(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 935 549 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
26.09.2018 Bulletin 2018/39

(21) Application number: **13803053.1**

(22) Date of filing: **13.12.2013**

(51) Int Cl.:
C11D 3/33 *(2006.01)*

(86) International application number:
PCT/EP2013/076514

(87) International publication number:
WO 2014/095617 (26.06.2014 Gazette 2014/26)

(54) METHOD FOR REMOVING FAT AND/OR OIL STAINS

VERFAHREN ZUR FETT- UND/ODER ÖLFLECKENENTFERNUNG

MÉTHODE D'ÉLIMINATION DE TACHES DE GRAISSE ET/OU D'HUILE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **20.12.2012 EP 12198568**

(43) Date of publication of application:
28.10.2015 Bulletin 2015/44

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  AL AT BE BG CH CZ DE DK EE ES FI FR GR HR HU IS IT LI LT LU LV MC MK NL NO PL PT RO RS SE SI SK SM TR

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Description

[0001] This invention relates to fabric stain removal methods for ambient-active fat/oil based stains, particularly but not exclusively as a pre-treatment or direct application.

[0002] DE 19 42 236 A1, US 3 707 505 A, US 5 306 444 A, EP 2 305 785 A1, US 2010/0261631 A1, US 2006/0100115 A1, and WO 95/03389 A1 all refer to detergent compositions comprising an arginine compound and a surfactant.

[0003] In many climates and in developing countries, aqueous substrate cleaning is performed at cold or ambient temperatures. These temperatures are a challenge for fat/oil stain removal technology which relies on water temperatures of 40 - 70 degrees. In the case of modern washing machines, stain removal mainly relies largely on the heating of water above ambient temperatures in the washing machine. This accounts for a large proportion of the laundry related green-house gas footprint which needs reducing for environmental reasons.

[0004] The objective of the invention is the removal of fabric stains from stained fabric, where the fabric stains comprise fat/oil.

[0005] In a first aspect, the invention provides a method for removing a stain comprising fat/oil from a stained fabric, comprising the step of applying to the stain, a fabric stain removal composition comprising an arginine compound and a surfactant.

[0006] In a second aspect, the invention provides a method of the first aspect of the invention, wherein the step of applying the fabric stain removal composition is a pre-treatment step using a pre-treatment device, wherein the pre-treatment device comprises (i) a storage chamber storing said fabric stain removal composition and (ii) a dispenser for locally applying said fabric stain removal composition to a stain on a fabric.

[0007] In a third aspect, the invention provides use of arginine compound, preferably in combination with a surfactant, in the removal of oil/fat stains from a stained fabric, preferably in the removal of fat stains, at ambient temperatures.

[0008] With the invention, the removal of oil/fat stains at low temperatures is radically improved and so offers improved laundry cleaning in regions where ambient washing occurs out of habit or necessity. Improved washing performance at lower temperatures is generally desirable but increased low temperature performance may also help inhibit the adoption of hot water washing in these countries, a rising trend as standards of living increase and more people are able to afford washing machines. The invention provides stain removal performance of fat based soil and/or stains in an ambient temperature cleaning processes (with low temperature wash liquor) without serious consideration to the temperature sensitivity of ingredients during storage. The formulation can therefore be designed more freely, on the basis of other considerations.

[0009] As used herein, the term "substrate" includes fabric, and clothing and other surfaces such as cutlery, crockery and other domestic hard surfaces.

[0010] As used herein, the term "arginine compound" is intended to include any suitable arginine compound, including stereoisomeric and racemic forms, derivatives, and substituted derivative and mixtures thereof.

[0011] The term "ambient-active" is intended to mean less that 25 degrees Celcius and preferably 22 degrees Celcius or less, more preferably 15 degrees or less but always greater than 1 degree Celcius and "active" means effective in achieving stain removal.

[0012] As used herein "stain removal" is means removal as measured in terms of Remission units or a Remission index. For a visible (by the human eye) effect, effective stain removal is represented by remission equal to or greater than 2 Remission units and preferably greater or equal to 5 units.

[0013] As used herein, the abbreviation "wt%" means "% by weight". Unless specified otherwise, all percentages mentioned herein are by weight calculated relative to the total composition.

[0014] The stain may comprise oil or fat, preferably fat. However, it is often found that other biological material may be included in the stain.

[0015] The method of the invention preferably comprises an aqueous washing process. Accordingly it is preferred that the method comprises the step of adding water to the composition to form an aqueous wash liquor

[0016] Preferably the method comprises localised application of the composition to a stain or stained area of the fabric. The method may be pre-treatment method, and be followed by a subsequent aqueous washing step. Pre-treatment steps may take place without further addition of any water (beyond any contained in the composition). Alternatively or additionally, the pre-treatment process may comprise the step of soaking the substrate in an aqueous solution to which the treatment composition has been added.

[0017] The second step of the method of the invention may be a 'main' wash and may be a manual washing process or a washing process in a washing machine. The second step may use any suitable detergent composition. Preferably this detergent composition comprises one or more surfactants and/or other functional ingredients, adjuncts etc. as described below.

[0018] In the case of pre-treatment according to the invention, subsequent steps may not require further application of the arginine compound.

[0019] Preferably the method of the invention is less than 90 minutes in duration, more preferably less than 60 minutes

and most preferably less than 30 minutes. In pre-treatment embodiments, the pre-treatment step is preferably less than 5 minutes, and more preferably less than 2 minutes.

[0020] The pre-treatment device may be by any suitable device such as roll-on applicator or tube, sprays, aerosols, pastes, a pump-operated dispenser or the like. The pre-treatment device may comprise a scrubbing member having brush, bristles, tufts, projections, embossments etc or any combination thereof to further aid application of the detergent composition to a substrate.

[0021] Preferably the treatment composition is ambient-active. Accordingly, the temperature of the wash liquor step of aqueous washing process is therefore less than 40 °C and preferably less than 30 °C and more preferably less than 25 °C and more preferably less than or equal to 22 °C further more preferably 15°C or less at all times during the washing but excluding drying. Encouraging low temperature wash liquor is advantageous environmentally and financially.

[0022] The treatment composition of the invention and/or any detergent composition used subsequently may comprise any of the following ingredients.

[0023] Compositions may comprise enzymes. The enzymes are preferably present at 0.001 - 5%wt more preferably 0.01 - 3%.

[0024] Enzymes may be from animal, vegetable, bacterial origin (derived from bacteria) or fungal origin (derived from fungus) however enzymes from bacterial origin are preferred. Chemically modified or protein engineered mutants are included. Genes encoding such enzymes can be transferred from one host to a preferred expression production host which may or may not be the same as the original host. As used herein the term "enzyme" includes enzyme variants (produced, for example, by recombinant techniques) are included. Examples of such enzyme variants are disclosed, e.g., in EP 251,446 (Genencor), WO 91/00345 (Novo Nordisk), EP 525,610 (Solvay) and WO 94/02618 (Gist-Brocades NV).

[0025] The one or more enzymes preferably comprise a protease. Preferred proteases are serine proteases or metallo proteases, preferably an alkaline microbial protease or a trypsin-like protease.

[0026] Commercially available protease enzymes include Alcalase™, Savinase™, Primase™, Duralase™, Dyrazym™, Esperase™, Everlase™, Polarzyme™, and Kannase™, (Novozymes A/S), Maxatase™, Maxacal™, Maxapem™, Properase™, Purafect™, Purafect OxP™, FN2™, and FN3™ (Genencor International Inc.).

[0027] The one or more enzymes preferably comprises an amylase. Suitable amylases (alpha and/or beta) include those of bacterial or fungal origin. Chemically modified or protein engineered mutants are included. Amylases include, for example, alpha-amylases obtained from Bacillus, e.g. a special strain of B. licheniformis, described in more detail in GB 1,296,839, or the Bacillus sp. strains disclosed in WO 95/026397 or WO 00/060060.

