for testing blood and other bodily fluids and tissues; test plates for use in medical diagnostic tests of biological samples; in-vitro diagnostic testing apparatus, specifically for blood analysis; biosensors for use in medical diagnostic tests of biological samples; parts and fittings therefor; all not for use in cytometry
Filing Basis: Section 1(b), Intent to Use: The applicant has a bona fide intention to use or use through the applicant's related company or licensee the mark in commerce on or in connection with the identified goods and/or services as of the filing date of the application. (15 U.S.C. Section 1051(b)).

Filing Basis: Section 44(d), Priority based on foreign filing: Applicant has a bona fide intention to use the mark in commerce on or in connection with the identified goods and/or services, and asserts a claim of priority based on [European Community application number _____ filed _____]. 15 U.S.C.Section 1126(d), as amended.

Filing Basis: Section 44(e), Based on Foreign Registration: Applicant has a bona fide intention to use the mark in commerce on or in connection with the identified goods and /or services, and will submit a copy of [European Community registration number 008316796 registered 01/21/2010 with a renewal date of _____ and an expiration date of 05/22/2019], and translation thereof, if appropriate, before the application may proceed to registration. 15 U.S.C. Section 1126(e), as amended.

SIGNATURE(S)
Request for Reconsideration Signature
Signature: /J. Robert LeBlanc/ Date: 10/17/2013
Signatory's Name: J. Robert LeBlanc
Signatory's Position: Attorney of record, Texas bar member

Signatory's Phone Number: 214-651-5106

The signatory has confirmed that he/she is an attorney who is a member in good standing of the bar of the highest court of a U.S. state, which includes the District of Columbia, Puerto Rico, and other federal territories and possessions; and he/she is currently the applicant's attorney or an associate thereof; and to the best of his/her knowledge, if prior to his/her appointment another U.S. attorney or a Canadian attorney/agent not currently associated with his/her company/firm previously represented the applicant in this matter: (1) the applicant has filed or is concurrently filing a signed revocation of or substitute power of attorney with the USPTO; (2) the USPTO has granted the request of the prior representative to withdraw; (3) the applicant has filed a power of attorney appointing him/her in this matter; or (4) the applicant's appointed U.S. attorney or Canadian attorney/agent has filed a power of attorney appointing him/her as an associate attorney in this matter.

The applicant is filing a Notice of Appeal in conjunction with this Request for Reconsideration.

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Internet Transmission Date: Thu Oct 17 16:05:41 EDT 2013
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OAR – Ser. No. 77878491 – BIOSURFIT

RESPONSE

As a preliminary matter, the Office Action regarding this refusal is marked "final." Action on the application was suspended pending disposition of prior-filed applications, but the discussion of the 2(d) refusal with respect to those applications and the Cited Marks was deferred. Pursuant to TMEP § 716.01, and because the Notice of Suspension did not indicate that the refusals would be made final following suspension, Applicant respectfully submits that the Office Action should not be final. Applicant's counsel attempted to contact the Examining Attorney via phone and email to request clarification, but as the deadline to respond to this Office Action has approached, Applicant is filing this Response as a Request for Reconsideration and has filed a Notice of Appeal to preserve its rights.

Next, Applicant has amended the identification of goods to clarify that: (1) its diagnostic reagents for in-vitro use in Class 5 relate specifically to diagnostic reagents for use in blood analysis; (2) its scientific apparatus for diagnostic testing of biological samples in Class 9 does not include apparatus for use in cytometry; and (3) its medical apparatus for performing in-vitro diagnostic tests in Class 10 are used specifically for blood analysis and are not for use in cytometry.

Finally, the Examining Attorney has indicated that there may be a likelihood of confusion between Applicant's mark BIOSURFIT ("Applicant's Mark") and Biosure, Inc.'s registrations for BIOSURE, Reg. Nos. 1,945,465; 2,259,048; and 2,817,555 ("the Cited Marks"). For the reasons discussed below, Applicant respectfully submits that no likelihood of confusion in the instant case exists. The weak and extraordinarily common nature of BIOS-formative marks for goods in the relevant field, the dissimilarities between the marks, the unique and divergent connotations of the marks, the differences in the goods provided under the respective marks, the distinct contexts in which the respective goods are marketed, and the sophisticated nature of the relevant consumers all illustrate the lack of likelihood of confusion in this case. *See In re E.I. DuPont de Nemours & Co.*, 476 F.2d 1357, 177 U.S.P.Q. 563 (C.C.P.A. 1973).

As a threshold matter, the Cited Marks display an extraordinarily limited degree of distinctiveness, an important factor in the likelihood of confusion analysis. BIOS-formative marks are exceedingly common in the relevant fields. Applicant refers the Examining Attorney to the following non-exhaustive list of peacefully coexisting BIOS-formative registrations, owned by different parties, covering goods and services closely related to those listed in the Cited Marks, which comprise only a small sample of the total BIOS-formative filings. *See* **Exhibit 1** for TESS printouts of the below-listed filings.

Mark	Owner	Edited Goods/Services
(The Cited Marks) **BIOSURE** Reg. No. 1,945,465	Biosure, Inc.	5: diagnostic reagents for clinical medical laboratory use 10: containers for infectious waste
BIOSURE Reg. No. 2,259,048		1: live and dead cells and organelles for research use 5: live and dead cells and organelles for clinical diagnostic use
BIOSURE Reg. No. 2,817,555		1: Diagnostic reagents for scientific or research use
BIOSS Reg. No. 4,145,362	BIOSS, Inc.	1: Biochemical reagents … diagnostic reagents … reagents for scientific or medical research use …
BIOSOLUTIONS Reg. No. 1,941,719	Brand-Nu Labortories, Inc.	1: Chemicals and reagents for use in molecular biology, biopharmaceutical production and DNA testing and analysis
BIOSOLVE Reg. No. 3,644,373	Biomatrica, Inc.	1: Reagents used for the purification of biological materials for use in scientific and research applications
BIOSERVATIVE Reg. No. 4,226,497	Capitol Vial, Inc.	1: Chemical reagents other than for medical or veterinary purposes, namely, chemical stabilizing reagent …
BIOSEIZER Reg. No. 3,945,191	Taiwan Liposome Co., Ltd.	5: … Medical imaging reagents …
BIOSPECTRA Reg. No. 4,076,412	Biospectra, Inc.	1: Biochemical buffers, reagent chemicals and specialty chemicals …
BIOSPOT Reg. No. 3,544,006	Cellular Technology Limited	5: Medical diagnostic kits comprising reagents and assay plates for clinical or medical use
BIOSHAKE Reg. No. 4,252,178	Quantifoil Instruments GmbH	9: Laboratory apparatus for the treatment, conversion and processing of liquid samples, namely, apparatus for the dosing, refilling, mixing, temperature control, concentrating, homogenizing and filtering of substances and reagents …
BIOSCRIPT Reg. No. 3,318,843	Bioline Reagents Limited	1: Reagents for laboratory use …
BIOSCORE Reg. No. 3,474,089	Enzo Biochem, Inc.	1: Reagent kits for scientific use consisting primarily of primers, enzymes and buffers for use in the

		screening and/or amplification of nucleic acid 5: Reagent kits for medical use …
BIOSCOT Reg. No. 3,575,025	Merck KGAA	1: Diagnostic blood typing reagents for clinical or medical laboratory use
BIOSCALE Reg. No. 3,313,355	Bioscale, Inc.	1: Diagnostic reagents for scientific use 10: Medical equipment and the nature of a bio-molecular sensing system and microelectronic mechanical system space …
BIOSTEP Reg. No. 3,462,462	Biostep GmbH	1: Biological and biochemical products, namely chemicals, chemical preparations including gels, buffers, stains and dies, and reagents and chemical test kits consisting primarily of chemicals, chemical preparations, and reagents offer use in scientific and medical research and laboratories …
BIOSTIC Reg. No. 3,640,627	Mo Bio Laboratories, Inc.	1: Reagent kits comprising generic DNA circle, DNA primers, polymerase and buffers for use in biotechnology fields
BIOSTAR Reg. No. 2,050,360	Inverness Medial-Biostar Inc.	9: Diagnostic test kits for scientific research consisting of test tubes, pipettes, culture slides and clinical reagents
BIOSTAR Reg. No. 1,915,949		5: Diagnostic reagents for clinical medical laboratory use
BIOSTAR Reg. No. 1,921,449		5: Medical diagnostic test kits consisting of reagents …
BIOSTAR Reg. No. 1,436,984		1: Immunodiagnostic essay medical test kits, consisting primarily of free agents and other chemicals …
BIOSTATUS Reg. No. 3,535,747	Biostatus Limited	1: Diagnostic scanning agents for in-vitro use, namely essays and reagents for use in cell-based scientific research … 5: Florescent light emitting reagents for fluorescence-based detection systems for medical or clinical use … 42: Scientific research and development, research and development of chemicals and reagents …
BIOSTRAT Reg. No. 3,958,464	BioVantra, LLC	1: Diagnostic reagents for clinical or medical laboratory use 5: … Reagents and antibodies for use in analysis of gene expression, genetics, … and other analytes in biological samples
BIOSTRAND Reg. No. 2,965,474	Precision System Science Co., Ltd.	1: Chemical carriers having oligo-nucleotides bonded therewith for analysis of DNA sequences, not for medical or veterinary use … 5: Chemical carriers having oligo-nucleotides bonded therewith for analysis of DNA sequences clinical

		medicine or clinical medical procedures … 9: Reagent reservoirs …
G BIOSCIENCES Reg. No. 3,311,781	Geno Technology, Inc.	1: Reagents for research purposes and scientific use
BIOSITE Reg. No. 3,152,581	Alere San Diego, Inc.	1: Reagents for use in scientific and/or medical research uses … 5: Biological reagents, namely anti-bodies for medical and veterinary diagnostic and therapeutic use …
BIOSITE Reg. No. 1,794,618		5: Laboratory diagnostic test kits containing antibodies, reagents, reagent vesicles, support racks, and pipettes
BIOSYN Reg. No. 3,233,771	Biosyn Arzneimittel GmbH	5: Diagnostic chemical reagents and test preparations for medical laboratory clinical use in the production of vaccines …

The fact that so many BIOS-formative marks can coexist, all used in connection with reagents and diagnostic goods, evidences the Trademark Office's recognition that confusion is unlikely between such marks and that they are entitled to only a very narrow scope of protection. *See Am. Chiclet Co. v. Topps Chewing Gum, Inc.*, 112 F. Supp. 848, 97 U.S.P.Q. 528 (E.D.N.Y. 1953), *aff'd*, 210 F.2d 680, 101 U.S.P.Q. 133 (2nd Cir. 1954). Consumers clearly are accustomed to distinguishing among BIOS-formative marks in the relevant fields. As a result, Applicant's Mark is also sufficiently dissimilar so as to avoid confusion among consumers.

This is particularly the case because the term "bios" is highly suggestive in the bioscience industry, particularly as used in connection with reagents. Bioscience consumers are well aware that there are multitudes of BIOS-formative marks for reagents and other diagnostic goods, all offered by different sources, and that they must carefully examine other terms that appear in such marks, as they are in many cases the only distinguishing characteristics between otherwise identical products.

Moreover, Applicant respectfully submits that its mark is dissimilar from the Cited Marks in terms of sight, sound, and commercial impression. Marks are to be considered *in their entireties* when determining whether a likelihood of confusion exists. TMEP § 1207.01(c)(ii); *Franklin Mint Corp. v. Master Mfg. Co.*, 667 F.2d 1005, 212 U.S.P.Q. 233 (C.C.P.A. 1981) (a mark "must be considered as a whole" in determining likelihood of confusion); *Sun-Fun Prods. Inc. v. Suntan Research & Dev., Inc.*,

656 F.2d 186, 213 USPQ 91 (5th Cir. 1981) (the test is "overall impression," not a "dissection of individual features").

Thus, the scope of inquiry must move beyond the fact that both marks contain the term "biosur" to encompass all aspects of the marks' presentation, sound, and connotation, particularly the unique endings of the marks – SURFIT versus SURE, respectively. In fact, "SURFIT" and "SURE" are the dominant features of the marks at issue, and therefore greater consideration should be given to these features in determining likelihood of confusion. *See* TMEP § 1207.01(c)(ii) (stating that "[a]lthough it is not proper to dissect a mark, if one feature of a mark is more significant than another feature, greater weight may be given to the dominant feature for purposes of determining likelihood of confusion"). "SURFIT" and "SURE" are the dominant features of the respective marks because consumers viewing the marks are likely to form a strong association with these distinguishable terms as opposed to the familiar preface "bios." Consumers must rely upon the terms SURFIT and SURE to determine the source of the goods, because the common prefix in the marks at issue, "bios," is markedly weak. *See* TMEP 1207.01(b)(viii). In a field in which marks such as BIOSOLUTIONS and BIOSOLVE, BIOSCORE and BIOSCOT, BIOSTAR and BIOSTATUS, BIOSTRAT and BIOSTRAND, and BIOSITE and BIOSYN, among others, identify types of reagents offered by completely different companies (as discussed previously), consumers instinctively focus on the second term of any BIOS-formative mark that is used in the bioscience/reagents/diagnostics fields in order to determine the source of the goods. Once the "SURFIT" and "SURE" portions of the marks at issue are accorded their proper weight, it is clear that the marks themselves are dissimilar for several key reasons. In short, BIOSURFIT and BIOSURE are simply visually different, with distinct auditory impacts and completely different meanings.

Moreover, if BIOSOLUTIONS and BIOSOLVE, BIOSCORE and BIOSCOT, BIOSTAR and BIOSTATUS, BIOSTRAT and BIOSTRAND, and BIOSITE and BIOSYN can coexist, then surely also so can BIOSURFIT and BIOSURE.

The mere fact that marks share common first terms is a wholly insufficient basis for determining that the marks in their entireties are confusingly similar. *See, e.g., Omaha Nat'l Bank v. Citibank*, 633 F.

Supp. 231, 236, 229 U.S.P.Q. 51 (D. Neb. 1986) (BANK-IN-A-BILLFOLD not confusingly similar with BANK IN A WALLET, though both were used in connection with credit card services); *In re Hearst Corp.*, 982 F.2d 493, 494, 25 U.S.P.Q.2d 1238 (Fed. Cir. 1992) (VARGA GIRL not confusingly similar to VARGAS, both used in connection with similar printed artwork, based on the finding that the unique ending of VARGAS GIRL as used in connection with the term "VARGAS" sufficiently distinguished the marks). Likewise, the distinctive endings of each of the marks at issue – SURFIT versus SURE – combined with the differences between the marks when viewed in their entireties, are sufficiently different to preclude any possibility of confusion between the two marks in the present case.

The marks also impart entirely distinct commercial impressions because the final terms in each of the marks have markedly different meanings. "SURE" connotes the idea of certainty and accuracy. The Cited Marks BIOSURE as a whole, as a result, suggests the idea of a product for use in the bioscience industry that produces accurate results.

By contrast, "BIOSURF" is suggestive of "biosurfactants," which are surface-active substances synthesized by living cells that are useful in a number of industries, including the bioscience industry as a reagent. See **Exhibit 2** for discussion of biosurfactants. BIOSURFIT as a whole can connote the idea of "biosurf-ing it"; that is, a product that is related in some way to biosurfactants. In that regard, Applicant's Mark is not pronounced "bio-shure-fit" but rather as "bio-surf-it," as anyone knowledgeable in the biosciences industry would recognize given the play on "biosurfactants" contained in the mark. This wordplay transforms the mark BIOSURFIT such that it achieves significance greater than that of either the "BIOS" prefix alone, or the Cited Marks. The TTAB has long recognized that such linguistic turns elevate marks to a higher degree of distinctiveness than they might otherwise have realized. When the arrangement of specific terms within a mark is in some way inventive or otherwise evokes a unique commercial impression, the mark as a whole achieves a greater level of distinctiveness. *See In re Nat'l Shooting Sports Found., Inc.*, 219 U.S.P.Q. 1018, 1020 (TTAB 1983); *see also In re Madson Prods., LLC*, Ser. No. 78/565,462 (TTAB Sept. 13, 2007) [non-precedential] (mark YAK SAK distinctive for motion sickness bags because it is "likely to be understood as a double entendre in connection with the

identified goods," since "yak" can also refer to an animal); *In re Kraft, Inc.*, 218 U.S.P.Q. 571, 573 (TTAB 1983) ("The mark 'LIGHT N' LIVELY' as a whole has a suggestive significance which is distinctly different from the merely descriptive significance of the term 'LIGHT' per se. … The expression as a whole has an alliterative lilting cadence which encourages persons encountering it to perceive it as a whole. For these reasons, we believe that purchasers … will rather regard it as a unitary mark."); *see also Ex parte Barker*, 92 U.S.P.Q. 218, 219 (Comm'r Pat. 1952) (finding the mark CHERRY-BERRY-BING for preserves distinctive due to the words' "unusual association or arrangement … [that] results in a unique and catchy expression.").

Therefore, whereas the Cited Marks are vaguely laudatory, Applicant's Mark evokes the notion of biosurfactants. Clearly, in view of the differences between the respective marks in terms of sight, sound, and commercial impression, no confusion is likely in the case at hand.

Furthermore, Applicant respectfully submits that Applicant's goods and registrant's goods are so dissimilar in nature, especially in light of the large number of other users of "BIOS" marks in the relevant field, as to preclude any likelihood of confusion between the respective marks. The central inquiry in the case at hand is whether the goods are so related that they are likely to be connected in the mind of a prospective purchaser. *Homeowners Group, Inc. v. Home Mktg. Specialists, Inc*., 18 U.S.P.Q.2d 1587 (6th Cir. 1991). In the case at hand, the goods are so different that there is little likelihood of confusion in the minds of purchasers.

Although the identifications of goods or services of each party's trademark filings include "reagents" in the broadest possible sense along with several other items, Applicant's and registrant's products are not even remotely competitive. To be clear, "reagent" is a broad term, encompassing many products, purposes, and fields. A reagent is generally any substance used to potentially generate a chemical reaction, or for detecting, measuring, or preparing a component of another substance. See **Exhibit 3**.

It is patently not the case that, per the Examining Attorney's expressed concern, Applicant's and registrant's goods are "closely related." Applicant's application, as amended in this Response, covers

diagnostic preparations and reagents **for blood analysis**, apparatus for non-medical diagnostic testing of biological samples, and medical diagnostic apparatus for testing biological samples **for blood analysis**. Specifically, Applicant's BIOSURFIT products revolve around innovative medical diagnostics solutions to improve the performance and outcomes of **physicians**, by providing real-time and accurate results of blood analysis. Its core product is a blood-test reader/disposable cartridge combination that can give precise results within 15 minutes from just one small drop of blood. *See* **Exhibit 4** for details about Applicant and its products.

Meanwhile, the registrant's products are reagents, cells, and infectious waste containers, all of which are used in connection with cytometry and in particular flow cytometry. *See* **Exhibit 5** for more information about the registrant's products. Cytometry involves the biological methods that are used to measure parameters of cells, such as cell size, stage of cell cycle, DNA, proteins, and other attributes. *See* **Exhibit 6** for discussion of cytometry. "Flow cytometry" is a sub-field of cytrometry, in which a laser is used to analyze the cells as they flow in liquid. *See* **Exhibit 7**. The registrant's products, including its reagents, are *only* used in connection with cytometry, but not for blood analysis.

The relevant consumer group views the functions of these respective products as completely distinct. The products are used in entirely separate methods, involving separate apparatuses, for separate processes, for separate purposes, in separate settings. Applicant's products are used to analyze blood and other biological samples; registrant's products are used solely in connection with flow cytometry to determine specific attributes of cells.

In short, Applicant's BIOSURFIT products are not and cannot be used for any type of cytometry, nor can the registrant's products be used in connection with blood analysis.

Even more, and as can be seen clearly from **Exhibits 4** and **5**, Applicant at its heart offers a diagnostic device. Registrant, however, provides testing chemicals, solutions and other such consumables for use in laboratories.

Because "BIOS"-formative marks are afforded only a very narrow scope of protection due to their exceedingly weak nature, particularly as used in connection with reagents of all types, it is clear that

Applicant and the registrant are each operating in their own strictly delineated niches, both offering goods that, though tangentially involving bioscience reagents in the macro sense, serve entirely different functions and purposes.

