

# JSON-LD and RDF as a Model Transform Language



```
{
  "id": "patient:pat1",
  "dateOfBirth": "1998-01-01T00:00:00Z",
  "sex": "MALE",
  "taxonomy": {
    "id": "NCBITaxon:75857",
    "label": "American black duck"
  }
}
```

**PhenoPackets Individual**

```
{
  "resourceType": "Patient",
  "id": "pat1",
  "text": {"status": "generated"...},
  "identifier": [...],
  "active": true,
  "name": [...],
  "gender": "male",
  "contact": [...],
  "managingOrganization": {
    "reference": "Organization/1",
    "display": "ACME Healthcare, Inc"
  },
  "link": [...]
}
```

**FHIR Patient**

Community specific JSON

```
:pat1 a pkt:individual .
:pat1 a fhir:Patient .
:pat1 fhir:Patient.birthDate "1998-01-01T00:00:00+00:00"^^xsd:dateTime .
:pat1 fhir:Patient.gender "male" .
:pat1 fhir:Patient.gender "MALE" .
:pat1 fhir:Patient.name [
  fhir:HumanName.family "Donald" ;
  fhir:HumanName.given "Duck" ;
  fhir:HumanName.use "official"
] .
:pat1 pkt:taxonomy NCBITaxon:75857 .

NCBITaxon:75857 skos:preflabel "American black duck" .
```

**RDF Triples**

Shared RDF Equivalent

```
{
  "resourceType": "Patient",
  "id": "pat1",
  "text": {"status": "generated"...},
  "extension": [
    {
      "url": "https://aehrc.github.io/fhir-phenopackets-ig/StructureDefinition-Taxonomy.html",
      "valueCodeableConcept": {
        "coding": [
          {
            "system": "http://purl.obolibrary.org/obo/NCBITaxon_",
            "code": "75857",
            "display": "American black duck"
          }
        ]
      }
    }
  ],
  "identifier": [...],
  "active": true,
  "name": [...],
  "gender": "male",
  "birthDate": "1998-01-01",
  "contact": [...],
  "managingOrganization": {
    "reference": "Organization/1",
    "display": "ACME Healthcare, Inc"
  },
  "link": [...]
}
```

