

# Biology & Physiology topics 11

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**If you can cover all mutation patterns, a cancer treatment would also be effective 🤔**  
**(04/30/2022)**

I was reading an article called "[Trove of tumor genomes offers clues to cancer origins](#)" in Nature. Thank you very much. 😊  
This article introduced a study that provides clues to genetic and environmental causes of cancer from the genome of more than 12,000 tumors. The following are quotes from this article:

The study, published in Science on 21 April1, is the largest of its kind. **It adds dozens of entries to the growing catalogue of 'mutational signatures' that accompany cancer, and could, in some cases, help clinicians to select the best treatments for individuals.**

## **Mutational footprints**

An individual cancer cell can contain hundreds of thousands of mutations, sometimes more than one million, **but only a handful of these will contribute directly to the development of a tumor.** For years, researchers have been trawling through genomic data in search of these cancer drivers, in the hope that they could point to new therapies.

The many remaining 'bystander' mutations can also be informative. **Some cancer-causing agents create characteristic patterns of DNA changes. Ultraviolet light, for example, can cause a DNA base, or 'letter', called cytosine to be replaced by another called thymine at certain sites in the genome. Such changes are often found in melanomas.**

These patterns of mutations can be likened to footprints on a sandy beach, says Serena Nik-Zainal, a computational biologist at the University of Cambridge, UK, and a co-author on the Science study. **"The footprints may look random, but they are not — they are occurring for a very particular reason," she says. "You would be able to distinguish a human from an animal, a dog from a bird, even an adult from a child and whether they were walking or running."**

The work — which included samples from 19 tumor types — yielded dozens of previously unknown mutational footprints, some of which could be traced back to defects in specific cellular methods for repairing DNA.

Researchers have probably now found all of the most common mutational signatures, says Dávid Szüts, a cancer biologist at the Research Centre for Natural Sciences in Budapest. "It seems unlikely that the major processes are missed at this point," he says. But the hunt for rare signatures that occur in less than 1% of tumors in a given organ will probably continue as cancer-genome projects flourish worldwide.

**Previously, I wrote the study on the relationship between somatic mutation rates and lifespans on the topic of**

"Regardless of body sizes, somatic mutation rates are related to lifespans!?" 🤔🤔 (04/25/2022)", but I thought a key which is how to reduce cell mutations and control it for living organisms recently. 🤔 As it was in the article, if you know individually the mutations that lead to cancer-causing cells, I think cancer treatment will be more effective. 🙄

Keywords: Mutation, Cancer, Tumor, Genome, DNA

## **Regardless of body sizes, somatic mutation rates are related to lifespans!?"** 🤔🤔 **(04/25/2022)**

I was reading a paper called "Somatic mutation rates scale with lifespan across mammals" a little via a podcast called NaturePodcast. Thank you very much. 😊 This paper shows that a research on how Mammals' mutation rates affects their lifespans. The following are quotes from this article:

**The rates and patterns of somatic mutation in normal tissues are largely unknown outside of humans. Comparative analyses can shed light on the diversity of mutagenesis across species, and on long-standing hypotheses about the evolution of somatic mutation rates and their role in cancer and aging.**

The fact that the variation in somatic mutation rates across species appears to be dominated by lifespan rather than body size is also apparent when looking at particularly informative species. **Giraffe and naked mole-rat, for instance, have similar somatic mutation rates (99 and 93 substitutions per year, respectively), in line with their similar lifespans (80th percentiles: 24 and 25 years, respectively), despite a difference of around 23,000-fold in adult body mass.**

Similarly, cows, giraffes and horses weigh much more than an average human, and yet have somatic mutation rates that are several fold higher, in line with expectation from their lifespan but not their body mass. Altogether, the weak correlation between body mass and somatic mutation rates after correction for lifespan suggests that the evolution of larger body sizes may have relied on alternative or additional strategies to limit cancer risk, as has been speculated. **Of note, the low somatic mutation rate of naked mole-rats, which is unusual for their body mass but in line with their long lifespan, might contribute to the exceptionally low incidence rates of cancer in this species.**

It's a very interesting study. 🤔👏 I was very surprised that somatic mutation rates are related to lifespans rather than body size. 😊 I'm curious about the naked mole-rat. 😊

I did a little research about 80th percentile. 😊 I was watching a YouTube video called "[How to find the 20th and 80th percentile of a data set](#)". It is very helpful. Thank you very much. 😊 The 80th percentile is the smallest value that is at least as large as 80% of the elements of sizes. In other words, in the example above, the 80th percentile of lifespans of

giraffe and naked mole-rat are 24 and 25 years respectively, so 80% of the lifespans of giraffe and naked mole-rat are below than 24 and 25 years, respectively. 😊

Keywords: Somatic Mutation Rate, Lifespan, Mammal, Cancer, Naked Mole-rat, Percentile

## **Adenovirus may cause severe liver inflammation among children 🤔 (04/24/2022)**

I was reading an article called "[Puzzling cases of severe liver disease in children spark international probe](#)" on Ars Technica before. Thank you very much. 😊 This article introduced that a recent survey on severe liver inflammation among children. The following are quotes from this article:

Thursday's report detailed 13 severe cases in Scotland, mostly in children between the ages of 3 and 5 and nearly all occurring in just March and April this year. Scotland usually tallies fewer than four such cases of unexplained liver inflammation—aka hepatitis—in children over the course of an entire year. Of the 13 cases this year in Scotland, one has led to a liver transplant and five are still in the hospital. No deaths have been reported.