[0028] Commercially available amylases are Duramyl™, Termamyl™, Termamyl Ultra™, Natalase™, Stainzyme™, Fungamyl™ and BAN™ (Novozymes A/S), Rapidase™ and Purastar™ (from Genencor International IncCommercially available amylases include Stainzyme™ (Novozymes).

[0029] The one or more enzymes preferably comprise a lipase and in such cases, the preferred lipases include first wash lipases which comprise a polypeptide having an amino acid sequence which has at least 90 percent sequence identity with the wild-type lipase derived from Humicola lanuginosa strain DSM 4109 and compared to said wild-type lipase, comprises a substitution of an electrically neutral or negatively charged amino acid within 15 A of E1 or Q249 with a positively charged amino acid; and may further comprise:

(I) a peptide addition at the C-terminal;
(II) a peptide addition at the N-terminal;
(III) the following limitations:

i. comprises a negatively charged amino acid in position E210 of said wild-type lipase;
ii. comprises a negatively charged amino acid in the region corresponding to positions 90-101 of said wild-type lipase; and
iii. comprises a neutral or negatively charged amino acid at a position corresponding to N94 of said wild-type lipase; and/or
iv. has a negative charge or neutral charge in the region corresponding to positions 90-101 of said wild-type lipase; and
iv. mixtures thereof.

[0030] These are available under the Lipex™ brand from Novozymes. A similar enzyme from Novozymes but believed to fall outside of the above definition has been disclosed by Novozymes under the name Lipoclean™ and this is also preferred.

[0031] Other possible lipases include lipases from *Humicola* (synonym *Thermomyces*), e.g. from other *H. lanuginosa* (*T. lanuginosus*) strains or from *H. insolens,* a *Pseudomonas* lipase, e.g. from *P. alcaligenes* or *P. pseudoalcaligenes, P. cepacia, P. stutzeri, P. fluorescens, Pseudomonas* sp. strain SD 705 (WO 95/06720 and WO 96/27002), *P. wiscon-*

sinensis, a *Bacillus* lipase, e.g. from *B. subtilis* (Dartois et al. (1993), Biochemica et Biophysica Acta, 1131, 253-360), *B. stearothermophilus* (JP 64/744992) or *B. pumilus* (WO 91/16422).

[0032] Commercially available lipase enzymes include Lipolase™ and Lipolase Ultra™, and the Bacterial enzyme, Lipomax ® ex Genecor. This is a bacterially derived Lipase, of variant M21L of the lipase of *Pseudomonas alcaligenes* as described in WO 94/25578 to Gist-Brocades (M.M.M.J. Cox, H.B.M. Lenting, L.J.S.M. Mulleners and J.M. van der Laan).

[0033] The one or more enzymes preferably comprise a phospholipase classified as EC 3.1.1.4 and/or EC 3.1.1.32. As used herein, the term phospholipase is an enzyme which has activity towards phospholipids. Phospholipids, such as lecithin or phosphatidylcholine, consist of glycerol esterified with two fatty acids in an outer (sn-1) and the middle (sn-2) positions and esterified with phosphoric acid in the third position; the phosphoric acid, in turn, may be esterified to an amino-alcohol. Phospholipases are enzymes which participate in the hydrolysis of phospholipids. Several types of phospholipase activity can be distinguished, including phospholipases A1 and A2 which hydrolyze one fatty acyl group (in the sn-1 and sn-2 position, respectively) to form lysophospholipid; and lysophospholipase (or phospholipase B) which can hydrolyze the remaining fatty acyl group in lysophospholipid. Phospholipase C and phospholipase D (phosphodiesterases) release diacyl glycerol or phosphatidic acid respectively.

[0034] The one or more enzymes preferably comprise a cutinase. classified in EC 3.1.1.74. The cutinase used according to the invention may be of any origin. Preferably cutinases are of microbial origin, in particular of bacterial, of fungal or of yeast origin.

[0035] The one or more enzymes preferably comprise a cellulase preferably including those of bacterial or fungal origin. Chemically modified or protein engineered mutants are included. Suitable cellulases include cellulases from the genera *Bacillus, Pseudomonas, Humicola, Fusarium, Thielavia, Acremonium,* e.g. the fungal cellulases produced from *Humicola insolens, Thielavia terrestris, Myceliophthora thermophila,* and *Fusarium oxysporum* disclosed in US 4,435,307, US 5,648,263, US 5,691,178, US 5,776,757, WO 89/09259, WO 96/029397, and WO 98/012307. Commercially available cellulases include Celluzyme™, Carezyme™, Endolase™, Renozyme™ (Novozymes A/S), Clazinase™ and Puradax HA™ (Genencor International Inc.), and KAC-500(B)™ (Kao Corporation).

[0036] The one or more enzymes preferably comprise a peroxidase/oxidase are especially of bacterial origin. Chemically modified or protein engineered mutants are included. An example of an oxidative bacterium is, but not limited to, are *Aeromonas sp* wherefrom oxidases can be sourced.

[0037] The one or more enzymes preferably comprise a pectate lyase (also called polygalacturonate lyases): Examples of pectate lyases include pectate lyases that have been cloned from different bacterial genera such as Erwinia, Pseudomonas, Klebsiella and Xanthomonas, as well as from Bacillus subtilis (Nasser et al. (1993) FEBS Letts. 335:319-326) and Bacillus sp. YA-14 (Kim et al. (1994) Biosci. Biotech. Biochem. 58:947-949). Purification of pectate lyases with maximum activity in the pH range of 8-10 produced by Bacillus pumilus (Dave and Vaughn (1971) J. Bacteriol. 108:166-174), B. polymyxa (Nagel and Vaughn (1961) Arch. Biochem. Biophys. 93:344-352), B. stearothermophilus (Karbassi and Vaughn (1980) Can. J. Microbiol. 26:377-384), Bacillus sp. (Hasegawa and Nagel (1966) J. Food Sci. 31:838-845) and Bacillus sp. RK9 (Kelly and Fogarty (1978) Can. J. Microbiol. 24:1164-1172) have also been described. Any of the above, as well as divalent cation-independent and/or thermostable pectate lyases, may be used in practicing the invention. In preferred embodiments, the pectate lyase comprises the pectate lyase disclosed in Heffron et al., (1995) Mol. Plant-Microbe Interact. 8: 331-334 and Henrissat et al., (1995) Plant Physiol. 107: 963-976. Specifically contemplated pectatel lyases are disclosed in WO 99/27083 and WO 99/27084. Other specifically contemplated pectate lyases (derived from Bacillus licheniformis) are disclosed in US patent no. 6,284,524 (which document is hereby incorporated by reference). Specifically contemplated pectate lyase variants are disclosed in WO 02/006442, especially the variants disclosed in the Examples in WO 02/006442 (which document is hereby incorporated by reference). Examples of commercially available alkaline pectate lyases include BIOPREP™ and SCOURZYME™ L from Novozymes A/S, Denmark.

[0038] The one or more enzymes preferably comprise a Mannanase: Examples of mannanases (EC 3.2.1.78) include mannanases of bacterial and fungal origin. In a specific embodiment the mannanase is derived from a strain of the filamentous fungus genus Aspergillus, preferably Aspergillus niger or Aspergillus aculeatus (WO 94/25576). WO 93/24622 discloses a mannanase isolated from Trichoderma reseei. Mannanases have also been isolated from several bacteria, including Bacillus organisms. For example, Talbot et al., Appl. Environ. Microbiol., Vol.56, No. 11, pp. 3505-3510 (1990) describes a beta-mannanase derived from Bacillus stearothermophilus. Mendoza et al., World J. Microbiol. Biotech., Vol. 10, No. 5, pp. 551-555 (1994) describes a beta-mannanase derived from Bacillus subtilis. JP-A-03047076 discloses a beta-mannanase derived from Bacillus sp. JP-A-63056289 describes the production of an alkaline, thermostable beta-mannanase. JP-A-63036775 relates to the Bacillus microorganism FERM P-8856 which produces beta-mannanase and beta-mannosidase. JP-A-08051975 discloses alkaline beta-mannanases from alkalophilic Bacillus sp. AM-001. A purified mannanase from Bacillus amyloliquefaciens is disclosed in WO 97/11164. WO 91/18974 describes a hemicellulase such as a glucanase, xylanase or mannanase active. Contemplated are the alkaline family 5 and 26 mannanases derived from Bacillus agaradhaerens, Bacillus licheniformis, Bacillus halodurans, Bacillus clausii, Bacillus sp., and Humicola insolens disclosed in WO 99/64619. Especially contemplated are the Bacillus sp. mannanases con-

cerned in the Examples in WO 99/64619. Examples of commercially available mannanases include Mannaway™ available from Novozymes A/S Denmark.