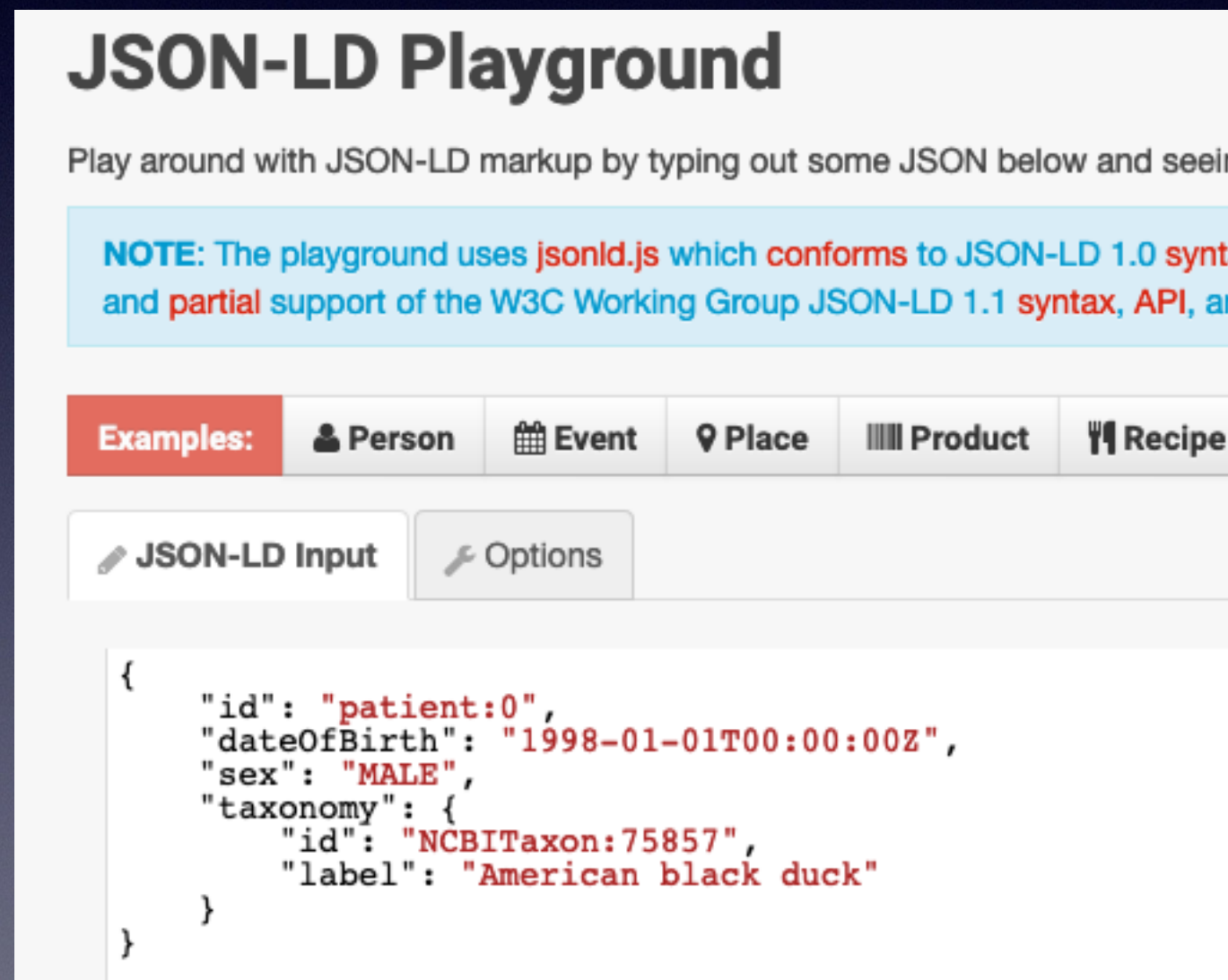
**Enhanced FHIR Patient**

Shared JSON



# Start with vanilla JSON

<https://phenopackets-schema.readthedocs.io/en/latest/individual.html>



**JSON-LD Playground**

Play around with JSON-LD markup by typing out some JSON below and seeing the results.

**NOTE:** The playground uses `jsonld.js` which conforms to JSON-LD 1.0 syntax and partial support of the W3C Working Group JSON-LD 1.1 syntax, API, and features.

**Examples:** Person Event Place Product Recipe

**JSON-LD Input** **Options**

```
{
  "id": "patient:0",
  "dateOfBirth": "1998-01-01T00:00:00Z",
  "sex": "MALE",
  "taxonomy": {
    "id": "NCBITaxon:75857",
    "label": "American black duck"
  }
}
```

<https://tinyurl.com/sqkg7bz>



# Context provides the Semantics and RDF mapping

JSON-LD Input

Options

Document URL

```
{
  "@context": {
    "FHIR": "http://hl7.org/fhir/",
    "PHENO": "http://phenopackets.org/",
    "XSD": "http://www.w3.org/2001/XMLSchema#",
    "NCBITaxon": {"@id": "http://purl.obolibrary.org/obo/NCBITaxon_", "@prefix": true},
    "SKOS": "http://www.w3.org/2004/02/skos/core#",
    "NCIT": "http://purl.obolibrary.org/obo/NCIT_",
    "patient": "FHIR:patient/",

    "id": "@id",
    "sex": "FHIR:Patient.gender",
    "dateOfBirth": {
      "@id": "FHIR:Patient.birthDate",
      "@type": "XSD:date"
    },
    "taxonomy": {"@id": "PHENO:taxonomy", "@context": {"label": "SKOS:preflabel"}}
  },
  "@type": "PHENO:individual",

  "id": "patient:0",
  "dateOfBirth": "1998-01-01T00:00:00Z",
  "sex": "MALE",
  "taxonomy": {
    "id": "NCBITaxon:75857",
    "label": "American black duck"
  }
}
```

Expanded

Compacted

Flattened

Framed

N-Quads

Normalized

Table

Visualized

Signed with RSA

Signed with Bitcoin

```
<http://hl7.org/fhir/patient/0> <http://hl7.org/fhir/Patient.birthDate> "1998-01-01T00:00:00Z"^^<http://www.w3.org/2001/XMLSchema#date> .
<http://hl7.org/fhir/patient/0> <http://hl7.org/fhir/Patient.gender> "MALE" .
<http://hl7.org/fhir/patient/0> <http://phenopackets.org/taxonomy> <http://purl.obolibrary.org/obo/NCBITaxon_75857> .
<http://hl7.org/fhir/patient/0> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://phenopackets.org/individual> .
<http://purl.obolibrary.org/obo/NCBITaxon_75857> <http://www.w3.org/2004/02/skos/core#preflabel> "American black duck" .
```

