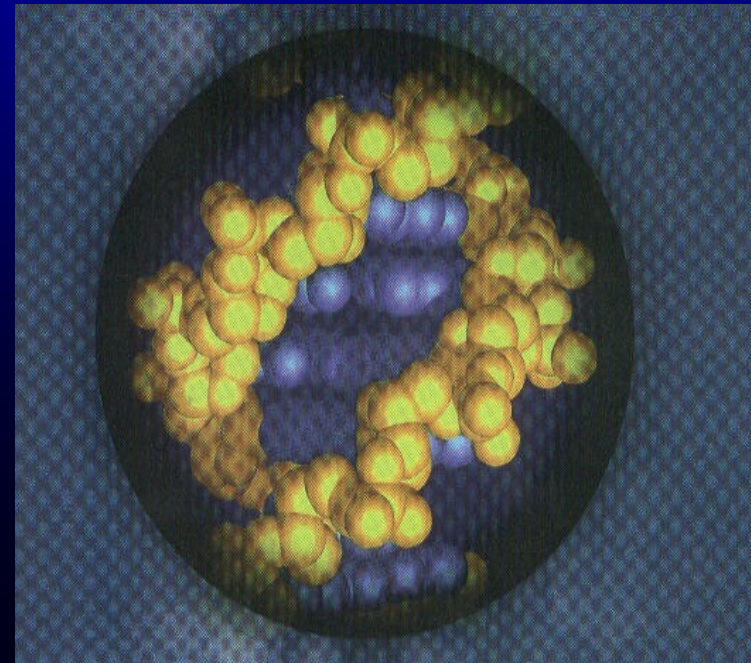# Single Nucleotide Polymorphisms (SNP)

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Communication and Cooperation

- Issues in Biotechnology are complex
  - Communication
    - Interviews
    - Focus on Invention
  - Cooperation
    - Open, frank discussions
    - Practice Specialists
  - Prosecution
    - Agree on the invention
    - Work out the claims
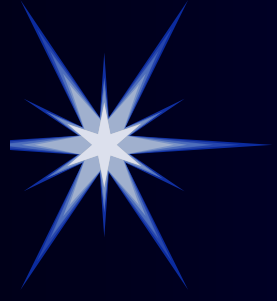   - Identify the issues

A Gene by Another Name????

Single Nucleotide Polymorphism -

A single base difference in a DNA sequence among individuals.

SNPs

- Association of sequence variations with heritable phenotypes
- Used in genotyping,
- Genomic and drug research
- Clinical diagnostics
- Markers in identifying genes and genetic differences that may determine the response of a given patient to disease and disease treatment.

Interesting Fact

SNPs are predicted to occur once every 100-300 bases at the gene level.

Private and Public Sector Efforts

- 2,841,419 SNPs currently (as of 3/22/01) in public database
- SNP Consortium
  - Objective: To identify 300,000 SNPs and map 150,000 SNPs evenly distributed throughout the human genome at a 95 percent confidence level.
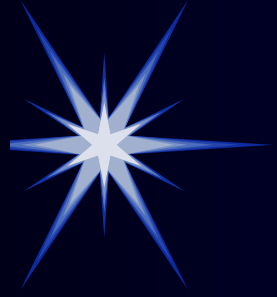
Magnitude

15-20% of patent applications in Art Unit 1655, or about 100-200 applications per year and climbing.
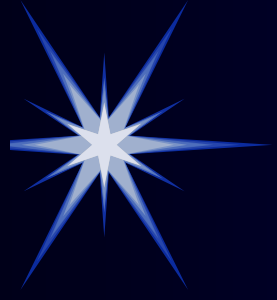
Patentability Issues

- Novelty
- Obviousness
- Utility
- Written Description

Novelty

- Claim:
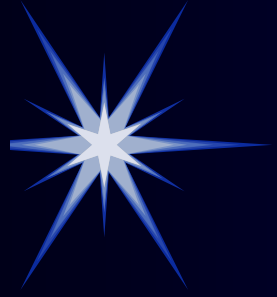
  - An isolated and purified nucleic acid comprising SEQ ID NO: 1.

  - Fact: SEQ ID NO: 1 differs from the prior art sequence by one nucleotide.

  - The prior art sequence is a breast cancer related DNA.

Novelty

☐ If the prior art does not teach the specific polymorphism, a claim to an isolated nucleic acid <u>with</u> the polymorphism is usually found to be allowable over the prior art.
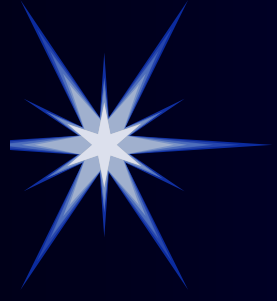
Obviousness

- Claim:
- An isolated and purified DNA comprising SEQ ID NO: 1.
- The prior art teaches the source of DNA (e.g. a specific patient's sample)
- The specification teaches that the SNP containing DNA was isolated from this same source.
- The prior art might provide the motivation to go to this particular source of DNA to isolate additional variants of the gene.

Novelty

- Claim:

- An isolated nucleic acid encoding SEQ ID NO: 2.

- Fact: SEQ ID NO: 2 is a known, well characterized protein.

- The prior art teaches SEQ ID NO: 2 and also teaches a DNA that encodes SEQ ID NO: 2, however the DNA encoding SEQ ID NO: 2 in the prior art is not the same as that which applicant has disclosed.