[0039] The enzyme and any perfume/fragrance or pro-fragrance present may show some interaction and should be chosen such that this interaction is not negative. Some negative interactions may be avoided by encapsulation of one or other of enzyme and pro-fragrance and/or other segregation within the product. The enzymes may be provided as an enzyme system.

[0040] The surfactant may be a synthetic surfactant or a biosurfactant which is mircrobially synthesized e.g. from bacteria, fungi or other microbe. The biosurfactant preferably comprises a microbially-derived biosurfactant. Preferably it comprises a glycolipid biosurfactant which may be a rhamnolipid or sophorolipid or trehalolipid or a mannosylerythritol lipid (MEL). Alternatively, the biosurfactant may advantageously comprise a cellobiose, peptide based biosurfactants, lipoproteins and lipopeptides e.g. surfactin, fatty acids e.g. corynomucolic acids (preferably with hydrocarbon chain C12-C14), phospholipids e.g. Phosphatidylethanolamine produced by Rhodococcus erythropolis grown on n-alkane resulted in the lowering of interfacial tension between water and hexadecane to less than 1 mN m-1 and CMC of 30 mg L-1 (Kretschner et al., 1982) and Spiculisporic acid; polymeric biosurfactants including emulsan, liposan, mannoprotein and polysaccharide-protein complexes.

[0041] Preferably the biosurfactant comprises a rhamnolipid.

[0042] The surfactant may be present by weight in the compositions at a level of from 3 to 85% by weight, preferably from 3 to 60% by weight, more preferably from 3 to 40% by weight, most preferably from 3 to 35% by weight.

[0043] Preferably the anionic surfactant is present at a level of from 0.1 to 95% by weight, preferably from 1 to 50% by weight, more preferably from 1.5 to 25% by weight based on total weight of surfactants present.

[0044] Preferably the surfactant is an anionic surfactant.

[0045] Anionic surfactants are defined herein as amphiphilic molecules comprising one or more functional groups that exhibit a net anionic charge when in aqueous solution at the normal wash pH of between 6 and 11.

[0046] Preferred anionic biosurfactants are rhamnolipds and lactonic forms of sophorolipids. Biosurfactants which are not expressed biologically in anionic form but have been modified to provide/improve anionic properties are included in the invention.

[0047] Preferred synthetic anionic surfactants are the alkali metal salts of organic sulphur reaction products having in their molecular structure an alkyl radical containing from about 6 to 24 carbon atoms and a radical selected from the group consisting of sulphonic and sulphuric acid ester radicals.

[0048] Although any anionic surfactant hereinafter described can be used, such as alkyl ether sulphates, soaps, fatty acid ester sulphonates, alkyl benzene sulphonates, sulphosuccinate esters, primary alkyl sulphates, olefin sulphonates, paraffin sulphonates and organic phosphate; preferred anionic surfactants are the alkali and alkaline earth metal salts of fatty acid carboxylates, fatty alcohol sulphates, preferably primary alkyl sulfates, more preferably they are ethoxylated, for example alkyl ether sulfates; and alkylbenzene sulfonates or mixtures thereof.

[0049] Amphoteric surfactants and/or zwitterionic surfactants may be present in the compositions according to the invention. For amphoteric the pH of the wash liquor is preferably of between 6 and 10. Preferably an amphoteric or zwitterionic surfactant is present at a level of from 0.1 to 20% by weight, more preferably from 0.25 to 15% by weight, even more preferably from 0.5 to 10% by weight.

[0050] Suitable zwitterionic surfactants are exemplified as those which can be broadly described as derivatives of aliphatic quaternary ammonium, sulfonium and phosphonium compounds with one long chain group having about 8 to about 18 carbon atoms and at least one water solubilizing radical selected from the group consisting of sulfate, sulfonate, carboxylate, phosphate or phosphonate. A general formula for these compounds is:

$$R_1(R_2)_xY^+R_3Z^-$$

wherein R_1 contains an alkyl, alkenyl or hydroxyalkyl group with 8 to 18 carbon atoms, from 0 to 10 ethylene-oxy groups or from 0 to 2 glyceryl units; Y is a nitrogen, sulfur or phosphorous atom; R_2 is an alkyl or hydroxyalkyl group with 1 to 3 carbon atoms; x is 1 when Y is a sulfur atom and 2 when Y is a nitrogen or phosphorous atom; R_3 is an alkyl or hydroxyalkyl group with 1 to 5 carbon atoms and Z is a radical selected from the group consisting of sulfate, sulfonate, carboxylate, phosphate or phosphonate.

[0051] Preferred amphoteric surfactants are amine oxides, for example coco dimethyl amine oxide. Preferred zwitterionic surfactants are betaines, and especially amidobetaines. Preferred betaines are C_8 to C_{18} alkyl amidoalkyl betaines, for example coco amido betaine. These may be included as co-surfactants, preferably present in an amount of from 0 to 10 wt %, more preferably 1 to 5 wt %, based on the weight of the total composition.

[0052] Preferred amphoteric or zwitterionic surfactants for incorporation in the composition according to the present invention are betaine surfactants. Examples of these are mentioned in the following list.

The sulfatobetaines, such as 3-(dodecyldimethylammonium)-1-propane sulfate; and 2-(cocodimethylammonium)-1-ethane sulfate.

The sulfobetaines, such as: 3-(dodecyldimethyl-ammonium)-2-hydroxy-1-propane sulfonate; 3-(tetradecyl-dimethylammonium)-1-propane sulfonate; 3-(C_{12}-C_{14} alkyl-amidopropyldimethylammonium)-2-hydroxy-1-propane sulfonate; and 3-(cocodimethylammonium)-1-propane sulfonate.

[0053] The carboxybetaines, such as (dodecyldimethylammonium) acetate (also known as lauryl betaine); (tetradecyldimethylammonium) acetate (also known as myristyl betaine); (cocodimethylammonium) acetate (also known as coconut betaine); (oleyldimethylammonium) acetate (also known as oleyl betaine); (dodecyloxymethyldimethylammonium) acetate; and (cocoamidopropyldimethylammonium) acetate (also known as cocoamido-propyl betaine or CAPB).

[0054] The sulfoniumbetaines, such as: (dodecyldimethylsulfonium) acetate; and 3-(cocodimethyl-sulfonium)-1-propane sulfonate.

[0055] The phosphoniumbetaines, such as 4-(trimethylphosphonium)-1-hexadecane sulfonate; 3-(dodecyldimethyl-phosphonium)-1-propanesulfonate; and 2-(dodecyldimethylphosphonium)-1-ethane sulfate.

[0056] The compositions according to the present invention preferably comprise carboxybetaines or sulphobetaines as amphoteric or zwitterionic surfactants, or mixtures thereof. Especially preferred is lauryl betaine.

[0057] Further optional ingredients include additional surfactants e.g non ionic and cationic surfactants, viscosity modifiers, foam boosting agents, preservatives (e.g. bactericides), pH buffering agents, polyelectrolytes, anti-shrinking agents, anti-wrinkle agents, anti-oxidants, sunscreens, anti-corrosion agents, drape imparting agents, anti-static agents and ironing aids. The compositions may further comprise, colorants, pearlisers and/or opacifiers, and shading dye. Fluorescent Agents

[0058] The invention will now be further described with reference to the following nonlimiting examples.

Examples

[0059] All values throughout are wt%/.

