



**GOVERNMENT OF INDIA
MINISTRY OF SCIENCE & TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY
INVITES**

**NOMINATIONS FOR BIOTECH PRODUCT, PROCESS DEVELOPMENT AND
COMMERCIALISATION AWARD 2017
(TO BE PRESENTED ON TECHNOLOGY DAY, 11TH MAY 2017)**

From scientists/innovators/entrepreneurs/institutions/companies both in public as well as private sector for outstanding contributions for development and commercialization of a process/technology or a product in the areas of biotechnology and biological sciences including agriculture, medical and environmental sciences

PROFORMA FOR NOMINATIONS

For individuals

1. Name of the Nominee (in case of a team, brief particulars of the team members should be given):

ANIRBAN BASU

2. Date of Birth: 16th November, 1968
3. Present position /designation: Scientist VI
4. Address with Tele/Fax/E-mail: National Brain Research Center, Manesar, Haryana-122 051
91-124-2845225 (office); 91-124-2338910/28 (Fax), anirban.nbrc@gmail.com
anirban@nbrc.ac.in
5. Academic qualifications (in the form of a table from Bachelor's degree onwards including particulars such as subject, class/division, names of institutions, year, rank/prizes, etc.):

Degree	University	Year	Subjects
B.Sc. (Hons)	Viswa Bharati University, Santiniketan	1991	Life Science/Physics/ Chemistry
M.Sc.	Viswa Bharati University, Santiniketan	1993	Life Science
Ph. D.	Indian Institute of Chemical Biology, Kolkata	1998	Immunology
Post-Doc Research Work	Penn State University, Hershey, USA	1999-2004	Neuro-immunology

6. Positions held (In chronological order):

Period	Place of Employment	Designation
2004-2008	National Brain Research Center, Manesar, India	Scientist III
2008-till date	National Brain Research Center, Manesar, India	Scientist IV
2011-2016	National Brain Research Center, Manesar, India	Scientist V
2016-till date	National Brain Research Center, Manesar, India	Scientist VI

7. Current area of Research (Not more than 200 words)

Acute Encephalitis Syndrome (AES) resulting from infection of neurotropic RNA viruses like Japanese Encephalitis Virus (JEV) and Chandipura Virus (CHPV) has been reported in India every year during the monsoons. Both JEV and CHPV are arboviruses differing in their genomic structure. Neuronal death following JEV and CHPV infection result from both direct neuronal killing by the virus as well as by a bystander method mediated by microglial activation and massive inflammatory attack.

It has been previously established that both these enveloped viruses manipulate the host cholesterol metabolism in brain at some point of their life cycle to facilitate their survival within the host. Hence, it may be postulated that statins might have an answer against the pathogenesis of these viruses and evade the development of AES. In our preliminary studies we explored the efficacy of atorvastatin (AT) calcium trihydrate in both CHPV and JEV infection mice models. AT calcium trihydrate is a well-established statin drug that is prescribed by medical practitioners against hypercholesterolemia.

Apart from its established role, AT has been implicated as an anti-oxidative and anti-neurodegenerative agent. AT can cross the blood brain barrier (BBB) showing promising results in our preliminary studies providing symptomatic relief and enhancing the survival of the infected animals. At present project we are exploring the role of AT in the pathogenesis of JEV and CHPV and focus on the repurposing of this drug in AES.

We have also initiated a collaboration with Sun Pharmaceuticals Advanced Research Center (SPARC) to develop newer generation of anti virals from plant extracts. We are screening the antiviral potential of this particular plant derived compound for several neurotropic virus like Japanese Encephalitis Virus (JEV), Chandipura virus (CHPV), and West Nile Virus (WNV).

8. (a) List of publications in indexed journals.

