The digitized TNA

Computerization of the TNA is a necessary task due to the size and complexity of the data. Manual handling is not appropriate today. Our goal is to be compatible with the essentials of database development in life sciences as recommended by the OBO Foundry (Smith et al. 2007). The database implementation of the TNA is prepared in a well defined context. In short, the following guiding lines are to be mentioned:

- There is a need to access a taxonomy of the domain; to do that, we naturally have selected the taxonomy of the Foundation Model of Anatomy (FMA) as developed by Rosse and Mejino, 2003;
- In order to be compatible with other ontologies in related domains, we have adopted the basic principles of Basic Formal Ontology (BFO 2.0; Smith et al. 2015);
- Since the TNA derives from the TA98, and cross references are present, the TA database is an integral part of the TNA database;
- A preponderant goal of FIPAT is the translation into numerous languages, giving an international dimension to the whole terminology; manual translation is dependent on unavailable humanpower resources and must be replaced by an adequate automatic translation; this is a necessary solution for a terminology subject to permanent updates and improvements.
- The identifiers of TA98, as officially adopted by FIPAT in 2013 (see Fribourg website), are preserved; each new term receives a new unique, computer-generated identifier;
- In the partonomic lists, external references are given to the FMA and the TA98, whereever they are possible;
- For further information, see Baud and ten Donkelaar (2019).

During the preparation of the TNA database, the following major changes were developed:

1. presenting the terms in a top-down approach, i.e from telencephalon to spinal cord, to make terms compatible to the FMA and other parts of the TA98;
2. the new view on tracts presented by Baud et al. (2018) was implemented;
3. a universal model for terms was applied; the basic part of a term and its expansions to already existing related terms, starting from the Latin representation, are modeled giving the universal formula independent of any language.

The universal model of the terminology is a process that produces a universal representation independent of any language. The translation process is successful because the languages of anatomical terminology are a subset (without verbs) of the natural languages. In such a context, an exact translation can be reached but human validation is recommended for some terms.

The white matter of the CNS is difficult to represent in anatomy because it is located predominantly 'between' other anatomical entities. In a classic presentation, like a cross section of a brain segment, white matter is present and can be labelled adequately. Several appearances of the same entity are feasible on distant presentations. The problem is the absence of a global view on long tracts, and more generally, the lack of a comprehensive classification of white matter pathways. From the Terminologia Neuroanatomica (TNA 2017), Baud et al. (2018) have developed a new schema for the representation of white matter. In this approach, white matter is directly attached to the CNS, and no more considered as part of the brain segments. Such a move does not affect the content but redistributes the anatomical entities in a more natural fashion. The new classification of white matter tracts selects the origin as the primary criterion and the type of tract as the secondary criterion. On this basis, the tracts of the CNS were classified by their origin in the following nine segments: telencephalon (pallium), telencephalon (subpallium), hypothalamus, diencephalon, mesencephalon, cerebellum, rhombencephalon rostrale, rhombencephalon caudale and medulla spinalis. For the type of tracts, the criteria of the TNA are followed: central roots, commissural tracts, intrinsic tracts and long tracts.

References

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