

# Development and Supportive Care (DSC) Foundation for Newborn & Children (India)

Workshop on  
Developmentally Supportive Care (DSC) in Premies & Neuroprotection in the NICU



Chief Scientific Editor  
**Dr Amitava Sengupta**

## Work Book

*Edition September 2021*



**Development and Supportive Care (DSC)  
Foundation of India for Newborn & Children**

B - 106, Chitranjan Park, New Delhi - 110 019, India

**WITHIN  
JUST**

**2**

2,000+ babies

200+ hospitals

2,00,000+ units

**YEARS**

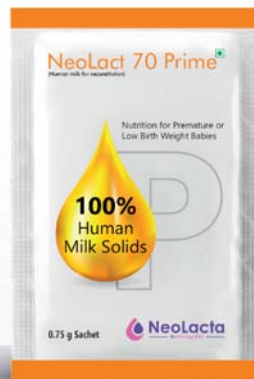


**a Big thank you**

**for all your Support**



**NeoLact MMF**  
(Mother's Milk Fortifier 1 g / 0.5g)



**NeoLact 70 Prime**  
(Human milk for reconstitution)



**NeoLact 70**  
(Human milk sachet 1.55 g for reconstitution)



For further information, visit us at  
[www.neolacta.com](http://www.neolacta.com)

1800-103-2456 (Toll-free)  
[enquiry@neolacta.com](mailto:enquiry@neolacta.com)

# Development and Supportive Care (DSC) Foundation for Newborn & Children (India)

Workshop on  
Developmentally Supportive Care (DSC) in Premies & Neuroprotection in the NICU

*Chief Scientific Editor*  
**Dr Amitava Sengupta**

**Work Book**  
*Edition September 2021*



**Development and Supportive Care (DSC)  
Foundation of India for Newborn & Children**

B - 106, Chitranjan Park, New Delhi - 110 019, India

# Contents

<b>Chapter 1:</b> Overview of Developmentally Supportive Care (DSC) in Micropreemies & Neuroprotection in the NICU...	06
<b>Chapter 2:</b> Sensory Systems.....	13
<b>Chapter 3:</b> Perspectives In Neuro Anatomy & Physiology.....	16
<b>Chapter 4:</b> Preterm Brain Haemorrhage & Neuroprotection Strategies.....	19
<b>Chapter 5:</b> Octopus Therapy for Preemies in NICU .....	23
<b>Chapter 6:</b> Cycled Lighting in the NICU .....	26
<b>Chapter 7:</b> Feeding in High- Risk Infants and Neurodevelopmental Assessment of Feeding Abilities .....	31
<b>Chapter 8:</b> Use of Human-Based Human Milk Fortifier in Very Low Birth Weight Infants manifesting with Intolerance to Bovine-Based Human Milk Fortifier .....	34
<b>Workstation 1: Assessment of Stress, Self-Regulation and Sleep States; Managing Stress and Pain .....</b>	<b>35</b>
1. Introductory Talk on DSC Concept.....	35
2. Sequence of Maturation and development of sensory systems, Proprioception and Kinesthesia.....	36
3. Learning Objectives.....	36
4. Theoretical Foundations .....	37
5. Assessment of Infant’s Stress and Self-Regulation Responses .....	39
6. Infant Position in Relation to Stress and Self-Regulation .....	45
7. Checklist of NICU Caregiver Behaviors.....	47
8. States of Arousal (Sleep States).....	48
9. Managing Pain and Stress .....	49
10. Age/Stage of Development.....	51
<b>Workstation 2: Therapeutic Positioning, Infant Care Handling &amp; Feeding.....</b>	<b>55</b>
1. Introductory Talk on DSC Concept.....	55
2. Learning Objectives.....	55
a. Theoretical Foundations	
b. Practical Considerations	
3. Therapeutic Positioning and Nesting.....	56
4. Infant Care and Handling .....	75
5. Optimizing Nutrition and Feeding.....	77
Therapeutic Massage in the NICU.....	78
<b>Workstation 3: The Healing Environment - Physical and Sensory .....</b>	<b>86</b>
1. Introductory Talk on DSC Concept.....	86
2. Learning Objectives.....	86
3. Light Design and Recommendations.....	87
4. Sound and Acoustics.....	87
5. Hands on Activity/Exercise by Delegates - Sound and Light .....	87
6. Implementation of Sound and Light Protocols.....	88
7. Formats and Tools .....	88
8. Protecting Skin .....	94
9. Hands on Activity/Exercise by Delegates - PIPP Tool Braden Q scale.....	98
<b>Appendix A:</b> Seven Neuroprotective core measures.....	99
<b>Appendix B:</b> Quick Tips for all NICU Caregivers .....	104
<b>Appendix C:</b> Implementing Potentially Better Practices (PBPs) to support the neurodevelopment of infants in the NICU.....	107
Soar Analysis .....	108
Photographs of DSC Workshops held Across India & Abroad.....	114