Peer reviewed publications-Chronological list (most recent first):

Publication summary:

Total No. of peer reviewed publications: **127**

Research Impact: *h* index = **36**; Total citations: **4256 [Google scholar]**

Research articles: 101; Reviews: 19; Commentary/Editorials: 03; Book chapters: 04

Patent: 01

- 101.** M Nain, S Mukherjee, S Karmakar, A Paton, J Paton, M Abdin, **A Basu**, M Kalia, and S Vrati (2017) GRP78 is an important host-factor for Japanese encephalitis virus entry and replication in mammalian cells. *Journ of Virology* (in press)
- 100.** S Mukherjee, N Singh, N Sengupta, M Fatima, P Seth, A Mahadevan, S K Shankar, A Bhattacharyya, **A Basu** (2017) Japanese encephalitis virus induces human neural stem/progenitor cell death by elevating GRP78, PHB and hnRNPC through ER stress. *Cell Death & Disease* (in press)
- 99.** P Mall, A Verma, **A Basu**, Chandrakanta, S F Khan, A Jain, P Tripathi, S Jain, A Parihar, R Kumar (2016) Clinical and magnetic resonance imaging features in survivors of acute encephalitis syndrome in Uttar Pradesh, India. *Curr Pediatr Res* 2016; 20 (1&2): 245-249
- 98.** S Ghosh, S Mukherjee, N Sengupta, A Roy, D Dey, S Chakraborty, D J Chattopadhyay, A Banerjee, and **A Basu** (2016) Network analysis reveals common host protein/s modulating pathogenesis of neurotropic viruses. *Scientific Reports* 1;6:32593
- 97.** N Sharma, K Kumawat, M Rastogi, **A Basu**, and S Singh (2016) Japanese Encephalitis Virus exploits the microRNA-432 to regulate the expression of Suppressor of Cytokine Signaling (SOCS) 5. *Scientific Reports*; 6:27685
- 96.** A K Verma, S Ghosh, S Pradhan, and **A Basu** (2016) Microglial activation induces neuronal death in Chandipura virus infection. *Scientific Reports*; 6:22544.
- 95.** R Kumar, **A Basu**, S Sinha, Das M, Tripathi P, Jain A, Kumar C, Atam V, Khan S, Singh AS (2016) Role of oral Minocycline in acute encephalitis syndrome in India - a randomized controlled trial. *BMC Infect Dis*. 2016 Feb 4;16(1):67.
- 94.** Kumari B, Jain P, Das S, Ghosal S, Hazra B, Trivedi AC, **Basu A**, Chakrabarti J, Vrati S, Banerjee A. (2016) Dynamic changes in global microRNAome and transcriptome reveal complex miRNA-mRNA regulated host response to Japanese Encephalitis Virus in microglial cells. *Scientific Reports*. 2016 Feb 3; 6:20263.
- 93.** Swaroop S, Sengupta N, Suryawanshi AR, Adlakha YK, **Basu A** (2016) HSP60 plays a regulatory role in IL-1 β -induced microglial inflammation via TLR4-p38 MAPK axis. *J Neuroinflammation*. 2016 Feb. 2;13(1):27.
- 92.** K L Handore, P D Jadhav, B Hazra, **A Basu***, and D S Reddy (2015) Total Syntheses and Biological Evaluation of (\pm)-Botryosphaeridione, 2 (\pm)-Pleodendione, 4-epi-Periconianone B,

and Analogues. *ACS Medicinal Chemistry Letters* 6 (11), pp 1117–1121 [* joint corresponding author]

91. S Mahanti, A Majhi, K Kundu, **A Basu**, and B Bishayi (2015) Systemic Staphylococcus aureus infection in restraint stressed mice modulates impaired immune response resulting in improved behavioural activities. *Journ of Neuroimmunology* 288:102-13.

90. S Ghosh, G. Vinodh Kumar, **A Basu**, and A Banerjee (2015) Graph theoretic network analysis reveals protein pathways underlying cell death following neurotropic viral infection. *Scientific Reports* 5:14438

89. S Vasaikar, S Ghosh, P Narain, **A Basu**, and J Gomes (2015) HSP70 mediates survival in apoptotic cells – Boolean network prediction and experimental validation. *Frontiers in Cellular Neuroscience* 9:319

88. N Sengupta, S Mukherjee, P Tripathi, R Kumar, A R Suryawanshi, **A Basu** (2015) Cerebrospinal Fluid Biomarkers of Japanese Encephalitis. *F1000 Research* 4:334

87. S Ghosh, S Mukherjee, and **A Basu** (2015) Chandipura Virus Perturbs Cholesterol Homeostasis Leading to Neuronal Apoptosis. *Journal of Neurochemistry* 135(2):368-80 (cover page).