<https://tinyurl.com/t4m777z>



# Convert RDF to JSON-LD Expanded Form

RDF JSON-LD

```
JSON-LD Input Options

[
  {
    "@type": [
      "http://phenopackets.org/individual"
    ],
    "http://hl7.org/fhir/Patient.birthDate": [
      {
        "@type": "http://www.w3.org/2001/XMLSchema#date",
        "@value": "1998-01-01T00:00:00Z"
      }
    ],
    "@id": "http://hl7.org/fhir/patient/0",
    "http://hl7.org/fhir/Patient.gender": [
      {
        "@value": "MALE"
      }
    ],
    "http://phenopackets.org/taxonomy": [
      {
        "@id": "http://purl.obolibrary.org/obo/NCBITaxon_75857",
        "http://www.w3.org/2004/02/skos/core#preflabel": [
          {
            "@value": "American black duck"
          }
        ]
      }
    ]
  }
]

Expanded Compacted Flattened Framed N-Quads Normalized
```

RDF Turtle

```
<http://hl7.org/fhir/patient/0> a :individual ;
  fhir:Patient.birthDate "1998-01-01"^^xsd:date ;
  fhir:Patient.gender "MALE" ;
  :taxonomy <http://purl.obolibrary.org/obo/NCBITaxon_75857> .

<http://purl.obolibrary.org/obo/NCBITaxon_75857> skos:preflabel "American black duck" .
```

← All Identical →

RDF NTriples

```
<http://hl7.org/fhir/patient/0> <http://hl7.org/fhir/Patient.birthDate> "1998-01-01T00:00:00Z"^^<http://www.w3.org/2001/XMLSchema#date> .
<http://hl7.org/fhir/patient/0> <http://hl7.org/fhir/Patient.gender> "MALE" .
<http://hl7.org/fhir/patient/0> <http://phenopackets.org/taxonomy> <http://purl.obolibrary.org/obo/NCBITaxon_75857> .
<http://hl7.org/fhir/patient/0> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://phenopackets.org/individual> .
<http://purl.obolibrary.org/obo/NCBITaxon_75857> <http://www.w3.org/2004/02/skos/core#preflabel> "American black duck" .
```



# JSON-LD Framing

## RDF —> JSON

The screenshot shows the JSON-LD Playground interface with the following components:

- JSON-LD Input:** Contains an RDF document in JSON-LD format. The input is a list of nodes: a patient node with birth date and gender, and a taxonomy node for "American black duck".
- Options:** A button to configure options.
- Document URL:** A field for the document's URL.
- JSON-LD Frame:** Contains a frame document that defines the context and the specific properties to be extracted from the input.
- Frame URL:** A field for the frame's URL.
- Expanded:** A button to view the expanded JSON-LD document.
- Compacted:** A button to view the compacted JSON-LD document.
- Flattened:** A button to view the flattened JSON-LD document.
- Framed:** A button to view the framed JSON-LD document.
- N-Quads:** A button to view the document as N-Quads.
- Normalized:** A button to view the normalized document.
- Table:** A button to view the document as a table.
- Visualized:** A button to visualize the document.
- Signed with RSA:** A button to sign the document with RSA.
- Signed with Bitcoin:** A button to sign the document with Bitcoin.

The **Expanded** view shows the resulting JSON document, which is a compacted representation of the framed input. It includes the patient's birth date, gender, and the taxonomy label "American black duck".

```
{
  "id": "patient:0",
  "@type": "PHENO:individual",
  "dateOfBirth": "1998-01-01T00:00:00Z",
  "sex": "MALE",
  "taxonomy": {
    "id": "NCBITaxon:75857",
    "label": "American black duck"
  }
}
```

<https://tinyurl.com/tau2nn9>



# You Don't have to use the Same Context (!!!)

The screenshot displays a web-based JSON-LD editor with two main panels: 'JSON-LD Input' and 'JSON-LD Frame'. The 'JSON-LD Input' panel contains an expanded JSON-LD document for a patient. The 'JSON-LD Frame' panel shows the same data framed according to a specific context. Below the panels is a toolbar with various view options, and the bottom panel shows the resulting framed JSON-LD document.

**JSON-LD Input**

```
[
  {
    "@type": [
      "http://phenopackets.org/individual"
    ],
    "http://hl7.org/fhir/Patient.birthDate": [
      {
        "@type": "http://www.w3.org/2001/XMLSchema#date",
        "@value": "1998-01-01T00:00:00Z"
      }
    ],
    "@id": "http://hl7.org/fhir/patient/0",
    "http://hl7.org/fhir/Patient.gender": [
      {
        "@value": "MALE"
      }
    ],
    "http://phenopackets.org/taxonomy": [
      {
        "@id": "http://purl.obolibrary.org/obo/NCBITaxon_75857"
      }
    ]
  }
]
```

**JSON-LD Frame**

```
{
  "@context": "https://fhircat.org/fhir-r5/rdf-r4/contexts/patient.context.jsonld",
  "@type": "http://phenopackets.org/individual",
  "resourceType": { "@default": "http://fhir.org/Patient" }
}
```

