

## NCBI Guidebook

NCBI stands for National Center for Biotechnology Information. It is a large database of biology-related information, ranging from tools to help you with parts design to research and review papers. If you work in a biology-related field, you will work with NCBI resources a lot.

NCBI resources can be accessed here: <https://www.ncbi.nlm.nih.gov/>

NCBI offers such a wide range of resources that we can't possibly comprehensively cover them all. As a result, we will show you some of the most useful tools available on NCBI for your use.

### 1. PubMed - <https://www.ncbi.nlm.nih.gov/pubmed>

If you are a science student, chances are you have been on PubMed. It's a database of life sciences and biomedical research related journal articles, which we will use a lot to find references to inform our research this summer.

When you first keyword-search PubMed, you may find that you have an insane number of search results.

The screenshot shows the NCBI PubMed search results page for the query "tooth enamel". The page has a blue header with the NCBI logo and navigation links. The search bar shows the query "tooth enamel" and a "Search" button. Below the search bar, there are options for "Format: Summary", "Sort by: Most Recent", and "Per page: 20". A sidebar on the left contains filters for "Article types", "Text availability", "Publication dates", "Species", "Languages", "Sex", and "Subjects". The main content area displays "Best matches for tooth enamel:" with a list of articles. The first article is "DENTAL ENAMEL FORMATION AND IMPLICATIONS FOR ORAL HEALTH AND DISEASE" by Lacruz RS et al. (2017). Below this, there is a "Search results" section showing "Items: 1 to 20 of 32668". The first result is "Wear of ceramic-based dental materials" by Borrero-Lopez O, Guiberteau F, Zhang Y, Lawn BR. (2019). On the right side, there are additional filters for "Filters: Manage Filters", "Send to", "Sort by", "Results by year" (a bar chart), and "PMC Images search for tooth enamel" (a grid of images).

Worry not - you are not required to read all of them to become well-versed in your field. PubMed allows you to streamline your search based on filters to ensure you can find the papers you want to read.

On your left-hand side, there is a list of filters that can be applied to your search.

Article types

Clinical Trial

Review

Systematic Reviews

Customize ...

Text availability

Abstract

Free full text

Full text

Publication dates

5 years

10 years

Custom range...

Species

Humans

Other Animals

Languages

English

Customize ...

Sex

Female

Male

Subjects

AIDS

Cancer

Systematic Reviews

Customize ...

Journal categories

Core clinical journals

Dental journals

MEDLINE

Nursing journals

Ages

Child: birth-18 years

Infant: birth-23 months

Adult: 19+ years

Adult: 19-44 years

Aged: 65+ years

Customize ...

Search fields

Choose ...

Format: Summary ▾

Sort by: Most Recent ▾

Per page: 20 ▾

Send to ▾

Sort

Re:

PM

enc

Titl

Eva

Best matches for tooth enamel:

[DENTAL ENAMEL FORMATION AND IMPLICATIONS FOR ORAL HEALTH AND DISEASE.](#)  
 Lacruz RS et al. *Physiol Rev.* (2017)  
[Stress analysis of irradiated human tooth enamel using finite element methods.](#)  
 Thiagarajan G et al. *Comput Methods Biomech Biomed Engin.* (2017)  
[A cytoplasmic role of Wnt/ \$\beta\$ -catenin transcriptional cofactors Bcl9, Bcl9l, and Pygopus in tooth enamel formation.](#)  
 Cantù C et al. *Sci Signal.* (2017)

Switch to our new best match sort order

Search results

Items: 1 to 20 of 32668

<< First < Prev Page 1 of 1634 Next > Last >>

☐ [Wear of ceramic-based dental materials.](#)  
 1. Borrero-Lopez O, Guiberteau F, Zhang Y, Lawn BR.  
*J Mech Behav Biomed Mater.* 2019 Jan 12;92:144-151. doi: 10.1016/j.jmbbm.2019.01.009.  
 [Epub ahead of print]  
 PMID: 30685728  
[Similar articles](#)

☐ [Enamel remineralization and repair results of Biomimetic Hydroxyapatite toothpaste on deciduous teeth: an effective option to fluoride toothpaste.](#)  
 2. Bossù M, Saccucci M, Salucci A, Di Giorgio G, Bruni E, Uccelletti D, Sarto MS, Familiari G, Relucenti M, Polimeni A.  
*J Nanobiotechnology.* 2019 Jan 25;17(1):17. doi: 10.1186/s12951-019-0454-6.  
 PMID: 30683113 **Free Article**  
[Similar articles](#)