# Foreword



The field of Neonatology has experienced some remarkable progress over the last four decades in care of the newborn. This has reflected with dramatic reductions in both neonatal and infant mortality and has enabled the neonatal team to save more babies of lower gestational age and extremely low birth weight (ELBW). In the present times, the incidence of prematurity is high in both western and eastern worlds. **However, morbidity rate of neurodevelopmental impairment has not decreased for this population.**

The preterm infant experiences a hostile environment in the intensive care (NICU) setting as compared to the womb. This altered sensory experience can have a negative impact on an infant's brain development.

The in-utero environment of a developing fetus is characterized by generalized extremity flexion and containment, limited light and noise exposure, sleep cycle preservation, and unrestricted access to mother via somatosensory, auditory, and chemosensory pathways. This environment is favorable for positive sensory input which is crucial for normal fetal brain development.

A newborn preterm infant is deprived of these basic developmental needs upon transition from the womb to the environment of the newborn intensive care unit. This environment is typically characterized by painful procedures, excessive light and noise exposure, interrupted and inadequate sleep, and separation from mother. Negative replaces positive sensory input into the developing fetal brain which, as research shows, can permanently alter normal brain development.

Developmentally Supportive Care (DSC) practices are evidence based interventions that promote newborn brain and neurobehavior development. They minimize the stress of NICU environment, support autonomic stability, normal motor, sensory neurological development and promote behavior state organization.

Developmental Care in the NICU involves efforts in unit design, equipment selection, policies, care protocols, and staff training to maintain the basic physical, sensory, and interpersonal needs of the preterm infant while minimizing exposure to noxious and painful stimuli.

A successful developmental care program is the product of a multidisciplinary team of parents, nurses, nurse practitioners, neonatologists, occupational/physical therapists, administrators, architects, engineers, and social workers.

It requires a shift of attitudes regarding ownership of an infant's care and the personhood of the preterm patient.

As neonatal care providers, our goal should be to improve functional outcome, have positive neuro developmental outcome and achieve the gold standard of "INTACT SURVIVAL" of the preterm, fragile and/or critically ill infants.

**Dr Amitava Sengupta**, Fellowship Neonatology (Neth), FNNF, MICP, DCH

Director: Mother & Child Unit, Neonatology & Pediatrics  
Paras Hospitals, Gurgaon (NCR), India

Chairperson & Executive Director  
Development and Supportive Care (DSC) Foundation for Newborn & Children (India)

Chairman Workshop Committee  
37<sup>th</sup> Annual Convention of National Neonatology Forum (**NEOCON 2017**)

National Assessor, NICU Accreditation Program (NNF-UNICEF).  
National Instructor, FBNC Program (NNF-UNICEF).  
National Faculty, NNF-IAP Advanced NRP.

