The blockbuster model for pharmaceuticals is slowly being supplanted by personalized medicine. Fundamental to the role of personalized medicine is the field of diagnostics. It can seem a very broad field as it includes: biomarkers per se; an assay capable of testing for a biomarker; a method of diagnosis based on the comparison of patient data with standard levels; the administration of a medication until biomarker levels show its been effective; the testing of an individual for a predisposition for a disease or of a patient’s suitability for a particular treatment; and, finally, devices or kits for use in all the above.

Clearly, it is a diverse field in which there will be opportunities for a range of inventions. In practice, however, the inventions will rely on a small number of claim types: a method of diagnosis; and DNA fragments (genes) per se. Because pharmaceuticals is a global business, it is instructive to see how the patent offices in the major pharmaceutical markets view such diagnostics claims.

As the sections set out below demonstrate, there are considerable differences of approach among the offices. This is surprising at a time when the concept of harmonization is widely accepted. Gene patenting is well established and the approach of the various offices reasonably consistent with India, and to an extent the United States, remaining the main outliers.

There is, however, much less homogeneity in the approach to claims to a method of diagnosing, whatever the claim format. The concept that diagnosis can be made on a sample has gained some traction, but in other respects there remains a great diversity of approach.

United States

The United States is both the world’s largest pharmaceuticals market and the source of much of its innovation. Turning to allowable claim types:

**Method of diagnosis**

In summary, processes, machines or new entities are all patentable under US patent law. However, excluded from patentability are inventions deemed to be “products of nature” and “natural phenomena”. Case law gives further guidance on the teaching of the statute. For example following the *Bilski* decision, the “machine or transformation” test has been applied to the patentability of methods. Pursuant to this test, a method is patentable if:

- “it is tied to a particular machine or apparatus” or
- “it transforms a particular article into a different state or thing”

The case that has catapulted diagnostic patents to the patenting hot topics list is the US case *Prometheus*. Patents, held by Prometheus Laboratories, claimed the process of administering a drug to a patient; then, by measuring the level of a metabolite of the drug, working out whether the patient had received a therapeutically effective amount of the medication. It was held that neither the administration of the drug, nor the measurement of metabolite levels constituted “machine or transformation steps” and that, following the test in *Bilski*, the subject matter claimed was not patentable.

**DNA fragments**

Turning to consider gene patents, the key case is *Myriad*. The case has been revisited at various levels of the US legal system, most recently by the Supreme Court in March 2012. Myriad filed patents with claims to isolated DNA molecules that...
encode the BRCA1/2 genes. Women who possess these genes are at much greater risk of developing breast cancer than other members of the population. DNA is the distinct double helix that encodes each individual human being. Genes is the term used to describe certain lengths along the DNA chain. The arguments made for patentability in this case are that in nature genes are chemically bonded into this length of DNA whereas isolated DNA molecules have been cut from this length and so have a distinctly different chemical structure from that of the whole. It is this different structure that underlies their patentability.

The case isn’t yet finished, but at present the position appears to be that as the structure of isolated DNA differs from that of native DNA, the genes should be patentable.

Europe

Method of diagnosis

Article 53 of the EPC states: European Patents shall not be granted in respect of:

(c) methods for treatment of the human or animal body by surgery or therapy and diagnostic methods practised on the human or animal body; this provision shall not apply to products, in particular substances or compositions, for use in any of these methods.

Guidance was given by the Enlarged Board in G 0001/04 in which it was held that a diagnostic method is excluded from patentability under relatively narrow circumstances. To be excluded the claim must include:

i) the diagnosis for curative purposes...representing the deductive medical or veterinary decision phase as a purely intellectual exercise,

ii) the preceding steps which are constitutive for making that diagnosis, and

iii) the specific interactions with the human or animal body which occur when carrying those out among these preceding steps which are of a technical nature.

Whether or not a method is a diagnostic method...may neither depend on the participation of a medical or veterinary practitioner.

To expand upon (i) and (ii), a method will be excluded from patentability if the claim contains:

• “An examination phase involving collection of the relevant data”

• “the comparison of the examination data..... with standard values”

• “the finding of any significant deviation [from standard values]” and

• “attributing the deviation to a particular clinical picture”

As stated above, these will be unpatentable only if practised on the human body. Accordingly in vitro tests don’t fall under these exclusions.

DNA fragments

In Europe, the EPO has chosen to consider patents for DNA in a manner analogous to those for a new substance.

