Bioinformatics Workshop 2008
Human Obesity Protein
- Leptin (1ax8)

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Bioinformatics??

- Bioinformatics:
  - the intersection of biological, computer, and information sciences necessary to manage, process, and understand large amounts of data, for instance from the sequencing of the human genome, or from large databases containing information about plants and animals for use in discovering and developing new drugs.

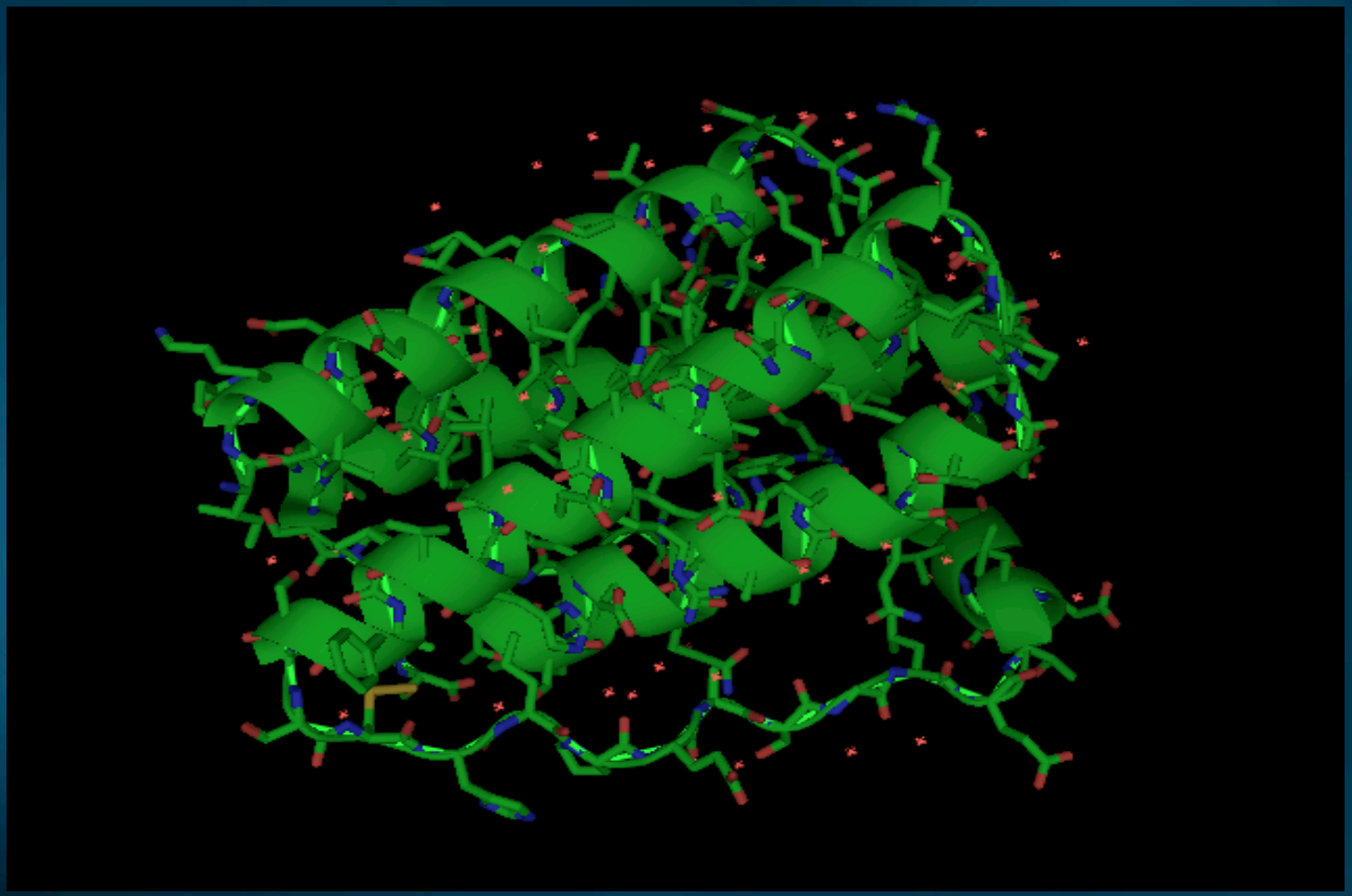
What is Leptin??