Enzyme-free Detergent formulation A

[0060]

Ingredient	% by weight
Non-ionic surfactant Neodol 25-7	6.2
Anionic surfactant LAS acid	11.8
Anionic surfactant SLES 3EO	6.5
Lauric Fatty Acid P5908	5.2
Glycerol	5.0
Monopropylene Glycol	9.0
Citric acid	3.9
Minors	2.0
Water	balance to 100

[0061] **Wherein:**

Neodol 25-7 ex.Shell = C_{12}-C_{15} alcohol 7-ethoxylate

LAS acid = C_{10}-C_{14} alkyl benzene sulphonic acid;

SLES = C12-C13 alcohol 3-ethoxylate sulphate, Na salt: = sodium lauryl ether sulphate (with on average 3 ethylene oxide groups);

Example 1

[0062] In this example, detergent formulations according to the invention were tested to determine their ability to treat i.e. remove beef fat stains from cotton fabric.

End-point Stain Removal Assay

Reagents:

[0063]

- CS46B (Beef fat, coloured) stained cloth (Testfabrics Inc.) was hole punched into discs and transferred to 300 μl 96 well plates.
- Composition A
- DL-Arginine (Sigma Cat No. 11020, EC Number: 230-571-3)

Procedure:

[0064]

- The stained cloth was pre-rinsed (before adding to the well plates) to remove any residual free stain:
  - 200 μl of distilled water was added to each well
  - Plates shaken at 900 rpm for 10 mins
  - water removed

[0065] Add washing mixtures as follows:
Test Mixture according to the invention:

Composition A 5 mg/L	100 μl
Arginine dilution*	20 μl
Distilled water	60 μl

*Arginine diluted to the following mg/ml concentrations in distilled water: 0.16, 0.32, 0.64, 1.28, 2.56, 5.12 and 10.24.

Control Mixture:

Compostion A 5 mg/L	100 μl
Distilled water	100 μl

- Reactions were incubated at 22 degrees for 1 hour with shaking at 900 rpm.
- The cloth was rinsed by adding 200 μl of distilled water to each well followed by shaking at 900 rpm for 5 minutes. The liquor was then removed. This procedure was repeated four consecutive times.
- The cloth was dried for 3 hours at 40 degrees
- After drying, the stain plates were digitally scanned and their deltaE measured. This value is used to express cleaning effect and is defined as the colour difference between a white cloth and that of the stained cloth after being washed. Mathematically, the definition of deltaE is:

$$\text{deltaE} = [\ (\Delta L)^{2} + (\Delta a)^{2} + (\Delta b)^{2}\ ]^{1/2}$$

wherein ΔL is a measure of the difference in darkness between the washed and white cloth; Δa and Δb are measures for the difference in redness and yellowness respectively between both cloths. From this equation, it is clear that the lower the value of deltaE, the whiter the cloth will be. With regard to this colour measurement technique, reference is made to Commission International de l'Eclairage (CIE); Recommendation on Uniform Colour Spaces, colour difference equations, psychometric colour terms, supplement no. 2 to CIE Publication, no. 15, Colormetry, Bureau Central de la CIE, Paris 1978.

Results

[0066] In the tables below the cleaning effect is expressed in the form of a stain removal index (SRI):

$$\text{SRI} = 100 - \text{deltaE}.$$

[0067] The higher the SRI the cleaner the cloth, SRI = 100 (white). "Stain removal" is measured in terms of Remission units or a Remission index. For a visible (by the human eye) effect, effective stain removal is preferably represented by

remission equal to or greater than 2 Remission units and more preferably greater or equal to 5 units.

[0068] Table 1: End-point stain removal assays using CS46B stained cloth treated with a range of arginine concentrations in MTS24 formulation. Four replicates were performed in parallel on the same 96 well plate. The plates were scanned and the SRI values calculated

	Rep 1	Rep 2	Rep 3	Rep 4	Average	
Arginine (mg/ml)	**SRI**	**SRI**	**SRI**	**SRI**	**SRI**	**STDEV**
0.0	65.6	64.2	66.1	64.0	65.0	1.0
0.16	72.5	72.0	70.0	72.5	71.7	1.2
0.32	74.8	73.3	74.2	74.8	74.3	0.7
0.64	75.9	75.3	72.7	74.9	74.7	1.4
1.28	77.1	76.2	76.3	76.3	76.5	0.4
2.56	78.1	76.4	77.5	78.8	77.7	1.0
5.12	80.2	79.6	81.8	81.6	80.8	1.0
10.24	81.6	81.9	82.7	81.8	82.0	0.5

[0069] The results of table 1 are shown in figure 1 which is a Graph displaying the average SRI for replicates 1-4 from Table 1 vs arginine concentration. Error bars display standard deviation between the four replicates for each concentration.

[0070] These results demonstrate that arginine removes the CS46B stain in dose dependent manner

Tergotometer Assays

[0071] The tergotometer (SR Lab Instruments) allows a scaled reproduction of larger agitator type washers. This device was used to assess the cleaning activity of arginine on different fat-based stained cloth in Composition A.

[0072] Stained Cloth:

- CS46B (Beef fat, coloured) (Testfabrics Inc.)
- Hamburger Grease & Violet Dye (Warwick Equest)
- Lard & Violet Dye (Warwick Equest)
- Artificial Sebum & Carbon Black Dye (in house)
- Composition A (+) surfactants (-) enzymes
- DL-Arginine (Sigma Cat No. 11020, EC Number: 230-571-3)

Procedure:

[0073] Two 10 X 10 cm pieces of the same stained cloth were added to each Tergotometer pot. Two pieces of 10 X 10 cm unstained, white cloth was also added to each Tergotometer pot to simulate a typical washing load. Arginine was applied using two different approaches: (i) by including it in the formulation containing wash mixture or (ii) pre-treating the cloth with a solution of arginine before washing.

-Arginine containing wash:

[0074] Stained cloths were transferred into 1 litre Tergotometer pots containing:

100 mg/ml Arginine (pH 8.0)	50 ml (10 mg/ml), 5 ml (1 mg/ml)
Compostion A	0.57 ml
French Hardness (50X)	10 ml

[0075] The volume was made up to 500 ml with demineralised water.

[0076] Wash conditions: 1 hour at 22 C

-Arginine Pre-treatment wash:

[0077] Stained cloths were pre-treated by soaking in solutions of 1 mg/ml or 10 mg/ml arginine in water (pH 8.0) for 5 mins before being transferred to Tergotometer pots containing:

Composition A	0.57 ml
French Hardness (50X)	10 ml

[0078] The volume was made up to 500 ml with demineralised water.
[0079] Wash conditions: 1 hour at 22 C

-Control Wash:

[0080] Stained cloths were transferred into 1 litre Tergotometerpots containing:

Composition A	0.57 ml
French Hardness (50X)	10 ml

[0081] The volume was made up to 500 ml with demineralised water.
[0082] Wash conditions: 1 hour at 22 C
[0083] After washing the cloths were rinsed for 5 X 2 mins in demineralised water and air dried over night.
[0084] When fully dry, the cloths were digitally scanned, their delta E measured and SRI calculated as described previously.

Results

[0085] In the tables below the cleaning effect is expressed in the form of a stain removal index (SRI):

$$SRI = 100 - deltaE.$$

[0086] The higher the SRI the cleaner the cloth, SRI = 100 (white).
[0087] Table 2: Tergotometerassay using CS46B stained cloth washed with 1 mg/ml and 10 mg/ml arginine in MTS24 formulation. 4 replicates were performed in parallel (2 X replicate per Tergotometerpot).

	SRI(1)	SRI(2)	SRI(3)	SRI(4)	Average SRI	STDEV
(-) Arginine	72.56	71.82	70.61	68.99	71.00	1.56
1 mg/ml Arginine	86.32	85.63	85.08	85.97	85.75	89.30
10 mg/ml Arginine	88.92	89.50	89.06	89.73	89.30	0.38

[0088] The results of table 2 are shown in Figure 2 which is a Bar chart displaying the average SRI for replicates 1-4 from Table 2 vs arginine concentration. Error bars display standard deviation between the four replicates for each concentration.
[0089] Table 3: Tergotometerassay using CS46B stained cloth pre-treated with 1 mg/ml and 10 mg/ml arginine and then washed in MTS24 formulation. 4 replicates were performed in parallel (2 X replicate per Tergotometerpot).