Meanwhile, health officials in England reported approximately 60 unexplained severe hepatitis cases in 2022, most of which

were in children ages 2 to 5. Some of those cases progressed to acute liver failure, and a few have also led to liver transplantation. Again, no deaths have been reported.

## **Hypotheses**

Some children have tested positive for an infection with an adenovirus. For instance, five of the 13 children in Scotland tested positive for an adenovirus—two by throat swab, two by blood tests, and one by stool samples. And according to the health officials in Scotland who have been in touch with CDC researchers, the US cluster of unexplained hepatitis cases is also linked to adenovirus infections.

**Adenoviruses are a large family of viruses that circulate widely and are often linked to respiratory and eye infections. However, they can cause various illnesses, including gastrointestinal and disseminated infections. Adenoviruses have been known to cause severe hepatitis in children, but it is rare in those who are not immunocompromised.**

**Some of the children in the UK have also tested positive for SARS-CoV-2 infections. For instance, five of the 13 children in Scotland had recently tested positive. None of the children had been vaccinated against the virus.**

According to health officials in Scotland, the leading hypothesis is that the illnesses are caused by an infectious agent—rather than a toxic exposure—and an adenovirus is the prime suspect. **The officials note two possibilities if an adenovirus is behind the acute cases: A new adenovirus has evolved to cause severe liver injury, or an existing variant that routinely circulates in children is causing severe disease because they have not previously been**

**exposed to adenoviruses and are immunologically naïve. "The latter scenario may be the result of restricted social mixing during the COVID-19 pandemic," the officials speculate.**

While researchers continue their investigation—which is still in the early stages—**health officials in the UK are alerting doctors to look out for children with hepatitis symptoms, such as dark urine, pale feces, jaundice, itchy skin, nausea, vomiting, and lethargy.**

Also, in order to further look up its latest news, I did a little research on its investigation. 😊 I was reading an article called ["WHO says at least one child has died after increase of acute hepatitis cases in children"](#) on MSN. Thank you very much. 😊

The following are quotes from this article:

(Reuters) - The World Health Organization said on Saturday that at least one child death had been reported following an increase of acute hepatitis of unknown origin in children, and that at least 169 cases had been reported in children in 12 countries.

The WHO said that as of April 21 acute cases of hepatitis of unknown origin had been reported in the United Kingdom, the United States, Spain, Israel, Denmark, Ireland, the Netherlands, Italy, Norway, France, Romania and Belgium. It said 114 of the 169 cases were in the United Kingdom alone.

The cases reported were in children aged from one month to 16 years, and 17 had required liver transplantation, it said. It gave no details of the death that it said had been reported, and did not say where it occurred.

The WHO said a common cold virus known as an adenovirus had been detected in at least 74 cases. COVID-19 infection was identified in 20 of those tested and 19 cases were detected with a COVID-19 and adenovirus co-infection, it said.

I was also reading an article called "[CDC issues health advisory about acute hepatitis in children](#)" on CNN. The following are quotes from this article:

In a health advisory Thursday, the US Centers for Disease Control and Prevention alerted health care providers and public health authorities to the investigation and recommended that **providers consider adenovirus testing in children with hepatitis when the cause is unknown, adding that testing the blood in whole -- not just blood plasma -- may be more sensitive.**

In its latest health advisory, the CDC asks that health care providers or state public health authorities alert the agency to any child younger than 10 who may have been diagnosed with hepatitis due to an unknown cause since October.

**"In November 2021, clinicians at a large children's hospital in Alabama notified CDC of five pediatric patients with significant liver injury, including three with acute liver failure, who also tested positive for adenovirus. All children were previously healthy,"** CDC officials wrote.

"Case-finding efforts at this hospital identified four additional pediatric patients with hepatitis and adenovirus infection for a total of nine patients admitted from October 2021 through February 2022; all five that were sequenced had adenovirus type 41 infection identified."



**Hepatitis is inflammation of the liver, a vital organ that processes nutrients, filters the blood and helps fight infections. When the liver is inflamed or damaged, its function can be affected.**



**Children's caregivers should be on the lookout for symptoms including diarrhea and vomiting. If a child has abdominal pain or develops a fever, fatigue or muscle pain, they should get checked by a doctor. Symptoms of jaundice -- including yellow eyes, dark urine or light-colored stools -- are physical signs of a problem with the liver.**

**There is no vaccine for adenoviruses in children. Adenoviruses tend to linger on surfaces, she said, and alcohol-based hand sanitizers don't work well against them.**

**"Thorough handwashing with soap and water is the best thing," Kaushik said. "Keeping distance from anybody who's sick with coughing and sneezing, and teach your children to cough or sneeze into their sleeve." Essentially, she said, keep up with all the good habits people have learned to prevent Covid-19.**

Apparently, there is a high possibility that adenovirus infection could cause children with severe liver inflammation. As CNN said above, the liver is the important organ that helps to treat nutrients, filter blood, and fight infections. 😞 If the liver is inflamed, could COVID-19 infection be more likely to cause severe COVID-19? 🤔

I wrote the story that my father's livers have been being a little

in bad condition in the topic called "[Diabetes risk increases due to SARS-CoV-2 infection!?](#) (04/05/2022)" before. It might also have been caused by a virus.

Keywords: Adenovirus, COVID-19, Hepatitis, Liver