A specific gene, be it obtained by isolation or by means of a technical process, can be patented. The industrial applicability of the gene needs to be disclosed, but the fact that the gene is identical to a gene in the human body is not prejudicial to novelty or inventive step. In this, the EPO is following the Biotechnology Directive:

(21) Whereas such an invention based on an element isolated from the human body or otherwise produced is not excluded from patentability

So, for those interested in diagnostics in Europe, the existence of an organism’s DNA is not a novelty bar to isolated DNA fragments, nor is there a statutory bar. Provided there is an inventive step and the isolated gene is sufficiently disclosed, there is no barrier to patentability. For diagnostic methods, claims of the type:

1) method of testing for disease X comprising testing for levels of marker Y in a sample; or

2) method of treating disease Y comprising:

• testing for levels of marker X in a sample

• comparing against reference level Z

• and if higher (or lower) administer drug should be allowable.

The EPO and USPTO are two large and well-respected patent offices. The lead taken by them in new or complex areas of patent law is often followed by other national offices. In the situation where there is clear divergence, how have other major offices treated this area of law?

Japan

Method of diagnosis

The JPO view of method of diagnosis patents has grown more liberal over the past few years, following a series of revisions to the examiner guidelines. The JPO view aligns closely with that of the EPO: a method for diagnosis, treatment, or operation of a human lacks industrial applicability and is therefore not patentable. However, as in Europe, in most cases diagnosis outside the human body doesn’t fall within this category and is, therefore, patentable. So, providing all steps are conducted in vitro, or on a sample which isn’t returned to the body, then such claims are allowable. However, the use of that information for dispensing purposes cannot form part of the claim. So claims of type (1) and (2) outlined in the Europe section above would not be patentable.

Genes

Japan takes a fairly liberal approach to gene patents. Claims to DNA fragments can be obtained; the act of cutting a length of DNA from a known sequence is sufficient to confer novelty.

China

Method of diagnosis

A method of diagnosing a disease or condition is not yet patentable in China. However, Swiss-type claims of the form, “the usage in preparation of a medicament or kit treating or diagnosing a disease” are allowed. In addition, re-drafting the description of the invention to claim an apparatus for carrying out the diagnosing method is recommended, for some specific cases.

Genes

A patent right may be granted in respect of a gene and a DNA fragment, provided the gene or DNA fragment is novel and has functions that are new in relation to the prior art. Pursuant to local practice, the scope of claims relating to a DNA fragment or gene (for example, a gene with a 95 identity) is mainly determined by experimental data disclosed in the specifica-
## Are diagnostics patentable?

<table>
<thead>
<tr>
<th>Country</th>
<th>Genes</th>
<th>Method of diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>United States</td>
<td>Yes (for the moment)</td>
<td>No</td>
</tr>
<tr>
<td>Japan</td>
<td>Yes</td>
<td>Yes (provided conducted on a sample)</td>
</tr>
<tr>
<td>China</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>India</td>
<td>Yes - but only for a modified gene</td>
<td>In part, provided conducted on a sample and diagnosis isn’t claimed</td>
</tr>
<tr>
<td>Canada</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Australia</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Philippines</td>
<td>Yes</td>
<td>Yes - on a sample</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Yes</td>
<td>Possibly</td>
</tr>
</tbody>
</table>

### Canada

The Canadian Patent Act broadly defines an invention in very similar terms to the United States. It has only the one express statutory exclusion, and that is in relation to a mere scientific principle or abstract theorem. However, the Courts have interpreted the subject-matter provisions to also exclude higher life forms and methods of medical treatment. The Patent Office has also objected to business method patents, or those including only mental steps or professional skills and judgment.

The Patent Office has also relied upon certain aspects of EPO practice, despite differences in the law.

#### Diagnostic method

A diagnostic method should be patentable subject matter in Canada. However, depending upon how the description of the diagnostic method is phrased, subject matter issues may arise.

#### Genes

CIPO follows the EPO line in judging a gene claim as analogous to a composition of matter claim.

### India

#### Diagnostic methods

Section 3(i) of the Indian Patents Act provides that any process for the prophylactic (diagnostic, therapeutic) treatment of human beings or animals is not to be considered an invention. The definition of diagnostic method provided in the manual of Patent Office practice and procedures is:

Diagnostic methods: Diagnosis is the identification of the nature of a medical illness, usually by investigating its history and symptoms and by applying tests. Determination of the general physical state of an individual (for example a fitness test) is considered to be diagnostic.

Therefore, any process which is performed on the human body to identify the nature of a medical illness is considered non-patentable. However, any process performed outside the human body, so where a sample from the human or animal body is taken completely out of the living body and the test is performed by help of machines or kits, may be allowed if it does not result in deduction of any disorder.