☐ [Inhibition of secondary caries in vitro by addition of chlorhexidine to adhesive components.](#)  
 3. Boutsiouki C, Frankenberger R, Lückner S, Krämer N.  
*Dent Mater.* 2019 Jan 21. pii: S0109-5641(18)30750-4. doi: 10.1016/j.dental.2018.12.002.  
 [Epub ahead of print]  
 PMID: 30679016  
[Similar articles](#)

☐ [Evaluation of crystalline indexes obtained through infrared spectroscopy and](#)

If, for example, I did not want to read through 32668 papers on tooth enamel, but instead I wanted to learn about the history of tooth enamel repair, I could change my article type to “review”, species to Human, and subject to History of Medicine. All of a sudden, my search results have been cut down to 19, which is a much more manageable number than 32668.

PubMed also has other tools such as the Citation Matcher, which allows you to find papers that have cited specific papers, or specialized databases for papers of specific topics.

## **2. BLAST - [https://blast.ncbi.nlm.nih.gov/Blast.cgi?CMD=Web&PAGE\\_TYPE=BlastHome](https://blast.ncbi.nlm.nih.gov/Blast.cgi?CMD=Web&PAGE_TYPE=BlastHome)**

BLAST, which stands for Basic Local Alignment Search Tool, allows you to compare DNA sequences and protein sequences to those submitted to the online database. We love and use BLAST so much that it deserved its own guidebook. Check out the BLAST guidebook for more information.

## **3. GenBank - <https://www.ncbi.nlm.nih.gov/genbank/>**

GenBank is a database of nucleotide sequences and their protein translations. You can find whole-genome sequences of various animals, plants, and bacteria on this database as well. Due to the incredible number of sequences available on this tool, filters are once again your best friend when filtering through this information.

Once you’ve clicked on a search result in GenBank, you will find information about the paper in which the sequence was first published and its authors, as well as annotated sequence information.

## **4. Gene - <https://www.ncbi.nlm.nih.gov/gene/>**

Although Gene is similar to GenBank in many ways, it differs in that its focus is less on the sequence of a gene and more on its functions. Often times there are descriptions of what the protein does within the cell, and both proteins and genes of similar structure and function are identified.

## **5. OMIM - <https://www.omim.org/>**

OMIM stands for Online Mendelian Inheritance in Man. OMIM is a database similar to both Gene and GenBank in that it contains gene and sequence information, but differs in that it is specifically targeted at characterizing human diseases. It places a particular emphasis on genetic disorders found in humans.

OMIM is unique in that you can search based on phenotype, not just by sequence or by gene.

## **6. Protein Database - <https://www.ncbi.nlm.nih.gov/protein>**

NCBI's protein database contains information on the coding regions of proteins. You can find the amino acid sequence itself, as well as annotations on particular functions or domains within the protein. Like GenBank, the paper in which the protein sequence was published, as well as its authors and editors, can be found on this resource.

## **7. PubChem - <https://pubchem.ncbi.nlm.nih.gov/>**

PubChem has a database on chemical compounds and how they can be used in biological assays. You can search by biological assay, chemical compounds, or by substance. You can find information on the structure, hazards, and other such chemical information on your chemical, as well as results from its use in biological assays, pathways, patents, and literature on the chemical.

## **8. Taxonomy - <https://www.ncbi.nlm.nih.gov/taxonomy>**

The Taxonomy database contains classification and nomenclature related to biological species, covering about 10% of all described species. This resource also links you to other databases that include gene and protein sequences of that particular species, including mitochondrial DNA.

## **9. Structure - <https://www.ncbi.nlm.nih.gov/structure>**

Structure is a protein database that compiles sequences, as well as the three-dimensional conformation of proteins. This tool also includes a special search tool called VAST, which stands for vector alignment search tool, which compares the three-dimensional structures of proteins to find proteins with homologous domains or functions.

## **10. Other NCBI Resources**

Above are only 9 out of the many tools that NCBI offers online for free. Based on your specific project and your needs, you can check out their resource list at <https://www.ncbi.nlm.nih.gov/guide/sitemap/>.