- Leptin:
  - Is a protein hormone that regulates food intake and energy expenditure.
  - It is produced by the body's fat cells (adipocytes) in the body.

The leptin protein signals the brain that the body has had enough to eat.

It stops you from eating too much and makes you more active so you burn off more energy.

PyMOL image of Leptin



What is PyMOL?

- PyMOL
  - is a computer software that enables the viewing of high quality 3D images of small molecules and biological macromolecules.
  - According to the creator, almost a quarter of all published images of 3D protein structures in the scientific literature are made using PyMOL.

Discovery

- The study of leptin began with an observation of mutant obese mice that arose at random within a mouse colony at the Jackson Laboratory (Maine) in 1950. The mice were called the *ob/ob* mice.
- However, leptin itself was discovered in 1994 by Jeffery Friedman and his colleagues at Rockefeller University, through the study of similar mice.
  - They found the mutated *ob* gene responsible for the syndrome, they purified the normal *ob* gene's product, which became known as *Leptin*.

Leptin and Obesity

- A very small group of humans possess a mutant form of leptin which leads to a constant desire for food, resulting in severe obesity.
- The condition can be treated by the administration of recombinant human leptin.
- Sometimes, humans that are obese tend to over produce the protein but cannot fully metabolize it.
- However, other humans are said to be resistant to the effects of the leptin protein, in the same way people with type 2 diabetes are resistant to the effects of insulin.

NCBI Blast:Protein sequence(146 letters) - Microsoft Internet Explorer

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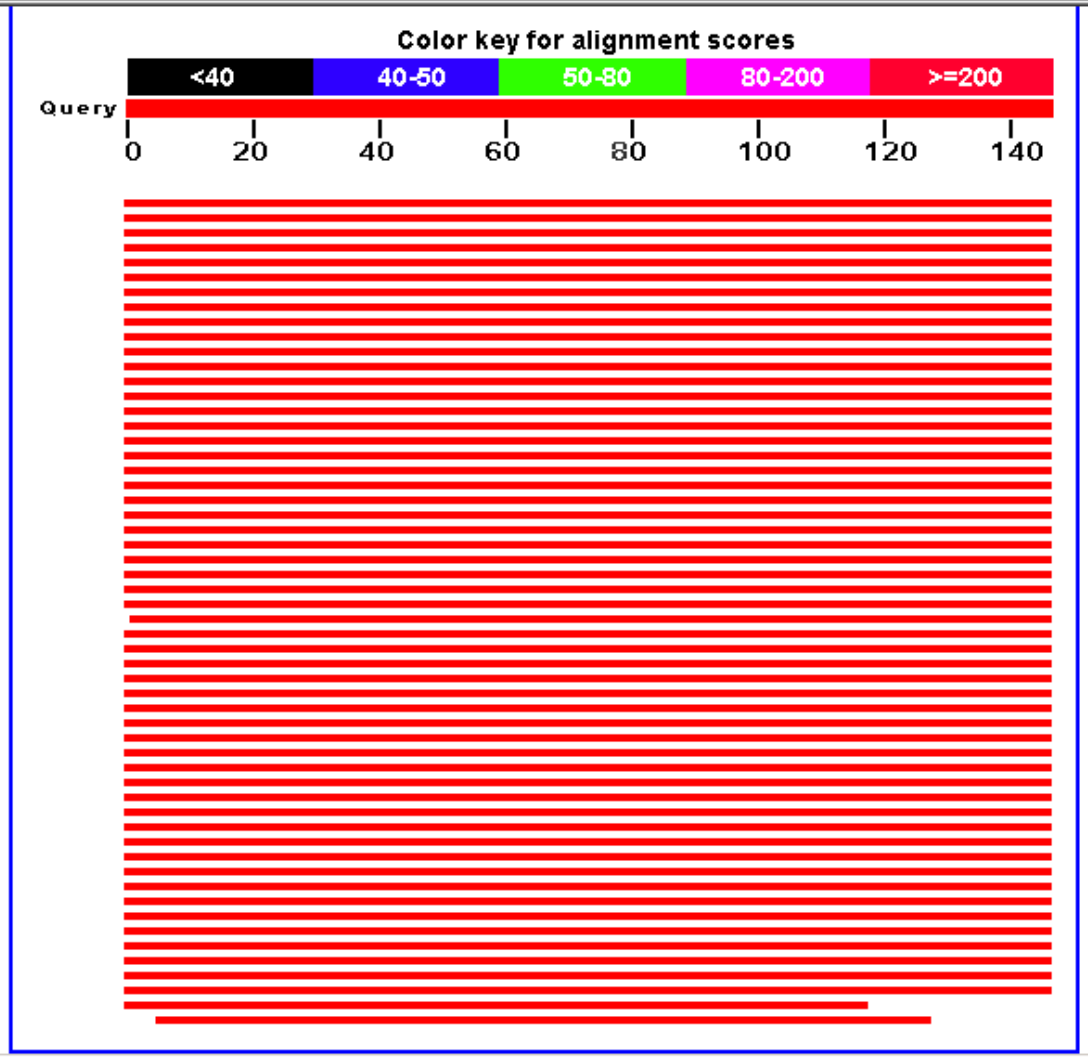