Therefore, the differences between the respective goods ensure that confusion is unlikely, a distinction that other proceedings have recognized in declining to find a likelihood of confusion in cases regarding the biotechnology field. *See, e.g.*, *Byk-Gulden, Inc. v. Trimen Laboratories, Inc.*, 211 U.S.P.Q. 364, 368 (TTAB 1981) (finding no likelihood of confusion between VIOPAN-T for vitamin tablets and RIOPAN for antacid preparations because "although it is clear that the products of the respective parties are related, both being 'pharmaceuticals,' it is equally clear that they are not the same, either in their composition or purpose."); *Ft. Dodge Laboratories, Inc. v. Haeussler*, 234 F.2d 506, 110 U.S.P.Q. 301 (CCPA 1956) (given different purposes and distribution methods, FORTOGENOL for vitamins and FORTOGEN for an antiseptic not confusingly similar); *Burroughs Wellcome & Co. v. Mezger Pharmacal Co.*, 228 F.2d 243 (CCPA 1955) (no likelihood of confusion between LIPOFAX for vitamins, intended for consumption, and TIMOFAX for an externally-applied fungicidal preparation). Thus, the goods provided under the respective marks are sufficiently different to prevent any likelihood of confusion among consumers.

As discussed in more detail above, the registrant's BIOSURE products are used in connection with flow cytometry, a specific process for analyzing attributes of cells. Its products are marked to laboratory consumers who are searching for products to aid in flow cytometry analysis. These consumers focus on the options available for flow cytometry.

Applicant's goods, by contrast, are mainly marketed and promoted to medical diagnostic consumers who are interested in the best, most effective solutions for obtaining the results of blood tests. There is little chance that consumers would somehow believe that both Applicant and the registrant are related, particularly given the differences in the marks and the weak nature of BIOS-formative marks, as discussed above, that more than suffice to prevent confusion. As a result, the bioscience professionals who encounter Applicant's Mark BIOSURFIT in its completely distinct medical diagnostic-oriented

blood analysis context will instantly know that the BIOSURE goods – which, again, are used for one specific type of cytometry to measure specific attributes of cells – refer to a different source. Therefore, the different contexts in which the respective goods are marketed and sold further emphasizes that confusion is unlikely in the case at hand.

Furthermore, confusion is particularly unlikely in this instance because case law clearly recognizes that "[w]hen a buyer has expertise or is otherwise more sophisticated with respect to the purchase of the services at issue, a higher standard is proper." *Homeowners Group*, 18 U.S.P.Q.2d 1587. Accordingly, when goods are sold to such sophisticated buyers, there is less likelihood of confusion. *See In re Shipp*, 4 U.S.P.Q.2d 1174 (TTAB 1987).

The relevant products are offered to exceedingly sophisticated, superbly educated bioscience experts who are seeking solutions to very distinct problems – in registrant's case, flow cytometry methods, and in Applicant's case, a blood test analysis. The stakes are high, and these customers must carefully evaluate the available flow cytometry products on the one hand and blood test readers on the other to determine the solution that best suits their needs. Thus, the consumer bases of both Applicant's and registrant's products must use a high level of care in choosing to utilize them. Since the consumers extensively examine every aspect of the available offerings, confusion is highly unlikely.

In conclusion, because of the coexistence of a considerable number of similar marks covering similar bioscience-related goods, the dissimilarities between the marks, the unique connotations of the marks, the dissimilarities between the respective goods, the different contexts in which the goods are marketed, and the sophisticated nature of the relevant consumers, there is no likelihood of confusion in the case at hand.

In view of the foregoing, Applicant respectfully requests that the Examining Attorney reconsider the refusal and allow this application to proceed to publication.

EXHIBIT 1

United States Patent and Trademark Office

Trademarks > Trademark Electronic Search System (TESS)

TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

Logout Please logout when you are done to release system resources allocated for you.

Start List At: OR Jump to record: **Record 27 out of 182**

BIOSS

Word Mark BIOSS

Goods and Services IC 001. US 001 005 006 010 026 046. G & S: Biochemical **reagents** commonly known as probes, for detecting and analyzing molecules in protein or nucleotide arrays; Biochemical **reagents** used for non-medical purposes; Biochemicals, namely, monoclonal antibodies for in vitro scientific or research use; Biomedical compounds, namely, peptide substrates used in analyzing and detecting certain toxins for laboratory or research use; Chemical solutions and preparations consisting of pre-mixed reactants and **reagents** for scientific and research use in connection with amplification, analysis or labeling of nucleic acid; Chemicals for use in the purification of proteins for in vitro use; Diagnostic preparations for scientific or research use; Diagnostic **reagents** for in vitro use in biochemistry, clinical chemistry and microbiology; Fluorescent dye for scientific or research use; Immunohistochemistry detection kits consisting of mouse secondary **reagents**, DAB chromogens, DAB buffers, peroxidase blocking **reagent**, and hematoxylin, for anatomic pathology purposes in the medical diagnostics industry; Kit containing pre-packed columns, chemicals, pre-made buffer concentrates, syringes and instructional manual for the purification of proteins for in vitro use; Laboratory chemicals, namely, an antibody **reagent** used for the detection of antigens in cell and tissue analysis for in vitro diagnostic use; Nucleic acid isolation and purification kit consisting primarily of **reagents** and magnetic beads for scientific research purposes; Protein arrays and nucleotide arrays for scientific and medical research; Protein in raw material form for scientific and medical research; **Reagent** kits comprising generic DNA circle, DNA primers, polymerase and buffers for use in biotechnology fields. **Reagents** and substrates, namely, chemical compounds for use in patterning at nano scale or near nano scale; **Reagents** for research purposes; **Reagents** for scientific or medical research use; **Reagents** for use in scientific apparatus for chemical or biological analysis; Testing kits containing peptide substrates used in analyzing and detecting certain toxins for clinical or medical laboratory use; Testing kits containing peptide substrates used in analyzing and detecting certain toxins for laboratory or research use. FIRST USE: 20011000. FIRST USE IN COMMERCE: 20100800

	IC 042. US 100 101. G & S: Custom design and development of chemical **reagents** and biochemical assays; Providing **reagent** sample testing and diagnostic services for others in the fields of science and research related thereto. FIRST USE: 20011000. FIRST USE IN COMMERCE: 20100800
Mark Drawing Code	(3) DESIGN PLUS WORDS, LETTERS, AND/OR NUMBERS
Design Search Code	01.09.05 - Atomic models; Molecular models 27.01.04 - Letters forming objects; Numbers forming objects; Objects composed of letters or numerals; Punctuation forming objects
Serial Number	85299681
Filing Date	April 20, 2011
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	March 6, 2012
Registration Number	4145362
Registration Date	May 22, 2012
Owner	(REGISTRANT) BIOSS Inc. CORPORATION MASSACHUSETTS 400 TradeCenter Ste. 5900 Woburn MASSACHUSETTS 01801
Attorney of Record	Sara Yang
Description of Mark	The color(s) black and green is/are claimed as a feature of the mark. The mark consists of the word "BIOSS" with an uppercase letter "B" in bold black, a lowercase letter "I" in bold black, the letter "O" represented by a pictorial representation of an antibody made up of a large spherical green orb with three green rods extending out of the main large spherical green orb to three smaller green orbs, followed by two lowercase letters "S" in bold black.
Type of Mark	TRADEMARK. SERVICE MARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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Start List At: OR Jump to record: **Record 90 out of 95**

Typed Drawing

Word Mark	BIOSOLUTIONS
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: chemicals and **reagents** for use in molecular biology, biopharmaceutical production and DNA testing and analysis. FIRST USE: 19950713. FIRST USE IN COMMERCE: 19950713
Mark Drawing Code	(1) TYPED DRAWING
Serial Number	74509108
Filing Date	April 5, 1994
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	February 28, 1995
Registration Number	1941719
Registration Date	December 12, 1995
Owner	(REGISTRANT) Brand-Nu Laboratories, Inc. CORPORATION CONNECTICUT 377 Research Parkway Meriden CONNECTICUT 06450
Attorney of Record	Anthony P. DeLio
Type of Mark	TRADEMARK
Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR). SECTION 8(10-YR) 20050916.
Renewal	1ST RENEWAL 20050916
Live/Dead Indicator	**LIVE**

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NEXT LIST | FIRST DOC | PREV DOC | NEXT DOC | LAST DOC

| HOME | SITE INDEX | SEARCH | eBUSINESS | HELP | PRIVACY POLICY

United States Patent and Trademark Office

Trademarks > Trademark Electronic Search System (TESS)

TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

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Start List At: OR Jump to record: **Record 75 out of 95**

BIOSOLVE

Word Mark	BIOSOLVE
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: **reagents** used for the purification of biological materials for use in scientific and research applications. FIRST USE: 20090101. FIRST USE IN COMMERCE: 20090101
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	77357261
Filing Date	December 20, 2007
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	December 9, 2008
Registration Number	3644373
Registration Date	June 23, 2009
Owner	(REGISTRANT) Biomatrica, Inc. CORPORATION CALIFORNIA 5627 Oberlin Dr. #120 San Diego CALIFORNIA 92121
Attorney of Record	Pollie Gautsch
Type of Mark	TRADEMARK

Register	PRINCIPAL
Live/Dead Indicator	**LIVE**

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TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

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Start List At: OR Jump to record: **Record 22 out of 182**

BIOSERVATIVE

Word Mark	BIOSERVATIVE
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: Chemical **reagents** other than for medical or veterinary purposes, namely, chemical stabilizing **reagent** provided in containers for the transport and maintenance of biological or microbiological samples for nucleic acid analysis. FIRST USE: 20120500. FIRST USE IN COMMERCE: 20120500
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	85242824
Filing Date	February 15, 2011
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	December 13, 2011
Registration Number	4226497
Registration Date	October 16, 2012
Owner	(REGISTRANT) Capitol Vial, Inc. CORPORATION ALABAMA 2039 McMillan Street Auburn ALABAMA 36832

Attorney of Record	Michael D. Fishman
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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NEXT LIST | FIRST DOC | PREV DOC | NEXT DOC | LAST DOC

| HOME | SITE INDEX | SEARCH | eBUSINESS | HELP | PRIVACY POLICY

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Start List At: OR Jump to record: **Record 59 out of 95**

TSDR | ASSIGN Status | TTAB Status *(Use the "Back" button of the Internet Browser to return to TESS)*

BioSeizer

Word Mark	BIOSEIZER
Goods and Services	IC 005. US 006 018 044 046 051 052. G & S: Antibiotics; antibiotic preparations; antiallergic medicines; steroids; hormones for medical purposes; immunomodulators; medical imaging **reagents**; liposome for injection; lymphocyte T cell monoclonal antibodies for use in treatment of autoimmune and inflammation diseases and cancer; anti-cancer preparations; pharmaceutical preparations for treating diabetes; insulin injectors sold filled with insulin; tumor suppressing agents; cardiovascular treatment preparations; cod-liver oil; antivirals; ophthalmic preparations; preparations for the relief of pain; and biological preparations for medical purposes for human use. FIRST USE: 20090819. FIRST USE IN COMMERCE: 20090819
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	77796648
Filing Date	August 4, 2009
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	June 15, 2010
Registration Number	3945191

Registration Date	April 12, 2011
Owner	(REGISTRANT) TAIWAN LIPOSOME CO., LTD. CORPORATION TAIWAN 11F-1, No. 3, Yuan Cyu St. Nankang Dist, Taipei TAIWAN
Attorney of Record	Thomas J. Moore
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	**LIVE**

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NEXT LIST | FIRST DOC | PREV DOC | NEXT DOC | LAST DOC

| HOME | SITE INDEX | SEARCH | eBUSINESS | HELP | PRIVACY POLICY

United States Patent and Trademark Office

Trademarks > Trademark Electronic Search System (TESS)

TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

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Start List At: OR Jump to record: **Record 30 out of 182**

BIOSPECTRA

Word Mark	BIOSPECTRA
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: Biological buffers, **reagent** chemicals and specialty chemicals, namely, ammonium sulfate, guanidine hydrochloride, tris hydrochloride, tromethamine that complies with United States Pharmacopoeia (U.S.P.), and urea that complies with U.S.P., all complying with current good manufacturing practice (cGMP) requirements, and all for use in biopharmaceutical science, research, educational, and industrial applications. FIRST USE: 19960430. FIRST USE IN COMMERCE: 19960430
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	85276517
Filing Date	March 25, 2011
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	October 11, 2011
Registration Number	4076412
International Registration	1098562

Number	
Registration Date	December 27, 2011
Owner	(REGISTRANT) Biospectra, Inc. CORPORATION PENNSYLVANIA Rockdale Lane RR2 Box 2129G Stroudsburg PENNSYLVANIA 18360
Attorney of Record	Michael J. Berkowitz
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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NEXT LIST | FIRST DOC | PREV DOC | NEXT DOC | LAST DOC

| HOME | SITE INDEX | SEARCH | eBUSINESS | HELP | PRIVACY POLICY

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TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

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Start List At: OR Jump to record: **Record 82 out of 95**

BIOSPOT

Word Mark	BIOSPOT
Goods and Services	IC 005. US 006 018 044 046 051 052. G & S: MEDICAL DIAGNOSTIC KITS COMPRISING **REAGENTS** AND ASSAY PLATES FOR CLINICAL OR MEDICAL USE. FIRST USE: 20070121. FIRST USE IN COMMERCE: 20071116 IC 009. US 021 023 026 036 038. G & S: LABORATORY EQUIPMENT, NAMELY, LABORATORY ANALYZERS FOR MEASURING, TESTING AND ANALYZING CELL-BASED ASSAYS AND OPERATING SOFTWARE FOR AUTOMATED IMAGE ACQUISITION AND ANALYSIS OF BIOASSAYS FOR SCIENTIFIC OR MEDICAL RESEARCH. FIRST USE: 20070121. FIRST USE IN COMMERCE: 20071116 IC 010. US 026 039 044. G & S: MEDICAL EQUIPMENT, NAMELY, APPARATUS FOR ANALYSIS OF CELL-BASED ASSAYS AND OPERATING SOFTWARE SOLD AS A UNIT FOR AUTOMATED IMAGE ACQUISITION AND ANALYSIS OF BIOASSAYS FOR MEDICAL DIAGNOSIS. FIRST USE: 20070121. FIRST USE IN COMMERCE: 20071116
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Trademark Search Facility Classification Code	SHAPES-MISC Miscellaneous shaped designs

Serial Number	76682468
Filing Date	October 1, 2007
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	May 20, 2008
Change In Registration	CHANGE IN REGISTRATION HAS OCCURRED
Registration Number	3544006
Registration Date	December 9, 2008
Owner	(REGISTRANT) Cellular Technology Limited LIMITED LIABILITY COMPANY OHIO 20521 Chagrin Boulevard Shaker Heights OHIO 44122
Attorney of Record	D. Benjamin Borson
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	**LIVE**

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NEXT LIST | FIRST DOC | PREV DOC | NEXT DOC | LAST DOC

| HOME | SITE INDEX | SEARCH | eBUSINESS | HELP | PRIVACY POLICY

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Trademarks > Trademark Electronic Search System (TESS)

TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

BioShake

Word Mark	BIOSHAKE
Goods and Services	IC 009. US 021 023 026 036 038. G & S: Laboratory apparatus for the treatment, conversion and processing of liquid samples, namely, apparatus for the dosing, refilling, mixing, temperature control, concentrating, homogenizing and filtering of substances and **reagents**; laboratory articles, namely, disposable laboratory articles in the nature of disposable latex gloves for laboratory uses, cuvettes, pipettes, pipette tips, test tubes, storage tubes, microtiter plates; laboratory workstation systems, namely, workstations consisting of computer controlled robots and laboratory mixers for the automatic treatment, conversion and processing of liquid samples and **reagents**; computer hardware and computer software for the control and operation of laboratory robots and laboratory mixers for the automatic treatment, conversion and processing of liquid samples and **reagents**
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	79109470
Filing Date	October 7, 2011
Current Basis	66A
Original Filing Basis	66A
Published for Opposition	September 18, 2012
Registration Number	4252178
International Registration Number	1107637
Registration Date	December 4, 2012

Owner	(REGISTRANT) Quantifoil Instruments GmbH gmbh FED REP GERMANY Loebstedter Str. 101 07749 Jena FED REP GERMANY
Attorney of Record	Trevor P. Schmidt
Priority Date	June 22, 2011
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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Trademarks > Trademark Electronic Search System (TESS)

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Start List At: OR Jump to record: **Record 33 out of 182**

BIOSCRIPT

Word Mark	BIOSCRIPT
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: **Reagents** for laboratory use; enzymes for laboratory use; enzymes for use in the field of molecular biology; enzyme preparations for laboratory use
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	79034535
Filing Date	December 27, 2006
Current Basis	66A
Original Filing Basis	66A
Published for Opposition	August 7, 2007
Registration Number	3318843
International Registration Number	0913366
Registration Date	October 23, 2007
Owner	(REGISTRANT) BIOLINE LIMITED LIMITED COMPANY UNITED KINGDOM 16 The Edge Business Centre, Humber Road; LONDON NW2 6EW UNITED KINGDOM (LAST LISTED OWNER) BIOLINE REAGENTS LIMITED UNKNOWN 16 The Edge Business Centre, Humber Road London NW2 6EW UNITED KINGDOM
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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Trademarks > Trademark Electronic Search System (TESS)

TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

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Start List At: OR Jump to record: **Record 41 out of 182**

TSDR | ASSIGN Status | TTAB Status *(Use the "Back" button of the Internet Browser to return to TESS)*

BIOSCORE

Word Mark	BIOSCORE
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: **Reagent** kits for scientific use consisting primarily of primers, enzymes and buffers for use in the screening and /or amplification of nucleic acid. FIRST USE: 20060922. FIRST USE IN COMMERCE: 20060922 IC 005. US 006 018 044 046 051 052. G & S: **Reagent** kits for medical use consisting primarily of primers, enzymes and buffers for use in the screening and /or amplification of nucleic acid. FIRST USE: 20060922. FIRST USE IN COMMERCE: 20060922
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	78956008
Filing Date	August 20, 2006
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	October 23, 2007
Registration Number	3474089
Registration Date	July 22, 2008

Owner	(REGISTRANT) Enzo Biochem, Inc. CORPORATION NEW YORK 9th Floor 527 Madison Avenue New York NEW YORK 10022
Attorney of Record	Laura E. Smith
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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NEXT LIST | FIRST DOC | PREV DOC | NEXT DOC | LAST DOC

| HOME | SITE INDEX | SEARCH | eBUSINESS | HELP | PRIVACY POLICY

United States Patent and Trademark Office

Trademarks > Trademark Electronic Search System (TESS)

TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

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Start List At: OR Jump to record: **Record 69 out of 95**

Bioscot

Word Mark	BIOSCOT
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: diagnostic blood typing **reagents** for clinical or medical laboratory use. FIRST USE: 19840000. FIRST USE IN COMMERCE: 19881231
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	77384407
Filing Date	January 30, 2008
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	December 2, 2008
Registration Number	3575025
Registration Date	February 17, 2009
Owner	(REGISTRANT) Millipore Corporation CORPORATION MASSACHUSETTS 290 Concord Road Billerica MASSACHUSETTS 01821 (LAST LISTED OWNER) MERCK KGAA A KOMMANDITGESELLSCHAFT AUF AKTIEN FED REP GERMANY FRANKFURTER STRASSE 250 D-64293 DARMSTADT FED REP GERMANY
Assignment	

Recorded	ASSIGNMENT RECORDED
Attorney of Record	William C. Wright
Prior Registrations	2536890
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	**LIVE**

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NEXT LIST | FIRST DOC | PREV DOC | NEXT DOC | LAST DOC

| HOME | SITE INDEX | SEARCH | eBUSINESS | HELP | PRIVACY POLICY

United States Patent and Trademark Office

Trademarks > Trademark Electronic Search System (TESS)

TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

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Start List At: OR Jump to record: **Record 59 out of 182**

TSDR | ASSIGN Status | TTAB Status *(Use the "Back" button of the Internet Browser to return to TESS)*

Typed Drawing

Word Mark	BIOSCALE
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: Diagnostic **reagents** for scientific use. FIRST USE: 20070517. FIRST USE IN COMMERCE: 20070517
	IC 009. US 021 023 026 036 038. G & S: Bio-molecular sensing systems and microelectronic mechanical systems comprised of functionalized biochips that permit capture of analytics for measurement, miniature sensors comprised of microelectromechanical resonant structures for testing samples for use in food and water testing, medical diagnostics, environmental monitoring, pharmaceuticals and therapeutics development and production as well as materials characterization; modular components for fluidic transport and delivery of samples to sensors, namely, fluid channels, valves, filters, concentrators, separators and pumps; electronics, namely, printed circuit boards for excitation and sensing of motion of the microstructures and microprocessor-based controllers for acquiring and processing sensor output and controlling system operation; electrical components, namely, connectors, cables, heaters, thermoelectric coolers and temperature sensors for interfacing biochips to systems and environmental controls; computer software for operating bio-molecular sensing systems and graphical user interface software all for use in the fields of biological, chemical and biochemical sensing. FIRST USE: 20070517. FIRST USE IN COMMERCE: 20070517
	IC 010. US 026 039 044. G & S: Medical equipment in the nature of a bio-molecular sensing system and microelectronic mechanical system comprised of functionalized biochips that permit capture of analytics for measurement, medical equipment in the nature of micro-electromechanical system resonating structures and sensors for use in the analysis of physiological fluids, solids, aerosols and gases such as raw and processed blood, lymph, saliva, urine, stool, breath and flatulence; medical equipment, namely modular components for fluidic transport, and delivery of samples to sensors for use in point of care diagnosis as well as laboratory testing. FIRST USE: 20070517. FIRST USE IN COMMERCE: 20070517
	IC 042. US 100 101. G & S: Design of biomolecular sensing systems. FIRST USE: 20031215. FIRST USE IN COMMERCE: 20031215
Mark Drawing Code	(1) TYPED DRAWING

