CHAPTER 3

Methodology

This chapter on methodology explains the trans-disciplinary research (TDR) approach followed in this study.
3.1 Introduction
The focus of this study is to analyze the concept of *Abhāva Pratinidhi Dravya* (APD) prevalent in codified and living practices of Ayurveda, in order to understand the Ayurvedic logic behind selection of alternative herbs. This chapter briefly describes the overall trans-disciplinary research (TDR) methodology followed in this doctoral study. The detailed descriptions of methods used for the compilation and analysis of APDs, including Ayurvedic, phytochemistry and pharmacology techniques are described under the respective chapters.

3.2 Trans-disciplinary research adopted for this study
With an aim to find the Ayurvedic logic in the APD concept, for this doctoral study, an appropriate TDR strategy was developed, facilitating dialogue between society, Ayurveda, traditional practices (living practices) and science within a given framework. Figure 3.1 gives a bird’s eye view of the strategy of this study.

In this doctoral study, a list of *Abhāva Dravyas* (ADs) and *Abhāva Pratinidhi Dravyas* (APD) was compiled from Ayurveda texts and living practices. A suitable trans-disciplinary research method was framed based on the interactions with Ayurvedic experts and scientists in order to analyze the list of APDs. A list 20 pairs of APDs were prioritized for literary analysis and two pairs were further selected for phytochemical and pharmacological studies. Awareness was created among traditional healers and researchers about the concept of APD and the possibility of appropriate substitution through workshops.
Structured literature & living practices survey formats

Inputs from living practice

- Societal need: substitutes for unavailable (AD) herbs
  - Possible solutions: APDs mentioned in Ayurveda
  - Survey on the AD concept and APDs: Literature and living practices
  - Compilation of a list of ADs & APDs
  - Systematic research

- AYURVEDA
  - Analysis of prioritized APD pairs using Dravyaguna parameters

- PHYTOCHEMISTRY
  - Phytochemical and chromatography analysis of prioritized APD pairs

- PHARMACOLOGY
  - Pharmacological analysis of selected actions of prioritized APD pairs

- Scientific validation of use of APDs
  - Ayurvedic logic between ADs and APDs
  - Returning the Knowledge backed by systematic research to the community in an acceptable and accessible form

**Figure 3.1:** TDR strategy to study APDs
3.3 Relevance of TDR for APD studies

Unavailability of medicinal plants has an inseparable relationship with deforestation and increased demand for them (Ved and Goraya, 2008). It has impact at multiple levels like threat to biodiversity, adulteration of medicinal plants, problems faced by the drug industry and finally the quality of Ayurvedic medicines. The concept of APD, which has flourished in Ayurveda during medieval periods, may be an answer to the problem of unavailability of herbs. However, there are certain hurdles in adopting this concept in contemporary practice. One of the major problems is that in spite of mentioning sets of APD’s, Ayurvedic literature does not explain the logic to select an APD for an AD. Moreover, there are certain obvious differences between some of the AD and APD pairs.

Having very limited theory behind this concept, probably Ayurveda literature alone cannot support the usage of APD concept by the Ayurveda fraternity, especially in the era of globalization. At this point it is appropriate to make use of various science disciplines like chemistry and pharmacology to bring a logical meaning to the APD concept and make it acceptable by the beneficiaries including the drug manufacturers and the consumers. However, it is important to identify and value the subtle wisdom Ayurveda has especially Dravyaguna knowledge while using science parameters. Figure 3.1 depicts a model of TDR, designed to study the APD concept facilitating dialogue between various disciplines. This model has been developed based on the various TDR models put forward by Lang and co-workers (2012) and Wiesmann and co-workers in 2008 (Wiesmann et al., 2008; Lang et al., 2012).

The TDR approach involving traditional knowledge principles and biomedical methods is considered to be beneficial also to the knowledge system (generally traditional knowledge,
imbibed with societies in their culture) from where the research problem/clues are taken. (Haverkort et al., 2014).