86. N Sharma, R Verma, K L Kumawat, **A Basu** and S K Singh (2015) miR-146a suppresses cellular immune response during Japanese encephalitis virus JaOArS982 strain infection in human microglial cells. *Journal of Neuroinflammation* 18;12(1):30

85. S Mukherjee, S Ghosh, A Nazmi, and **A Basu** (2015) RIG-I Knockdown Impedes Neurogenesis in a Murine Model of Japanese Encephalitis. *Cell Biol Int* 39(2):224-9.

84. P P Manna, S K Hira, **A Basu**, and S Bandyopadhyay (2014) Cellular therapy by allogeneic macrophages against visceral leishmaniasis: role of TNF- α . *Cellular Immunology* 290(1):152-163.

83. A Nazmi, S Mukherjee, K Kundu, K Dutta, A Mahadevan, S K Shankar, and **A Basu** (2014) TLR7 is a key regulator of innate immunity against Japanese Encephalitis Virus infection. *Neurobiology of Disease* 69: 235-247.

82. D K Kaushik, M C Thounajam, A Mitra, and **A Basu** (2014) Vespa tropica venom suppresses lipopolysaccharide mediated secretion of pro-inflammatory cyto-chemokines by abrogating nuclear factor- κ B activation in microglia. *Inflammation Research* 63(8):657-65.

- 81.** M C Thounajam, K Kundu, D K Kaushik, S Swaroop, A Mahadevan, S K Shankar, and **A Basu** (2014) MicroRNA-155 Regulates Japanese Encephalitis Virus Induced Inflammatory Response by Targeting src Homology 2-Containing Inositol Phosphatase-1. *Journal of Virology* 88(9): 4798–4810
- 80.** M C Thounajam, D K Kaushik, K Kundu, and **A Basu** (2014) microRNA-29b Modulates Japanese Encephalitis Virus Induced Microglia Activation by Targeting Tumor Necrosis Factor Alpha-induced Protein 3 (TNFAIP3) *Journ of Neurochemistry*. 129(1):143-54
- 79.** A Majhi, K Kundu, R Adhikary, M Banerjee, S Mahanti, **A Basu**, and B Bishayi (2014) Combination therapy with Ampicillin and Azithromycin in an experimental pneumococcal pneumonia is bactericidal and effective in down regulating inflammation in mice. *Journ of Inflammation* 24; 11(1):5
- 78.** N Sengupta, S Ghosh, S V Vasaikar, J Games, and **A Basu** (2014) Modulation of Neuronal Proteome Profile in Response to Japanese Encephalitis Virus Infection. *PLoS One* 9(3):e90211
- 77.** K L Kumawat, D K Kaushik, and **A Basu** (2014) Acute exposure to lead acetate activates microglia and induces subsequent bystander neuronal death via caspase-3 activation. *Neurotoxicology*; 41C:143-153
- 76.** G D Manocha, R Mishra, N Sharma, K L Kumawat, **A Basu** and S K Singh (2014) Regulatory role of TRIM21 in type-I interferon pathway in Japanese encephalitis virus infected human microglial cells. *Journal of Neuroinflammation* 11:24
- 75.** A Nazmi, I M Ariff, K Kundu, K Dutta, and **A Basu** (2014) Neural Stem/Progenitor Cells induces conversion of encephalitogenic T-cells into CD4⁺-CD25⁻ FOXP3⁺ Regulatory T-cells. *Viral Immunology* 27:2; 48-59
- 74.** K Kundu, K Dutta, A Nazmi, and **A Basu** (2013) Japanese encephalitis virus infection modulates the expression of Suppressors of Cytokine Signaling (SOCS) in macrophages: Implications for the hosts' innate immune response. *Cellular Immunology* 3; 285(1-2):100-110.
- 73.** S Ghosh, K Dutta, and **A Basu** (2013) Chandipura Virus induces Neuronal Death through Fas-mediated Extrinsic Apoptotic Pathway. *Journal of Virology* 87(22):12398-406.
- 72.** D K Kaushik, M C Thounajam, K L Kumawat, M Gupta, and **A Basu** (2013) Interleukin-1 β orchestrates underlying inflammatory responses in microglia via Kruppel-like factor 4. *Journ of Neurochemistry*. 127(2):233-244