Serial Number	78138751
Filing Date	June 25, 2002
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	February 24, 2004
Registration Number	3313355
International Registration Number	1110968
Registration Date	October 16, 2007
Owner	(REGISTRANT) BIOSCALE, INC. CORPORATION DELAWARE 4 Maguire Road Lexington MASSACHUSETTS 02421
Assignment Recorded	ASSIGNMENT RECORDED
Attorney of Record	Michael J. Bevilacqua, Esquire
Type of Mark	TRADEMARK. SERVICE MARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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Trademarks > Trademark Electronic Search System (TESS)

TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

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Start List At: OR Jump to record: **Record 36 out of 182**

biostep

Word Mark BIOSTEP

Goods and Services

IC 001. US 001 005 006 010 026 046. G & S: Chemicals for use in industry; biological and biochemical products, namely, chemicals, chemical preparations including gels, buffers, stains and dyes, and **reagents** and chemical test kits consisting primarily of chemicals, chemical preparations, and **reagents** all for use in scientific and medical research and laboratories, nucleic acid sequencing, analysis, and synthesis, genetic analysis, fragment analysis, linkage analysis, nucleic acid separation, protein separation, chromatography, electrophoresis, human identification, microbial identification, molecular microbiology, custom oligo synthesis, Polymerase Chain Reaction (PCR) and related applications, protein and peptide synthesis, fluorescence technology, cytometry, sample preparation, gene expression and gene discovery, genetic disease research, genomics, biotechnology consultation, research and development, and life science

IC 002. US 006 011 016. G & S: Colourants used for laboratory tests in the manufacture of chemical preparations including gels, stains and dyes used for scientific and medical research and laboratories, nucleic acid sequencing, analysis, and synthesis, genetic analysis, fragment analysis, linkage analysis, nucleic acid separation, protein separation, electrophoresis, human identification, microbial identification, molecular microbiology, custom oligo synthesis, Polymerase Chain Reaction (PCR) and related applications, protein and peptide synthesis, fluorescence technology, cytometry, sample preparation, gene expression and gene discovery, genetic disease research, genomics, biotechnology consultation, research and development, and life science

IC 009. US 021 023 026 036 038. G & S: Scientific, photographic, optical, weighing, measuring, signaling checking and analytical apparatus and instruments, namely, cameras, electronic module controls for computer independent control imaging camera, electronic module controls for high speed live images, infrared cameras, biochemical scanners, measuring interfaces, namely, tool measuring instruments, digital cameras for microscopy, camera filters, microscope illuminating devices, namely, transilluminators for measuring fluorescent quantification and laboratory instruments, namely, radiation devices in the nature of ultraviolet, visible, or infra-red light boxes for the analysis of bodily fluids and tri-pods; computers; medical laboratory apparatus and laboratory

apparatus instruments, namely, personal computers for biochemical imaging, analysis and processing, computer notebooks for biochemical imaging, analysis and processing, computer laboratory keyboards, computer mouse, thermal printers and power supplies, rectifier tubes, aperture plates, centrifuges, digital pipettes, pipette tips; measuring, signaling, checking and analytical laboratory apparatus, instruments and accessories, namely, apparatus for converting electronic radiation to electrical energy, namely, photovoltaic solar modules, radiation protection pipette shields for electronic products, illuminated hazard signs, radiation protection shields for electronic products, gelation timer, centrifuges, vortex sample mixer, spectrophotometers, computer software for biochemical imaging and analysis and processing, and for biochemical laboratory quality, medical software for molecular biology gel analysis and three dimensional gel display, medical software for molecular biology multi-module analysis and medical software for one and two dimensional gel analysis

IC 035. US 100 101 102. G & S: Dealerships in the field of cameras, module control for computer independent control imaging camera, module control for high speed live images, multi-camera biochemical imaging and analysis, biochemical scanners, measuring interfaces, digital cameras for microscopy, camera filters, transilluminators for fluorescent quantification, fluorescent screens, light boxes, ultraviolet light conversion screens, accessories for transilluminators, tri-pods, dark hoods and radiation detectors; retail store services featuring scientific, photographic, optical and medical weighing, measuring, signaling, checking and analytical laboratory apparatuses; dealerships in the field of electrophoresis imaging instruments, blotting cells and membranes for electrophoretic transfer, thermal cyclers, sample concentrators, sample block heaters, biological stirrers, cell culture vessels, personal computers for biochemical imaging, analysis and processing, computer notebooks for biochemical imaging, analysis and processing, computer laboratory keyboard, computer mouse, thermal printers, consumables for printers, test devices for quality and parameter control of camera-based biochemical imaging and analysis, ice baths, computerized biochemical imaging instruments and densitometers, biochemical microplate readers, accessories for electrophoresis systems, sequencing units, accessories for sequencing units, modular electrophoresis systems, power supplies, reaction tubes, Polymerase Chain Reaction (PCR) plates, Polymerase Chain Reaction (PCR) thermo sealer, accessories for Polymerase (PCR) plates, centrifuge tubes, digital pipets, pipet tips; retail store services featuring apparatus for identification, recording, transmission, electronic storing, evaluation and reproduction of laboratory data, chemicals, colourants and the related accessories

IC 042. US 100 101. G & S: Services of engineers, namely, development, testing, adaptation and adjustment of module control for computer independent control imaging camera, module control for high speed live images, multi-camera biochemical imaging and analysis, biochemical scanners, measuring interfaces, digital cameras for microscopy, camera filters, transilluminators for fluorescent quantification, fluorescent screens, light boxes, ultraviolet light conversion screens, accessories for transilluminators, tri-pods, darkhoods and radiation detectors

Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Trademark Search Facility Classification Code	SHAPES-MISC Miscellaneous shaped designs
Serial Number	79032223
Filing Date	March 24, 2006
Current Basis	66A
Original Filing Basis	66A
Published for Opposition	April 22, 2008
Registration Number	3462462
International	

Registration Number	0906803
Registration Date	July 8, 2008
Owner	(REGISTRANT) biostep GmbH LIMITED LIABILITY COMPANY FED REP GERMANY Meinersdorfer Strasse 47a 09387 Jahnsdorf FED REP GERMANY
Priority Date	January 10, 2006
Type of Mark	TRADEMARK. SERVICE MARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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NEXT LIST | FIRST DOC | PREV DOC | NEXT DOC | LAST DOC

| HOME | SITE INDEX | SEARCH | eBUSINESS | HELP | PRIVACY POLICY

United States Patent and Trademark Office

Trademarks > Trademark Electronic Search System (TESS)

TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

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Start List At: OR Jump to record: **Record 48 out of 95**

TSDR | ASSIGN Status | TTAB Status *(Use the "Back" button of the Internet Browser to return to TESS)*

BIOSTIC

Word Mark	BIOSTIC
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: **reagent** kits comprising generic DNA circle, DNA primers, polymerase and buffers for use in biotechnology fields. FIRST USE: 20081031. FIRST USE IN COMMERCE: 20081031
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Trademark Search Facility Classification Code	LETTER-3-OR-MORE BIO Combination of three or more letters as part of the mark
Serial Number	77635350
Filing Date	December 17, 2008
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	April 21, 2009
Registration Number	3650627
Registration	July 7, 2009

Date	
Owner	(REGISTRANT) Mo Bio Laboratories, Inc. CORPORATION CALIFORNIA 2746 Loker Avenue West Carlsbad CALIFORNIA 92010
Attorney of Record	Marnie Wright Barnhorst
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	**LIVE**

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NEXT LIST | FIRST DOC | PREV DOC | NEXT DOC | LAST DOC

| HOME | SITE INDEX | SEARCH | eBUSINESS | HELP | PRIVACY POLICY

United States Patent and Trademark Office

Trademarks > Trademark Electronic Search System (TESS)

TESS was last updated on Wed Jul 17 03:10:33 EDT 2013

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Start List At: OR Jump to record: **Record 92 out of 95**

Typed Drawing

Word Mark	BIOSTAR
Goods and Services	IC 009. US 021 023 026 036 038. G & S: diagnostic test kits for scientific research consisting of test tubes, pipettes, culture slides and clinical **reagents**. FIRST USE: 19860122. FIRST USE IN COMMERCE: 19860122
Mark Drawing Code	(1) TYPED DRAWING
Serial Number	74726716
Filing Date	September 8, 1995
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	January 14, 1997
Registration Number	2050360
Registration Date	April 8, 1997
Owner	(REGISTRANT) BioStar, Inc. CORPORATION DELAWARE 6655 Lookout Road Boulder COLORADO 80301 (LAST LISTED OWNER) INVERNESS MEDICAL-BIOSTAR INC. INVERNESS MEDICAL PROFESSIONAL DIAGNOSTICS CORPORATION DELAWARE 331 S 104TH STREET LOUISVILLE COLORADO 80027
Assignment Recorded	ASSIGNMENT RECORDED
Attorney of Record	ANDREW HARTMAN ESQ
Prior Registrations	1436984;1915948;1915949;1921448;1921449;1921450;1995565;AND OTHERS

Type of Mark	TRADEMARK
Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR). SECTION 8(10-YR) 20070512.
Renewal	1ST RENEWAL 20070512
Live/Dead Indicator	**LIVE**

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Start List At: OR Jump to record: **Record 93 out of 95**

Typed Drawing

Word Mark	BIOSTAR
Goods and Services	IC 005. US 018. G & S: diagnostic **reagents** for clinical medical laboratory use. FIRST USE: 19860122. FIRST USE IN COMMERCE: 19860122
Mark Drawing Code	(1) TYPED DRAWING
Serial Number	74534592
Filing Date	June 7, 1994
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	June 13, 1995
Registration Number	1915949
Registration Date	September 5, 1995
Owner	(REGISTRANT) BioStar, Inc. CORPORATION DELAWARE 6655 Lookout Road Boulder COLORADO 80301 (LAST LISTED OWNER) THERMO BIOSTAR INC. CORPORATION BY CHANGE OF NAME DELAWARE 331 S 104TH ST LOUISVILLE COLORADO 80027
Assignment Recorded	ASSIGNMENT RECORDED
Attorney of Record	ANDREW HARTMAN,
Prior Registrations	1436984
Type of Mark	TRADEMARK
Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR). SECTION 8(10-YR) 20050118.
Renewal	1ST RENEWAL 20050118

Live/Dead Indicator LIVE

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Start List At: OR Jump to record: **Record 94 out of 95**

Typed Drawing

Word Mark	BIOSTAR
Goods and Services	IC 005. US 006 018 044 046 051 052. G & S: medical diagnostic test kits consisting of **reagents**, test tubes, pipettes and culture slides. FIRST USE: 19860122. FIRST USE IN COMMERCE: 19860122
Mark Drawing Code	(1) TYPED DRAWING
Serial Number	74534581
Filing Date	June 7, 1994
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	July 4, 1995
Registration Number	1921449
Registration Date	September 26, 1995
Owner	(REGISTRANT) BioStar, Inc. CORPORATION DELAWARE 6655 Lookout Road Boulder COLORADO 80301 (LAST LISTED OWNER) THERMO BIOSTAR INC. CORPORATION BY CHANGE OF NAME DELAWARE 331 SOUTH 104TH ST LOUISVILLE COLORADO 80027
Assignment Recorded	ASSIGNMENT RECORDED
Attorney of Record	ANDREW HARTMAN,
Prior Registrations	1436984
Type of Mark	TRADEMARK

Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR). SECTION 8(10-YR) 20050124.
Renewal	1ST RENEWAL 20050124
Live/Dead Indicator	**LIVE**

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Start List At: OR Jump to record: **Record 95 out of 95**

Typed Drawing

Word Mark	BIOSTAR
Goods and Services	IC 001. US 006. G & S: IMMUNODIAGNOSTIC ASSAY MEDICAL TEST KITS, CONSISTING PRIMARILY OF **REAGENTS** AND OTHER CHEMICALS, WHICH DETECT THE PRESENCE OF IMMUNE COMPLEXES IN BODY FLUIDS. FIRST USE: 19860122. FIRST USE IN COMMERCE: 19860122
Mark Drawing Code	(1) TYPED DRAWING
Serial Number	73609575
Filing Date	July 15, 1986
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	January 27, 1987
Registration Number	1436984
Registration Date	April 21, 1987
Owner	(REGISTRANT) BIOSTAR MEDICAL PRODUCTS, INC. CORPORATION DELAWARE 5766 CENTRAL AVENUE BOULDER COLORADO 80302 (LAST LISTED OWNER) BIOSTAR, INC. CORPORATION ASSIGNEE OF DELAWARE 331 S 104th Street Louisville COLORADO 80027
Assignment Recorded	ASSIGNMENT RECORDED
Attorney of Record	JOHN F. SMITH
Type of Mark	TRADEMARK

Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR). SECTION 8(10-YR) 20070709.
Renewal	1ST RENEWAL 20070709
Live/Dead Indicator	**LIVE**

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Start List At: OR Jump to record: **Record 83 out of 95**

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BIOSTATUS

Word Mark	BIOSTATUS
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: (Based on Use in Commerce) and (Based on 44(e)) Diagnostic scanning agents for in-vitro use, namely, assays and **reagents** for use in cell-based scientific research; chemical preparations for use as fluorescent substrates in imaging of cells in cell-based scientific research; fluorescent chemical preparations for use in imaging in cell-based scientific research; substances for use in genetic probe assay kits for scientific or research use, namely, biochemical agents, commonly known as probes, for detecting and analyzing cells in cell-based research. FIRST USE: 20010621. FIRST USE IN COMMERCE: 20010621 IC 005. US 006 018 044 046 051 052. G & S: (Based on Use in Commerce) and (Based on 44(e)) Diagnostic agents for in-vitro use to locate cancer sites and for clinical and medical laboratory use; biological preparations for use as diagnostic agents for the diagnosis of diseases; diagnostic scanning agents for in-vitro use, namely, markers for therapeutic or diagnostic use; fluorescent light emitting **reagents** for fluorescence-based detection systems for medical or clinical use; substances for use in genetic probe assay kits for medical use, namely, biochemical agents, commonly known as probes, for detecting and analyzing cells in cell-based research; chemical preparations for use in DNA analysis for medical purposes. FIRST USE: 20010621. FIRST USE IN COMMERCE: 20010621 IC 042. US 100 101. G & S: (Based on 44(e)) Scientific research and development, namely, research and development of chemicals and **reagents** for use in scientific, research and medical analysis
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK

Serial Number	76591293
Filing Date	May 10, 2004
Current Basis	1A;44E
Original Filing Basis	1A;44D
Published for Opposition	May 22, 2007
Registration Number	3535747
Registration Date	November 25, 2008
Owner	(REGISTRANT) Biostatus Limited COMPANY UNITED KINGDOM 56 Charnwood Road Shepshed, Leicestershire LE12 9NP UNITED KINGDOM
Attorney of Record	Nicole M. Meyer
Priority Date	November 10, 2003
Type of Mark	TRADEMARK. SERVICE MARK
Register	PRINCIPAL
Live/Dead Indicator	**LIVE**

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Start List At: OR Jump to record: **Record 57 out of 95**

TSDR | ASSIGN Status | TTAB Status *(Use the "Back" button of the Internet Browser to return to TESS)*

BioStrat

Word Mark	BIOSTRAT
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: Diagnostic **reagents** for clinical or medical laboratory use. FIRST USE: 20100101. FIRST USE IN COMMERCE: 20100101
	IC 005. US 006 018 044 046 051 052. G & S: Diagnostic tests and test kits comprised of biological sample collection and storage containers, DNA probes, **reagents** and antibodies for use in analysis of gene expression, genetics, single nucleotide polymorphism, haplotypes, proteins and other analytes in biological samples for the diagnosis of diseases, the monitoring and prediction of disease incidence and progression, and for determining drug responses. FIRST USE: 20100101. FIRST USE IN COMMERCE: 20100101
	IC 010. US 026 039 044. G & S: Medical device, namely, a device for use in oncologic diagnosis, prognosis and therapeutic testing; medical device, namely, instruments for quantitative analysis of protein and nucleic acid biomarkers, namely, apparatus for molecular characterization of biological specimens. FIRST USE: 20100101. FIRST USE IN COMMERCE: 20100101
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	77751035
Filing Date	June 3, 2009
Current Basis	1A
Original Filing	

Basis	1B
Published for Opposition	June 1, 2010
Registration Number	3958465
Registration Date	May 10, 2011
Owner	(REGISTRANT) BioVantra, LLC LIMITED LIABILITY COMPANY FLORIDA P.O. Box 772287 Ocala FLORIDA 34477
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	**LIVE**

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Typed Drawing

Word Mark BIOSTRAND

Goods and Services IC 001. US 001 005 006 010 026 046. G & S: CHEMICAL CARRIERS HAVING OLIGO-NUCLEOTIDES BONDED THEREWITH FOR ANALYSIS OF DNA SEQUENCES, NOT FOR MEDICAL OR VETERINARY USE; KIT COMPRISED OF CHEMICAL CARRIERS HAVING OLIGO-NUCLEOTIDES BONDED THEREWITH FOR ANALYSIS OF DNA SEQUENCES, AND CHEMICALS [AND CHEMICAL TEST PAPER] FOR ANALYSIS OF BIOCHEMICAL AND BIOLOGICAL SUBSTANCES, NAMELY, DNA, RNA, OLIGO-NUCLEOTIDES, NUCLEOTIDES, POLY-NUCLEOTIDES, PROTEINS, CARBOHYDRATES, ANTIBODIES, ANTIGENS, AND HIGH MOLECULAR WEIGHT COMPOUNDS, NOT FOR MEDICAL OR VETERINARY USE

IC 005. US 006 018 044 046 051 052. G & S: CHEMICAL CARRIERS HAVING OLIGO-NUCLEOTIDES BONDED THEREWITH FOR ANALYSIS OF DNA SEQUENCES IN CLINICAL MEDICINE OR CLINICAL MEDICAL PROCEDURES; KIT COMPRISED OF CHEMICAL CARRIERS HAVING OLIGO-NUCLEOTIDES BONDED THEREWITH FOR ANALYSIS OF DNA SEQUENCES, IN CLINICAL MEDICINE OR CLINICAL MEDICAL PROCEDURES, AND CHEMICALS, [CHEMICAL TEST PAPER, AND PHARMACEUTICALS,] ALL FOR ANALYSIS OF BIOCHEMICAL AND BIOLOGICAL SUBSTANCES, NAMELY, DNA, RNA, OLIGO-NUCLEOTIDES, NUCLEOTIDES, POLY-NUCLEOTIDES, PROTEINS, CARBOHYDRATES, ANTIBODIES, ANTIGENS, AND HIGH MOLECULAR WEIGHT COMPOUNDS, IN CLINICAL MEDICINE AND CLINICAL MEDICAL PROCEDURES

IC 009. US 021 023 026 036 038. G & S: LABORATORY APPARATUS AND INSTRUMENTS, namely, [FLOW CELL METERS;] PIPETTES; PIPETTE TIPS; CAPILLARIES; TEST TUBES; MICROTUBES; [PETRI DISHES;] VIALS; [CULTURE BOTTLES AND TRAYS; FLASKS; FLASK HOLDERS;] SEALS; **REAGENT** RESERVOIRS; SYRINGES; [GRADUATED DISPENSERS;] AND SOLID AND LIQUID WASTE RECEPTACLES; ALL FOR USE IN THE ANALYSIS, TESTING, AND RESEARCH OF BIOCHEMICAL AND BIOLOGICAL SUBSTANCES, NAMELY, DNA, RNA, OLIGO-NUCLEOTIDES, NUCLEOTIDES, POLY-NUCLEOTIDES, PROTEINS, CARBOHYDRATES, ANTIBODIES, ANTIGENS, AND HIGH MOLECULAR WEIGHT COMPOUNDS; MEASURING AND TESTING MACHINES AND INSTRUMENTS FOR ANALYSIS OF BIOCHEMICAL AND BIOLOGICAL SUBSTANCES; NAMELY, DNA SEQUENCERS; GENETIC ANALYZERS; FRAGMENT ANALYZERS; [ELECTROPHORESIS MACHINES;] LINKAGE ANALYZERS; GENETIC MAPPERS; [ORGANIC AND INORGANIC

