



HCV Genotype, Quasispecies & Subtype

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FORWARD

The term genotype refers to different genetic variations or strains of hepatitis C (HCV). The variance in genetic differences is approximately 1/3 between the different genotypes. There are seven major groups or genotypes numbered 1 to 7 although some experts believe that there may be as many as 11. Within each genotype are further divisions called subtypes (for example 1a and 1b) and mutations of the hepatitis C virus called quasispecies.

HCV constantly changes and mutates as it replicates – more than 1 trillion hepatitis C virions replicate each day. During the replication process, the hepatitis C virus will make ‘bad’ copies or errors in the genetic make-up of the newly replicated viruses. The process of constant mutation helps the virus escape the body’s immune response – when the dominant quasispecies is eradicated, another quasi-species emerges. This requires the immune system to constantly identify and kill the newly emerged variants. This is one of the reasons why so many people develop chronic HCV disease. Scientists believe there are literally millions of different HCV quasispecies in everyone infected with hepatitis C, which are unique to everyone because of the individual’s immune response to HCV. Quasispecies may play a role in disease progression and treatment response, but this is still controversial and more studies are needed to fully appreciate the role of quasispecies.

This variability (genotype, subtypes and quasispecies) of hepatitis C has made it difficult to treat and to develop a vaccine that will protect against all HCV strains although recent advances in vaccine development have been encouraging.

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HCSP FACT SHEET

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The information in this fact sheet is designed to help you understand and manage HCV and is not intended as medical advice. All persons with HCV should consult a medical practitioner for diagnosis and treatment of HCV.

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Testing for Genotype, Subtype & Quasispecies

A blood test is required for the genotype and subtype test. Generally, a quasispecies test is only performed for research purposes. HCV genotype testing is only done once since the genotype does not change unless someone is re-infected with a different one.

Genotype Distribution

HCV genotypes and subtypes are distributed differently in different parts of the world, and certain genotypes predominate in certain areas although epidemiology studies are somewhat limited. HCV genotype 1-3 are known to be widely distributed throughout the world.

WORLDWIDE

| HCV Genotype | Distribution |
|--------------|---------------------|
| 1, 2, 3 | Worldwide |
| 4 | Middle East, Africa |
| 5 | South Africa |
| 6, 7 | Southeast Asia |

United States

In the United States the genotype distribution is genotype 1a is 62.8%, genotype 1b 10.9%, genotype 2b 8.2%, genotype 3a 12.4%, and the other genotypes are less than 6%.

Importance of Genotype Information

HCV genotype information is important because of the role it plays in HCV medical treatment. For instance, different genotypes may respond better to different types of hepatitis C medications. Additionally, some genotypes may require that some people are treated longer or shorter if they are infected with a certain genotype.

Mixed Genotypes

A person can become infected with more than one genotype. There is very little scientific data on people being infected with multiple genotypes.

Steatosis and Genotype

Steatosis (fatty infiltrates of the liver) is a well recognized feature of hepatitis C infection. Steatosis can contribute to HCV disease progression although the exact mechanism is not completely understood. People with HCV genotype 3 are more likely to develop steatosis and it is believed that HCV genotype 3 may actually play a direct role in the development of steatosis. This theory is validated by the fact that when HCV is cured levels of steatosis improve or completely resolve.

In people with HCV genotype non-3, HCV may contribute to the formation of steatosis, but unlike as with genotype 3, curing HCV does not improve or reduce the degree of steatosis.

Genotype and HCV Disease Progression

In regards to genotype and HCV disease progression, it has been suggested that certain genotypes may be associated with a more severe disease progression, but larger prospective clinical trials are needed to confirm this.

Genotype and Liver Transplantation

Genotype 1 (especially 1b) has been associated with a more rapid fibrosis progression in people who have received a liver transplant.

Subtypes

Subtypes are genetic variations of the particular hepatitis C genotype. It is unclear what role subtypes play

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in disease progression, but in regards to treatment outcomes there is a difference in cure rate. The difference is more pronounced in the outcomes of treatment with the new HCV direct-acting antiviral combination therapy. Some of the newer therapies work better in genotype 1b than in genotype 1a. In the future there will be even more drugs to treat hepatitis C and they will be tailored to a particular genotype and subtype as well as other viral factors.

Related publications:

An Overview of HCV Diagnostic Tests

www.hcvadvocate.org/hepatitis/factsheets_pdf/diagnostic.pdf

HCV Viral Load Tests

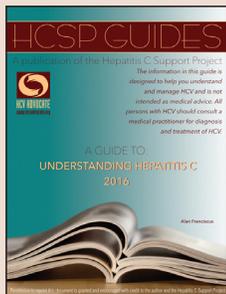
http://hcvadvocate.org/hepatitis/factsheets_pdf/viralload.pdf

Fibroscan

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For more information

- **Centers for Disease Control and Prevention**
www.cdc.gov/Hepatitis
- **Mayo Clinic:**
www.mayoclinic.com/health/liver-biopsy/MY00949
- **MedlinePlus:**
www.nlm.nih.gov/medlineplus/ency/article/003895.htm
- **National Digestive Diseases Information Clearinghouse (NDDIC)**
<http://digestive.niddk.nih.gov/ddiseases/pubs/liverbiopsy/>



A GUIDE TO UNDERSTANDING HCV 2016

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