	SRI(1)	SRI(2)	SRI(3)	SRI(4)	Average SRI	STDEV
(-) Arginine	68.99	70.61	71.82	72.56	71.00	1.56
1 mg/ml Arginine	79.89	80.10	80.12	80.48	80.15	0.25
10 mg/ml Arginine	82.93	82.38	85.36	85.12	83.95	1.51

[0090] Results of Table 3 are shown in Figure 3: a Bar chart displaying the average SRI for replicates 1-4 from Table

3 vs arginine concentration. Error bars display standard deviation between the four replicates for each concentration.

[0091] Table 4: Tergotometerassay using Lard & Violet Dye stained cloth washed with 1 mg/ml and 10 mg/ml arginine in MTS24 formulation. 4 replicates were performed in parallel (2 X replicate per Tergotometerpot).

	SRI(1)	SRI(2)	SRI(3)	SRI(4)	Average SRI	STDEV
(-) Arginine	47.64	46.13	45.05	46.57	46.35	1.07
1 mg/ml Arginine	53.36	51.01	51.29	52.52	52.05	1.09
10 mg/ml Arginine	57.04	55.22	55.84	54.21	55.58	1.18

[0092] Results of table 4 are shown in Figure 4: a Bar chart displaying the average SRI for replicates 1-4 from Table 4 vs arginine concentration. Error bars display standard deviation between the four replicates for each concentration.

[0093] Table 5: Tergotometerassay using Lard & Violet Dye stained cloth pre-treated with 1 mg/ml and 10 mg/ml arginine and then washed in MTS24 formulation. 4 replicates were performed in parallel (2 X replicate per Tergotometerpot).

	SRI(1)	SRI(2)	SRI(3)	SRI(4)	Average SRI	STDEV
(-) Arginine	47.64	46.13	45.05	46.57	46.35	1.07
1 mg/ml Arginine	55.22	51.50	52.23	53.22	53.04	1.62
10 mg/ml Arginine	58.83	57.98	56.74	57.23	57.70	0.91

[0094] The results of table 5 are shown in Figure 5: a Bar chart displaying the average SRI for replicates 1-4 from Table 5 vs arginine concentration. Error bars display standard deviation between the four replicates for each concentration.

[0095] Table 6: Tergotometerassay using Hamburger Grease & Violet Dye stained cloth washed with 1 mg/ml and 10 mg/ml arginine in MTS24 formulation. 4 replicates were performed in parallel (2 X replicate per Tergotometerpot).

	SRI(1)	SRI(2)	SRI(3)	SRI(4)	Average SRI	STDEV
(-) Arginine	52.27	48.89	51.46	52.38	51.25	1.62
1 mg/ml Arginine	55.73	58.45	52.90	54.31	55.35	2.37
10 mg/ml Arginine	63.48	57.45	60.10	58.56	59.90	2.62

[0096] The results of table 6 are shown in Figure 6: a Bar chart displaying the average SRI for replicates 1-4 from Table 6 vs arginine concentration. Error bars display standard deviation between the four replicates for each concentration.

[0097] Table 7: Tergotometerassay using Hamburger Grease & Violet Dye stained cloth pre-treated with 1 mg/ml and 10 mg/ml arginine and then washed in MTS24 formulation. 4 replicates were performed in parallel (2 X replicate per Tergotometerpot).

	SRI(1)	SRI(2)	SRI(3)	SRI(4)	Average SRI	STDEV
(-) Arginine	52.27	48.89	51.46	52.38	51.25	1.62
1 mg/ml Arginine	56.90	55.56	55.83	57.61	56.47	0.95
10 mg/ml Arginine	58.83	57.99	59.84	56.97	58.41	1.22

[0098] The results of table 7 are shown in Figure 7: a Bar chart displaying the average SRI for replicates 1-4 from Table 7 vs arginine concentration. Error bars display standard deviation between the four replicates for each concentration.

[0099] Table 8: Tergo-O-tometer assay using Artificial Sebum stained cloth washed with 1 mg/ml and 10 mg/ml arginine in MTS24 formulation. 4 replicates were performed in parallel (2 X replicate per Tergo-O-tometer pot).

	SRI(1)	SRI(2)	SRI(3)	SRI(4)	Average SRI	STDEV
(-) Arginine	66.83	64.97	63.22	65.35	65.09	1.49
1 mg/ml Arginine	85.76	82.26	87.81	83.84	84.92	2.40
10 mg/ml Arginine	91.43	86.41	87.89	85.95	87.92	2.48

[0100] The results of table 8 are shown in Figure 8: a Bar chart displaying the average SRI for replicates 1-4 from Table 8 vs arginine concentration. Error bars display standard deviation between the four replicates for each concentration.

Conclusions:

[0101] The inclusion of arginine improves removal of the fat-based stains tested. Pre-treatment of the stained cloth with arginine prior to washing in a surfactant containing composition A also improves stain removal.

Claims

1. A method for removing a stain comprising fat/oil from a stained fabric, comprising the step of applying to the stain, a fabric stain removal composition comprising an arginine compound and a surfactant.

2. A method according to claim 1, wherein the surfactant comprises an anionic surfactant.

3. A method according to claim 2, where the surfactant comprises a rhamnolipid.

4. A method according to any preceding claim, wherein said fabric stain removal composition is ambient-active.

5. A method according to any preceding claim comprising the step of adding water to the fabric stain removal composition to form an aqueous wash liquor.

6. A method according to any of claims 1 to 4 comprising localised application to a stain comprising fat/oil on a stained fabric, of the fabric stain removal composition as defined in claims 1-4.

7. A method according to any preceding claim wherein the step of applying the fabric stain removal composition is a pre-treatment step using a pre-treatment device, wherein the pre-treatment device comprises (i) a storage chamber storing the fabric stain removal composition as defined in any of claims 1-4 and (ii) a dispenser for locally applying said fabric stain removal composition to a stain on a fabric.

8. Use of an arginine compound in the removal of an oil/fat stain from a stained fabric at ambient temperatures, preferably in combination with surfactant.

Patentansprüche

1. Verfahren zum Entfernen eines Fett/Öl umfassenden Flecks aus einem verschmutzten Stoff, umfassend den Schritt des Aufbringens einer Textilfleckentfernungszusammensetzung, die eine Argininverbindung und ein Tensid umfasst, auf den Fleck.

2. Verfahren nach Anspruch 1, wobei das Tensid ein anionisches Tensid umfasst.

3. Verfahren nach Anspruch 2, wobei das Tensid ein Rhamnolipid umfasst.

4. Verfahren nach irgendeinem vorhergehenden Anspruch, wobei die Textilfleckentfernungszusammensetzung umgebungs-aktiv ist.

5. Verfahren nach irgendeinem vorhergehenden Anspruch, umfassend den Schritt der Zugabe von Wasser zu der Textilfleckentfernungszusammensetzung, um eine wässrige Waschlauge zu bilden.

6. Verfahren nach irgendeinem der Ansprüche 1 bis 4, umfassend die lokalisierte Aufbringung der Textilfleckentfernungszusammensetzung wie in den Ansprüchen 1-4 definiert auf einen Fett/Öl umfassenden Fleck auf einem verschmutzten Stoff.

7. Verfahren nach irgendeinem vorhergehenden Anspruch, wobei der Schritt des Aufbringens der Textilfleckentfernungszusammensetzung ein Vorbehandlungsschritt ist, bei dem eine Vorbehandlungsvorrichtung verwendet wird, wobei die Vorbehandlungsvorrichtung (i) eine Aufbewahrungskammer, in der die Textilfleckentfernungszusammensetzung wie in irgendeinem der Ansprüche 1-4 definiert gelagert wird, und (ii) einen Spender zum lokalen Aufbringen der Textilfleckentfernungszusammensetzung auf einen Fleck auf einem Stoff umfasst.