71. D Adhya, K Dutta, K Kundu, and **A Basu** (2013) Histone deacetylase inhibition by Japanese Encephalitis Virus in Monocyte/Macrophages: A Novel Viral Immune Evasion Strategy. *Immunobiology* 218: 1235– 1247
70. I M Ariff, M C Thounajam, S Das, and **A Basu** (2013) Japanese Encephalitis virus infection alters both neuronal and astrocytic differentiation of Neural Stem/progenitor Cells. *J Neuroimmuno Pharmacology*; 8(3):664-76
69. V Haridas, K S Rajgokul, S Sadanandan, T Agrawal, V Sharvani, M V S Gopalkrishna, M B Bijesh, K L Kumawat, **A Basu**, G R Medigeshi (2013) Bispidine-amino acid conjugates act as a novel scaffold for the design of antivirals that block Japanese encephalitis virus replication. *PLoS Neglected Tropical Diseases* 7(1): e2005
68. P Mal, K Dutta, **A Basu**, and B Bishayi (2013) Azithromycin in Combination with Riboflavin Decreases the Severity of Staphylococcus aureus Infection Induced Septic Arthritis by Modulating the Production of Free Radicals and Endogenous Cytokines. *Inflammation Research* Mar; 62(3):259-73
67. A Majhi, A Mahanti, K Kundu, K Dutta, **A Basu**, and B Bishayi (2013) Increased resistance of immobilized-stressed mice to infection: correlation with behavioral alterations. *Brain, Behaviour, and Immunity* 28:115-27
66. P Mal, S Dutta, D Bandyopadhyay, K Dutta, **A Basu**, and B Bishayi (2012) Gentamicin in combination with ascorbic acid regulates the severity of Staphylococcus Aureus induced septic arthritis in mice. *Scan J Immunol* 76(6):528-40
65. N. Sehgal, K.L. Kumawat, **A. Basu** and V. Ravindranath (2012) Fenofibrate reduces mortality and precludes neurological deficits in survivors in murine model of Japanese encephalitis viral infection. *PLoS ONE* 7(4): e35427.
64. A. Nazmi, R. Mukhopadhyay, K. Dutta, and **A. Basu** (2012) STING mediates neuronal innate immune response following Japanese encephalitis virus infection. *Scientific Reports* 2012, 2:347.
63. D K Kaushik, R Mukhopadhyay, K L Kumawat, M Gupta and **A Basu** (2012) Therapeutic targeting of Kruppel like factor 4 abrogates microglial activation. *Journal of Neuroinflammation* 9(1), 2012:57 (Recommended article by Faculty of 1000)
62. D K Kaushik, M Gupta, K L Kumawat, and **A Basu** (2012) NLRP3 inflammasome: Key mediator of neuroinflammation in murine Japanese Encephalitis. *PLoS One* 7(2); 2012:e32270.