SYNTHESIZERS; MASS SPECTROMETERS; SPECTROPHOTOMETERS;] METERS FOR MEASURING LUMINESCENCE ABSORBENCY, FLUORESCENCE, AND TIME-RESOLVED FLUORESCENCE; FLUORESCENT SCANNERS; [LIQUID CHROMATOGRAPHS;] THERMOMETERS, NOT FOR MEDICAL USE; [CHRONOGRAPHS FOR USE AS SPECIALIZED TIME RECORDING APPARATUS;] ROBOTIC WORKSTATIONS COMPRISED OF LABORATORY ROBOTS, COMPUTERS, AND COMPUTER MONITORS; INCUBATORS; IMMUNOASSAY ANALYZERS; AND SAMPLE PREPARATION AND SCREENING WORKSTATIONS COMPRISED OF CONTAINERS FOR BIOLOGICAL SUBSTANCES AND LIQUID MAGNETIC PARTICLE SUSPENSIONS, AND DISTRIBUTORS FOR APPLYING AND REMOVING MAGNETIC PARTICLES BOUND TO BIOLOGICAL SUBSTANCES; [PHOTOGRAPHIC MACHINES AND APPARATUS; NAMELY, ELECTRONIC CAMERAS AND MICROSCOPY IMAGING UNITS, FOR ANALYSIS OF BIOCHEMICAL AND BIOLOGICAL SUBSTANCES, ON LABELED MICROSCOPIC SLIDES; OPTICAL APPARATUS AND INSTRUMENTS; NAMELY, PHOTOSENSORS, MICROSCOPES, AND OPTICAL SCANNERS. ELECTRONIC MACHINES, APPARATUS, AND THEIR PARTS, NAMELY, CENTRAL PROCESSING UNITS, COMPUTER HARDWARE,] AND COMPUTER SOFTWARE, ALL USED IN THE TESTING, ANALYSIS, AND EXAMINATION OF DNA, RNA, OLIGO-NUCLEOTIDES, NUCLEOTIDES, POLY-NUCLEOTIDES, PROTEINS, CARBOHYDRATES, ANTIBODIES, ANTIGENS, AND HIGH MOLECULAR WEIGHT COMPOUNDS; [ELECTROLYSERS; AND ELECTROLYTIC CELLS]

IC 037. US 100 103 106. G & S: REPAIR AND MAINTENANCE OF MEDICAL MACHINES AND APPARATUS, CHEMICAL PROCESSING MACHINES AND APPARATUS, MEASURING AND TESTING MACHINES AND INSTRUMENTS, LABORATORY APPARATUS AND INSTRUMENTS

(CANCELLED) IC 042. US 100 101. G & S: [TESTING AND INSPECTION OF, AND RESEARCH REGARDING, CHEMICAL CARRIERS HAVING OLIGO-NUCLEOTIDES BONDED THEREWITH FOR CLINICAL MEDICINE OR CLINICAL MEDICAL PROCEDURES, SUCH AS ANALYSIS OF DNA SEQUENCES, PHARMACEUTICALS, COSMETICS, AND FOODSTUFFS; TESTING AND RESEARCH ON MEDICAL MACHINES AND APPARATUS, CHEMICAL PROCESSING MACHINES AND APPARATUS, MEASURING OR TESTING MACHINES AND INSTRUMENTS, LABORATORY APPARATUS AND INSTRUMENTS; DESIGNING OF MACHINES, APPARATUS, INSTRUMENTS AND PARTS THEREFOR OR SYSTEMS COMPOSED OF SUCH MACHINES, APPARATUS, AND INSTRUMENTS, FOR BIOCHEMICAL AND BIOLOGICAL ANALYSIS, TESTING, AND RESEARCH; COMPUTER SOFTWARE DESIGN AND PROGRAMMING FOR OTHERS; MAINTENANCE OF COMPUTER SOFTWARE; TESTING AND RESEARCH ON POLLUTION PREVENTION; TESTING, INSPECTION AND RESEARCH ON AGRICULTURE, LIVESTOCK BREEDING AND FISHERIES; RENTAL OF OPTICAL MACHINES AND INSTRUMENTS; RENTAL OF MEASURING APPARATUS; AND RENTAL OF RESEARCH LABORATORY APPARATUS AND INSTRUMENTS]

Mark Drawing Code	(1) TYPED DRAWING
Serial Number	76360059
Filing Date	January 17, 2002
Current Basis	44E
Original Filing Basis	1B;44D
Published for Opposition	December 9, 2003
Change In Registration	CHANGE IN REGISTRATION HAS OCCURRED
Registration Number	2965474
Registration Date	July 12, 2005
Owner	(REGISTRANT) Precision System Science Co., Ltd. CORPORATION JAPAN 88, Kamihongou, Matsudo-shi Chiba JAPAN 2710064

Attorney of Record	Purvi J. Patel
Priority Date	July 18, 2001
Description of Mark	Color is not claimed as a feature of the mark.
Type of Mark	TRADEMARK. SERVICE MARK
Register	PRINCIPAL
Affidavit Text	SECT 15. PARTIAL SECT 8 (6-YR).
Live/Dead Indicator	**LIVE**

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Start List At: OR Jump to record: **Record 39 out of 182**

G BIOSCIENCES

Word Mark	G BIOSCIENCES
Goods and Services	IC 001. US 001 005 006 010 026 046. G & S: **REAGENTS** FOR RESEARCH PURPOSES AND SCIENTIFIC USE. FIRST USE: 20040815. FIRST USE IN COMMERCE: 20040815 IC 016. US 002 005 022 023 029 037 038 050. G & S: LITERATURE AND PUBLICATIONS, NAMELY, NEWSLETTERS, BULLETINS, BROCHURES, AND BOOKLETS IN THE FIELD OF BIOTECHNOLOGY. FIRST USE: 20040815. FIRST USE IN COMMERCE: 20040815
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Trademark Search Facility Classification Code	LETS-1 G A single letter, multiples of a single letter or in combination with a design
Serial Number	78700508
Filing Date	August 25, 2005
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	July 31, 2007

Registration Number	3311781
Registration Date	October 16, 2007
Owner	(REGISTRANT) Geno Technology, Inc. CORPORATION MISSOURI 92 Weldon Parkway Maryland Heights MISSOURI 63043
Attorney of Record	Sarah Bruno
Type of Mark	TRADEMARK
Register	PRINCIPAL
Live/Dead Indicator	LIVE

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Start List At: OR Jump to record: **Record 78 out of 95**

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BIOSITE

Word Mark BIOSITE

Goods and Services

IC 001. US 001 005 006 010 026 046. G & S: **Reagents** for use in scientific and/or medical research uses, namely antibodies, fluorescent compounds for use as detectable labels, immunoassay standards, and buffer solutions. FIRST USE: 20010701. FIRST USE IN COMMERCE: 20010701

IC 005. US 006 018 044 046 051 052. G & S: Biological **reagents**, namely antibodies for medical and veterinary diagnostic and therapeutic use in a wide variety of illnesses and diseases. FIRST USE: 20010701. FIRST USE IN COMMERCE: 20010701

IC 009. US 021 023 026 036 038. G & S: Laboratory analyte testing apparatuses, namely fluorometers, immunoassay devices, pipets, and electronic storage media containing encoded testing parameters, for detection of drugs of abuse, microbes, and markers related to a wide variety of illnesses and diseases. FIRST USE: 20010701. FIRST USE IN COMMERCE: 20010701

IC 010. US 026 039 044. G & S: Medical diagnostic testing apparatuses, namely fluorometers, immunoassay devices, and electronic storage media containing encoded testing parameters, for detection of drugs of abuse, microbes, and markers related to a wide variety of illnesses and diseases. FIRST USE: 20010701. FIRST USE IN COMMERCE: 20010701

IC 042. US 100 101. G & S: Scientific and medical research services, namely generation of antibodies and antibody expression libraries, diagnostic assay design and development, and identification and validation of diagnostic and therapeutic targets. FIRST USE: 20010701. FIRST USE IN COMMERCE: 20010701

Mark Drawing Code	(3) DESIGN PLUS WORDS, LETTERS, AND/OR NUMBERS
Design Search Code	01.09.05 - Atomic models; Molecular models 26.01.21 - Circles that are totally or partially shaded. 27.03.01 - Geometric figures forming letters, numerals or punctuation
Serial Number	76634473
Filing Date	March 28, 2005
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	July 18, 2006
Registration Number	3152581
Registration Date	October 10, 2006
Owner	(REGISTRANT) Biosite, Inc. CORPORATION DELAWARE 11030 Roselle Street, Suite D San Diego CALIFORNIA 92121 (LAST LISTED OWNER) ALERE SAN DIEGO, INC. CORPORATION DELAWARE 9975 SUMMERS RIDGE ROAD SAN DIEGO CALIFORNIA 92121
Assignment Recorded	ASSIGNMENT RECORDED
Prior Registrations	1794618;1796567
Description of Mark	Color is not claimed as a feature of the mark.
Type of Mark	TRADEMARK. SERVICE MARK
Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR).
Live/Dead Indicator	**LIVE**

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Start List At: OR Jump to record: **Record 91 out of 95**

BIOSITE

Word Mark	BIOSITE
Goods and Services	IC 005. US 018 026 044. G & S: laboratory diagnostic test kits containing antibodies, **reagents, reagent** vesicles, support racks, and pipettes. FIRST USE: 19920212. FIRST USE IN COMMERCE: 19920212 IC 009. US 026. G & S: laboratory analyte testing apparatus for detection of abused drugs and metabolites thereof. FIRST USE: 19920212. FIRST USE IN COMMERCE: 19920212
Standard Characters Claimed	
Mark Drawing Code	(4) STANDARD CHARACTER MARK
Serial Number	74260208
Filing Date	March 30, 1992
Current Basis	1A
Original Filing Basis	1A
Published for Opposition	July 6, 1993
Change In Registration	CHANGE IN REGISTRATION HAS OCCURRED
Registration Number	1794618
Registration Date	September 28, 1993
Owner	(REGISTRANT) BIOSITE DIAGNOSTICS, INCORPORATED CORPORATION DELAWARE

	11030 Roselle Street, Suite D San Diego CALIFORNIA 92121
	(LAST LISTED OWNER) ALERE SAN DIEGO, INC. CORPORATION DELAWARE 9975 SUMMERS RIDGE ROAD SAN DIEGO CALIFORNIA 92121
Assignment Recorded	ASSIGNMENT RECORDED
Attorney of Record	Francine M. Hanson
Type of Mark	TRADEMARK
Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR). SECTION 8(10-YR) 20030616.
Renewal	1ST RENEWAL 20030616
Live/Dead Indicator	**LIVE**

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Start List At: OR Jump to record: **Record 85 out of 95**

Typed Drawing

Word Mark	BIOSYN
Goods and Services	IC 005. US 006 018 044 046 051 052. G & S: DIAGNOSTIC CHEMICAL **REAGENTS** AND TEST PREPARATIONS FOR MEDICAL LABORATORY AND CLINICAL USE IN THE PRODUCTION OF VACCINES; AND PHARMACEUTICAL PREPARATIONS FOR THE TREATMENT OF TUMORS, BACTERIAL AND VIRAL INFECTIONS, IMMUNE DISEASES, HEART DISEASES AND INFLAMMATORY DISEASE AND NUTRITIONAL SUPPLEMENTS. FIRST USE: 19950101. FIRST USE IN COMMERCE: 19950101
Mark Drawing Code	(1) TYPED DRAWING
Serial Number	75776685
Filing Date	August 16, 1999
Current Basis	1A
Original Filing Basis	1B
Published for Opposition	July 1, 2003
Registration Number	3233771
Registration Date	April 24, 2007
Owner	(REGISTRANT) Biosyn Arzneimittel GmbH CORPORATION FED REP GERMANY Schorndorfer Strasse 32 70734 Fellbach FED REP GERMANY
Attorney of Record	Audie de Castro
Type of Mark	TRADEMARK
Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR).
Live/Dead	LIVE

Indicator

EXHIBIT 2

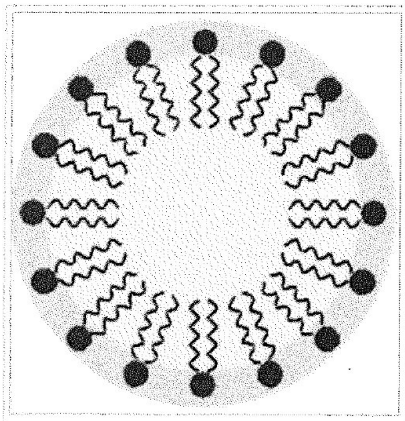
Surfactant

From Wikipedia, the free encyclopedia

Surfactants are compounds that lower the surface tension (or interfacial tension) between two liquids or between a liquid and a solid. Surfactants may act as detergents, wetting agents, emulsifiers, foaming agents, and dispersants.

Contents

- 1 Etymology and definition
- 2 Composition and structure
  - 2.1 Structure of surfactant phases in water
  - 2.2 Dynamics of surfactants at interfaces
- 3 Characterization of interfaces and surfactant layers
  - 3.1 Detergents in biochemistry and biotechnology
- 4 Classification of surfactants
  - 4.1 Anionic
    - 4.1.1 Sulfate, sulfonate, and phosphate esters
    - 4.1.2 Carboxylates
  - 4.2 Cationic head groups
  - 4.3 Zwitterionic surfactants
  - 4.4 Nonionic surfactant
  - 4.5 According to the composition of their counter-ion
- 5 Current market and forecast
- 6 Health and environmental controversy
- 7 Biosurfactants
- 8 Safety and environmental risks
  - 8.1 Biosurfactants and Deepwater Horizon
- 9 Applications
- 10 See also
- 11 References
- 12 External links



Micelle in aqueous solution

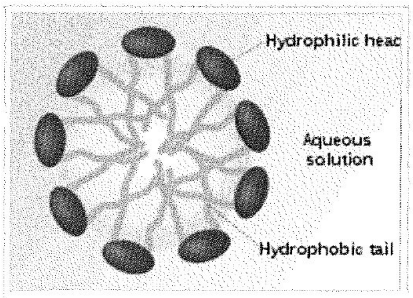
Etymology and definition

The term *surfactant/surfactants* is a blend of *surface active agents*.[1]

In Index Medicus and the United States National Library of Medicine, *surfactant/surfactants* is reserved for the meaning pulmonary surfactant. For the more general meaning, *surface active agent/s* is the heading.

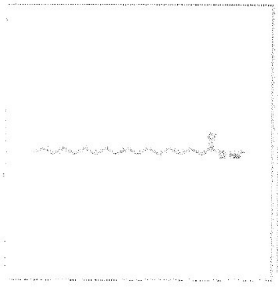
Composition and structure

Surfactants are usually organic compounds that are amphiphilic, meaning they contain both hydrophobic groups (their *tails*) and hydrophilic groups (their *heads*).[2] Therefore, a surfactant contains both a water insoluble (or oil soluble) component and a water soluble component. Surfactants will diffuse in water and adsorb at interfaces between air and water or at the interface between oil and water, in the case where water is mixed with oil. The insoluble hydrophobic group may extend out of the bulk water phase, into the air or into the oil phase, while the water soluble head group remains in the water phase. This alignment of surfactants at the surface modifies the surface properties of water at the water/air or water/oil interface.

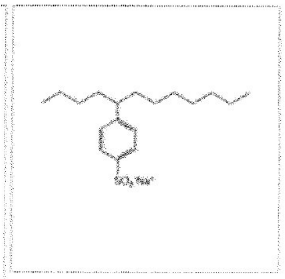


A micelle—the lipophilic tails of the surfactant ions remain on the inside of the micelle due to unfavourable interactions. The polar "heads" of the micelle, due to favourable interactions with water, form a hydrophilic outer layer that in effect protects the hydrophobic core of the micelle. The compounds that make up a micelle are typically amphiphilic in nature, meaning that micelles are soluble not only in protic solvents such as water but also in aprotic solvents as a reverse micelle.

World production of surfactants is estimated at 15 Mton/y, of which about half are soaps. Other surfactants produced on a particularly large scale are linear alkylbenzenesulfonates (1700 kton/y), lignin sulfonates (600 kton/y), fatty alcohol ethoxylates (700 ktons/y), and alkylphenol ethoxylates (500 kton/y).[3]



Sodium stearate, the most common component of most soap, which comprise about 50% of commercial surfactants.



4-(5-Dodecyl) benzenesulfonate, a linear dodecylbenzenesulfonate, one of the most common surfactants.

Structure of surfactant phases in water

In the bulk aqueous phase, surfactants form aggregates, such as micelles, where the hydrophobic tails form the core of the aggregate and the hydrophilic heads are in contact with the surrounding liquid. Other types of aggregates such as spherical or cylindrical micelles or bilayers can be formed. The shape of the aggregates depends on the chemical structure of the surfactants, depending on the balance of the sizes of the hydrophobic tail and hydrophilic head. This is known as the HLB, Hydrophilic-lipophilic balance. Surfactants reduce the surface tension of water by adsorbing at the liquid-gas interface. The relation that links the surface tension and the surface excess is known as the Gibbs isotherm.

Dynamics of surfactants at interfaces

The dynamics of adsorption of surfactants is of great importance for practical applications such as foaming, emulsifying or coating processes, where bubbles or drops are rapidly generated and need to be stabilized. The dynamics of adsorption depends on the diffusion coefficient of the surfactants. Indeed, as the interface is created, the adsorption is limited by the diffusion of the surfactants to the interface. In some cases, there exists a barrier of energy for the adsorption or the desorption of the surfactants, then the adsorption dynamics is known as 'kinetically limited'. Such energy barrier can be due to steric or electrostatic repulsions. The surface rheology of surfactant layers, including the elasticity and viscosity of the surfactant layers plays a very important role in foam or emulsion stability.

Characterization of interfaces and surfactant layers

Interfacial and surface tension can be characterized by classical methods such as the -pendant or spinning drop method Dynamic surface tensions, i.e. surface tension as a function of time, can be obtained by the Maximum Bubble Pressure apparatus

The structure of surfactant layers can be studied by ellipsometry or X-Ray reflectivity.

Surface rheology can be characterized by the oscillating drop method or shear surface rheometers such as double-cone, double-ring or magnetic rod shear surface rheometer.

Detergents in biochemistry and biotechnology

In solution, detergents help solubilize a variety of chemical species by dissociating aggregates and unfolding proteins. Popular surfactants in the biochemistry laboratory are SDS and CTAB. Detergents are key reagents to extract protein by lysis of the cells and tissues: They disorganize the membrane's lipidic bilayer (SDS, Triton X-100, X-114, CHAPS, DOC, and NP-40), and solubilize proteins. Milder detergents such as (OctylThioGlucosides) are used to solubilize sensible proteins (enzymes, receptors). Non-solubilized material is harvested by centrifugation or other means. For electrophoresis, for example, proteins are classically treated with SDS to denature the native tertiary and quaternary structures, allowing the separation of proteins according to their molecular weight.

Detergents have also been used to decellularise organs. This process maintains a matrix of proteins that preserves the structure of the organ and often the microvascular network. The process has been successfully used to prepare organs such as the liver and heart for transplant in rats.[4] Pulmonary surfactants are also naturally secreted by type II cells of the lung alveoli in mammals.

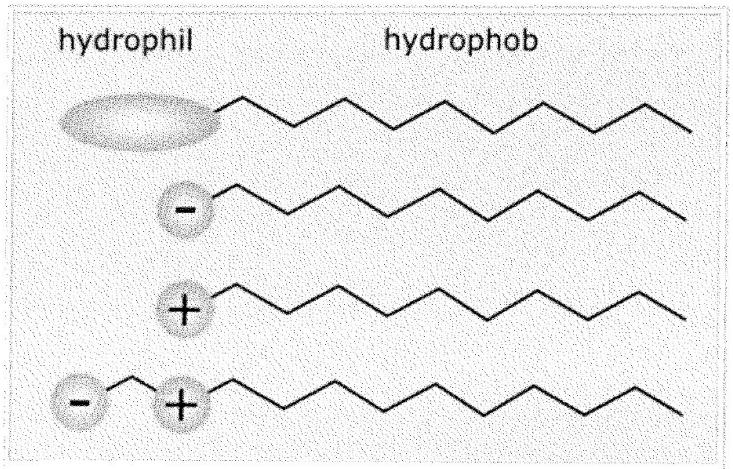
Classification of surfactants

The "tail" of most surfactants are fairly similar, consisting of a hydrocarbon chain, which can be branch, linear, or aromatic. Fluorosurfactants have fluorocarbon chains. Siloxane surfactants have siloxane chains.