### 3.4 Trans-disciplinary research (TDR): concept and definition

The popular model of focused scientific research (deeper study of any one discipline of science) is effective to answer well defined problems. However, such research fails when the research problem involves multiple components of the society. Therefore, researchers in the past few decades started to look into an effective model of research which can involve many disciplines within a given frame-work, supporting one another. Such a model is called as trans-disciplinary research, which is ideal to deal with scientific problems derived from "real-world" problems (Jaegar and Scheringer, 1998). The concept of TDR is fairly young and still developing. It is rooted in the ‘knowledge society’ or scientific knowledge in the societal fields with an acknowledgment to the existing knowledge which is produced in society other than science. TDR focuses on the links within science specialties and between science and society.

While discussing propositions for enhancing TDR, Wiesmann et al. (2008) defined TDR as, “The research that includes cooperation within the scientific community and a debate between research and the society at large. Transdisciplinary research therefore transgresses boundaries between scientific disciplines and between science and other societal fields and includes deliberation about facts, practices and values”. (Wiesmann et al., 2008)
3.5 Research gap

Ayurvedic texts during medieval period, introduced the concept of APD. They suggest APDs for several unavailable/rare medicinal herbs (ADs). (Chunekar, 2004; Mishra, 2007; Sastry, 2002;). However, the suggestion of substitution is not practiced uniformly across the country, nor accepted by regulatory bodies like Ayurvedic Formulary of India. No clarity about logic of selecting substitute, and the process of substitute identification in the classical Ayurvedic texts may be the main reason for under/non-utilization of this unique concept. Sufficient clarity, if brought by an research may facilitate adequate use of this concept resulting in bringing down adulteration in herbal drug industry, may protect bio-diversity of rare and endangered species as well.

3.6 Steps involved in the TDR of APD concept

The steps involved in current TDR on APD are mentioned below. Detailed methods about the same are explained in the respective chapters.

3.6.1 Literature review – Ayurveda and modern biomedicine

The literature available on the concept of APD from published literature, classical texts of Ayurveda and phytochemistry and pharmacology information of prioritized APD pairs is given in Chapter 2. It gives a picture of current level of understanding about the APD concept and its anticipated utility. Literature survey of research on prioritized APD pairs analyses the existing knowledge about their phytochemistry and pharmacological uses of the same. However, the existing knowledge on this concept is very low; steps in the proposed TDR strategy also further provide a detailed understanding of the subject (chapters 4 and 5).
3.6.2 Stating the research sub-problems and solutions: To understand the logic behind the concept of APD, following sub-problems were identified.

a) Documentation of existing knowledge about APD concept, including suggested APD pairs in Ayurvedic literature and living traditions

Solution: A structured literature survey of selected Ayurvedic texts and interactions with traditional practitioners was conducted to document the concept of APD and suggested APD pairs (Chapter 4).

b) Relationship between ADs and APDs as per Ayurvedic perspective

Solution: 20 pairs of Ayurveda suggested APDs were prioritized and analyzed for clues to find the logic behind substitution. This analysis was based on fundamental concepts of Dravyaguna (Ayurvedic pharmacology and pharmacognosy) (Chapter 5).

c) Similarity and differences in the Phytochemistry of identified pairs of APDs

Solution: Phyto-chemical and chromatography studies of selected pairs of APDs (Ativisä-Mustä and Dädima-Vrshämla) were carried out to study the possible phytochemical similarity between the pairs (Chapter 6).

d) Pre-clinical validation of pharmacological similarities between Ads and APDs

Solution: Anti-hyperlipidemic, anti diarrhoeal and antipyretic actions of Ativisä and Mustä was studied in appropriate rodent models. Iron bio-availability enhancing potential of Dädima and Vršämla was studied using in vitro cell free and cell based models (Chapter 7 and 8).
e) Returning the Knowledge: capacity building of the beneficiaries about APD concept

**Solution:** 2 Customized workshops for traditional practitioners were conducted to raise the awareness about the possibility of drug substitution. Throughout the study there was constant engagement with the Traditional practitioners in terms of raising awareness and sharing the research findings. Apart from publication in peer reviewed journals, attempts made to reach Ayurveda practitioners and industry through regional language articles, training modules, fact-sheet distribution and display panels in biodiversity meet, write-up in news-letter of government agencies with conservation concern and presentations at international seminars (Annexure 7).

### 3.6.3 Integration of research findings

Findings from Ayurveda, phytochemistry and pharmacology studies were integrated to develop a comprehensive understanding about APD concept of Ayurveda.