**Toolbar:** Expanded, Compacted, Flattened, Framed, N-Quads, Normalized, Table, Visualized, JSON-LD R4, JSON-LD R5

**Resulting Framed JSON-LD:**

```
{
  "@context": "https://fhircat.org/fhir-r5/rdf-r4/contexts/patient.context.jsonld",
  "@graph": [
    {
      "@id": "fhir:patient/0",
      "@type": "http://phenopackets.org/individual",
      "birthDate": {
        "@type": "xsd:date",
        "@value": "1998-01-01T00:00:00Z"
      },
      "gender": "MALE",
      "http://phenopackets.org/taxonomy": {
        "@id": "http://purl.obolibrary.org/obo/NCBITaxon_75857",
        "http://www.w3.org/2004/02/skos/core#preflabel": "American black duck"
      },
      "resourceType": "http://fhir.org/Patient"
    }
  ]
}
```

<https://tinyurl.com/qu9rexk>

**Note:** Work in Progress

# JSON-LD Context

The “secret sauce”

## Plain ‘ol JSON

```
{
  "name": "BigCocolnc",
  "type": "Company",
  "people": {
    "Sam": {
      "name": {
        "first": "Sam",
        "last": "Smith"
      }
    },
    "employees": ["Melissa", "Dazhi"]
  },
  "Melissa": {
    "name": {
      "last": "Johnson"
    }
  },
  "Dazhi": {
  }
}
```

## Context

```
{
  "@context": {
    "sdo": "http://schema.org/",
    "foaf": "http://xmlns.com/foaf/0.1/",
    "co": "http://companies.com/",
    "@base": "http://companies.com",
    "type": "@type",
    "name": "@id",
    "people": {
      "@id": "sdo:employee",
      "@container": "@id",
      "@context": {
        "name": "sdo:name",
        "first": "foaf:givenName",
        "last": "foaf:familyName",
        "employees": {
          "@reverse": "co:reports_to",
          "@type": "@id"
        }
      }
    }
  }
}
```

## RDF

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix co: <http://companies.com/> .
@prefix sdo: <http://schema.org/> .

co:BigCocolnc a co:Company ;
  sdo:employee co:Dazhi,
  co:Melissa,
  co:Sam .

co:Dazhi co:reports_to co:Sam .

co:Melissa co:reports_to co:Sam ;
  sdo:name [ foaf:familyName "Johnson" ] .

co:Sam sdo:name [ foaf:familyName "Smith" ;
  foaf:givenName "Sam" ] .
```

<http://tinyurl.com/tbmkhzp>



# JSON-LD Context

- A mapping between:
  - json names and URI's
  - json values and types + representation
- Context and JSON can be *completely* separate
  - Either add in an “@context” or can applied completely separately
  - Contexts can be URL's (!!)

[https://raw.githubusercontent.com/fhircat/fhir\\_rdf\\_validator/master/tutorial/company.context.jsonld](https://raw.githubusercontent.com/fhircat/fhir_rdf_validator/master/tutorial/company.context.jsonld)

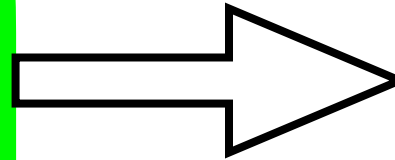


# JSON-LD Context

The “secret sauce”

## Slightly Edited JSON

```
{
  "@context": "https://raw.githubusercontent.com/fhircat/
  fhir_rdf_validator/master/tutorial/company.context.jsonld",
  "name": "BigCocolnc",
  "type": "Company",
  "people": {
    "Sam": {
      "name": {
        "first": "Sam",
        "last": "Smith"
      },
      "employees": [
        "Melissa",
        "Dazhi"
      ]
    },
    "Melissa": {
      "name": {
        "last": "Johnson"
      }
    },
    "Dazhi": {}
  }
}
```



## RDF

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix co: <http://companies.com/> .
@prefix sdo: <http://schema.org/> .

co:BigCocolnc a co:Company ;
  sdo:employee co:Dazhi,
  co:Melissa,
  co:Sam .

co:Dazhi co:reports_to co:Sam .

co:Melissa co:reports_to co:Sam ;
  sdo:name [ foaf:familyName "Johnson" ] .

co:Sam sdo:name [ foaf:familyName "Smith" ;
  foaf:givenName "Sam" ] .
```

<http://tinyurl.com/whgprn2>



# JSON-LD Framing

Makes it bidirectional (!)