8. Verwendung einer Argininverbindung bei der Entfernung eines Öl-/Fettflecks aus einem verschmutzten Stoff bei Umgebungstemperaturen, bevorzugt in Kombination mit Tensid.

Revendications

1. Procédé pour enlever une tache comprenant des graisses/huiles sur une étoffe tachée, comprenant l'étape d'application sur la tache d'une composition d'enlèvement des taches sur les étoffes comprenant un composé d'arginine et un tensioactif.

2. Procédé selon la revendication 1, dans lequel le tensioactif comprend un tensioactif anionique.

3. Procédé selon la revendication 2, dans lequel le tensioactif comprend un rhamnolipide.

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel ladite composition d'enlèvement des taches sur les étoffes est active dans les conditions ambiantes.

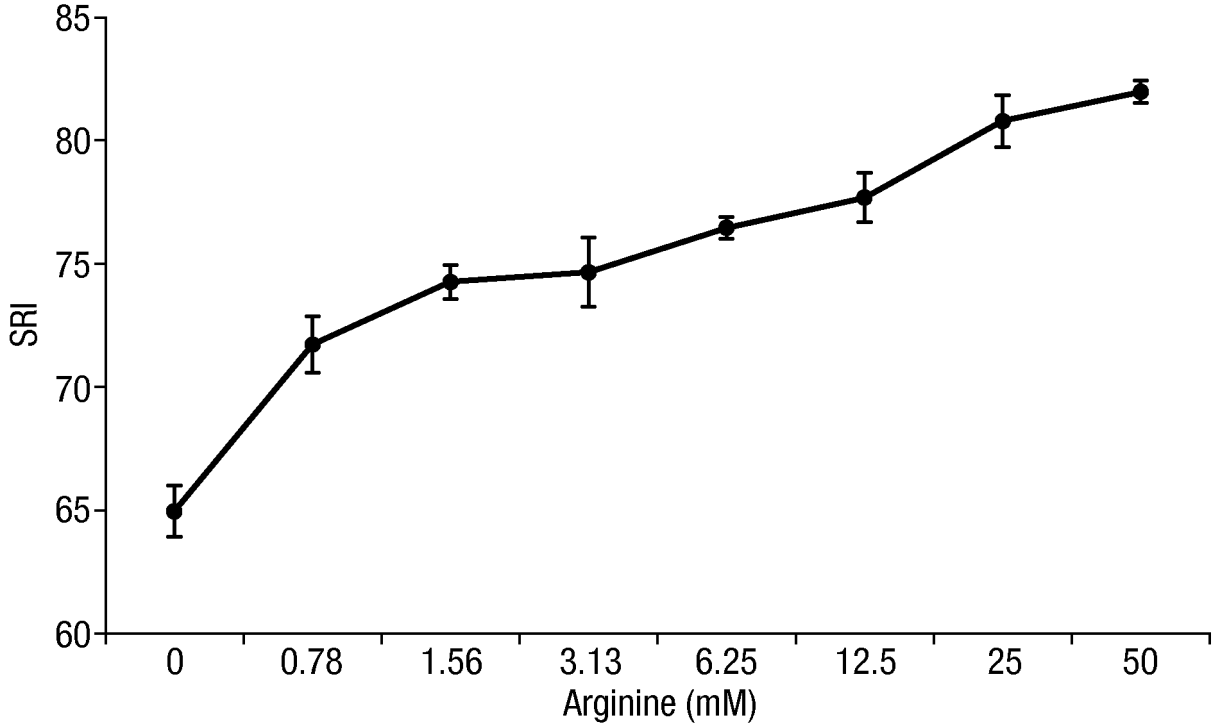
5. Procédé selon l'une quelconque des revendications précédentes comprenant l'étape d'addition d'eau à la composition d'enlèvement des taches sur les étoffes pour former une liqueur de lavage aqueuse.

6. Procédé selon l'une quelconque des revendications 1 à 4 comprenant l'application localisée sur une tache comprenant des graisses/huiles sur une étoffe tachée, de la composition d'enlèvement des taches sur les étoffes telle que définie dans les revendications 1 à 4.

7. Procédé selon l'une quelconque des revendications précédentes dans lequel l'étape d'application de la composition d'enlèvement des taches sur les étoffes est une étape de prétraitement utilisant un dispositif de prétraitement, dans lequel le dispositif de prétraitement comprend (i) une chambre de stockage qui stocke la composition d'enlèvement des taches sur les étoffes telle que définie dans l'une quelconque des revendications 1 à 4 et (ii) un distributeur pour appliquer localement sur une tache sur une étoffe ladite composition d'enlèvement des taches sur les étoffes.

8. Utilisation d'un composé d'arginine dans l'enlèvement d'une tache de graisse/huile sur une étoffe tachée à la température ambiante, de préférence en combinaison avec un tensioactif.

Fig. 1


85
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75
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SRI
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0.78
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3.13
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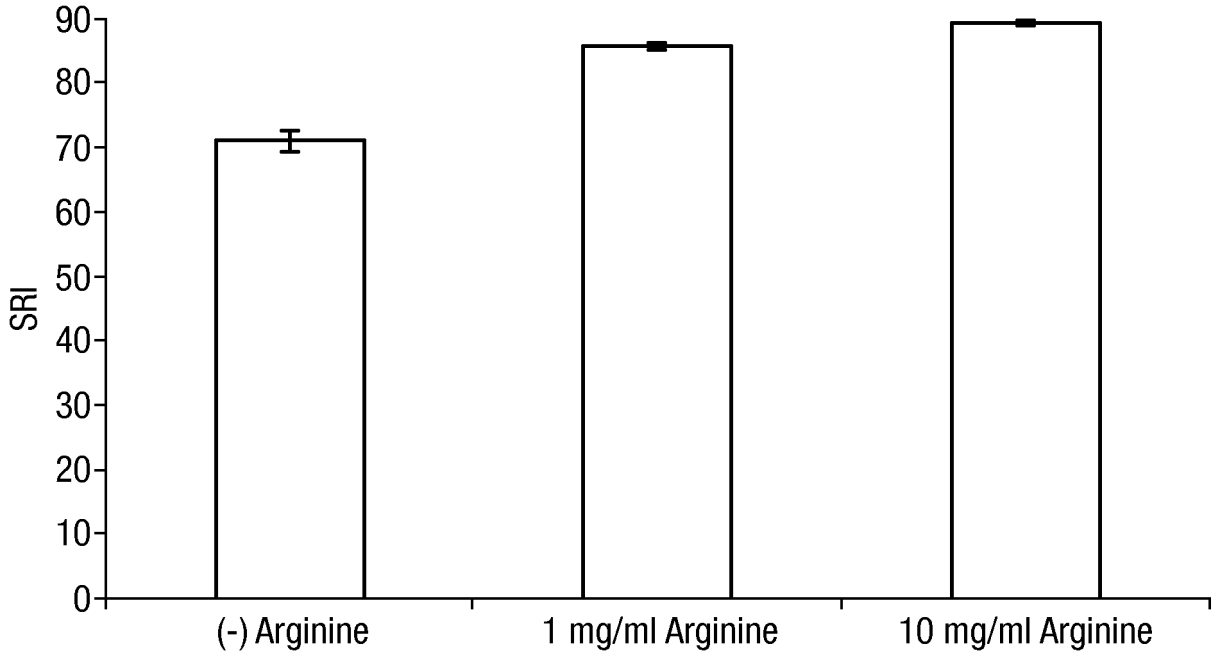
12.5
25
50
Arginine (mM)