61. E Sen, **A Basu**, L B Willing, T F Uliasz, J L Myrkalo, S J Vannucci, S J Hewett, and S W Levison (2011) Pre-Conditioning Induces the Precocious Differentiation of Neonatal Astrocytes to Enhance Their Neuroprotective Properties. *ASN Neuro* 3(3). pii: e00062
60. A Nazmi, K Dutta, and **A Basu** (2011) RIG-I Mediates Innate Immune Response in Mouse Neurons Following Japanese Encephalitis Virus Infection. *PLoS One* 6(6):e21761
59. A Nazmi, K Dutta, S Das, and **A Basu** (2011) Japanese Encephalitis Virus Infected Macrophages Induces Neuronal Death *J Neuroimmuno Pharmacology* 6(3):420-33
58. S Das, K Dutta, K L Kumawat, A Ghoshal, D Adhya, and **A Basu** (2011) Abrogated Inflammatory Response Promotes Neurogenesis in a Murine Model of Japanese Encephalitis. *PLoS One* 6(3); e17225
57. S Majumdar, K Dutta, S K Manna, **A Basu**, and B Bishayi (2011) Possible protective Role of Chloramphenicol in TSST-1 and coagulase positive *Staphylococcus aureus* induced septic arthritis with altered level of inflammatory mediators. *Inflammation* 34(4):269-82.
56. A Nazmi, K Dutta, and **A Basu** (2010) Antiviral and Neuroprotective Role of Octaguanidinium Dendrimer-Conjugated Morpholino Oligomers in Japanese Encephalitis. *PLoS Neglected Tropical Diseases* 4(11) e892
55. D K Kaushik, M Gupta, S Das, and **A Basu** (2010) Krüppel-like factor 4, a novel transcription factor regulates microglial activation and subsequent neuroinflammation. *Journal of Neuroinflammation* 7 (1):68.
54. S Das, S Chakraborty, and **A Basu** (2010) Critical role of lipid rafts in virus entry and activation of Phosphoinositide 3' Kinase / Akt signaling during early stages of Japanese Encephalitis Virus infection in neural stem/progenitor cells. *J Neurochem* 115 (2): 537-549.
53. U K Misra, J Kalita, R Srivastava, P P Nair, M K Mishra and **A Basu** (2010) A Study of cytokines in tuberculous meningitis: clinical and MRI correlation. *Neurosci Lett* 483 (1): 6-10.
52. K Dutta, K L Kumawat, A Nazmi, M K Mishra, and **A Basu** (2010) Minocycline Differentially Modulates Viral Infection And Persistence In An Experimental Model Of Japanese Encephalitis. *J Neuroimmuno Pharmacology* 5(4):553-65
51. K Dutta, M K Mishra, A Nazmi, K L Kumawat and **A Basu** (2010) Minocycline

Differentially Modulates Macrophage Mediated Peripheral Immune Response Following Japanese Encephalitis Virus Infection. *Immunobiology* 215: 884-893

50. D Nandi, M K Mishra, A Basu, and B Bishayi (2010) Effects of IL-18 and IL-10 pre-treatment on the alteration of endogenous cytokines in liver and spleen of mice with experimental endotoxemia. *Indian Journal of Experimental Biology* 48 (11): 1103-1110.

45. S Ghosh, D K Kaushik, J Gomes, S Nayeem, S Deep, and A Basu (2010) Changes in cytosolic Ca²⁺ levels correspond to fluctuations of lactate levels in crosstalk of astrocyte-neuron cell lines. *Indian Journal of Experimental Biology* 48(06):529-537

44. K Dutta, D Ghosh, A Nazmi, K L Kumawat, and A Basu (2010) A Common Carcinogen Benzo[a]pyrene Causes Neuronal Death in Mouse via Microglial Activation *PLoS One* 5(4): e9984

43. J Kalita, R Srivastava, M K Mishra, A Basu, and U K Misra (2010) Cytokines and chemokines in viral encephalitis: a clinicoradiological correlation. *Neurosci Lett* 31; 473(1):48-51

42. D Nandi, M K Mishra, A Basu, and B Bishayi (2010) Protective effects of Interleukin-6 in Lipopolysaccharide (LPS) induced experimental endo-toxemia are linked to alteration in hepatic anti-oxidant enzymes and endogenous cytokines. *Immunobiology* 215: 443-451

41. R Mukhopadhyay, M K Mishra, A Basu, and B Bishayi (2010) Effect of particular antigenic stimulation or in vivo administration of Interleukin-6 on the level of steroidogenic enzymes in adrenal glands and lymphoid tissues of mice with parallel alteration in endogenous inflammatory cytokine level. *Cellular Immunology* 261 (2010) 23–28.

40. S Das, D Ghosh, and A Basu (2009) Japanese encephalitis virus induce immuno-competency in neural stem/progenitor cells. *PLoS One* 4(12): e8134

39. M K Mishra, K Dutta, S K Saheb, and A Basu (2009) Understanding the molecular mechanism of blood brain barrier damage in an experimental model of Japanese Encephalitis: Correlation with minocycline administration as a therapeutic agent. *Neurochemistry International* 55(8):717-233.