Novelty

- If the nucleotide change does not result in an amino acid change, the prior art reference is anticipatory.
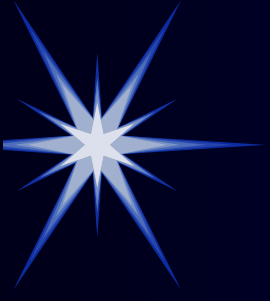
Utility Considerations for Single Nucleotide Polymorphisms (SNPs)

Scenarios

- A disclosure details single nucleotide polymorphisms present relative to a reference nucleic acid molecule. The reference nucleic acid:

  - 1.   Encodes a protein with a well-established utility or which is supported in the specification by a specific, substantial, and credible utility.
    - A.   The polymorphism does not affect the encoded protein.
    - B.   The polymorphism alters the nature of the encoded protein in an undisclosed manner.
  - 2.   Does **not** encode a protein with a specific, substantial, and credible utility or a well-established utility, but the disclosed polymorphism **is disclosed** as correlative to some disease or condition.
  - 3.   Does **not** encode a protein with a specific, substantial, and credible utility or a well-established utility, and the disclosed polymorphism **is not disclosed** as correlative to some disease or condition.

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Scenario 1A

- The reference nucleic acid (SEQ ID NO: 1) encodes a protein (SEQ ID NO: 2) with a well-established utility or which is supported in the specification by a specific, substantial, and credible utility. The polymorphism does not affect the encoded protein.

- Claim: A nucleic acid comprising SEQ ID NO: 1, wherein the nucleotide at position 128 is replaced with a G.

Scenario 1A

- Based upon the fact pattern, the claimed nucleic acid will still encode a protein that has a specific, substantial, and credible utility or a well-established utility.

- **Therefore, there is no utility (or enablement or written description) issue.**

Scenario 1B

- The reference nucleic acid (SEQ ID NO: 1) encodes a protein (SEQ ID NO: 2) with a well-established utility or which is supported in the specification by a specific, substantial, and credible utility. The polymorphism alters the nature of the encoded protein in an undisclosed manner.

- Claim: A nucleic acid comprising SEQ ID NO: 1, wherein the nucleotide at position 128 is replaced with a G.

Scenario 1B

- Based upon the fact pattern, the claimed nucleic acid will not encode a protein that would support a specific, substantial, and credible utility or well-established utility for the claimed polymorphic molecule.

- **Therefore, there is a utility question that is addressed in Scenario 2 or 3.**

Scenario 2

- A disclosure details single nucleotide polymorphisms present relative to a reference nucleic acid molecule. The reference nucleic acid does **not** encode a protein with a specific, substantial, and credible utility or a well-established utility, but the disclosed polymorphism **is disclosed** as correlative to some disease or condition.

- Claim: A nucleic acid comprising SEQ ID NO: 1, wherein the nucleotide at position 128 is replaced with a G.

Scenario 2

□ Based upon the fact pattern, the claimed nucleic acid will not encode a protein that would support a specific, substantial, and credible utility or well-established utility for the claimed polymorphic molecule.

□ However, the nucleic acid **consisting of** SEQ ID NO: 1, wherein the nucleotide at position 128 is replaced with a G, does have a specific, substantial, and credible utility.

Scenario 2

- Note that the appropriate scope of the claim will be determined by consideration of:
  - 35 U.S.C. §112, first paragraph, adequate written description
  - 35 U.S.C. §112, first paragraph, enablement
  - 35 U.S.C. §102/103 - nature of prior art

Scenario 3

- A disclosure details single nucleotide polymorphisms present relative to a reference nucleic acid molecule. The reference nucleic acid does **not** encode a protein with a specific, substantial, and credible utility or a well-established utility, and the disclosed polymorphism **is not disclosed** as correlative to some disease or condition or other patentable utility.

- Claim: A nucleic acid comprising SEQ ID NO: 1, wherein a G is present at position 128.

Scenario 3

- Based upon the fact pattern, the claimed nucleic acid will not encode a protein that would support a specific, substantial, and credible utility or well-established utility for the claimed polymorphic molecule.

- In addition, there is no disclosed specific, substantial, and credible or well-established utility for the nucleic acid of SEQ ID NO: 1, wherein the nucleotide at position 128 is replaced with a G.

Scenario 3

- Therefore, the claim will be rejected under 35 U.S.C. §101 as failing to be supported by a specific, substantial, and credible utility or a well-established utility.

Scenario 3: What can you do?

- Provide evidence that the claimed nucleic acid would have a use that is supported by the as-filed specification, e.g.
    - A particular useful population marker
    - A particular disease marker
- Be careful that your use is supported by the specification or submit evidence that the use would have been "well-established".

Written Description and SNPs

Scenario 1

An isolated polynucleotide comprising SEQ ID NO: 1.

SEQ ID NO: 1 is a 100mer obtained from a human glioblastoma cDNA library.

SEQ ID NO: 1 is homologous to a known DNA molecule that encodes a useful protein.

Claim Scope

- Claim reads on any nucleic acid comprising SEQ ID NO: 1
  - Gene
  - Full ORF
  - Fusion constructs, etc.
  - cDNAs

Single Species

Actual reduction to practice of a single species.

- SEQ ID NO: 1.

Scenario 2

- An isolated polynucleotide comprising SEQ ID NO: 1.

- SEQ ID NO: 1 is a Full length Open Reading Frame (ORF) cDNA sequence that is shown in the specification to encode SEQ ID NO: 2 (a member of a well known family of proteins).

Written Description

- Claim: An isolated polynucleotide comprising SEQ ID NO: 1.

- SEQ ID NO: 1 is a full length ORF that encodes SEQ ID NO: 2

- Claim reads on the ORF with any additional elements

- The disclosed invention is based upon the ORF; any additional elements would have been considered conventional and well known in the art

- Adequate Written Description

Questions and Comments?