Many important surfactants include a polyether chain terminating in a highly polar anionic group. The polyether groups often comprise ethoxylated (polyethylene oxide-like) sequences inserted to increase the hydrophilic character of a surfactant. Polypropylene oxides conversely, may be inserted to increase the lipophilic character of a surfactant.

Surfactant molecules have either one tail or two; those with two tails are said to be **double-chained**.

Most commonly, surfactants are classified according to polar head group. A non-ionic surfactant has no charge groups in its head. The head of an ionic surfactant carries a net charge. If the charge is negative, the surfactant is more specifically called anionic; if the charge is positive, it is called cationic. If a surfactant contains a head with two oppositely charged groups, it is termed zwitterionic. Commonly encountered surfactants of each type include:



Surfactant classification according to the composition of their head: nonionic, anionic, cationic, amphoteric.

Anionic

Sulfate, sulfonate, and phosphate esters

Anionic surfactants contain anionic functional groups at their head, such as sulfate, sulfonate, phosphate, and carboxylates. Prominent alkyl sulfates include ammonium lauryl sulfate, sodium lauryl sulfate (SDS, sodium dodecyl sulfate, another name for the compound) and the related alkyl-ether sulfates sodium laureth sulfate, also known as sodium lauryl ether sulfate (SLES), and sodium myreth sulfate.

Docusates: dioctyl sodium sulfosuccinate, perfluorooctanesulfonate (PFOS), perfluorobutanesulfonate, linear alkylbenzene sulfonates (LABs).

These include alkyl-aryl ether phosphates and the alkyl ether phosphate

Carboxylates

These are the most common surfactants and comprise the alkyl carboxylates (soaps), such as sodium stearate. More specialized species include sodium lauroyl sarcosinate and carboxylate-based fluorosurfactants such as perfluorononanoate, perfluorooctanoate (PFOA or PFO).

Cationic head groups

- pH-dependent primary, secondary, or tertiary amines: Primary and secondary amines become positively charged at pH < 10:[5]
  - Octenidine dihydrochloride;

- Permanently charged quaternary ammonium cation:
  - Alkyltrimethylammonium salts: cetyl trimethylammonium bromide (CTAB) a.k.a. hexadecyl trimethyl ammonium bromide, cetyl trimethylammonium chloride (CTAC
  - Cetylpyridinium chloride (CPC)
  - Benzalkonium chloride (BAC)
  - Benzethonium chloride (BZT)
  - 5-Bromo-5-nitro-1,3-dioxane
  - Dimethyldioctadecylammonium chloride
  - Cetrimonium bromide
  - Dioctadecyldimethylammonium bromide (DODAB)

Zwitterionic surfactants

Zwitterionic (amphoteric) surfactants have both cationic and anionic centers attached to the same molecule. The cationic part is based on primary, secondary, or tertiary amines or quaternary ammonium cations. The anionic part can be more variable and include sulfonates, as in CHAPS (3-[(3-Cholamidopropyl)dimethylammonio]-1-propanesulfonate). Other anionic groups are sultaines illustrated by cocamidopropyl hydroxysultaine. Betaines, e.g., cocamidopropyl betaine. Phosphates: lecithin

Nonionic surfactant

Many long chain alcohols exhibit some surfactant properties. Prominent among these are the fatty alcohols cetyl alcohol, stearyl alcohol, and cetostearyl alcohol (consisting predominantly of cetyl and stearyl alcohols), and oleyl alcohol.

- Polyoxyethylene glycol alkyl ethers (Brij): $CH_3–(CH_2)_{10–16}–(O-C_2H_4)_{1–25}–OH$:
  - Octaethylene glycol monododecyl ether
  - Pentaethylene glycol monododecyl ether
- Polyoxypropylene glycol alkyl ethers: $CH_3–(CH_2)_{10–16}–(O-C_3H_6)_{1–25}–O$
- Glucoside alkyl ethers: $CH_3–(CH_2)_{10–16}–(O-Glucoside)_{1–3}–OH$:
  - Decyl glucoside,
  - Lauryl glucoside
  - Octyl glucoside
- Polyoxyethylene glycol octylphenol ethers: $C_8H_{17}–(C_6H_4)–(O-C_2H_4)_{1–25}–OH$:
  - Triton X-100
- Polyoxyethylene glycol alkylphenol ethers: $C_9H_{19}–(C_6H_4)–(O-C_2H_4)_{1–25}–OH$:
  - Nonoxynol-9
- Glycerol alkyl esters:
  - Glyceryl laurate
- Polyoxyethylene glycol sorbitan alkyl esters: Polysorbate
- Sorbitan alkyl esters: Spans
- Cocamide MEA, cocamide DEA
- Dodecyldimethylamine oxide
- Block copolymers of polyethylene glycol and polypropylene glycol: Poloxamers
- Polyethoxylated tallow amine (POEA).

According to the composition of their counter-ion

In the case of ionic surfactants, the counter-ion can be:

- Monoatomic / Inorganic:
  - Cations: metals : alkali metal, alkaline earth metal, transition metal
  - Anions: halides: chloride (Cl^-), bromide (Br^-), iodide (I^-)
- Polyatomic / Organic:
  - Cations: ammonium, pyridinium, triethanolamine (TEA)
  - Anions: tosyls, trifluoromethanesulfonates, methylsulfate

Current market and forecast

The annual global production of surfactants was 13 million metric tons in 2008, and the annual turnover reached US$24.33 billion in 2009, nearly 2% up from the previous year. The market is expected to experience quite healthy growth by 2.8% annually to 2012 and by 3.5 – 4% thereafter.[6][7] Specialists expect the global surfactant market to generate revenues of more than US$41 billion in 2018 – translating to an average annual growth of 4.5%[8]

Health and environmental controversy

Surfactants are routinely deposited in numerous ways on land and into water systems, whether as part of an intended process or as industrial and household waste. Some of them are known to be toxic to animals, ecosystems, and humans, and can increase the diffusion of other environmental contaminants.[9][10][11] As a result, there are proposed or voluntary restrictions on the use of some surfactants. For example, PFOS is a persistent organic pollutant as judged by the Stockholm Convention. Additionally, PFOA has been subject to a voluntary agreement by the U.S. Environmental Protection Agency and eight chemical companies to reduce and eliminate emissions of the chemical and its precursors.[12]

The two major surfactants used in the year 2000 were linear alkylbenzene sulfonates (LAS) and the alkyl phenol ethoxylates (APE). They break down in the aerobic conditions found in sewage treatment plants and in soil.[13]

Ordinary dishwashing detergent, for example, will promote water penetration in soil, but the effect would last only a few days (many standard laundry detergent powders contain levels of chemicals such as alkali and chelating agents that can be damaging to plants and should not be applied to soils). Commercial soil wetting agents will continue to work for a considerable period, but they will eventually be degraded by soil micro-organisms. Some can, however, interfere with the life-cycles of some aquatic organisms, so care should be taken to prevent run-off of these products into streams, and excess product should not be washed down.[*citation needed*]

Anionic surfactants can be found in soils as the result of sludge application, wastewater irrigation, and remediation processes. Relatively high concentrations of surfactants together with multimetals can represent an environmental risk. At low concentrations, surfactant application is unlikely to have a significant effect on trace metal mobility.[14][15]

Biosurfactants

Biosurfactants are surface-active substances synthesised by living cells. Interest in microbial surfactants has been steadily increasing in recent years due to their diversity, environmentally friendly nature, possibility of large-scale production, selectivity, performance under extreme conditions, and potential applications in environmental protection.[16][17] Few of the popular examples of microbial biosurfactants includes Emulsan produced by *Acinetobacter calcoaceticus*,[18] Sophorolipids produced by several yeasts belonging to *candida* and *starmerella clade*,[19][20] and Rhamnolipid produced by *Pseudomonas aeruginosa* [21] etc.

Biosurfactants enhance the emulsification of hydrocarbons, have the potential to solubilise hydrocarbon contaminants and increase their availability for microbial degradation. The use of chemicals for the treatment of a hydrocarbon polluted site may contaminate the environment with their by-products, whereas biological treatment may efficiently destroy pollutants, while being biodegradable themselves. Hence, biosurfactant-producing microorganisms may play an important role in the accelerated bioremediation of hydrocarbon-contaminated sites.[22][23][24] These compounds can also be used in enhanced oil recovery and may be considered for other potential applications in environmental protection.[24][25] Other applications include herbicides and pesticides formulations, detergents, healthcare and cosmetics, pulp and paper, coal, textiles, ceramic processing and food industries, uranium ore-processing, and mechanical dewatering of peat.[16][17][26]

Several microorganisms are known to synthesise surface-active agents; most of them are bacteria and yeasts.[27][28] When grown on hydrocarbon substrate as the carbon source, these microorganisms synthesise a wide range of chemicals with surface activity, such as glycolipid, phospholipid, and others.[29][30] These chemicals are synthesised to emulsify the hydrocarbon substrate and facilitate its transport into the cells. In some bacterial species such as *Pseudomonas aeruginosa*, biosurfactants are also involved in a group motility behavior called swarming motility.

Safety and environmental risks

Most anionic and nonionic surfactants are nontoxic, having LD50 comparable to sodium chloride. The situation for cationic surfactants is more diverse. Dialkyldimethylammonium chlorides have very low LD50's (5 g/kg) but alkylbenzyldimethylammonium chloride has an LD50 of 0.35 g/kg. Prolonged exposure of skin to surfactants can cause chaffing because surfactants (e.g., soap) disrupts the lipid coating that protects skin (and other) cells.[3]

Biosurfactants and Deepwater Horizon

The use of biosurfactants as a way to remove petroleum from contaminated sites has been studied and found to be safe and effective in the removal petroleum products from soil. Biosurfactants were not used by BP after the Deepwater Horizon oil spill. However, unprecedented amounts of Corexit (active ingredient: Tween-80), were sprayed directly into the ocean at the leak and on the sea-water's surface, the theory being that the surfactants isolate droplets of oil, making it easier for petroleum-consuming microbes to digest the oil.

Applications

Surfactants play an important role as cleaning, wetting, dispersing, emulsifying, foaming and anti-foaming agents in many practical applications and products, including:

- Detergents
- Fabric softeners
- Emulsions
- Paints
- Adhesives
- Inks
- Anti-fogs
- Ski waxes, snowboard wax
- Deinking of recycled papers, in flotation, washing and enzymatic processes
- Laxatives
- Agrochemical formulations
  - Herbicides (some)
  - Insecticides
- Quantum dot coatings
- Biocides (sanitizers)
- Cosmetics:
  - Shampoos
  - Hair conditioners (after shampoo)
  - Toothpastes
- Spermicides (nonoxynol-9)
- Firefighting
- Pipelines, liquid drag reducing agent
- Alkali Surfactant Polymers (used to mobilize oil in oil wells)
- Ferrofluids
- Leak Detectors

See also

- Anti-fog
- Cleavable detergent
- Emulsion
- MBAS assay, an assay that indicates anionic surfactants in water with a bluing reaction.
- Niosome
- Oil dispersants
- Pulmonary surfactant
- Surfactants in paint

References

1. ^ Rosen MJ and Kunjappu JT (2012). *and Interfacial Phenomena* (http://books.google.com/books?id=1rCdNIzB78AC&printsec=frontcover) (4th ed.). Hoboken, New Jersey: John Wiley & Sons. p. 1. ISBN 1-118-22902-9.
2. ^ "Bubbles, Bubbles, Everywhere, But Not a Drop to Drink" (http://www.samuelfurse.com/2011/11/bubbles-bubbles-everywhere-but-not-a-drop-to-drink/). *The Lipid Chronicles*. Retrieved 08/01/2012.

3. ^ [a] [b] Kurt Kosswig "Surfactants" in Ullmann's Encyclopedia of Industrial Chemistry, Wiley-VCH, 2005, Weinheim. doi:10.1002/14356007.a25_747 (http://dx.doi.org/10.1002%2F14356007.a25_747)
4. ^ Wein, Harrison (28 June 2010). "Progress Toward an Artificial Liver Transplant – NIH Research Matters" (http://www.nih.gov/researchmatters/june2010/06282010liver.htm). National Institutes of Health (NIH).
5. ^ http://www.chem.wisc.edu/areas/reich/pkatable/index.htm. Missing or empty `|title=` (help)
6. ^ "Market Report: World Surfactant Market" (http://www.acmite.com/market-reports/chemicals/world-surfactant-market.html). Acmite Market Intelligence (http://www.acmite.com).
7. ^ Reznik, Gabriel O.; Vishwanath, Prashanth; Pynn, Michelle A.; Sitnik, Joy M.; Todd, Jeffrey J.; Wu, Jun; Jiang, Yan; Keenan, Brendan G. et al. (2010). "Use of sustainable chemistry to produce an acyl amino acid surfactant". *Applied Microbiology and Biotechnology* **86** (5): 1387–97. doi:10.1007/s00253-009-2431-8 (http://dx.doi.org/10.1007%2Fs00253-009-2431-8). PMID 20094712 (//www.ncbi.nlm.nih.gov/pubmed/20094712).
8. ^ Market Study on Surfactants by Ceresana Research (http://www.ceresana.com/en/market-studies/chemicals/surfactants)
9. ^ Metcalfe, Tracy L.; Dillon, Peter J.; Metcalfe, Chris D. (2008). "DETECTING THE TRANSPORT OF TOXIC PESTICIDES FROM GOLF COURSES INTO WATERSHEDS IN THE PRECAMBRIAN SHIELD REGION OF ONTARIO, CANADA". *Environmental Toxicology and Chemistry* **27** (4): 811–8. doi:10.1897/07-216.1 (http://dx.doi.org/10.1897%2F07-216.1). PMID 18333674 (//www.ncbi.nlm.nih.gov/pubmed/18333674).
10. ^ Emmanuel, E; Hanna, K; Bazin, C; Keck, G; Clement, B; Perrodin, Y (2005). "Fate of glutaraldehyde in hospital wastewater and combined effects of glutaraldehyde and surfactants on aquatic organisms". *Environment International* **31** (3): 399–406. doi:10.1016/j.envint.2004.08.011 (http://dx.doi.org/10.1016%2Fj.envint.2004.08.011). PMID 15734192 (//www.ncbi.nlm.nih.gov/pubmed/15734192).
11. ^ Murphy, M; Alkhalidi, M; Crocker, J; Lee, S; Oregan, P; Acott, P (2005). "Two formulations of the industrial surfactant, Toximul, differentially reduce mouse weight gain and hepatic glycogen in vivo during early development: effects of exposure to Influenza B Virus". *Chemosphere* **59** (2): 235–46. doi:10.1016/j.chemosphere.2004.11.084 (http://dx.doi.org/10.1016%2Fj.chemosphere.2004.11.084). PMID 15722095 (//www.ncbi.nlm.nih.gov/pubmed/15722095).
12. ^ USEPA: "2010/15 PFOA Stewardship Program" (http://www.epa.gov/opptintr/pfoa/pubs/pfoastewardship.htm) Accessed October 26, 2008.
13. ^ Scott, M; Jones, Malcolm N (2000). "The biodegradation of surfactants in the environment". *Biochimica et Biophysica Acta (BBA) – Biomembranes* **1508**: 235–251. doi:10.1016/S0304-4157(00)00013-7 (http://dx.doi.org/10.1016%2FS0304-4157%2800%2900013-7).
14. ^ Hernández-Soriano Mdel, C; Degryse, F; Smolders, E (2011). "Mechanisms of enhanced mobilisation of trace metals by anionic surfactants in soil". *Environmental pollution (Barking, Essex : 1987)* **159** (3): 809–16. doi:10.1016/j.envpol.2010.11.009 (http://dx.doi.org/10.1016%2Fj.envpol.2010.11.009). PMID 21163562 (//www.ncbi.nlm.nih.gov/pubmed/21163562).
15. ^ Hernández-Soriano Mdel, C; Peña, A; Dolores Mingorance, M (2010). "Release of metals from metal-amended soil treated with a sulfosuccinamate surfactant: effects of surfactant concentration, soil/solution ratio, and pH". *Journal of environmental quality* **39** (4): 1298–305. doi:10.2134/jeq2009.0242 (http://dx.doi.org/10.2134%2Fjeq2009.0242). PMID 20830918 (//www.ncbi.nlm.nih.gov/pubmed/20830918).
16. ^ [a] [b] Banat, I. M., Makkar, R. S., Cameotra, S. S. (2000). "Potential commercial applications of microbial surfactants". *Appl. Microbiol. Biotechnol.* **53** (5): 495–508. doi:10.1007/s002530051648 (http://dx.doi.org/10.1007%2Fs002530051648). PMID 10855707 (//www.ncbi.nlm.nih.gov/pubmed/10855707).
17. ^ [a] [b] Rahman, K. S. M., Thahira-Rahman, J., McClean, S., Marchant, R., Banat, I.M (2002). "Rhamnolipid biosurfactants production by strains of Pseudomonas aeruginosa using low cost raw materials". *Biotechnol Prog.* **18** (6): 1277–1281. doi:10.1021/bp020071x (http://dx.doi.org/10.1021%2Fbp020071x). PMID 12467462 (//www.ncbi.nlm.nih.gov/pubmed/12467462).
18. ^ Appl. Environ. Microbiol. September 1983 vol. 46 no. 3 573-579
19. ^ Kurtzman, C. P.; Price, N. P.; Ray, K. J.; Kuo, T. M., Production of sophorolipid biosurfactants by multiple strains of the Starmerella (Candida) bombicola yeast clade. FEMS Microbiol Lett 2010, 311 (2), 140-146.

20. ^ Parekh, V. J.; Pandit, A. B., Optimization of fermentative production of sophorolipid biosurfactant by starmerella bombicola NRRL Y-17069 using response surface methodology. International Journal of Pharmacy and Biological Sciences 2011, 1 (3), 103-116
21. ^ Ito S, Honda H, Tomita F, Suzuki T. Rhamnolipids produced by Pseudomonas aeruginosa grown on n-paraffin (mixture of C 12 , C 13 and C 14 fractions). J Antibiot (Tokyo) 1971 Dec;24(12):855–859
22. ^ Rosenberg, E., Ron, E. Z (1999). "High and low molecular mass microbial surfactants". *Appl. Microbiol. Biotechnol.* **52** (2): 154–162. doi:10.1007/s002530051502 (http://dx.doi.org/10.1007%2Fs002530051502). PMID 10499255 (//www.ncbi.nlm.nih.gov/pubmed/10499255).
23. ^ Del 'Arco, J. P., De Franca, F. P (2001). "Influence of oil contamination levels on hydrocarbon biodegradation in sandy sediments". *Environ. Pollut.* **110**: 515–519.
24. ^ [a] [b] Rahman, K. S. M., Banat, I.M., Thahira-Rahman, J., Thayumanavan, T., Lakshmanaperumalsamy, P (2002). "Bioremediation of gasoline contaminated soil by a bacterial consortium amended with poultry litter, coir pith and rhamnolipid biosurfactant". *Bioresource Technol.* **81**: 25–32. doi:10.1016/S0960-8524(01) 00105-5 (http://dx.doi.org/10.1016%2FS0960-8524%2801%2900105-5).
25. ^ Shulga, A., Karpenko, E., Vildanova-Martsishin, R., Turovsky, A., Soltys, M (1999). "Biosurfactant enhanced remediation of oil-contaminated environments". *Adsorpt. Sci. Technol.* **18**: 171–176.
26. ^ Ron, E. Z., Rosenberg, E (2001). "Natural roles of biosurfactants". *Environ. Microbiol.* **3** (4): 229–236. doi:10.1046/j.1462-2920.2001.00190.x (http://dx.doi.org/10.1046%2Fj.1462-2920.2001.00190.x). PMID 11359508 (//www.ncbi.nlm.nih.gov/pubmed/11359508).
27. ^ Banat, I. M (1995). "Biosurfactants production and possible uses in microbial enhanced oil recovery and oil pollution remediation: a review". *Bioresource Technol.* **51**: 1–12. doi:10.1016/0960-8524(94)00101-6 (http://dx.doi.org/10.1016%2F0960-8524%2894%2900101-6).
28. ^ Kim, S.E., Lim, E. J., Lee, S.O., Lee , J. D., Lee, T.H (2000). "Purification and characterisation of biosurfactants from Nocardia sp. L-417". *Biotechnol. Appl. Biochem.* **31** (3): 249–253. doi:10.1042/BA19990111 (http://dx.doi.org/10.1042%2FBA19990111).
29. ^ Muriel, J.M., Bruque, J.M., Olias, J.M., Sanchez, A. J (1996). "Production of biosurfactants by Cladosporium resinae". *Biotechnol. Lett.* **18** (3): 235–240. doi:10.1007/BF00142937 (http://dx.doi.org/10.1007%2FBF00142937).
30. ^ Desai, J.D., Banat, I.M (1997). "Microbial production of surfactants and their commercial potential" (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC232600). *Microbiol. Mol. Biol. Rev.* **61** (1): 47–64. PMC 232600 (//www.ncbi.nlm.nih.gov/pmc/articles/PMC232600). PMID 9106364 (//www.ncbi.nlm.nih.gov/pubmed/9106364).