Chief Advisor: 49th Annual National Conference of IAP (Pedicon 2012).  
Email: amit19762000@yahoo.com

# Development and Supportive Care (DSC) Foundation for Newborn and Children

## Governing Body

### Chairperson & Executive Director



**Amitava Sengupta**, Fellowship Neonatology (Neth), FNNF, MICP, DCH  
Director: Mother & Child Unit, Neonatology & Pediatrics  
Paras Hospitals, Gurgaon (NCR), India  
Chairperson & Executive Director  
Development and Supportive Care (DSC) Foundation for Newborn & Children (India)  
Chairman Workshop Committee  
37<sup>th</sup> Annual Convention of National Neonatology Forum (NEOCON 2017)  
National Assessor, NICU Accreditation Program (NNF-UNICEF) 2014.  
National Instructor, FBNC Program (NNF-UNICEF) 2014.  
National Faculty, NNF-IAP Advanced NRP 2010.  
Chief Advisor: 49<sup>th</sup> Annual National Conference of IAP (Pedicon 2012).

### International Advisory Members



**Sunil Sinha**, MD PhD FRCP FRCPC  
Professor of Paediatrics, University of Durham  
Consultant Neonatologist,  
James Cook University Hospital, Middlesbrough  
United Kingdom (UK)



**Samir Gupta**, DM MRCP MD FRCPC FRCPI  
Professor of Neonatology, Durham University  
Honorary Research Fellow, University of Oxford  
Director, Research & Development  
Consultant Neonatologist  
University Hospital of North Tees



**Vladimiras Chijenas**, MD  
Consultant Neonatologist,  
Neonatal Division, Vilnius Maternity Hospital  
Vilnius, Lithuania  
UNICEF Consultant team leader 2014-15



**Win Tin**, FRCPC and Neonatal Fellow  
Professor of Paediatrics, University of Durham  
& Senior Consultant Paediatrician.  
The James Cooke University Hospital  
Middlesbrough, TS4 3BW  
United Kingdom (UK)

### Governing Body Trustee



**Mrs Anuradha Sengupta**  
Governing Body Trustee  
DSC Foundation for Newborn & Children  
New Delhi

### Executive Members



**Vikram Datta**, MD, DNB, FNNF  
Director Professor, Department of Neonatology,  
Lady Hardinge Medical College, New Delhi, India  
President, NQOCN  
Member National Editorial Board (2015-17)  
Indian Journal of Pediatrics  
Secretary (2013-14)  
National Neonatology Forum, India  
Editor in Chief (2013-14)  
Journal of Neonatology, India  
WHO Fellow in Epidemiology, PSU, Thailand



**Amy Carroll**, OTD, OTR/L  
Assistant Professor, Post-professional Doctoral  
Program in Occupational Therapy  
Jefferson College of Health Professions  
Thomas Jefferson University  
Philadelphia, PA 19107, USA



**Sushil Srivastava**, MD, MBA (HCA)  
Professor  
Division of Neonatology, Department of Pediatrics  
University College of Medical Sciences  
& G.T.B. Hospital  
Dilshad Garden, Delhi, India  
Advisor, NQOCN



**Ashok Kumar**, MD, FIAP, FNNF, FAMS  
Professor & Head, Department of Pediatrics  
Institute of Medical Sciences  
Banaras Hindu University (BHU), Varanasi  
Commonwealth Fellow in Neonatology (UK)  
ICMR International Fellowship (Norway)  
Visiting Professor, Ulm University (Germany)



**Satish Ghanta**, MD (Paed) Manipal Neonatal Fellowship (Sydney, Aus)  
Bayley Scales Accredited Developmental Pediatrics (Sydney, Aus)  
Pediatric & Cardiac Intensive Care Fellowship (Sydney, Aus)  
Director, Neonatal & Pediatric Intensive Care Services  
Little Stars Children's Hospital, Hyderabad



**Kedar Sawleshwarkar**, MBBS, MD  
Director NICU, Deogiri Children's Hospital, Aurangabad  
Formerly Associate Professor, Govt Medical College, Aurangabad  
National Faculty NRP India  
National Instructor: FBNC Program (NNF-UNICEF) 2014  
President IAP Aurangabad 2015



**Suman Rao**, MD, DM (Neonatology)  
Professor & Head, Department of Neonatology  
St John's Medical College and Hospital  
Bengaluru, India