Fig. 2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SRI
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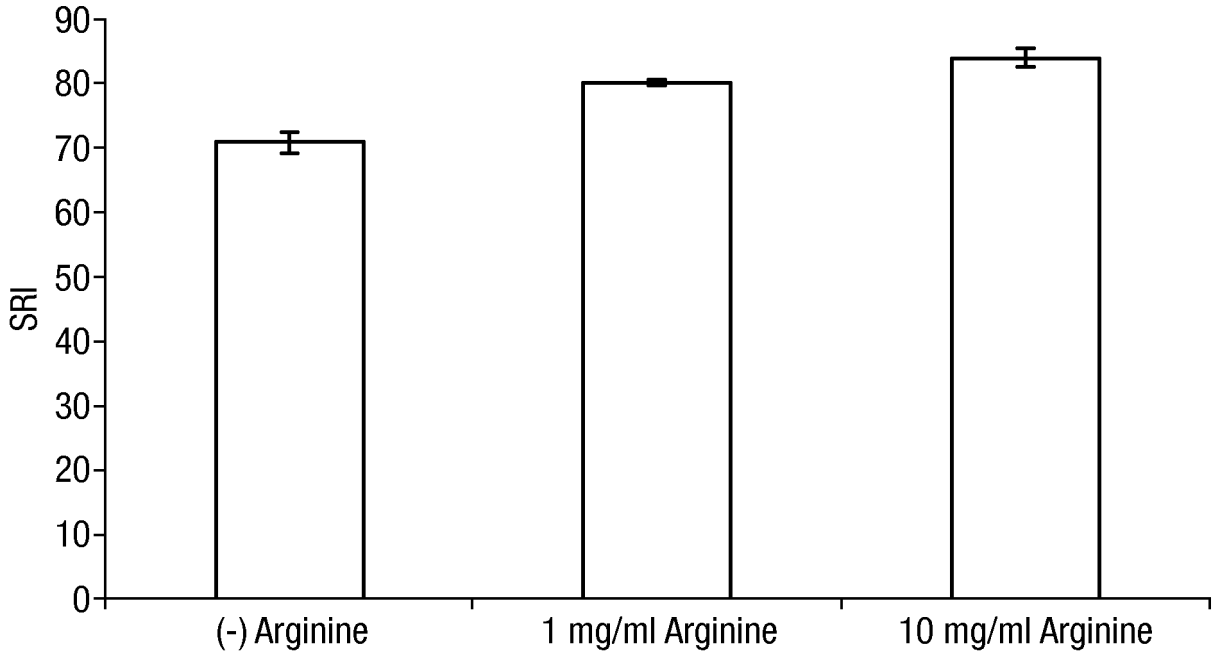
10 mg/ml Arginine

Fig. 3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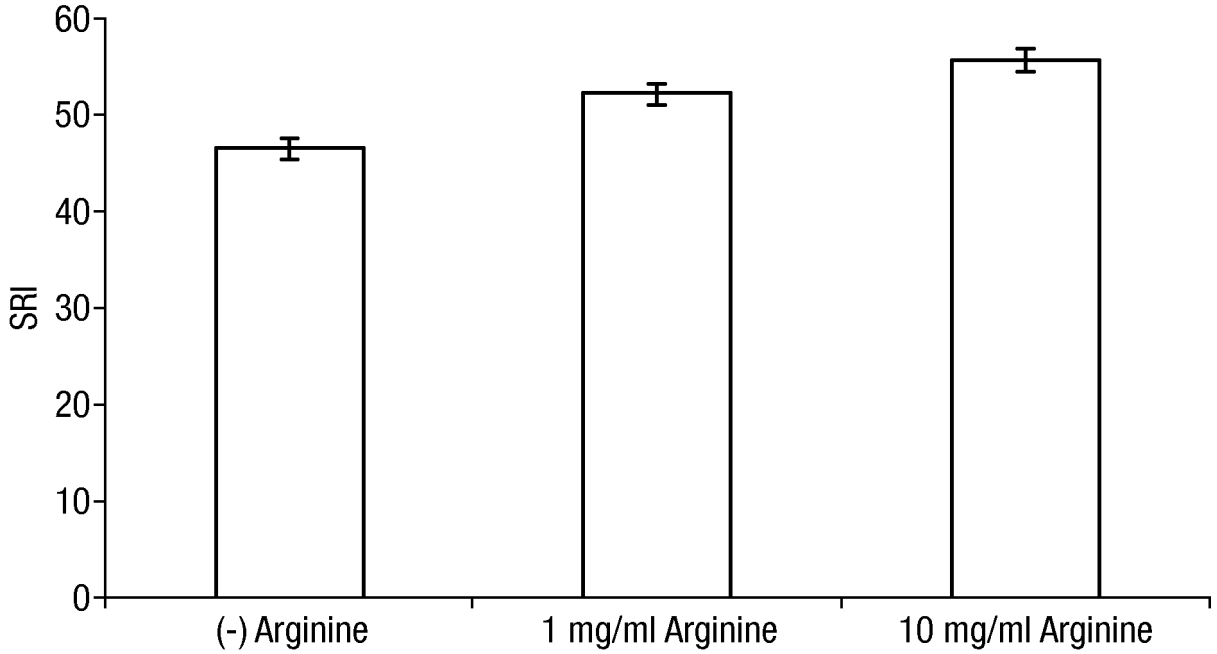
(-) Arginine
1 mg/ml Arginine
10 mg/ml Arginine

Fig. 4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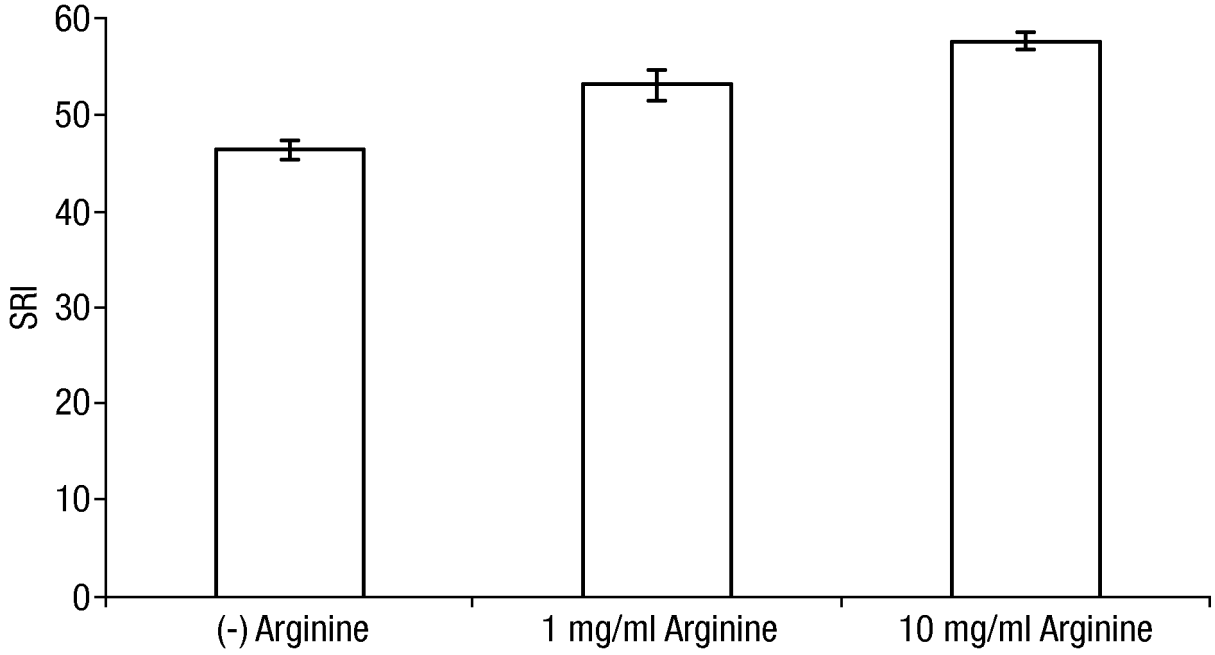
10 mg/ml Arginine