## Plain 'ol JSON

```
{
  "name": "BigCocolnc",
  "type": "Company",
  "people": {
    "Sam": {
      "name": {
        "first": "Sam",
        "last": "Smith"
      }
    },
    "employees": [
      "Melissa",
      "Dazhi"
    ]
  },
  "Melissa": {
    "name": {
      "last": "Johnson"
    }
  },
  "Dazhi": {}
}
```

<http://tinyurl.com/tgxu78k>

## RDF

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix co: <http://companies.com/> .
@prefix sdo: <http://schema.org/> .

co:BigCocolnc a co:Company ;
  sdo:employee co:Dazhi,
  co:Melissa,
  co:Sam .

co:Dazhi co:reports_to co:Sam .

co:Melissa co:reports_to co:Sam ;
  sdo:name [ foaf:familyName "Johnson" ] .

co:Sam sdo:name [ foaf:familyName "Smith" ;
  foaf:givenName "Sam" ] .
```

## Frame

```
{ "@context": [
  "https://raw.githubusercontent.com/fhircat/fhir_rdf_validator/master/tutorial/
company.context.jsonld",
  {
    "@vocab": "http://company.com/",
    "@base": "http://company.com/"
  }
],
"@type": "co:Company"
}
```



# Multiple Contexts

## Community A JSON

```
{
  "name": "BigCocolnc",
  "type": "Company",
  "people": {
    "Sam": {
      "name": {
        "first": "Sam",
        "last": "Smith"
      }
    },
    "employees": ["Melissa", "Dazhi"]
  },
  "Melissa": {
    "name": {
      "last": "Johnson"
    }
  },
  "Dazhi": {
  }
}
```

## Context 1

```
{
  "@context": {
    "sdo": "http://schema.org/",
    "foaf": "http://xmlns.com/foaf/0.1/",
    "co": "http://companies.com/",
    "@base": "http://companies.com",
    "type": "@type",
    "name": "@id",
    "people": {
      "@id": "sdo:employee",
      "@container": "@id",
      "@context": {
        "name": "sdo:name",
        "first": "foaf:givenName",
        "last": "foaf:familyName",
        "employees": {
          "@reverse": "co:reports_to",
          "@type": "@id"
        }
      }
    }
  }
}
```

## Shared RDF

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix co: <http://companies.com/> .
@prefix sdo: <http://schema.org/> .

co:BigCocolnc a co:Company ;
  sdo:employee co:Dazhi,
  co:Melissa,
  co:Sam .

co:Dazhi co:reports_to co:Sam .

co:Melissa co:reports_to co:Sam ;
  sdo:name [ foaf:familyName "Johnson" ] .

co:Sam sdo:name [ foaf:familyName "Smith" ;
  foaf:givenName "Sam" ] .
```

# Multiple Contexts

## Communit B JSON

```
{
  "COMP": "BigCocolnc",
  "type": "Company",
  "people": {
    "Sam": {
      "name": {
        "first": "Sam",
        "last": "Smith"
      }
    },
    "employees": ["Melissa", "Dazhi"]
  },
  "Melissa": {
    "name": {
      "last": "Johnson"
    }
  },
  "Dazhi": {
  }
}
```

## Context 2

```
{
  "@context": {
    "sdo": "http://schema.org/",
    "foaf": "http://xmlns.com/foaf/0.1/",
    "co": "http://companies.com/",
    "@base": "http://companies.com",
    "type": "@type",
    "COMP": "@id",
    "people": {
      "@id": "sdo:employee",
      "@container": "@id",
      "@context": {
        "name": "sdo:name",
        "first": "foaf:givenName",
        "last": "foaf:familyName",
        "employees": {
          "@reverse": "co:reports_to",
          "@type": "@id"
        }
      }
    }
  }
}
```

## RDF

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix co: <http://companies.com/> .
@prefix sdo: <http://schema.org/> .

co:BigCocolnc a co:Company ;
  sdo:employee co:Dazhi,
  co:Melissa,
  co:Sam .

co:Dazhi co:reports_to co:Sam .

co:Melissa co:reports_to co:Sam ;
  sdo:name [ foaf:familyName "Johnson" ] .