External links

- Surfactants explained for parents (http://www.curoservice.com/parents_visitors/surfactant/surfactant_composition_action.asp)
- Identification of Surfactants Using Liquid Chromatography-Mass Spectrometry (LC-MS) (http://littlemsandsailing.wordpress.com/2011/05/01/identification-of-surfactants-in-commercial-products-by-mass-spectrometry/)
- Surfactant films on ocean surface implicated in global warming (http://www.q-mag.org/vladimirpudovoce/index.html)

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Article

An efficiency evaluation of iron concentrates flotation using rhamnolipid biosurfactant as a frothing reagent

Khoshdast, Sam [more]

Environmental Engineering Research 01/2012; 17(1):9-15.

ABSTRACT The effect of a rhamnolipid biosurfactant produced by a Pseudomonas aeruginosa MA01 strain on desulfurization of iron concentrates was studied. Surface tension measurement and frothing characterization indicated better surface activity and frothability of rhamnolipid compared to methyl isobutyl carbinol (MIBC) as operating frother. Reverse flotation tests using rhamnolipid either as a sole frother or mixed with MIBC, showed that desulfurization process is more efficient at pH 4.5 and high concentration of rhamnolipid in the presence of MIBC. However, under these conditions water recovery decreased due to the change in rhamnolipid aggregates morphology. Results from the present study seemed promising to introduce the biosurfactant from Pseudomonas aeruginosa as a new frother. [less]

Keywords

conditions water recovery
methyl isobutyl carbinol
new frother
Pseudomonas aeruginosa
Pseudomonas aeruginosa MA01 strain
Reverse flotation tests
rhamnolipid aggregates morphology
rhamnolipid biosurfactant
surface activity
Surface tension measurement


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Conference Proceeding

Mineral flotation in the presence of rhamnolipid biosurfactant as a frothing reagent

Khoshdast, Abbasi, Sam, Akbari Noghabi [more]

01/2012; In proceeding of: International Mining Congress and Expo (IMC 2012), At Tehran, Iran

EXHIBIT 3

Merriam-Webster
m-w.com

Quizzes & Games | Word of the Day | Video | New Words | My Favorites

New!
Spanish Central ▸

reagent Subm

Quiz
Name That Thing
Take Our 10-Question Quiz

reagent

Save Popularity

8 ENTRIES FOUND:
reagent
Girard reagent
Grignard reagent

Save this word to your Favorites.
If you're logged into Facebook, you're ready to go

re·agent *noun* \rē-'ā-jənt\

chemistry : a substance that is used to test for the presence of another substance by causing a chemical reaction with it

Full Definition of REAGENT

Like

: a substance used (as in detecting or measuring a component, in preparing a product, or in developing photographs) because of its chemical or biological activity

See reagent defined for English-language learners »

Origin of REAGENT

New Latin *reagent-, reagens,* present participle of *reagere* to react — more at REACT

First Known Use: 1797

Other Chemical Engineering Terms

alkali, cation, decant, hygroscopic, isotope, oxidize, slurry, solute, viscous

re·agent *noun* \rē-'ā-jənt\ ***(Medical Dictionary)***

Medical Definition of REAGENT

1 : a substance used (as in detecting or measuring a component, in preparing a product, or in developing photographs) because of its chemical or biological activity

2 : REACTOR 1b

Learn More About REAGENT

Britannica.com: Encyclopedia article about "reagent"

Browse

- Next Word in the Dictionary: reaggregate
- Previous Word in the Dictionary: reagency
- All Words Near: reagent

Seen & Heard

What made you want to look up *reagent*? Please tell us where you read or heard it (including the quote, if possible).

MORE QUIZZES

Spell It
The commonly misspelled words quiz
Hear It, Spell It »

Vocabulary Quiz
How strong is your vocabulary?
Take the Quiz »

Quizzitive: Our New App!
The Vocab Quiz Game for iPhone & iPad
★★★★★ "Incredibly fun and addictive. And informative!" — User Review, iTunes
Download the App »

"Opportunity," and Other Words We Love
Most Popular Tweets About Words, Vol. 2

Seen & Heard: Good Quotes From Great Books
Favorite "Seen & Heard" Comments From Readers

PHOTO CONTEST: THE WINNERS

"Serendipity"
You showed us hundreds of ways to look at "serendipity."
View the Top 15 »

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EXHIBIT 4

Biosurfit

Overview | Products | Employee Insights

biosurfit

Biosurfit develops innovative medical diagnostics solutions in order to improve the performance and outcomes of physicians, by providing real-time and accurate results of blood analysis.
It´s core product is spinit®, a user-friendly reader that combined with a disposable cartridge uses one small drop of blood to give precise results within 15 min for multi-parameter test panels.
Spinit® will soon have the potential to perform a vast majority of blood tests combining cell and immuno-based diagnostics, with integrated sample preparation into the disposable cartridge. Biosurfit will continuously develop different cartridge tests for the spinit® platform, addressing the physicians needs.

Specialties
point of care, medical devices, Surface Plasmon Ressonance (SPR), microfluidics
less

Company Updates

Biosurfit Portugal Ventures recognizes Biosurfit with "Startup of the Year 2013" Award - check Biosurfit News at http://lnkd.in/bGfiEWh
Logo
biosurfit.com
Lisbon, 12th September 2013 – Biosurfit, a rapidly-growing company focused on the Point of Care medical diagnostic market, is pleased to announce today it has won the "startup of the Year" Award from Portugal Ventures. Based on their analysis of...
1 month ago

Type
Privately Held

Company Size
11-50 employees

Website
http://www.biosurfit.com

Industry
Medical Devices

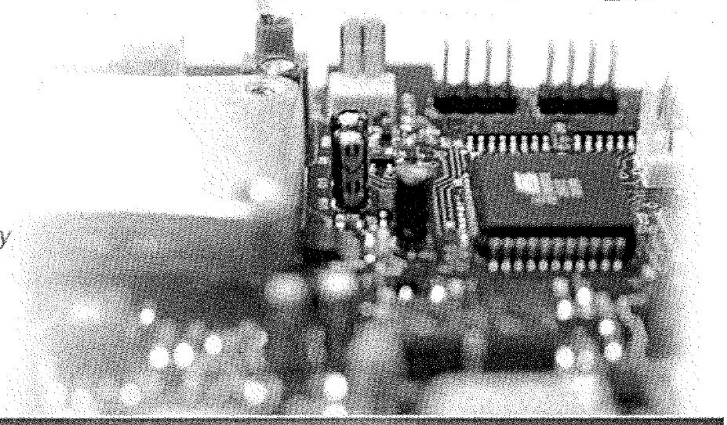
Founded
2006

Headquarters

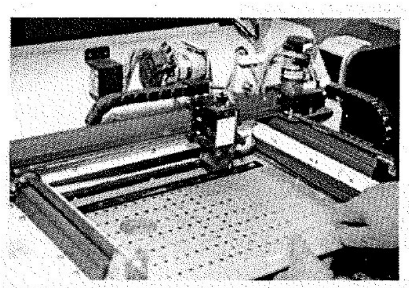
Edificio ICAT, Faculdade de Ciências da Universidade de Lisboa
Lisbon, 1749-016
PORTUGAL

Biosurfit spinit® Technology

The spinit platform includes a powerful SPR based analyser and an optical visualization sensor which are used in conjunction with our proprietary disposable cartridge to provide clinically relevant results including several blood markers and blood cell counts.



Instrumentation



The spinit® instrument currently combines optical modules for Immunoassays and optical microscopy for cell counts.

The technology behind the spinit® Immunoassay detection relies on Surface Plasmon Resonance (SPR) , a well established spectrometry technique, that enables the detection of molecular changes on the cartridge's biological recognition layer. SPR biosensors are based on a simple and direct optical technique that can be used to probe refractive index changes that occur in the very close vicinity of a thin metal film surface.

Biosurfit's in-house R&D enables us to integrate several of our proprietary technologies with tried-and-true standard industrial computer systems to provide a cost-effective high precision SPR analyser within a small footprint. Thanks to the modular development approach used in the spinit® instrument, several other analyzer modules that we are

Cartridge

The spinit® cartridge contains all the required reagents to perform a test, and uses only a drop of blood from the patient. When placed in the spinit® instrument, the cartridge will spin to predetermined velocities, and the resulting centrifugal force in the microfluidic structures of the cartridge will perform the necessary fluid handling operations.

Biosurfit's microfluidic R&D has resulted in several patented technologies to enable complex fluid management in a compact disc format. These technologies were combined with standard compact disc production techniques from our industrial partners to develop the spinit® cartridge, a disposable self-contained cartridge for the spinit® instrument.

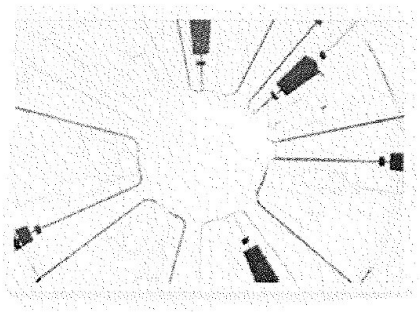


EXHIBIT 5

BioSure®

About BioSure®

Ordering Information

Links

What's New

Comments

Menu

Cytometry Controls | Cytometry Solutions | BioSure Procedures | Price List | What's New

Looking for products for
more effective flow cytometry results and QC?

You've come to the right place!

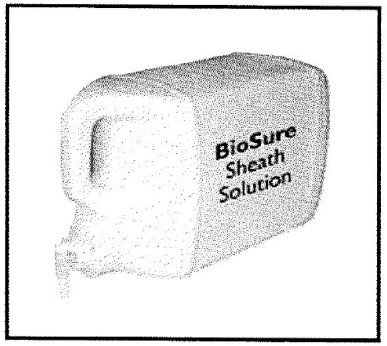
BioSure®

Home | Menu | Comments | Ordering

NEWS

Study plant DNA the

BioSure®



- Cytometry standards and controls for flow cytometric immunophenotyping and human, animal, and plant cell DNA analysis
- Flow cytometry solutions, including staining solution, sheath reagents that come in recyclable containers, and BioSure Bulk Sheath Solution

Sheath Solution 8X Concentrate Now in recyclable bottles!

When it comes to excellence in consumable products for flow cytometry, BioSure® will satisfy your lab's needs

About BioSure

Home | Menu | Comments | Ordering

Our Background

Founded in 1986, BioSure® began as a provider of unique products and expert technical assistance to research, industry, clinical laboratories, hospitals, and medical/dental facilities worldwide. Currently, we manufacture biological controls, standards, and reagents for cytometry, flow cytometry, and cellular counting.

Our Mission

We strive to be the premier supplier of the most economical consumable biological products available for cytometry, cellular counting, and for related bioanalytical techniques. We also offer these products for biotechnology laboratory quality control and quality assurance.

Our Products

- Cytometry standards and controls for flow cytometric immunophenotyping and DNA analysis
- Flow cytometry solutions, including staining solution, sheath reagents that come in recyclable containers, and BioSure Bulk Sheath Solution

Our Privacy Statement

Collection of Personal Information
When you place an order directly from the BioSure web site, we will ask you for personal or company information, including individual contact addresses, telephone numbers, and e-mail addresses, shipping instructions, and credit card numbers. We do not collect any personal information as a result of your visiting the web site for other purposes.

Information Security
We intend to guard the integrity of your personal information and collect only what is necessary to reliably manage the processing of your order. Information received from your order form is purged regularly from our computer system. We keep paper records with this data, securely stored in our Grass Valley, California offices, for two to three years following placement of your order, to meet state and federal tax requirements.

Information Sharing
We do not rent, sell, or share your information with any other parties, except in response to subpoenas, court orders, or legal processes, or to establish our legal rights or defend against legal claims.

Opt-In Policy
BioSure distributes product or applications information only in response to your specific request. We do not use your address, telephone number, FAX number, or e-mail address for unsolicited contacts or mass distributions. We will send you brochures or e-mails only if you ask for them. You may download most product information directly from the BioSure web site.

Links to Third-Party Web Sites
Occasionally, as a convenience to you, we may post links to other useful web sites on the BioSure web site. Once you click a link and leave the BioSure site, we are not responsible for any of these other web sites. BioSure assumes no responsibility for the actions of any third parties associated with these sites.

Children's Privacy
This web site is not structured nor intended to attract children. Accordingly, we would not collect personal information about anyone whom we know to be under 18 years of age.

Right to Change
By placing an order from this web site, you consent to the collection and use of your personal information for ordering purposes as outlined in this Privacy Statement. BioSure may decide to change this policy at any time. If we do, we will post the changes on this page so that you are aware of them.

Questions, suggestions or requests?

We would like to hear from you!

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BioSure®
1050 Whispering Pines Lane, Suite F
Grass Valley, CA 95945

Phone (800) 345-2267 or
(530) 273-5095
Fax (530) 273-5097
email

Menu

About BioSure®

BioSure® will satisfy your biomedical/biotechnology lab's needs.

Cytometry Controls

Efficient instrument QC, a known baseline for DNA studies: you can get these and more when you standardize with BioSure® controls. Maximize your cytometer's reliability and boost throughput while you save time, labor, and money. These dependable biological particles offer guaranteed quality and ease of use. Once you try them, you'll never prepare your own controls again.

- CRBC's - Chicken Red Blood Cells
- Negative Control
- CEN's - Chicken Erythrocyte Nuclei
- CEN Singlets
- TEN's - Trout Erythrocyte Nuclei
- Triploid Trout Nuclei
- CTN's - Calf Thymocyte Nuclei

Cytometry Solutions

Prepackaged as 8X concentrates, BioSure® sheath solutions can save most labs between 25% and 75% in shipping costs alone, without compromising quality. Help save the environment, too, when you recycle the sheath solution container. BioSure® PI Solutions offers convenience and the longest useful life of any PI product.

- Sheath Solution 8X Concentrate
- Bulk Sheath Solution
- Preservative Free Sheath Solution 8X Concentrate
- Hanks' Balanced Salt Solution (Modified) 8X Concentrate
- Propidium Iodide Staining Solution
- Propidium Iodide Powder

Procedures

Check out our simple, practical procedures for using BioSure® controls. Then use the procedures to help check out your flow cytometer performance. Evaluate alignment and linearity with BioSure® CEN's. Use CEN singlets to determine the mean pea channel. Run CTN's to set the ratio for cell-cycle analyses. BioSure® TEN's and TEN triploids make great references.

- CEN's Alignment and Linearity Check Procedure
- Negative Control Sensitivity Check Procedure
- CRBC's Initial Standardization Procedure
- CRBC's Daily Monitoring Procedure

Price List

- **Ordering Information**
- **Links** — Here are a few links to other Web sites of interest to those in the field of Cytometry.
- **What's New**
- **Comments** — Questions, suggestions or requests? We would like to hear from you.

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Cytometry Controls

BioSure®

BioSure Controls Mean Confidence in Your Flow Cytometry Results

Efficient instrument QC and a known baseline for DNA studies, whether human, animal or plant: you can get these and more when you standardize with BioSure® controls. Maximize your cytometer's reliability and boost throughput while you save time, labor, and money. These dependable biological particles offer guaranteed quality and ease of use. Once you try them, you'll never prepare your own controls again.

Innovative Uses for BioSure Controls

CRBC's - Chicken Red Blood Cells

Ideal for initial standardization and monitoring of the cytometer's optical and fluorescence parameters and PMT stability. Makes peak assessment a snap.

For more information, see our data sheet. And, review our procedures for initial standardization and daily monitoring.

Order Chicken Red Blood Cells (2.0 mL)

Order Save Money - Buy in Bulk!
Bulk Chicken Red Blood Cells (6.0 mL)

Negative Control

Monitor the lower limit fluorescence sensitivity to be sure your instrument is ready for immunophenotyping assays.

For more information, see our data sheet, or see our complete procedure for checking sensitivity.

Call us or send email Negative Control (2.0 mL)

CEN's - Chicken Erythrocyte Nuclei

These nuclei, which have multiple peaks, are excellent for checking instrument linearity.

For more information, see our data sheet or take a look at our procedure for alignment and linearity.

Order Chicken Erythrocyte Nuclei (2.0 mL)

CEN Singlets - Chicken Erythrocyte Nuclei Singlets

Use as an internal control for DNA studies using plant or animal cells.

For more information, see our data sheet. Ask about using CEN singlets to spike patient or other study samples.

Order Chicken Erythrocyte Nuclei Singlets (2.0 mL)

TEN's - Trout Erythrocyte Nuclei

TEN's

Triploid Trout Nuclei

TEN's

Triploid Trout Nuclei

TEN's

Triploid Trout Nuclei

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Triploid Trout Nuclei

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Triploid Trout Nuclei

TEN's

Triploid Trout Nuclei

TEN's easily mark a reference point to human ploidy to establish a constant DNA index range. Try TEN's for marking reference points for plant cell DNA studies. This strain of trout, *Oncorhynchus mykiss* (*Salmo gairdneri*: older literature), contains 5.149 - 5.240 pg of DNA. See data sheet for literature cited

For more information, see our data sheet.

Order Trout Erythrocyte Nuclei (2.0 mL)

Triploid Trout Nuclei

Great to run with patient samples, with almost no large aggregates (less than or equal to 3%), these cells have 3N nuclei that make them exceptionally useful for evaluating human diploid DNA values. Triploid trout nuclei are excellent for plant DNA work, too.

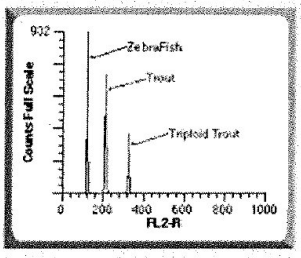
For more information, see our data sheet.

Order Triploid Trout Nuclei (2.0 mL)

ZebraFish

ZebraFish nuclei, the newest addition to the BioSure DNA controls and standards, are produced from ZebraFish (*Danio rerio)*, with a genome size of 3.4 - 3.5 pg. Use this product with TENs (rainbow trout) and TTNs (triploid rainbow trout) to provide you with a triple set of flow cytometry reference points.

For more information, see our data sheet.



Call us or send email ZebraFish (2.0 mL)

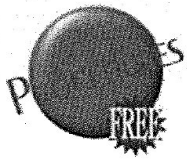
CTN's - Calf Thymocyte Nuclei

These natural cycling cells provide daily cell-cycle statistics, and also evaluate the doublet discrimination module or electronic pulse-processing system.

For more information, see our data sheet.

Order Calf Thymocyte Nuclei (2.0 mL)

Review Order



FREE PROCEDURES NOW AVAILABLE!

Write, call, fax, or e-mail us today to get procedures for using BioSure® Controls. These procedures will give you new ideas, convenient tips, and get you started on improving your cytometer QC program. Whether you want to check alignment, linearity, sensitivity, or evaluate the DDM or electronic pulse-processing system, there's an easy BioSure® procedure for you.

Questions, Suggestions or Requests?

We would like to hear from you!

TEN's

Triploid Trout Nuclei

TEN's

Triploid Trout Nuclei

TEN's

Triploid Trout Nuclei

TEN's

Triploid Trout Nuclei

TEN's

Triploid Trout Nuclei

TEN's

Triploid Trout Nuclei

ZebraFish

CTN's

Menu

Help

Convenience for Cutting-Edge Labs

Key Benefits of BioSure Controls

Stable, Liquid, No Preparation

Just squeeze a few drops into a test tube, add stain, mix, and evaluate.

Economical

One 2-mL bottle lasts most labs three to six months. Ask about bulk quantities for even greater savings.

Cost Effective

Save time and labor costs by not having to make your own controls.

Guaranteed Quality

Extensively tested on today's flow cytometers.

Review Order

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Grass Valley, CA 95945

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(530) 273-5095
Fax (530) 273-5097
email

BioSure®

Cytometry Solutions

Sheath Solution

Bulk Sheath Solution

Preservative Free

Hanks' Balanced

Propidium Iodide Solution

Hanks' Balanced

Propidium Iodide Solution

Hanks' Balanced

Propidium Iodide Solution

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Propidium Iodide

Cytometry Controls | Cytometry Solutions | BioSure Procedures | Price List | What's New

Cytometry Solutions

BioSure®

Home | Menu | Comments | Ordering

BioSure® now offers **Custom Cytometry Solutions** and **Exotic Buffers**. Contact us for details and prices.

