


## Chapter 3

# Exposure to Toxic Environmental Agents in the Form of Fragrances and Development of Autism Spectrum Disorders (ASD)

**Omar Bagasra**  
Claflin University, USA

**Anisah Bagasra**  
 <https://orcid.org/0000-0002-7057-5278>  
Kennesaw State University, USA

### ABSTRACT

*In this chapter, the authors explore how the human brain develops and what the critical stages are in which a fetal brain may acquire genetic and developmental abnormalities through environmental agents. They summarize the prevailing theories regarding the etiologies of autism and present scientific data supporting the thesis that some of the most commonly used environmental agents that we have so easily accepted into our social fabric of life may be major contributors in the development of autism spectrum disorders (ASD). They provide a large body of scientific data carried out in their laboratory, utilizing developing human neurons exposed to femtomolar concentrations of chemicals found in fragrances. The studies demonstrate that synthetic fragrances can impart profound neuromodifications at the morphologic, immunologic, and molecular levels. It is hypothesized that high exposure to teratogenic neurotoxins in our environment during critical periods of development best explains the rapid rise of autism spectrum disorder diagnosis over the past three decades.*

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## **INTRODUCTION**

In the process of scientific investigations, new ideas and information emerge that cannot be easily reconciled with the present paradigm. Still, scientists and the medical community are naturally reluctant to adopt new paradigms when established concepts still appear feasible, although they may be in need of major revision. Typically, the effects of such scientific reluctance manifest themselves in enlivened discussions at professional conferences and journals, or in books written by journalists (Silberman, 2016), scientists (Wolff, 2004; Bagasra & Heggen, 2018) and medical professionals (Schopler, Medibov & Kunce, 1998). In the area of autism pathogenesis, however, the consequences of over half-a century of inadequate progress in coming to grips with the basic underlying biology of autism spectrum disorder (ASD) may be calculated not in journal publications or media coverage, but in the quality of human lives for literally millions of autistic children and desperate parents, who find themselves bewildered at the effects of the disorder on both their children and themselves (Bagasra & Heggen, 2018; Chaste et al., 2017). Autism Spectrum Disorder research is at an important crossroads right now, with many pertinent issues being explored including the validity of the current ASD diagnosis criteria, a genetic basis for ASD, and the exploration of epigenetic factors in ASD.

This chapter will review the current research paradigms regarding ASD and focus on new trends in research regarding environmental factors impacting the development and manifestation of ASD. This research is significant in exploring the various prevailing models regarding the development of ASD, and providing pertinent research to argue that environmental factors play a larger contributing role in ASD that previously discussed. This research is important in providing evidence to suggest there are significant concrete ways to reduce rates of ASD by limiting exposure of developing fetuses to toxins in the environment.

## **BACKGROUND**

### **Autism Spectrum Disorder Definition and History**

Autism Spectrum Disorder (ASD) is a psychological disorder defined in the Diagnostic and Statistical Manual (DSM) that has been modified and updated over time. The DSM is a handbook originally published in 1952 to address the needs of clinicians in an attempt to classify mental disorders. The most recent changes occurred from the DSM-IV-TR which was published in 2000, to the newest version the DSM-5 published in 2013 (American Psychiatric Association, 2013). The DSM-IV-TR outlined three unique autism spectrum disorders under the category of pervasive developmental disorders. These were Autistic disorder (AD), Asperger's disorder, and pervasive developmental disorder-not otherwise specified. The criteria for diagnosis of any of the three autism spectrum disorders was wide and varied, and resulted in an inconsistent application of criteria by clinicians and health service providers (McPartland et al., 2012; Robertson et al., 2013). The DSM-V resulted in the combination of those three separate diagnoses into one broad category known as Autism Spectrum Disorder. Kulage, Smaldone & Cohn (2014) analyzed to impact of the changes in diagnostic criteria from the DSM-IV-TR to the DSM-5 and concluded from their review that the changes would likely decrease the number of individuals diagnosed with ASD as a result of a smaller number of possible combinations of criteria for diagnosis, and the elimination of the pervasive developmental disorder-not otherwise specified (PDD-NOS) diagnosis. Cur-

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