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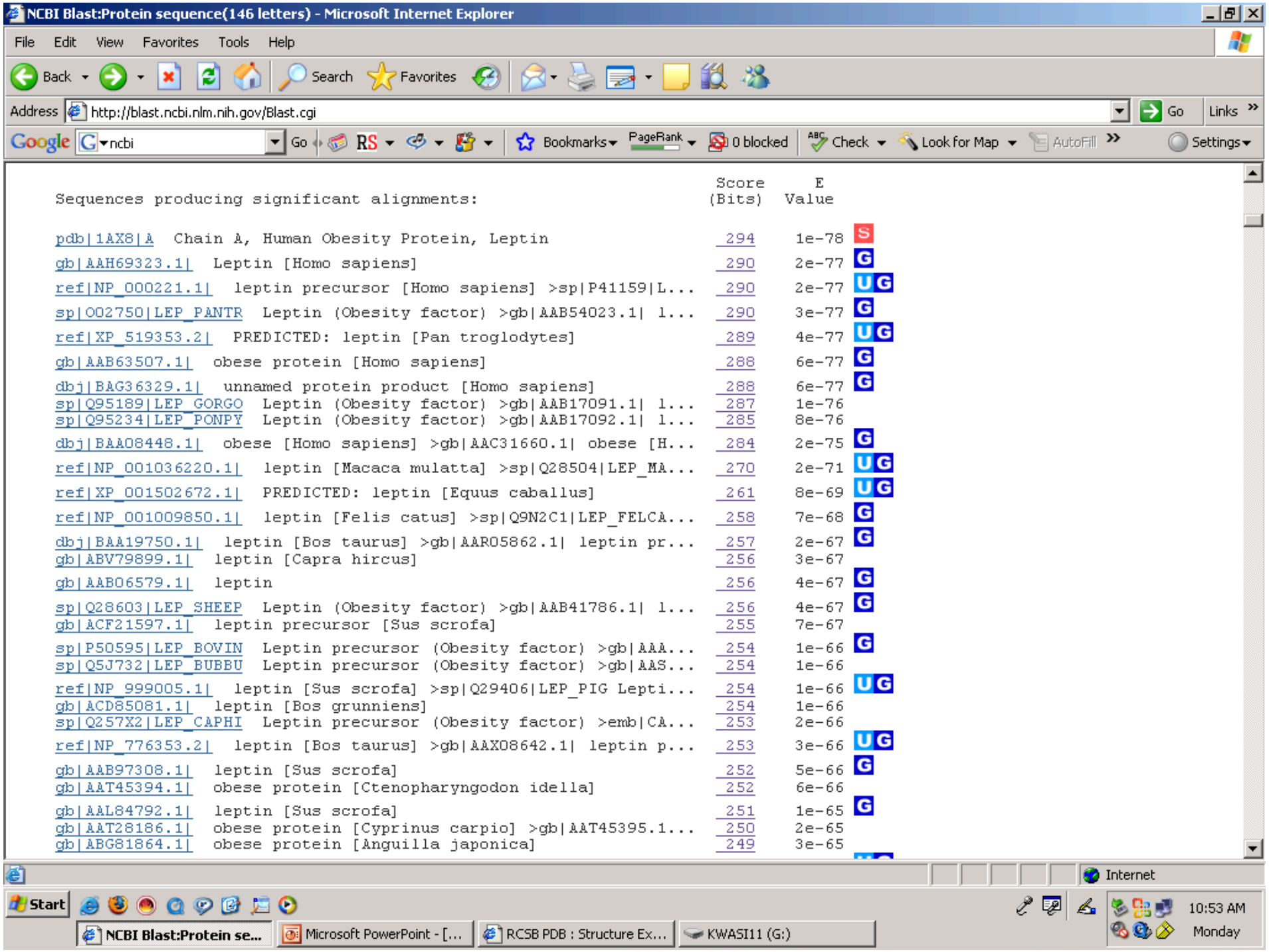
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Sequences producing significant alignments: Score (Bits) E Value
pdb|1AX8|A Chain A, Human Obesity Protein, Leptin 294 1e-78 S
gb|AAH69323.1| Leptin [Homo sapiens] 290 2e-77 G
ref|NP_000221.1| leptin precursor [Homo sapiens] >sp|P41159|L... 290 2e-77 U G
sp|O02750|LEP_PANTR Leptin (Obesity factor) >gb|AAB54023.1| l... 290 3e-77 G
ref|XP_519353.2| PREDICTED: leptin [Pan troglodytes] 289 4e-77 U G
gb|AAB63507.1| obese protein [Homo sapiens] 288 6e-77 G
dbj|BAG36329.1| unnamed protein product [Homo sapiens] 288 6e-77 G
sp|Q95189|LEP_GORGO Leptin (Obesity factor) >gb|AAB17091.1| l... 287 1e-76
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dbj|BAA08448.1| obese [Homo sapiens] >gb|AAC31660.1| obese [H... 284 2e-75 G
ref|NP_001036220.1| leptin [Macaca mulatta] >sp|Q28504|LEP_MA... 270 2e-71 U G
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dbj|BAA19750.1| leptin [Bos taurus] >gb|AAR05862.1| leptin pr... 257 2e-67 G
gb|ABV79899.1| leptin [Capra hircus] 256 3e-67
gb|AAB06579.1| leptin 256 4e-67 G
sp|Q28603|LEP_SHEEP Leptin (Obesity factor) >gb|AAB41786.1| l... 256 4e-67 G
gb|ACF21597.1| leptin precursor [Sus scrofa] 255 7e-67
sp|P50595|LEP_BOVIN Leptin precursor (Obesity factor) >gb|AAA... 254 1e-66 G
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What is BLAST??

- BLAST (Basic Local Alignment Search Tool)
  - is an internet database for comparing biological sequence information, such as the amino-acid sequences of different proteins or the nucleotides of DNA sequences.
- It can also enable us to know where a certain sequence of DNA originates from.

Structure

- Leptin is a four-helix bundle with a very short strand segment.
- Its molecular weight is around 16 kDa (kilodalton).
- Leptin has 67% sequence identity among diverse species which include orangutans, gorillas, cows and pigs.

References

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Acknowledgments

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