When you want savings, efficiency, and performance, choose BioSure Solutions

BioSure® Sheath Solutions have been thoroughly tested on popular flow cytometers. Our standard sheath solution with preservative, an 8X concentrate, is now available in bulk quantities. For studies using cell sorters, try BioSure® Preservative-Free Sheath Solution - now available in 3.785-liter bottles. It's sterile and contains no azide or anti-fungal/bacterial agents. Also for your cell sorter studies, use BioSure® Hanks' Balanced Salt Solution. BioSure® Propidium Iodide Staining Solution is like no other for convenience and value. Just mix the stain with the buffer and add to BioSure® controls as needed. Make BioSure® Propidium Iodide part of your procedure for quality DNA analysis. It's ideal for human, animal, and plant cells.

Undiluted Economy

Concentrate on Maximum Savings

Our special sheath products are the ideal solutions for your flow cytometer! Prepackaged as 8X concentrates, BioSure® sheath solutions can save most labs between 25% and 75% in shipping costs alone, without compromising quality.

Key Benefits of BioSure Sheath Solution

Convenient

Shipped in 10-L twin packs, ready to install. Or, order in convenient bulk dispensers. Just add particulate free water.

Space Saving

Takes only half the bench space of traditional sheath containers.

Azide and Particulate Free

For reliable studies, choose the standard antibacterial and antifungal variety of BioSure® Sheath Solution, or the preservative-free version for Cell Sorters.

Dependable Performance

Extensively tested on popular flow cytometers, with quality guaranteed.

Save by Recycling

Remember to recycle all your bottles of BioSure Sheath Solution and save resources. Just be sure to keep the right sized bottle handy for diluting BioSure Sheath Solution.

Solution

Hanks' Balanced

Propidium Iodide Solution

Hanks' Balanced

Propidium Iodide Solution

Hanks' Balanced

Propidium Iodide Solution

Hanks' Balanced

Propidium Iodide Solution

Hanks' Balanced

Propidium Iodide Solution

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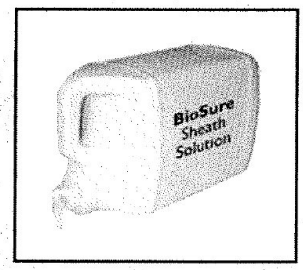
Propidium Iodide Solution

Hanks' Balanced

Sheath Solution 8X Concentrate

Now in recyclable bottles!

HDPE



BioSure® Sheath Solution 8X Concentrate is a buffered, azide-free support/carrier reagent for transporting particles through a flow cytometer. The product contains an antibacterial/antifungal preservative (not azide). The product is for in vitro diagnostic use only.

You get two 10-liter bottles, each containing 1.2 L of 8X concentrate. When reconstituted with high-purity water, each bottle yields 9.6 L of working solution, for a total of 19.2 L per carton.

For more information, see our data sheet and our MSDS

Order Sheath Solution (8X Concentrate) (2 x 2.5 gallons)

Save Money - Buy in Bulk!

Bulk Sheath Solution 8X Concentrate

HDPE

Now in recyclable bottles!

Just one 2.5-gallon (9.463-L) container of BioSure® Bulk 8X Sheath Solution produces 75.7 L of working reagent. If you use large volumes of sheath solution, it's the perfect combination of convenience and economy. Maximize savings on shipping and eliminate the hassle of making your own. This reagent has the same composition as the regular BioSure® 8X Sheath Solution.

You get two 2.5 gallon (9.463 L) bottles filled with 8X concentrate. Each liter of concentrate is reconstituted with 7 L of high-purity water to yield 8 L of working solution, for a total of 151.4 L per carton. Extra convenient, because you change lots less often. Need an extra bottle for dilution? Ask and we will send you one with your next order.

For more information, see our data sheet and our MSDS

Order Bulk Sheath Solution 8X Concentrate (2 x 2.5 gallons)
Minimun order 4 cartons

Preservative-Free Sheath Solution 8X Concentrate

HDPE

Now in recyclable bottles!

BioSure® Preservative-Free Sheath Solution 8X Concentrate contains no antibacterial/antifungal preservatives. It is ideal for use with cell sorters and systems requiring a preservative-free buffer. The product is for in vitro diagnostic use only.

You get four 1-liter bottles of 8X sterile concentrate. Each liter of sterile concentrate is reconstituted with 7 liters of high purity sterile water to yield 8 liters of sterile working solution. Total volume from one carton is 32 liters.

For more information, see our data sheet and our MSDS

Order Preservative-Free Sheath Solution (8X Concentrate) (4 x 960 mL)

Save Money - Buy in Bulk!

Bulk Preservative-Free Sheath Solution 8X Concentrate

HDPE

Now in recyclable bottles!

BioSure® Preservative-Free Sheath Solution 8X Concentrate contains no antibacterial/antifungal preservatives. It is ideal for use with cell sorters and systems requiring a preservative-free buffer. The product is for in vitro diagnostic use only.

You get four 1-gallon bottles of 8X sterile concentrate. Each gallon of sterile concentrate is reconstituted with 7 liters of high purity sterile water to yield 8 gallons (30 liters) of working solution. Each 4-gallon carton produces 32 gallons (121 liters) of solution.

For more information, see our data sheet and our MSDS

Order Bulk Preservative-Free Sheath Solution (8X Concentrate) (4 x 3.785 Liter)

Propidium Iodide Solution
Hanks' Balanced
Propidium Iodide Solution
Hanks' Balanced
Propidium Iodide Solution
Hanks' Balanced
Propidium Iodide Solution
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Hanks' Balanced
Propidium Iodide Solution
Hanks' Balanced
Propidium Iodide Solution
Hanks' Balanced
Propidium Iodide Solution
Solution
Propidium Iodide Powder
Menu
Help

Hanks' Balanced Salt Solution (Modified) 8X Concentrate

Now in recyclable bottles!

Hanks' Balanced Salt Solution (Modified) 8X Concentrate is a preservative-free transport medium for cell sorters. The product contains no antibacterial/antifungal preservative, calcium chloride, magnesium chloride, phenol red or sodium bicarbonate. The product is for research use only.

For more information, see our data sheet and our MSDS

Order Hanks' 8 X Balanced Salt Solution (Modified) (4 x 960 mL)

Review Order

BioSure Propidium Iodide Staining Solution

BioSure® PI Staining Solution at a concentration of 50 micrograms.mL is a welcome addition to your human, animal and plant cellular DNA analysis efforts. There's nothing like it for convenience and value. It has the longest useful life of any PI product.

Maximum stability: BioSure® PI solution is dated for a minimum of one year stability. Once mixed, BioSure® PI buffered solution (50 microgram/mL) remains stable for 90 days when stored in the amber bottle at refrigerator temperature (2 - 8 degrees C).

Unique packaging system: Propidium Iodide stain is an intercalating dye that fluoresces red at 488 nm. It is used in flow cytometry to analyze cellular DNA content.

The PI stain solution is supplied in two bottles. Bottle A is the Propidium iodide dye; Bottle B is the buffer (PBS/Nonidet P40). The mixed solution is stable at least 90 days when stored in the amber bottle at refrigerator temperatures (2 - 8 degrees C)

Easy to prepare: Just mix the stain with the buffer, refrigerate, and add to BioSure® controls as needed.

For more information, see our data sheet and our MSDS.

Order Propidium Iodide Staining Solution (100 mL)

Propidium Iodide Powder

BioSure® PI Powder allows you to customize your own concentration of PI staining. The powder can be reconstituted in your choice of buffers.

Maximum stability: BioSure® PI Powder - before reconstitution - is dated for 15 months stability on each bottle.

Packaging: BioSure® PI Powder consists of two bottles of PI powder at 5 mg per bottle

Easy to prepare: Simply mix the powder with your choice of buffers at your desired concentration

For more information, see our data sheet and our MSDS

Order Propidium Iodide Powder (2 x 5.0 mg/vial)

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BioSure®
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(530) 273-5095

EXHIBIT 6

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CYTO/Congress
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Resources for Cytometrists
Cytometry Certification
Interest Groups
Contact Us

Cytometry is a general name for a group of **biological** methods used to measure various parameters of **cells**. Parameters which can be measured by cytometric methods are cell size, the stage of the **cell cycle**, the **DNA** content of the cell, the existence or absence of specific **proteins** on the cell surface or in the **cytoplasm**, to name but a few.

Image Cytometry - In image cytometry the cell samples are fixed and static; they are usually analyzed by means of **microscopy**. An alternative technique that can be used is laser scanning cytometry.

Flow Cytometry - In flow cytometry a large number of cells flow in liquid and are analyzed by a **laser** beam. Image cytometry allows in-depth analysis of the shape and morphology of individual cells, whereas in flow cytometry a large number of cells can be analyzed quickly, albeit without detailed information as to the morphology of individual cells.

Biology Applications
Clinical Applications
Technology Applications

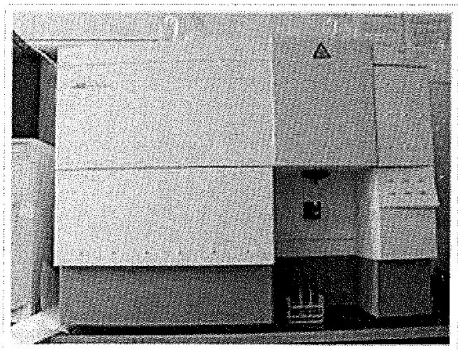
Return to home

EXHIBIT 7

Cytometry

From Wikipedia, the free encyclopedia

Cytometry is a general name for a group of biological methods used to measure various parameters of cells. Parameters which can be measured by cytometric methods are cell size, the stage of the cell cycle, the DNA content of the cell, the existence or absence of specific proteins on the cell surface or in the cytoplasm, to name but a few.



A modern flow cytometer

Image cytometry

Main article: Image cytometry

In image cytometry the cell samples are fixed and static; they are usually analyzed by means of microscopy. An alternative technique that can be used is laser scanning cytometry.

Flow cytometry

Main article: Flow cytometry

In flow cytometry a large number of cells flow in liquid and are analyzed by a laser beam. Image cytometry allows in-depth analysis of the shape and morphology of individual cells, whereas in flow cytometry a large number of cells can be analyzed quickly, albeit without detailed information as to the morphology of individual cells.

External links

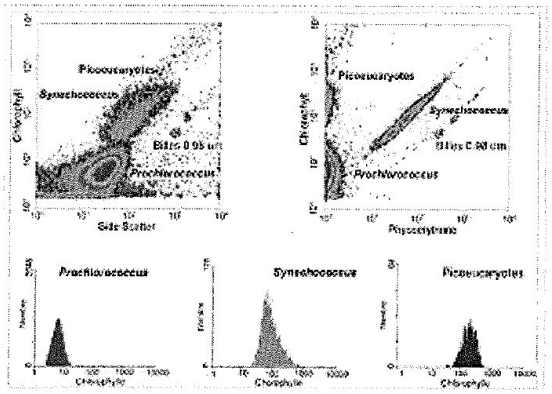
- International Society for Advancement of Cytometry (http://www.isac-net.org/)
- Cytometry Part A, a peer-reviewed scientific journal (http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1552-4930)
- Cytometry Part B: Clinical Cytometry, a peer-reviewed scientific journal (http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1552-4957)

Flow cytometry

From Wikipedia, the free encyclopedia

In cell biology, **flow cytometry** is a laser based, biophysical technology employed in cell counting, cell sorting, biomarker detection and protein engineering, by suspending cells in a stream of fluid and passing them by an electronic detection apparatus. It allows simultaneous multiparametric analysis of the physical and chemical characteristics of up to thousands of particles per second.

Flow cytometry is routinely used in the diagnosis of health disorders, especially blood cancers, but has many other applications in basic research, clinical practice and clinical trials. A common variation is to physically sort particles based on their properties, so as to purify populations of interest.



Analysis of a marine sample of photosynthetic picoplankton by flow cytometry showing three different populations (*Prochlorococcus*, *Synechococcus*, and picoeukaryotes)

Contents

- 1 History
  - 1.1 Name of the technology
- 2 Principle
- 3 Flow cytometers
- 4 Data analysis
  - 4.1 Gating
  - 4.2 Computational analysis
- 5 Fluorescence-activated cell sorting (FACS)
- 6 Labels
  - 6.1 Fluorescent labels
  - 6.2 Quantum dots
  - 6.3 Isotope labeling
- 7 Measurable parameters
- 8 Applications
- 9 See also
- 10 Bibliography
- 11 References
- 12 External links

History

The first impedance-based flow cytometry device, using the Coulter principle, was disclosed in U.S. Patent 2,656,508, issued in 1953, to Wallace H. Coulter. Mack Fulwyler was the inventor of the forerunner to today's flow cytometers - particularly the cell sorter.[1] Fulwyler developed this in 1965 with his publication in *Science*.[2] The first fluorescence-based flow cytometry device (ICP 11) was developed in 1968 by Wolfgang Göhde from the University of Münster, filed for patent on 18 December 1968[3] and first commercialized in 1968/69 by German developer and manufacturer Partec through Phywe AG in Göttingen. At that time, absorption methods were still widely favored by other scientists over fluorescence methods.[4] Soon after, flow cytometry instruments were developed, including the Cytofluorograph (1971) from Bio/Physics Systems Inc. (later: Ortho Diagnostics), the PAS 8000 (1973) from Partec, the first FACS (Fluorescence-activated cell sorting) instrument from Becton Dickinson (1974), the ICP 22 (1975) from Partec/Phywe and the Epics from Coulter (1977/78).

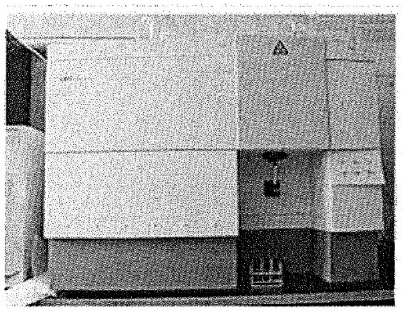
Name of the technology

The original name of the fluorescence-based flow cytometry technology was "pulse cytophotometry" (German: *Impulszytophotometrie*), based on the first patent application on fluorescence -based flow cytometry. At the 5th American Engineering Foundation Conference on Automated Cytology in Pensacola (Florida) in 1976 - eight years after the introduction of the first fluorescence-based flow cytometer (1968) - it was agreed to commonly use the name "flow cytometry", a term that quickly became popular.[5]

Principle

A beam of light (usually laser light) of a *single wavelength* is directed onto a hydrodynamically focused stream of liquid. A number of detectors are aimed at the point where the stream passes through the light beam: one in line with the light beam (Forward Scatter or FSC) and several perpendicular to it (Side Scatter or SSC) and one or more fluorescence detectors. Each suspended particle from 0.2 to 150 micrometers passing through the beam scatters the ray, and fluorescent chemicals found in the particle or attached to the particle may be excited into emitting light at a longer wavelength than the light source. This combination of scattered and fluorescent light is picked up by the detectors, and, by analysing fluctuations in brightness at each detector (one for each fluorescent emission peak), it is then possible to derive various types of information about the physical and chemical structure of each individual particle. FSC correlates with the cell volume and SSC depends on the inner complexity of the particle (i.e., shape of the nucleus, the amount and type of cytoplasmic granules or the membrane roughness). This is because the light is

scattered off of the internal components of the cell. Some flow cytometers on the market have eliminated the need for fluorescence and use only light scatter for measurement. Other flow cytometers form images of each cell's fluorescence, scattered light, and transmitted light.



Front view of a desktop flow cytometer - the Becton-Dickinson Fluorescence activated cell sorter (FACSCalibur)

Flow cytometers

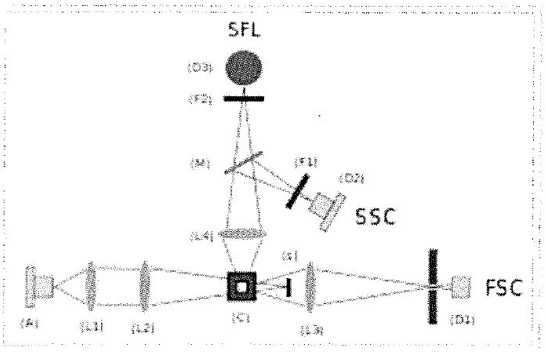


Diagram of the optics of a flow cytometer: a source of monochromatic light, usually a laser diode (A) sends a beam that is collimated (L1) and focused (L2) by lenses on the laminar flow chamber (C), after passing through the camera, the direct light beam is arrested by a screen (s), while the scattered light is focused by another lens (L3) on a photodiode (D1), this constitutes the Forward SCatter detector FSC. The side scattered light and the fluorescence are focused by a lens onto a dichroic mirror (M) that reflects most of the light of wavelength equal to that produced by the source (A), goes through a filter (F1) and impinges on a photodiode detector. This constitutes the Side SCatter detector (SSC). The light that is not reflected by the dichroic mirror and which has a wavelength different from that emitted and impinges on it goes through an interference filter (F2) which can be adjusted to a specific wavelength, thus discriminating between different fluorophores, to ultimately impinge on a photomultiplier tube (D3), this is the Side FLuorescence detector (SFL)

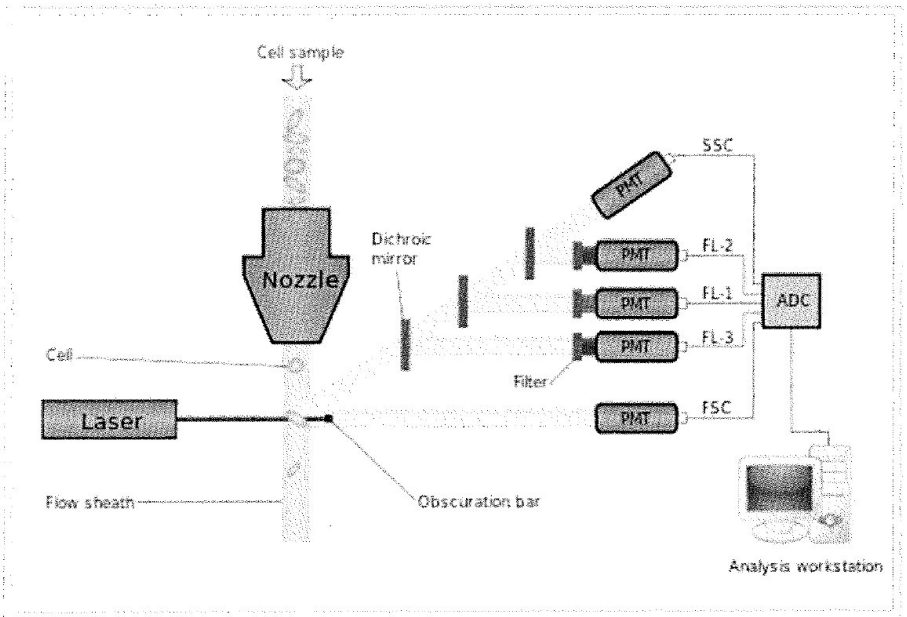
Modern flow cytometers are able to analyze several thousand particles every second, in "real time," and can actively separate and isolate particles having specified properties. A flow cytometer is similar to a microscope, except that, instead of producing an image of the cell, flow cytometry offers "high-throughput" (for a large number of cells) automated quantification of set parameters. To analyze solid tissues, a single-cell suspension must first be prepared.

A flow cytometer has five main components:

- a flow cell - liquid stream (sheath fluid), which carries and aligns the cells so that they pass single file through the light beam for sensing
- a measuring system - commonly used are measurement of impedance (or conductivity) and optical systems - lamps (mercury, xenon); high-power water-cooled lasers (argon, krypton, dye laser); low-power air-cooled lasers (argon (488 nm), red-HeNe (633 nm), green-HeNe, HeCd (UV)); diode lasers (blue, green, red, violet) resulting in light signals
- a detector and Analogue-to-Digital Conversion (ADC) system - which generates FSC and SSC as well as fluorescence signals from light into electrical signals that can be processed by a computer
- an amplification system - linear or logarithmic
- a computer for analysis of the signals.

The process of collecting data from samples using the flow cytometer is termed 'acquisition'. Acquisition is mediated by a computer physically connected to the flow cytometer, and the software which handles the digital interface with the cytometer. The software is capable of adjusting parameters (i.e. voltage, compensation, etc.) for the sample being tested, and also assists in displaying initial sample information while acquiring sample data to insure that parameters are set correctly. Early flow cytometers were, in general, experimental devices, but technological advances have enabled widespread applications for use in a variety of both clinical and research purposes. Due to these developments, a considerable market for instrumentation, analysis software, as well as the reagents used in acquisition such as fluorescently labeled antibodies has developed.

