

SUMMARY OF THE INVENTION

[0007] In one aspect, the present invention refers to method method of selectively separating a biological target from a sample comprising the biological target material or suspected of comprising the biological target comprising the steps of (i) providing a solid comprising ureide moieties at its surface; (ii) contacting the sample with the solid, whereby a substantial fraction of the biological target in the sample binds to the ureide moieties; and (iii) separating the solid from the sample. EmbodimentsExamples disclosed herein provide methods for selectively separating biological targets from a sample, including the steps of (i) providing a solid having one or more ureide moieties at its surface; (ii) contacting the sample with the solid, whereby a substantial fraction of biological targets in the sample binds to the ureides on the surface of the solid; and (iii) separating the solid from the sample. In some embodimentsexamples, the biological targets are considered “large.” The term “large,” as used herein in reference to biological targets, will be understood to include individual biological targets or assemblages of biological targets with an aggregate size from about 20 microns to millions of Daltons. Exemplary biological targets include cells and cellular substructures such as organelles, inclusion bodies, endotoxins, aggregates and viruses. Solids having one or more ureides at their surfaces particularly include ureide crystals or ureides immobilized on a surface. In certain embodimentsexamples the ureide particularly includes allantoin.

[0008] In certain embodimentsexamples, the sample is the local environment and the method provides means for selectively removing biological targets from that environment. In some such embodimentsexamples the sample is air, contacted with a solid material having one or more ureides on its surface. In one particular embodimentexamples the airborne biological target is a virus or other pathogenic agent, and the ureide is allantoin.

[0009] In certain embodimentsexamples, the sample is a liquid, contacted with a solid material having one or more ureides on its surface. In one such embodimentexample, the sample is water, the biological targets include pathogenic microbes or derivative substructures thereof such as endotoxins, and the ureide is allantoin at a supersaturating concentration. In another such embodimentexample, the sample is a protein preparation containing a desired protein such as containing a recombinant protein, and the ureide is allantoin at a supersaturating concentration. In certain such embodimentsexamples, the protein preparation may contain cells, cell debris, microbes and substructures thereof including endotoxins to be removed from the liquid. In certain such embodimentsexamples, organic multivalent ions may be combined with the ureide to enhance the removal of unwanted materials. In certain such embodimentsexamples, the sample treated with the ureide and/or organic multivalent ions may be combined with other solids comprising organic multivalent ions to further enhance the removal of unwanted materials.

[0010] In certain embodimentsexamples the biological targets may be recovered from the solid having one or more ureides at its surface by dissolving the solid, or by disrupting the interaction of the target with the ureide. In one such embodimentexample, the ureide is allantoin. In one such

~~embodiment~~example, the method provides the additional step of recovering a virus from the solid wherein the sample contains a desired virus to be purified. In another such ~~embodiment~~example, the method provides the additional step of recovering a cellular organelle from the solid wherein the sample contains a desired organelle to be purified. In a further aspect, the present invention refers to a kit for the convenient practice of any of the methods of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Figure 1 shows a time course plot indicating a reduction in high molecular weight aggregates and reduction of host cell protein contaminants in accordance with methods disclosed herein.

[0012] Figures 2A and 2B show size exclusion chromatography profiles before and after treatment of IgM-84 antibody in accordance with methods disclosed herein.

[0013] Figure 3 shows size exclusion chromatography profiles before and after the treatment of an anti-HER2 monoclonal IgG antibody in accordance with methods disclosed herein.

DETAILED DESCRIPTION

[0014] It has been surprisingly discovered that a solid having one or more ureides at its surface mediates a sufficiently strong affinity for biological targets, including large biological targets, that they can be selectively extracted from a sample simply by removing the solid to which they are bound. The extracted biological targets can be subsequently discarded or recovered. Large biological targets are understood to include individual targets or assemblages of targets with an aggregate size from 20 microns to millions of Daltons (D), and particularly include cells and cellular substructures such as organelles, microbes and substructures of microbes such as endotoxins, and aggregates. Smaller biological targets particularly including proteins may exhibit less affinity for ureides on a solid surface, which facilitates their separation from the larger targets bound to the ureide.

[0015] In some embodiments, the biological target has a size in a range selected from the group consisting of (1) from about 10 nm to about 200 nm, (2) from about 200 nm to about 1 micron, (3) from about 1 micron to about 20 microns, and (4) about 20 microns or greater. One skilled in the art will appreciate that the exact size of the biological target will be a function of the nature of the target itself. Where smaller biological targets are to be purified, methods disclosed herein may be combined with other purification techniques to provide the desired degree of purification.

[0016] Without being bound by any particular theory, experimental data indicate that the affinity of allantoin may be mediated through van der Waals interactions, particularly including hydrogen bonds. Such bonds are affected by pH, conductivity, and the presence of organic