Fig. 5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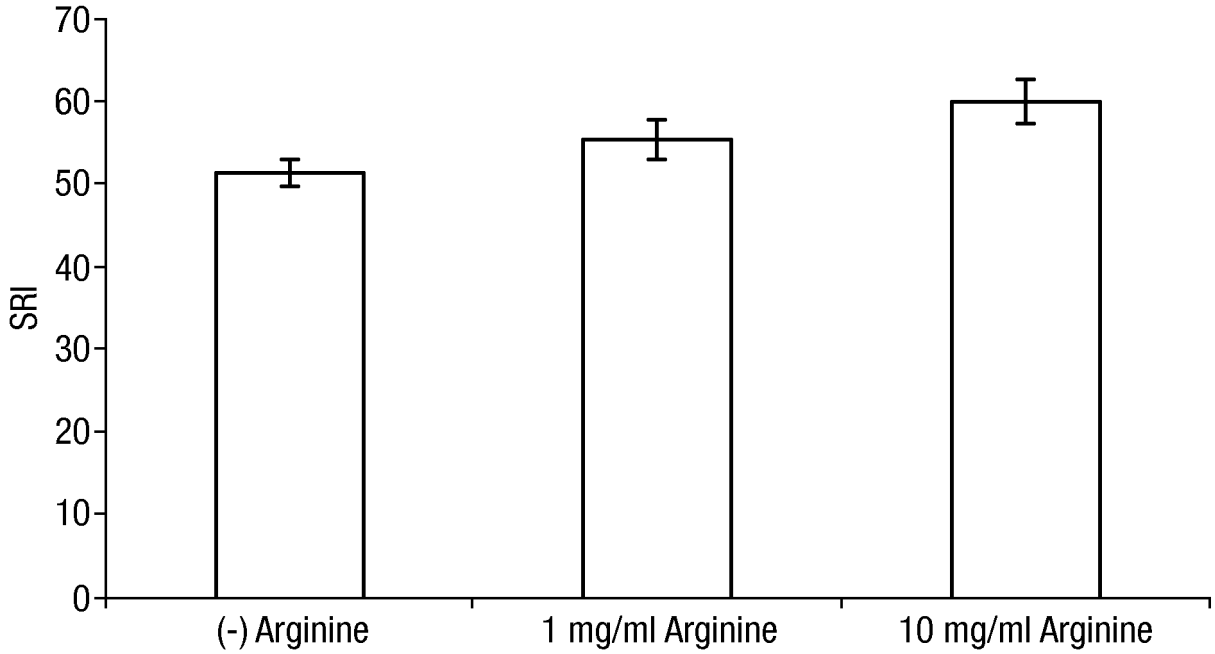
(-) Arginine
1 mg/ml Arginine
10 mg/ml Arginine

Fig. 6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SRI
(-) Arginine
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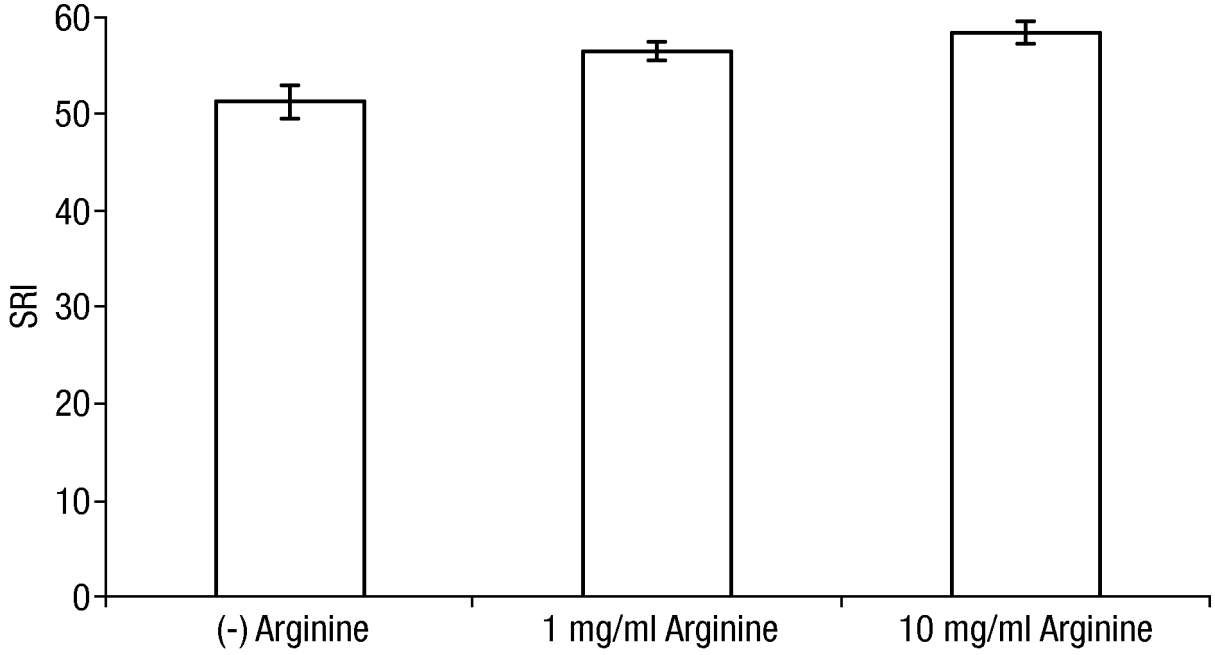
10 mg/ml Arginine

Fig. 7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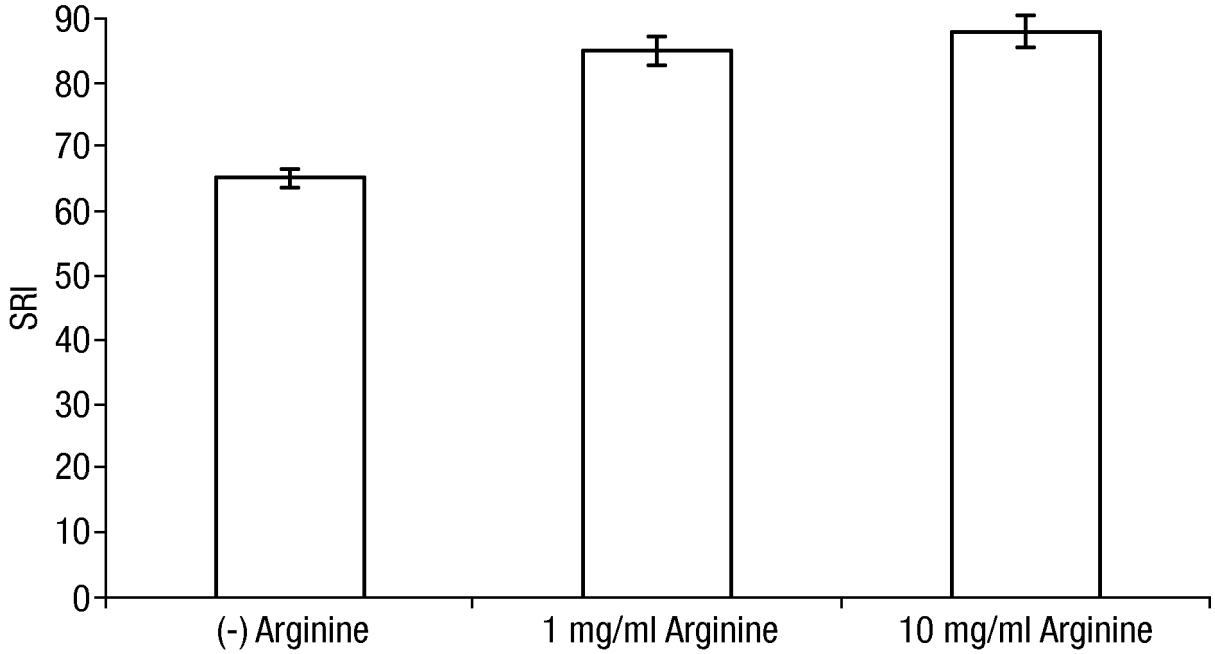
SRI
(-) Arginine
1 mg/ml Arginine
10 mg/ml Arginine

Fig. 8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SRI
(-) Arginine
1 mg/ml Arginine
10 mg/ml Arginine

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