Analysing the extent of cell type information present in Wikidata

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Authors

- **João Vitor Ferreira Cavalcante**
  0000-0001-7513-7376 · jvfe
  Bioinformatics Multidisciplinary Environment, Federal University of Rio Grande do Norte

- **Tiago Lubiana Alves**
  0000-0003-2473-2313 · lubianat
  Computational Systems Biology Laboratory, University of São Paulo

Abstract

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Keywords: wikidata, knowledge graph, cell type, ontology.

Introduction

Wikidata

Wikidata is an open, freely editable, knowledge graph database within the semantic web that stores knowledge across a multitude of domains, such as arts, history, chemistry and biology, using an item-property-value linked data model (Figure 1). It is easy to use and edit, by both humans and machines, with a rich web user interface and wrapper packages available in common programming languages such as R and Python. All the data within Wikidata is linked and inherently public domain, thus, it presents a great opportunity to make scientific data more FAIR (Findable, accessible, interoperable and reusable), as well as provides the necessary tools to curate and develop ontologies.

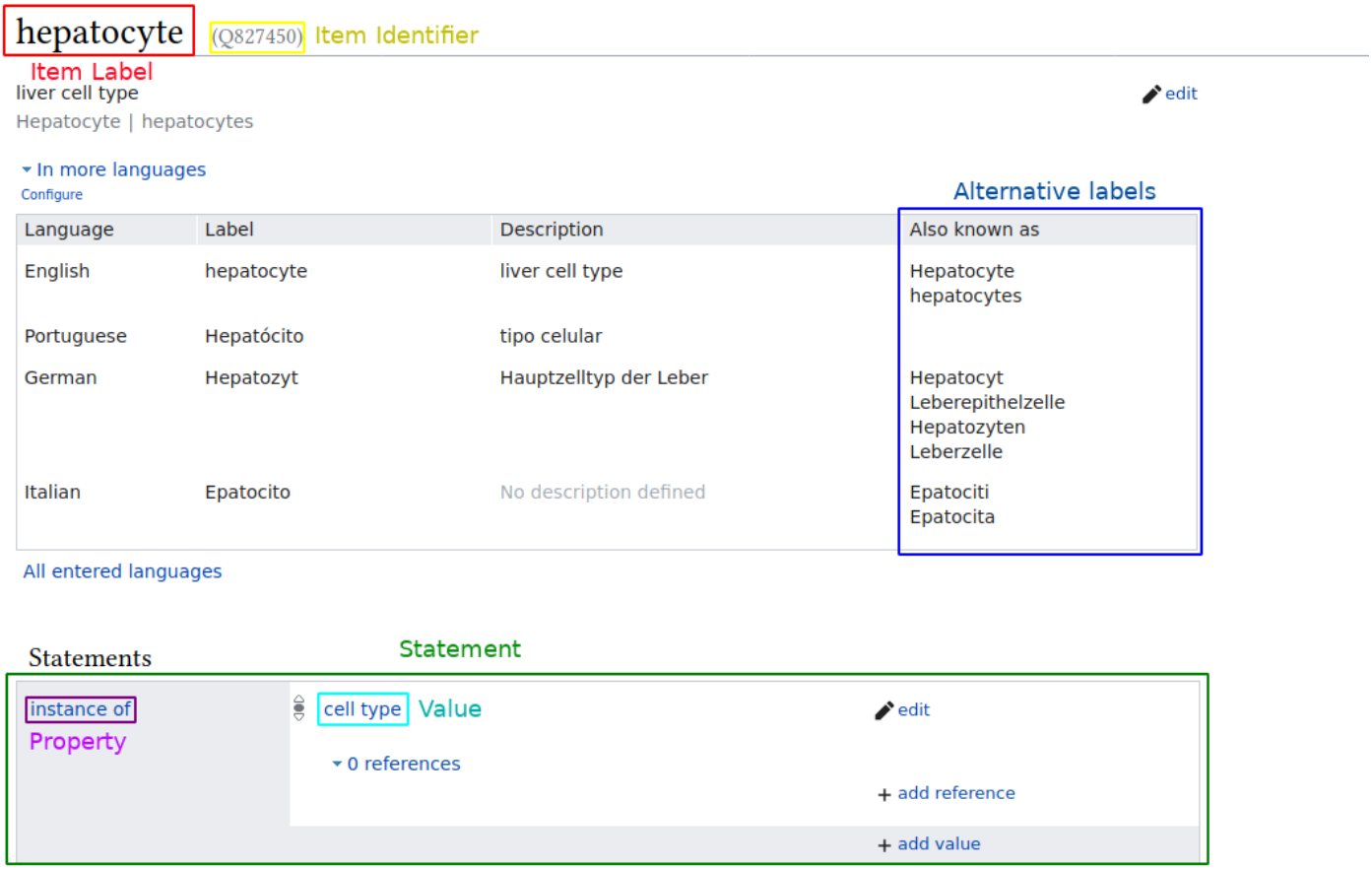

Figure 1: Wikidata item example, showing item hepatocyte (Q827450), the labels change according to the user's language, but each item has a universal identifier, called QID.

Several advances towards biological data integration and biological data analysis in Wikidata have been made before, yielding positive results [1] [2] and showcasing it's potential for bioinformatics-related analyses, such as drug repurposing and ID conversion [2]. Wikidata has been proposed as a unified base to gather and distribute biomedical knowledge, with more than 50 000 human gene items indexed and hundreds of biomedical-related properties [3]. However, as of August 2020, cell type information is still very scarse, with only 264 items being categorized as instances of cell types (Q189118), of those, only nine have a "Cell Ontology ID" (P7963)[4] associated, and most have a varying amount of statements (Table 1).

Table 1: As of August 2020, Wikidata items regarding cell types have a varying amount of information, with most having very few statements.

Cell type Item	Number of statements
red blood cell (Q37187)	48
myocyte (Q428914)	18
mesenchymal cell (Q66568500)	2

PanglaoDB

PanglaoDB [5] is a public database that contains data and metadata on hundreds of single-cell RNA sequencing experiments, providing extensive information on cell types, genes and tissues, as well as manually and community curated cell type markers (Table 2). It also provides a rich web user interface for easy data acquisition, including database dumps for bulk downloads.

Table 2: Database statistics for each species in PanglaoDB, as of 31st August 2020.

	Mus musculus	Homo sapiens
Samples	1063	305
Tissues	184	74
Cells	4,459,768	1,126,580
Cell Clusters	8,651	1,748

Objectives

In this study, we aim to answer questions regarding the integration of biological data from PanglaoDB in Wikidata, analysing items such as cell types, genes and tissues. Some of the questions we gathered so far are:

- How many cell types in PanglaoDB are also present in Wikidata? How many of those items are exact matches?
- Of those that are exact matches, how many statements do they have associated? Are these items well annotated?
- How does the coverage of biological items differ within Wikidata? Are the items for tissues and genes better annotated? How so?
    - Do items with alternative identifiers, such as genes, have their alternative identifiers indexed within Wikidata?

In the end, we'll have gathered and analysed enough data to formulate a report on the integration of this knowledge.

Methodology

Data acquisition

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Reconciliation

Como categorizar cobertura? Match=True na reconciliação? Cutoff de score da reconciliação?

Como verificar os aliases de genes? - Pegar o altlabel pela interface de serviço

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