38. D Ghosh and A Basu (2009) Japanese Encephalitis - A Pathological and Clinical Perspective

37. D Ghosh, M K Mishra, S Das, D K Kaushik and **A Basu** (2009) Tobacco carcinogen induces microglial activation and subsequent neuronal damage. *J Neurochem* 110 (3): 1070-1081
36. K Dutta, D Ghosh, and **A Basu** (2009) Curcumin protects neuronal cells from Japanese Encephalitis virus mediated cell death and also inhibits infective viral particle formation by dysregulation of Ubiquitin proteasome system. *J Neuroimmuno Pharmacology* 4(3): 328
35. M K Mishra, D Ghosh, R Duseja, and **A Basu** (2009) Antioxidant potential of Minocycline in Japanese Encephalitis Virus infection in murine neuroblastoma cells: Correlation with membrane fluidity and cell death *Neurochemistry International* 54 : 464-470.
34. R Mukhopadhyay, M K Mishra, **A Basu**, and B Bishayi (2009) Modulation of steroidogenic enzymes in murine lymphoid organs after immunization with soluble antigen. *Immunological Investigations* 38(1):14-30
33. M K Mishra, K L Kumawat and **A Basu** (2008) Japanese Encephalitis Virus differentially modulate the induction of multiple pro inflammatory mediators in human astrocytoma and astrogloma cell lines. *Cell Biology International* 32: 1506-1513
32. J Ghosh, V Swarup, A Saxena, S Das, A Hazra, P Paira, S Banerjee, N B Mondal and **A Basu** (2008) Therapeutic Effect of a Novel Anilidoquinoline derivative- 2-(2-methyl-quinoline-4ylamino)-N-(2-chlorophenyl)-acetamide In Japanese Encephalitis: Correlation with in vitro neuroprotection. *Int J Antimicrob Agents* 32 (2008) 349–354.
31. S Das and **A Basu** (2008) Japanese Encephalitis virus infects neural progenitor cells and decreases their proliferation. *J Neurochem* 106(4):1624-36. (*News and views reported and published by Nature India and as a part of several national and international press release*)
30. S Das, M K Mishra, J Ghosh and **A Basu** (2008) Japanese Encephalitis Virus infection induce IL-18 and IL-1 β in microglia and astrocytes: Correlation with in vitro cytokine responsiveness of glial cells and subsequent neuronal death. *Journal of Neuroimmunology* 195 (2008) 60–72.
29. V Swarup, J Ghosh, S Das, and **A Basu** (2008) Tumor necrosis factor receptor-associated death domain mediated neuronal death contributes to the microglial activation and subsequent release of proinflammatory mediators in Japanese Encephalitis. *Neurochemistry International* 52 (2008) 1310–1321.

28. M K Mishra and **A Basu** (2008) Minocycline neuroprotects, reduces microglial activation, inhibits caspase-3 induction, and viral replication following Japanese Encephalitis. *J Neurochem* 105(5):1582-95
27. V Swarup, J Ghosh, M K Mishra, and **A Basu** (2008) Novel strategy for treatment of Japanese Encephalitis using Arctigenin, a plant lignan. *Journ Antimicrob Chemotherapy* 61(3):679-88
26. J K Krady, H W Lin, C M Liberto, **A Basu**, S G Kremlev and S W Levison (2008) Ciliary neurotrophic factor modifies microglial reactivity to promote motor neuron survival. *J Neurosci Res* 86 (6): 1199-1208
24. V Swarup, S Das, S Ghosh and **A Basu** (2007) Tumor Necrosis Factor Receptor-1 Induced Neuronal Death by TRADD Contributes to the Pathogenesis of Japanese Encephalitis. *J Neurochem* 103(2): 771-83.
23. V Swarup, J Ghosh, R Duseja, S Ghosh and **A Basu** (2007) Japanese Encephalitis Virus infection decrease endogenous IL-10 production: correlation with microglial activation and neuronal death. *Neurosci Lett.* 420(2): 144-9.
22. V Swarup, J Ghosh, S Ghosh, A Saxena and **A Basu** (2007) Anti Viral And Anti Inflammatory Effect of Rosmarinic Acid In An Experimental Murine Model of Japanese Encephalitis. *Antimicrobial Agents and Chemotherapy*, 51(9) 3367-70.
21. V Sharma, M Mishra, S Ghosh, **A Basu**, P Seth and E Sen (2007) Modulation of Interleukin-1 β mediated inflammatory response in human astrocytes by flavonoids: Implications in neuroprotection. *Brain Res. Bull.* 15; 73(1-3): 55-63.
20. M K Mishra, P Koli, S Bhowmick and **A Basu** (2007) Neuroprotection conferred by astrocytes is insufficient to protect animals from succumbing to Japanese Encephalitis. *Neurochemistry International* 50:764-773.
19. A Ghoshal, S Das, S Ghosh, M K Mishra, V Sharma, P Koli, E Sen and **A Basu** (2007) Proinflammatory mediators released by activated microglia induces neuronal death in Japanese Encephalitis. *Glia* 55:483-496.
18. S Bhowmick, R Duseja, S Das, M B Appaiahgiri, S Vrati and **A Basu** (2007) Induction of IP-10 (CXCL10) in astrocytes following Japanese Encephalitis. *Neurosci Lett.* 414: 45-50.
17. H W Lin, ***A Basu**, C Drukman, M Cicchese, J K Krady and S W Levison (2006)