The definition of the diagnostic method as provided in the manual clearly states that any methods performed on the living body, or outside if they lead to diagnosis of a disorder, will be rendered non-patentable. Therefore, claims to a diagnostic method being performed outside the human body should be restricted to methods that do not lead to deduction of any disorder or ailment. It should be noted that in vitro diagnostic methods are clearly allowed. Further, diagnostic devices or apparatus are also considered appropriate subject matter of patents. In this regard, there are similarities in the approaches of the JPO and SIPO.

#### Genes

Under section 3(i) of Indian Patents Act, no plant or animal or part thereof is patentable. As genes and DNA fragments are part of a plant or animal, they are considered non-patentable. However, modified genes or DNA fragments are allowed. The argument generally given in favour of such an approach is that as the genes are modified, they are not present per se in nature, but are the result of human technical intervention.

As far as isolated genes or DNA fragments are concerned, section 3(c) is also relevant. It provides that discovery of any living thing or non-living substance occurring in nature is not to be considered patentable. As an isolated gene or DNA fragment is considered to be something existing in nature, it is not patentable. This argument is extended to genes snipped from a piece of known DNA. This act of isolation is insufficient to confer novelty on the gene, despite the fact that this exact section of DNA is not known, except as part of a longer strand.

### Australia

Australia affords the broadest protection to diagnostics available anywhere.

#### Methods of diagnosis

Australia is distinguished by allowing claims to methods of diagnosis, whether in or out of the human body. Those countries that do allow method of diagnosis claims typically require that all the key steps are conducted outside the human body – for example, on a
sample of tissue or blood. To allow claims to diagnosis in the body is astonishingly liberal, particularly for a nation that doesn’t have a strong life sciences industry.

**Genes**

Claims to isolated genes or nucleic acids *per se* are patentable. The only restriction is a “contrary to law” exclusion which prohibits the use of biological material (for example stem cells) to create an embryo.

**Indonesia**

The practice in Indonesia is often to grant an Indonesian patent on the strength of a foreign corresponding grant in countries that are known to conduct independent examination such as the United States, Japan and European countries. Given the diversity of approach of the offices in these countries, the views of examiners responsible for life sciences patents in Indonesia were obtained.

**Methods of diagnosis**

There is no definite view on patentability. The primary objection is that such claims might not meet the industrial applicability requirement in Indonesian patent law:

**Article 5**

An Invention is applicable in industry if the Invention is operable in industry as described in the Application. Elucidation: If the Invention is a product, the product must be capable of being massively made in the same quality, and for an Invention in the form of a process, the process must be capable of being operated or applied to practice.

Interestingly, the examiners do not cite any of the exclusions from patentable subject matter in article 7, which excludes any method of treatment:

**Article 7**

A Patent shall not be granted for an invention on:
- a process or product whose announcement and exercise or implementation is against the prevailing laws and regulations, religious morality, public order, or decency.
- a method of examination, treatment, medication and/or surgery applied to human and/or animals; Elucidation: If the examination, treatment, medication and surgery using medical equipment, this provision only applies to the Invention of its methods, while the medical equipment including the device, materials, and drug are not covered by this provision.
- a theory or method in science and mathematics; or
- (i) all living creatures, except micro-organism;
  Elucidation: Living creature in item (d) point (i) here may be human being, animal, or plant, and micro-organism is living creature of micro-size which can only be viewed through a microscope, such as amoeba, yeast, virus and bacteria.
  (ii) a biological process essential for the production of plants or animals, except non-biological process or microbiological process.
  Elucidation: Essential biological process for producing plants or animals in point (ii) is a conventional or natural crossing process such as through grafting, transplantation, or natural pollination, while non-biological or microbiological process for producing plants and animals is the process for producing plants or animals by trans-genial means/engineering done by using chemical, physical processes, using micro-organism or other genetic engineering.

**Genes**

These are acceptable as they do not fall foul of article 7, which excludes life forms from being patentable.

**Philippines**

**Method of diagnosis**

Product diagnostic methods practised on the human or animal body are expressly excluded from patent protection under the IP Code. However, products and compositions for use in such methods are allowed.

So far, there have been no key decisions by the courts or the Patent Office in these areas (patent issues are hardly litigated). However, the Manual for Substantive Examination issued by the IPO states that, to be excluded from patent protection, a treatment or diagnostic method would “generally have to be carried out on the living human or animal body”. Thus, diagnostic methods applied on body tissues or fluids “after they have been removed from the human or animal body” are not excluded from patentability “in so far as these tissues or fluids are not returned to the same body”. As an example, the Manual cites diagnostic testing of blood samples, which is considered patentable.

Accordingly, claims of the type (1) and (2), as spelt out in the Europe section above, should both be allowable provided any samples are not returned to the body.

**Genes**

Genes claims are allowed by the Patent Office; there is no express prohibition under the IP Code.

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