co:Sam sdo:name [ foaf:familyName "Smith" ;
  foaf:givenName "Sam" ] .
```



# Another Example

https://github.com/fhircat/CORD-19-on-FHIR

raw.githubusercontent.com

fhircat / CORD-19-on-FHIR

Unwatch

8

Star

5

Fork

1

<> Code

Issues 9

Pull requests 0

Actions

Projects 0

Wiki

Security

Insights

Settings

Semantics for COVID-19 Discovery

Edit

Manage topics

56 commits

1 branch

0 packages

0 releases

5 contributors

View license

Branch: master

New pull request

Create new file

Upload files

Find file

Clone or download

hsolbrig

New release with pubtator links and other changes

Latest commit 1e8773d yesterday

contexts	Include the pubtator link	2 days ago
datasets	New release with pubtator links and other changes	yesterday
examples	Include the pubtator link	2 days ago
scripts	Include the pubtator link	2 days ago
source	Include the pubtator link	2 days ago
.gitignore	Add PMC samples, add source to .gitignore	2 days ago
LICENSE	Updated license	7 days ago
Pipfile	Merge remote-tracking branch 'origin/master'	2 days ago
Pipfile.lock	Include the pubtator link	2 days ago
README.md	Edited README	6 days ago

README.md

## CORD-19-on-FHIR -- Semantics for COVID-19 Discovery



# Metadadata File

sha,source\_x,title,doi,pmcid,pubmed\_id,license,abstract,publish\_time,authors,journal,Microsoft Academic Paper ID,WHO #Covidence,has\_full\_text,full\_text\_file

,Elsevier,Intrauterine virus infections and congenital heart disease,10.1016/0002-8703(72)90077-4,,4361535,els-covid,"Abstract The etiologic basis for the vast majority of cases of congenital heart disease remains largely undefined. Viruses have been considered to be likely candidates since the recognition of the association between intrauterine rubella and congenital heart disease. Although the pathogenesis of cardiovascular defects is poorly understood, information gained from the study of congenital rubella syndrome suggests mechanisms such as focal endothelial cell damage, resulting in obliteration of vascular supply, decreased growth rate, and shortened survival time of certain cells, and disturbed DNA replication in cells whose chromosomes were damaged secondary to the effects of viral replication may be operative in the production of defects in the developing fetus. In addition to rubella there is suggestive, but not conclusive, evidence that Coxsackie B3 and B4 virus infections during pregnancy can result in the birth of infants with a variety of types of congenital heart lesions and that intrauterine mumps virus infection may be etiologically related to the postnatal development of endocardial fibroelastosis (EFE). Although there are a number of other viruses that are potential etiologic agents of congenital heart disease, the current status of information is inadequate to allow even suggestive associations to be made. The most profitable areas for future investigation appear to be: (1) the epidemiology of congenital heart disease, (2) prospective studies of the association of maternal viral infection with abnormal offspring, (3) the in-depth virologic investigation of the infant with a cardiac defect, and (4) the development of experimental animal models of congenital heart disease. Successful control of virus-induced congenital heart disease will depend on the results of these investigations and the development of vaccines against the identified causative viruses and/or safe and effective antiviral chemotherapy for the woman in early gestation who is infected with a known teratogenic agent.",1972-12-31,"Overall, James C.",American Heart Journal,,,False,custom\_license

,Elsevier,Coronaviruses in Balkan nephritis,10.1016/0002-8703(80)90355-5,,6243850,els-covid,,1980-03-31,"Georgescu, Leonida; Diosi, Peter; Buțiu, Ioan; Plavoșin, Livia; Herzog, Georgeta",American Heart Journal,,,False,custom\_license

,Elsevier,Cigarette smoking and coronary heart disease: new evidence and old reactions,10.1016/0002-8703(80)90356-7,,7355701,els-covid,,1980-03-31,"Friedman, Gary D",American Heart Journal,,,False,custom\_license

aecbc613ebdab36753235197ffb4f35734b5ca63,Elsevier,Clinical and immunologic studies in identical twins discordant for systemic lupus erythematosus,10.1016/0002-9343(73)90176-9,,4579077,els-covid,"Abstract Middle-aged female identical twins, one of whom had systemic lupus erythematosus (SLE), were evaluated for immunologic reactivity to previous antigenic challenges, including primary immunization with a foreign antigen, keyhole limpet hemocyanin (KLH). These two women had lived together for all of their 58 years and neither was receiving anti-inflammatory or immunosuppressive drugs at the time of these studies. Both twins demonstrated comparable 7S and 19S humoral antibody response to KLH, as well as similar viral antibody titers. However, the twin with SLE was anergic to common antigens, streptokinase-streptodornase, Trichophyton and Candida; furthermore delayed hypersensitivity to KLH did not develop after immunization. This observed discrepancy between humoral and cellular immunity in genetically similar subjects may be significant in the pathogenesis of SLE.",1973-08-31,"Brunner, Carolyn M.; Horwitz, David A.; Shann, Mary K.; Sturgill, Benjamin A.; Davis, John S.",The American Journal of Medicine,,,True,custom\_license

,Elsevier,"Epidemiology of community-acquired respiratory tract infections in adults Incidence, etiology, and impact",10.1016/0002-9343(85)90361-4,,4014285,els-covid,"Abstract Upper respiratory tract infections are the most common types of infectious diseases among adults. It is estimated that each adult in the United States experiences two to four respiratory infections annually. The morbidity of these infections is measured by an estimated 75 million physician visits per year, almost 150 million days lost from work, and more than \$1 billion in costs for medical care. Serotypes of the rhinoviruses account for 20 to 30 percent of episodes of the common cold. However, the specific causes of most upper respiratory infections are undefined. Pneumonia remains an important cause of morbidity and mortality for nonhospitalized adults despite the widespread use of effective antimicrobial agents. There are no accurate figures on the number of episodes of pneumonia that occur each year in ambulatory patients. In younger adults, the atypical pneumonia syndrome is the most common clinical presentation; Mycoplasma pneumoniae is the most frequently identified causative agent. Other less common agents include Legionella pneumophila, influenza viruses, adenoviruses, and Chlamydia. More than half a million adults are hospitalized each year with pneumonia. Persons older than 65 years of age have the highest rate of pneumonia admissions, 11.5 per 1,000 population. Pneumonia ranks as the sixth leading cause of death in the United States. The pathogens responsible for community-acquired pneumonias are changing. Forty years ago, Streptococcus pneumoniae accounted for the majority of infections. Today, a broad array of community-acquired pathogens have been implicated as etiologic agents including Legionella species, gram-negative bacilli, Hemophilus influenzae, Staphylococcus aureus and nonbacterial pathogens. Given the diversity of pathogenic agents, it has become imperative for clinicians to establish a specific etiologic diagnosis before initiating therapy or to consider the diagnostic possibilities and treat with antimicrobial agents that are effective against the most likely pathogens.",1985-06-28,"Garibaldi, Richard A.",The American Journal of Medicine,,,False,custom\_license

212e990b378e8d267042753d5f9d4a64ea5e9869,Elsevier,Infectious diarrhea: Pathogenesis and risk factors,10.1016/0002-9343(85)90367-5,,2861742,els-covid,"Abstract Our understanding of the pathogenesis of infectious, especially bacterial, diarrhea has increased dramatically in the past few years. The etiologic agents of infectious diarrhea are now well defined, and the mechanisms of pathogenesis are becoming clearer. The epidemiology of infectious diarrhea is changing, and the risk factors for its development are becoming more apparent. The clinical presentation of infectious diarrhea is becoming more specific, and the diagnostic possibilities are becoming more limited. The treatment of infectious diarrhea is becoming more effective, and the prognosis is becoming more favorable. The prevention of infectious diarrhea is becoming more important, and the public health implications are becoming more significant.",1985-06-28,"Garibaldi, Richard A.",The American Journal of Medicine,,,False,custom\_license



# Metadata to JSON

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JSON-LD Input Options Document URL

{
  "sha": "a04811d55a6f779546cf0c2bf5d46982fb989908",
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  "doi": "10.14202/vetworld.2018.845-851",
  "pmcid": "PMC6048076",
  "pubmed_id": "30034180",
  "license": "cc-by",
  "abstract": "BACKGROUND AND AIM: Rhipicephalus microplus (Rm) is one of the most problematic livestock tick species in the world. Its rapid propagation and resistance to acaricides make it control difficult in the sub-region and Benin particularly. The aim of this work was to check its presence in wildlife and to confirm the possible role of reservoir wildlife may play in the propagation of the parasite. This will help to design more efficient control strategy. MATERIALS AND METHODS: This study was conducted from February to March 2017 in the National Parks of Benin (Pendjari and W Park) and wildfowl's assembly and selling point in Benin. Ticks were manually picked with forceps from each animal after slaughtering by hunters then stored in 70° ethanol. Collected ticks were counted and identified in the laboratory using the identification key as described by Walker. RESULTS: Overall, seven species of ticks (Amblyomma variegatum, Boophilus decoloratus, Rm, Boophilus spp., Hyalomma spp., Rhipicephalus sanguineus, Rhipicephalus spp.) were identified on nine wild animal species sampled (Cane rat, wildcat, Hare, Doe, Cricetoma, Buffalo, Buffon Cobe, and Bushbuck and Warthog). The average number of ticks varies from 3 to 6 between animal species, 3 to 7 between localities visited, and 2 to 5 between tick species. However, these differences are statistically significant only for localities. Considering tick species and animal species, the parasite load of Rm and Rhipicephalus spp. is higher; the buffalo being more infested. The analysis of deviance reveals that the abundance of ticks observed depends only on the observed localities (p>0.05). However, the interactions between animal species and localities on the one hand and between animal and tick species on the other hand, although not significant, have influenced the abundance of ticks as they reduce the residual deviance after their inclusion in the model. CONCLUSIONS: This study reported the presence of Rm in wildlife of Benin and confirmed its role in the maintenance and spread of the parasites. It is, therefore, an important risk factor that we must not neglect in the epidemiological surveillance and ticks control strategies in the West African sub-region and particularly in Benin.",
  "publish_time": "2018 Jun 25",
  "authors": [
    "Adinci, Kossi Justin",
    "Akpo, Yao",
    "Adoligbe, Camus",
    "Adehan, Safiou Bienvenu",
    "Yessinou, Roland Eric",
    "Sodé, Akoeugnigan Idelphonse",
    "Mensah, Guy Appolinaire",
    "Youssao, Abdou Karim Issaka",
    "Sinsin, Brice",
    "Farougou, Souaïbou"
  ],
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  "has_full_text": "True",
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  "id": "https://doi.org/10.14202/vetworld.2018.845-851",
  "pubtator": "PMC6048076",
  "fhir_link": [
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}
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<https://tinyurl.com/w884xgq>



# Add Semantics

JSON-LD Input

Options

Document URL

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{
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    "dc": "http://purl.org/dc/terms/",
    "ncit": "http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#",
    "sso": "http://semanticscholar.org/cv-research/",
    "whocv": "http://semanticscholar.org/cv-research/WHO#",
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Expanded

Compacted

Flattened

Framed

N-Quads

Normalized

Table

Visualized

Signed with RSA


Signed with Bitcoin