**S P Senthil Kumar**, M.D. (PAED)  
Fellowship Pediatric Critical Care  
Consultant Pediatric Intensivist,  
Department of Neonatology & Pediatrics  
Columbia Asia Hospital, Bangalore  
National Faculty: NNF-IAP Advanced NRP 2010



**Archana Bilagi**, MD  
Secretary, NNF - Karnataka Chapter 2014-16  
Member, ROP committee, NNF Karnataka  
Consultant Neonatologist  
St. Philomena's Hospital, Bengaluru, India



**Sudip Dutta**, MD  
Professor & HOD  
Department of Pediatrics  
Sikkim Manipal Institute of Medical Sciences  
Gangtok, Sikkim, India

### Scientific Coordinators



**Sanjay Wazir**, MD, DM Neonatology (PGI Chandigarh)  
Director: Neonatology  
Cloudnine Hospitals, Gurgaon (NCR), India  
National Faculty: NNF-IAP Advanced NRP 2010



**Shalabh Garg**, MD FRCPCH PGCI  
Consultant Neonatologist  
James Cook University Hospital  
Middlesbrough, UK



**Rakesh Tiwari**, MD, MBA (HCA)  
Consultant, Department of Neonatology & Pediatrics  
DSC Team, Mother & Child Unit  
Paras Hospitals, Gurgaon (NCR), India



**Dr Sandeep S Patil**, MBBS, MD (Pediatrics)  
DM(Neonatology), Fellow PCCM(ISCCM)  
Director CARE Advanced Neonatal Center  
Nanded, Maharashtra



**Arnab Sengupta**, BDS, MDS (Pedodontics)  
Director  
KIDZ Dental Centre  
Gurgaon (NCR), India



**Ajay Lal**, Fellowship Neonatology (NNF, India)  
Medical Director and Consultant Neonatologist  
Lal Superspeciality Hospital and Newborn Centre  
Gurgaon (NCR), India

#### Copyright and Photocopying

All rights reserved. No part of this publication may be reproduced, stored or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording or any information storage and retrieval system, without permission in writing from the chief scientific editor of the book.

#### Disclaimer

The publisher and the chief scientific editor cannot be held responsible for errors or any consequences arising from the use of information contained in this book, the views and opinions expressed do not necessarily reflect those of the publisher or chief scientific editor.

PRESENTING

# Neolact MMF PLUS

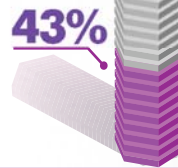
(Mother's Milk Fortifier 1 g / 0.5 g)

Designed to succeed

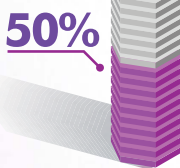


with **27%** Human milk protein<sup>#</sup>

Helps modulate gut health<sup>1</sup>  
Higher 2-FL<sup>1</sup> HMO<sup>\*</sup>



Builds passive immunity<sup>2</sup>  
Higher IgA and sIgA<sup>\*</sup>



Improves bone mineralisation<sup>3</sup>

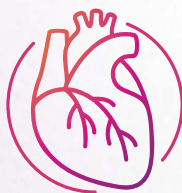
Fortified with Calcium and Phosphorus



For nutritional management in conditions such as



Chronic Lung Disease (BPD)



Cardiac anomalies (PDA)



Post-surgical nutrition



Failure to thrive

<sup>#</sup> Per sachet (w/w)

<sup>\*</sup> Data on file compared to unfortified human milk / fortified with bovine milk-derived fortifiers.

1. Lyons KE, et al. Nutrients. 2020 Apr 9;12(4):1039. 2. Pierzynowska K et al. Front Immunol. 2020 May 19;11:855. 3. Hitrova S, et al. 2012;51(7):24-30.



For further information, visit us at

[www.neolacta.com](http://www.neolacta.com)

1800-103-2456 (Toll-free)

[enquiry@neolacta.com](mailto:enquiry@neolacta.com)





**Development and Supportive Care (DSC)  
Foundation of India for Newborn & Children**

B - 106, Chitranjan Park, New Delhi - 110 019, India

**Price: ₹1500/-**