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(54) Title: COMPOSITIONS, METHODS AND KITS FOR ISOLATING NUCLEIC ACIDS FROM BODY FLUIDS USING ANION EXCHANGE MEDIA

(57) Abstract: This invention provides compositions and methods for rapid separation, isolation and purification of nucleopolymers, especially nucleic acids, from biological samples, using anionic exchange media. The method of the present invention can utilize commercially available strong or weak anion exchanger materials with selected solutions of known ionic strength for adsorption and elution. The medium/nucleoprotein bound complex may be optionally stored or transported, but is subsequently treated with appropriate eluents to remove any undesirable proteins, including destabilizing enzymes, and inorganic salts and the like. The partially purified complex may also be stored or transported prior to further processing. The instant method is particularly advantageous as it provides the means for rapid isolation and purification of soluble nucleic acids obtained from samples of biological fluids of comparatively large volume, allowing ease of handling and storage, and stabilizing the samples against degradation prior to analysis. It also permits the purification and identification of shorter fragments of nucleic acids from bodily fluids which, up till now, had not been identified. The method is widely useful as a means to prepare samples formats that are convenient in diagnostic analytical methods, particularly those that rely on the detection, characterization and identification of nucleic acid sequences, from body fluids.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/21723

A. CLASSIFICATION OF SUBJECT MATTER

IPC: **A23J 1/00**(2006.01);C07K **1/00(2006.01),14/00(2006.01),16/00(2006.0 1),17/00(2006.01)**
C12Q 1/68(2006.01);C12P 19/34(2006.01)

USPC: 530/4 16;210/683

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 530/4 16;210/683

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PubMed, ScienceDirect, WEST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,935,342 (SELIGSON et al.) 19 June 1990 (19.06.1990), Abstract; col. 2, lines 60-68;	1-3,5
---	col. 3, lines 19-55; col. 4, lines 12-60; col. 5, lines 5-66.	-----
Y		4
Y	US 6,872,527 B2 (GERDES et al.) 29 March 2005 (29.03.2005), Abstract; col. 5, lines 62-68; col. 6, lines 1-3 and 27-59.	4



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents	"T "	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent published on or after the international filing date	"Y"	document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		

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28.10.08

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/21723

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
 2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of any additional fees.
 3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

 4. ☒ N° required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-5
- Remark on Protest
- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US07/21723

BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions *or* groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-5, drawn to a method of isolating cell-free nucleic acids from urine using anion-exchange chromatography.

Group π , claim(s) 6-10, drawn to a method of isolating cell-free nucleic acids from blood using anion-exchange chromatography.

Group DI, claim(s) 11-18, drawn to a kit comprising a solid carrier capable of adsorbing nucleic acid contained in a sample and nucleic acid elution buffers.

The inventions listed as Groups I- π do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Seligson et al. (U.S. Patent No. 4,935,342, published 19 June 1990) teach isolation of nucleic acids from urine using anion exchange columns (Abstract; col. 8, lines 1-13, 67, 68; col. 9, lines 1-27; col. 11, lines 29-39), therefore claims do not represent a contribution over prior art and thus lack a unifying special technical feature.