```
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Adinci, Kossi Justin" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Adoligbe, Camus" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Akpo, Yao" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Farougou, Souaïbou" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Mensah, Guy Appolinaire" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Sinsin, Brice" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Sodé, Akoeugnigan Idelphonse" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Yessinou, Roland Eric" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Youssao, Abdou Karim Issaka" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/identifier> "PMC6048076" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/identifier> <https://doi.org/10.14202/vetworld.2018.845-851> .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/identifier> <https://www.ncbi.nlm.nih.gov/pubmed/30034180> .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/issued> "2018 Jun 25"^^<http://www.w3.org
/2001/XMLSchema#date> .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/license> "cc-by" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/title> "Preliminary study on the tick population of Benin
wildlife at the moment of its invasion by the Rhipicephalus microplus tick (Canestrini, 1888)" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://semanticscholar.org/cv-research/full_text_file> "comm_use_subset" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://semanticscholar.org/cv-research/has_full_text> "True" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://semanticscholar.org/cv-research/journal> "Vet World" .
```


<https://tinyurl.com/w4o9m8r>



# Publish Context

 JSON-LD Input

 Options

 Document URL

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{
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  "sha": "a04811d55a6f779546cf0c2bf5d46982fb989908",
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  "doi": "10.14202/vetworld.2018.845-851",
  "pmcid": "PMC6048076",
  "pubmed_id": "30034180",
  "license": "cc-by",
  "abstract": "BACKGROUND AND AIM: Rhipicephalus microplus (Rm) is one of the most problematic livestock tick species in the world. Its rapid propagation and resistance to acaricides make it control difficult in the sub-region and Benin particularly. The aim of this work was to check its presence in wildlife and to confirm the possible role of reservoir wildlife may play in the propagation of the parasite. This will help to design more efficient control strategy. MATERIALS AND METHODS: This study was conducted from February to March 2017 in the National Parks of Benin (Pendjari and W Park) and wildfowl's assembly and selling point in Benin. Ticks were manually picked with forceps from each animal after slaughtering by hunters then stored in 70° ethanol. Collected ticks were counted and identified in the laboratory using the identification key as described by Walker. RESULTS: Overall, seven species of ticks
```