Modern instruments usually have multiple lasers and fluorescence detectors. The current record for a commercial instrument is five lasers[6] and 18 fluorescence detectors. Increasing the number of lasers and detectors allows for multiple antibody labeling, and can more precisely identify a target population by their phenotypic markers. Certain instruments can even take digital images of individual cells, allowing for the analysis of fluorescent signal location within or on the surface of cells.



Schematic diagram of a flow cytometer, showing focusing of the fluid sheath, laser, optics (in simplified form, omitting focusing), photomultiplier tubes (PMTs), analogue-to-digital converter, and analysis workstation.

Data analysis

Gating

The data generated by flow-cytometers can be plotted in a single dimension, to produce a histogram, or in two-dimensional dot plots or even in three dimensions. The regions on these plots can be sequentially separated, based on fluorescence intensity, by creating a series of subset extractions, termed "gates." Specific gating protocols exist for diagnostic and clinical purposes especially in relation to hematology.

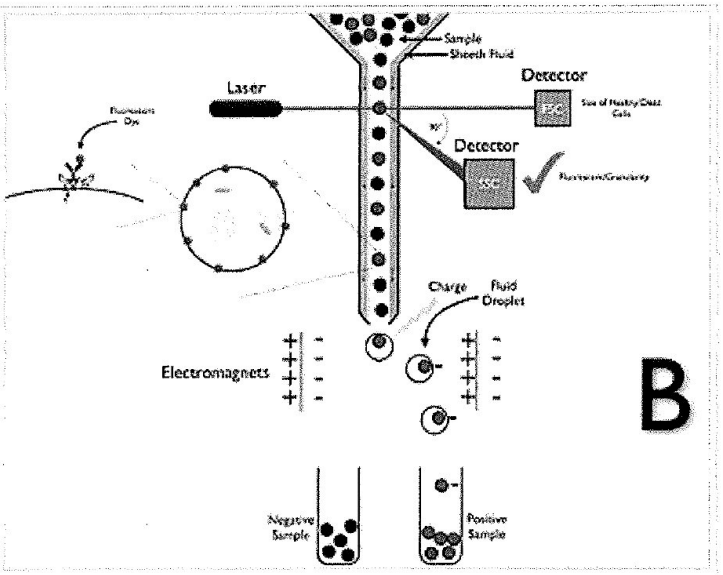
The plots are often made on logarithmic scales. Because different fluorescent dyes' emission spectra overlap,[7] signals at the detectors have to be compensated electronically as well as computationally. Data accumulated using the flow cytometer can be analyzed using software, e.g., WinMDI,[8] Flowing Software,[9] and web-based Cytobank[10] (all freeware), FCS Express, Flowjo, FACSDiva, CytoPaint (aka Paint-A-Gate),[11] VenturiOne, CellQuest Pro, or Cytospec.[12] Once the data are collected, there is no need to stay connected to the flow cytometer. For this reason, analysis is most often performed on a separate computer. This is especially necessary in core facilities where usage of these machines is in high demand.

Computational analysis

Recent progress on automated population identification using computational methods has offered an alternative to traditional gating strategies. Automated identification systems could potentially help findings of rare and hidden populations. Representative automated methods include FLOCK [13] in Immunology Database and Analysis Portal (ImmPort),[14] FLAME [15] in GenePattern and flowClust,[16] [17][18] in Bioconductor. Collaborative efforts have resulted in an open project called FlowCAP (Flow Cytometry: Critical Assessment of Population Identification Methods,[19]) to provide an objective way to compare and evaluate the flow cytometry data clustering methods, and also to establish guidance about appropriate use and application of these methods.

Fluorescence-activated cell sorting (FACS)

Fluorescence-activated cell sorting (FACS) is a specialized type of flow cytometry. It provides a method for sorting a heterogeneous mixture of biological cells into two or more containers, one cell at a time, based upon the specific light scattering and fluorescent characteristics of each cell. It is a useful scientific instrument, as it provides fast, objective and quantitative recording of fluorescent signals from individual cells as well as physical separation of cells of particular interest. The acronym FACS is trademarked and owned by Becton, Dickinson and Company.[20] Among the large majority of researchers who use this technology for sorting or analysis, this term has become generic in common usage, much like xerox or kleenex. The first cell sorter was invented by Mack Fulwyler in 1965, using the Coulter principle, a relatively difficult technique and one no longer used in modern instruments. The technique was expanded by Len Herzenberg, who was responsible for coining the term FACS.[21] Herzenberg won the Kyoto Prize in 2006 for his seminal work in flow cytometry.



Fluorescence Assisted Cell Sorting (FACS)

The cell suspension is entrained in the center of a narrow, rapidly flowing stream of liquid. The flow is arranged so that there is a large separation between cells relative to their diameter. A vibrating mechanism causes the stream of cells to break into individual droplets. The system is adjusted so that there is a low probability of more than one cell per droplet. Just before the stream breaks into droplets, the flow passes through a fluorescence measuring station where the fluorescent character of interest of each cell is measured. An electrical charging ring is placed just at the point where the stream breaks into droplets. A charge is placed on the ring based on the immediately prior fluorescence intensity measurement, and the opposite charge is trapped on the droplet as it breaks from the stream. The charged droplets then fall through an electrostatic deflection system that diverts droplets into containers based upon their charge. In some systems, the charge is applied directly to the stream, and the droplet breaking off retains charge of the same sign as the stream. The stream is then returned to neutral after the droplet breaks off.

Labels

Fluorescent labels

Main article: Fluorophore

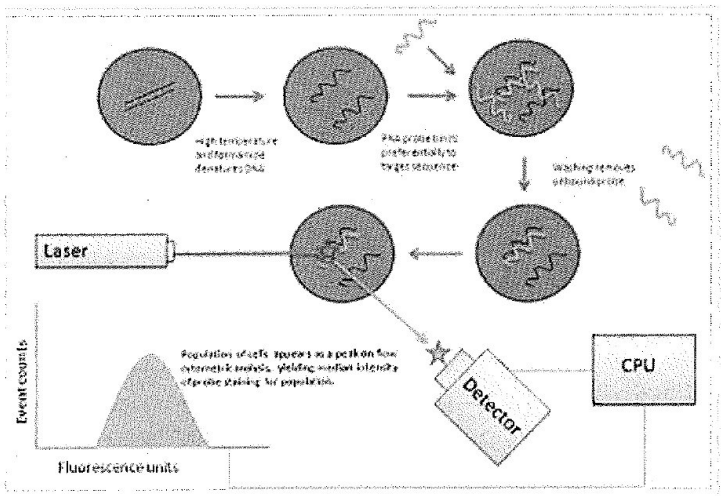
A wide range of fluorophores can be used as labels in flow cytometry. Fluorophores, or simply "fluors", are typically attached to an antibody that recognises a target feature on or in the cell; they may also be attached to a chemical entity with affinity for the cell membrane or another cellular structure. Each fluorophore has a characteristic peak excitation and emission wavelength, and the emission spectra often overlap. Consequently, the combination of labels which can be used depends on the wavelength of the lamp(s) or laser(s) used to excite the fluorochromes and on the detectors available.[22] The maximum number of distinguishable fluorescent labels is thought to be 17 or 18, and this level of complexity necessitates laborious optimization to limit artifacts, as well as complex deconvolution algorithms to separate overlapping spectra.[23]

Quantum dots

Quantum dots are sometimes used in place of traditional fluorophores because of their narrower emission peaks.

Isotope labeling

In one approach to overcoming the fluorescent labeling limit, lanthanide isotopes are attached to antibodies. This method could theoretically allow the use of 40 to 60 distinguishable labels and has been demonstrated for 30 labels.[23] Cells



Use of flow cytometry to measure copy number variation of a specific DNA sequence (Flow-FISH)

are introduced into a plasma, ionizing them and allowing time-of-flight mass spectrometry to identify the associated isotopes. Although this method permits the use of a large number of labels, it currently has lower throughput capacity than traditional flow cytometry. It also destroys the analysed cells, precluding their recovery by sorting.[23]

Measurable parameters

This list is very long and constantly expanding.

- used for confirming diagnosis of chronic lymphocytic leukemia
- volume and morphological complexity of cells
- cell pigments such as chlorophyll or phycoerythrin
- total DNA content (cell cycle analysis, cell kinetics, proliferation, ploidy, aneuploidy, endoreduplication, etc.)
- total RNA content
- DNA copy number variation (by Flow-FISH or BACs-on-Beads technology)
- chromosome analysis and sorting (library construction, chromosome paint)
- protein expression and localization
- Protein modifications, phospho-proteins
- transgenic products *in vivo*, particularly the Green fluorescent protein or related Fluorescent Proteins
- cell surface antigens (Cluster of differentiation (CD) markers)
- intracellular antigens (various cytokines, secondary mediators, etc.)
- nuclear antigens
- enzymatic activity
- pH, intracellular ionized calcium, magnesium, membrane potential
- membrane fluidity
- apoptosis (quantification, measurement of DNA degradation, mitochondrial membrane potential, permeability changes, caspase activity)
- cell viability
- monitoring electropermeabilization of cells
- oxidative burst
- characterising multidrug resistance (MDR) in cancer cells
- glutathione
- various combinations (DNA/surface antigens, etc.)
- cell adherence (for instance pathogen-host cell adherence)

Applications

The technology has applications in a number of fields, including molecular biology, pathology, immunology, plant biology and marine biology. It has broad application in medicine (especially in transplantation, hematology, tumor immunology and chemotherapy, prenatal diagnosis, genetics and sperm sorting for sex preselection). In marine biology, the autofluorescent properties of photosynthetic plankton can be exploited by flow cytometry in order to characterise abundance and community structure. In protein engineering, flow cytometry is used in conjunction with yeast display and bacterial display to identify cell surface-displayed protein variants with desired properties.

See also

- Cell cycle analysis
- Coulter counter
- Dielectrophoresis
- Microfluorimetry

Bibliography

- *Flow Cytometry First Principles* by Alice Longobardi Givan. ISBN 0-471-38224-8
- *Practical Flow Cytometry* by Howard M. Shapiro. ISBN 0-471-41125-6
- *Flow Cytometry for Biotechnology* by Larry A. Sklar. ISBN 0-19-515234-4
- *Handbook of Flow Cytometry Methods* by J. Paul Robinson, et al. ISBN 0-471-59634-5
- *Current Protocols in Cytometry*, Wiley-Liss Pub. ISSN 1934-9297 (http://www.worldcat.org/search?fq=x0:jrnl&q=n2:1934-9297)
- *Flow Cytometry in Clinical Diagnosis*, v4, (Carey, McCoy, and Keren, eds), ASCP Press, 2007. ISBN 0-89189-548-5
- Ormerod, M.G. (ed.) (2000) *Flow Cytometry — A practical approach.* 3rd edition. Oxford University Press, Oxford, UK. ISBN 0-19-963824-1
- Ormerod, M.G. (1999) *Flow Cytometry.* 2nd edition. BIOS Scientific Publishers, Oxford. ISBN 1-85996-107-X
- *Flow Cytometry — A basic introduction.* Michael G. Ormerod, 2008. ISBN 978-0-9559812-0-3

References

1. ^ US 3380584 (http://worldwide.espacenet.com/textdoc?DB=EPODOC&IDX=US3380584), Mack Fulwyler, "Particle Separator", issued 1965-06-01
2. ^ Fulwyler, M. J. (1965). "Electronic separation of biological cells by volume". *Science* **150** (698): 910–911. doi:10.1126/science.150.3698.910 (http://dx.doi.org/10.1126%2Fscience.150.3698.910). PMID 5891056 (//www.ncbi.nlm.nih.gov/pubmed/5891056).
3. ^ DE 1815352 (http://worldwide.espacenet.com/textdoc?DB=EPODOC&IDX=DE1815352), Wolfgang Dittrich & Wolfgang Göhde, "Flow-through Chamber for Photometers to Measure and Count Particles in a Dispersion Medium"
4. ^ Kamentsky in Proceedings of the 1968 Conference „Cytology Automation" (1970), edited by D. M. D. Evans.
5. ^ Sack et al., Ulrich. *Zelluläre Diagnostik.* Karger Publishers (2006).
6. ^ UniCel DxH800
7. ^ http://pingu.salk.edu/flow/fluo.html
8. ^ "TSRI Cytometry Software Page" (http://facs.scripps.edu/software.html). Retrieved 2009-09-03.
9. ^ "Flowing Software Web Page" (http://www.flowingsoftware.com). Retrieved 2013-02-22.
10. ^ "Cytoank Main Page" (http://cytobank.org). Retrieved 2013-05-28.
11. ^ http://leukobyte.com
12. ^ "PUCL Cytometry Software Page" (http://www.cyto.purdue.edu/Purdue_software). Retrieved 2011-07-07.
13. ^ Qian, Yu; Wei, Chungwen; Eun-Hyung Lee, F.; Campbell, John; Halliley, Jessica; Lee, Jamie A.; Cai, Jennifer; Kong, Y. Megan et al. (2010). "Elucidation of seventeen human peripheral blood B-cell subsets and quantification of the tetanus response using a density-based method for the automated identification of cell populations in multidimensional flow cytometry data". *Cytometry Part B: Clinical Cytometry* **78B**: S69. doi:10.1002/cyto.b.20554 (http://dx.doi.org/10.1002%2Fcyto.b.20554).
14. ^ "Immunology Database and Analysis Portal" (https://www.immport.org/immportWeb/home/home.do?loginType=full). Retrieved 2009-09-03.

15. ^ "FLow analysis with Automated Multivariate Estimation (FLAME)" (http://www.broadinstitute.org/cancer/software/genepattern/modules/FLAME/). Retrieved 2009-09-03.
16. ^ "flowClust" (http://www.bioconductor.org/packages/2.5/bioc/html/flowClust.html). Retrieved 2009-09-03.
17. ^ http://www3.interscience.wiley.com/journal/117925662/abstract?CRETRY=1&SRETRY=0
18. ^ http://www.biomedcentral.com/1471-2105/10/145
19. ^ "FlowCAP - Flow Cytometry: Critical Assessment of Population Identification Methods" (http://flowcap.flowsite.org/). Retrieved 2009-09-03.
20. ^ "FACS MultiSET System" (http://www.bdbiosciences.com/pdfs/brochures/23-3428-02.pdf) (PDF). Becton Dickinson. Retrieved 2007-02-09.
21. ^ Herzenberg, LA; Julius MH, Masuda T (1972). "Demonstration that antigen-binding cells are precursors of antibody-producing cells after purification with a fluorescence-activated cell sorter." (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC426835). *PNAS* **69** (7): 1934–8. PMC 426835 (//www.ncbi.nlm.nih.gov/pmc/articles/PMC426835). PMID 4114858 (//www.ncbi.nlm.nih.gov/pubmed/4114858).
22. ^ Loken MR (1990). *Immunofluorescence Techniques in Flow Cytometry and Sorting* (2nd ed.). Wiley. pp. 341–53.
23. ^ [a] [b] [c] Ornatsky, O.; Bandura, D.; Baranov, V.; Nitz, M.; Winnik, M. A.; Tanner, S. (2010). "Highly multiparametric analysis by mass cytometry". *Journal of Immunological Methods* **361** (1–2): 1–20. doi:10.1016/j.jim.2010.07.002 (http://dx.doi.org/10.1016%2Fj.jim.2010.07.002). PMID 20655312 (//www.ncbi.nlm.nih.gov/pubmed/20655312).

External links

- Flow cytometry - How does it work? (http://www.unsolvedmysteries.oregonstate.edu/flow_06) (Oregon State University)
- How a flow cytometer operates (http://sciencepark.mdanderson.org/fcores/flow/files/Operation.html) (MD Anderson Cancer Center)
- Learn About Flow Cytometry (http://www.millipore.com/flowcytometry/fc4/learn) (Millipore)
- Powerpoint lectures on flow cytometry (http://www.cyto.purdue.edu/flowcyt/educate/pptslide.htm) (Purdue University)
- Tutorials on fluorescence and flow cytometry (http://probes.invitrogen.com/resources/education/) (Invitrogen)
- Searchable database of fluorescent dyes (http://www.fluorophores.tugraz.at/) (Graz University of Technology)
- Table of fluorochromes (http://pingu.salk.edu/flow/fluo.html) (Salk Institute)
- Java Fluorescence Spectrum Viewer (http://www.bdbiosciences.com/spectra/) (Becton, Dickinson and Company)
- Flow cytometry (http://www.nlm.nih.gov/cgi/mesh/2011/MB_cgi?mode=&term=Flow+cytometry) at the US National Library of Medicine Medical Subject Headings (MeSH)
- FICCS (http://www.ficcs.org/) - the Flow Informatics and Computation Cytometry Society
- History of Flow Cytometry by Bob Auer (http://www.coulterflow.com/bciflow/history.php) (hosted by Beckman Coulter)
- Flow Cytometry - A Basic Introduction (http://flowbook.denovosoftware.com/) (hosted by De Novo Software)
- Clinical Flow Wiki (http://wiki.clinicalflow.com/)
- The History of the Cell Sorter Interviews (http://siarchives.si.edu/collections/siris_arc_217722) from the Smithsonian Institution Archives

What Is Flow Cytometry?

for Microbiology 542, Immunology Laboratory

University of Massachusetts, Amherst MA US

Flow cytometers (FC or FCM) are automated instruments that quantitate properties of single cells, one cell at a time. They can measure cell size, cell granularity, the amounts of cell components such as total DNA, newly synthesized DNA, gene expression as the amount messenger RNA for a particular gene, amounts of specific surface receptors, amounts of intracellular proteins, or transient signalling events in living cells. Quantities are usually relative, but can be numbers of molecules per cell when absolute values are needed. Typically, up to three to six properties or components are quantitated in a single sample, cell by cell, for about 10,000 cells, in less than one minute (not counting time to prepare the sample, which might be an hour or more).

Simply measuring cell size and granularity is sufficient to distinguish the major categories of leukocytes in peripheral blood. This is the basis for clinical instruments that do automated complete blood counts (CBC). Adding fluorescent probes to the cells enables quantitation of specific structures ("flow cyto**fluoro**metry"). The most common use of flow cytofluorometry is for total DNA per cell in biopsy specimens from tumors, for clinical cancer diagnosis and prognosis. Another major use is quantiation of CD4+ vs. CD8+ T lymphocytes in blood to determine when an HIV infection has resulted in AIDS, and the degree to which anti-HIV drugs are working.

Flow cytometry is widely used in research. More than one third of papers in the *Journal of Immunology* include flow cytometric data, as do a substantial percentage of papers on cell structure, function, and mechanism in other journals.

Flow cytometers take in a suspension of monodisperse (single, unclumped) cells and run them one at a time (single file) past a laser beam. As each cell passes through the laser beam, scattered and fluorescent light are quantitated. Sensitivity is limited by "autofluorescence", naturally fluorescent components of cells that set a background fluorescence intensity -- fluorescent probes must emit substantially greater intensities in order for their signals to be quantitated accurately. Most flow cytometry is analytical: after the information is obtained as it passes through the cytometer, the sample is discarded. Some flow cytometry is preparative: living cells are sorted into separate containers based on the properties of each cell.

Flow cytofluorometry (FC) can be contrasted with fluorescence microscopy (FM). FC can quantitate total amounts of a component per cell for a large number of cells (typically 10,000, up to 100,000 easily). FC cannot ordinarily locate where a component is within the cell. FM shows whether a fluorescent component is uniformly distributed in the cell, or concentrated in anatomical compartments, and whether the distribution changes with time. FM can quantitate total amounts, and amounts in different anatomical compartments within cells, but typically for tens to hundreds of cells rather than the tens of thousands easily processed by FC. FC requires a monodisperse suspension of single (unclumped) cells, while FM does not. FM can provide information about cell interactions, while FC can rarely do this. FC can sort thousands of living cells according to their fluorescent properties, while FM cannot.

The objectives of the flow cytometry experiment in this class include:

Immunology

1. Identification of lymphocyte subpopulations

   a. obtaining percentage of cells with each type of receptor
   b. obtaining relative numbers of receptors per cell
2. Relating the results to structure and function of the immune system

General Scientific

3. Working with living mammalian lymphocytes
4. Understanding fluorescence and its power in scientific investigation
5. Experience with computer data analysis software and graphics
6. Experience with analysis of large amounts of data (four parameters times 10,000 cells = 40,000 numbers per sample)
7. Understanding how flow cytometry works, its strengths and weaknesses
8. Being able to interpret flow cytometric data in scientific publications