<https://tinyurl.com/twl3cvu>



# Batch Conversion

```
1  import os
2
3  import jsonasobj
4  from rdflib import Graph
5
6  from scripts.metadata import METADATA_DIR, CONTEXT_DIR
7
8  CONTEXT = os.path.join(CONTEXT_DIR, 'metadata.context.json')
9  context_j = jsonasobj.load(CONTEXT)
10 BASE = context_j['@context']['@base']
11
12 n_converted = 0
13 for fname in os.listdir(METADATA_DIR):
14     basename, ext = os.path.splitext(fname)
15     if ext == '.json':
16         g = Graph()
17         g.parse(os.path.join(METADATA_DIR, fname), format="json-ld", context=CONTEXT, base=BASE)
18         g.serialize(os.path.join(METADATA_DIR, basename + '.ttl'), format='ttl')
19         n_converted += 1
20
21 print(f"*** {n_converted} files converted ***")
```



# Next Steps

<https://fhircat.org/jsonld/playground/>



# Links

- [JSON-LD Home page](#) — everything you need to know about JSON-LD
- [JSON-LD Playground](#) — note that the source is available for this in github
- [JSON-LD 1.1 Syntax Specification](#)
- [FHIR-RDF and JSON-LD working group site](#) — note that the README isn't the best at the moment. Should change soon. Issues list is a bit of an entry point
- [FHIR / JSON-LD Playground](#) — a variation on the above playground specifically for FHIR
- These Slides