Astrogliosis is not solely depend upon activating the type 1 Interleukin-1 receptor. *Journal of Neuroinflammation* 3:15 (**co first author*)]

16. J Lazovic, ***A Basu**, J K Krady, R P Rothstein, M B Smith and S W Levison (2005) Neuro-protection following hypoxia-ischemia in IL-1 type 1receptor deficient mice: suppression of inflammation and inducible nitric oxide synthase (iNOS) production *Stroke* 36:2226-2231 (**co first author*)]

15. J K Krady, **A Basu**, C M Allen, Y Xu, K F LaNoue, T W Gardner and S W Levison (2005) Minocycline Reduces Pro-Inflammatory Cytokine Expression, Microglial Activation And Caspase-3 Activation In A Rodent Model Of Diabetic Retinopathy. *Diabetes* 54:1559-65.

14. **A Basu**, J Lazovic, J K Krady, D T Maguer, R P Rothstein, M B Smith and S W Levison (2005) Interleukin-1 and the Interleukin-1 Type 1 receptor are essential for the progressive neurodegeneration that ensues subsequent to a mild stroke. *Journ of Cereb Blood Flow and Metab* 25:17-29 [*Nature Publishing Group (cover photo)*].

12. S W Levison, S Druckman, G Young and **A Basu** (2003) Neural stem cell in the subventricular zone are a source of astrocytes and oligodendrocytes, but not microglia. *Dev Neurosci* 25(2-4):184-196.

11. C J Kuhlow, J K Krady, **A Basu** and S W Levison. (2003) Astrocytic ceruloplasmin expression, which is induced by IL-1b and by traumatic brain injury, increases in the absence of the IL-1 type 1 receptor. *Glia* 44(4):76-84.

10. **A Basu**, J K Krady, Mark O'Malley, Scott D Styren, Steven T Dekosky and S W Levison (2002) The type 1 Interleukin-1 receptor is essential for the efficient activation of microglia and the induction of multiple pro-inflammatory mediators in response to brain injury. *J Neurosci* 22(14): 6071-6082

09. **A Basu**, J K Krady, J R Enterline and SW Levison (2002) Transforming Groth Factor- β 1 prevents IL-1 β induced microglial activation, whereas TNF- α and IL-6 stimulated activation are not antagonized. *Glia* 40 (1): 109-120.

08. J K Krady, **A Basu**, S W Levison, and R J Milner (2002) Differential expression of protein tyrosine kinase genes during microglial activation. *Glia* 40(1):11-24.

07. N P Sahu, C Pal, N B Mandal, S Banerjee, M Raha, A P Kundu, **A Basu**, M Ghosh K Roy and S Bandyopadhyay (2002) Synthesis of 2-(2-methyl-quinolin-4-ylamino)-*N*-phenyl

acetamide: a Potential Antileishmanial drug. *Bioorg and Med Chem* **10**: 1687-1693.

06. S Adhya, Md Q Hassan, S Mukherjee, P P Manna, **A Basu**, S Sen and S Bandyopadhyay (2002). Visceral leishmaniasis in India: promises and pitfalls of a PCR-based blood test. *Trans of the Royal society of Trop Med and Hyg* **96**: Supplement 1: S179-83.

05. C Pal, M Raha, **A Basu**, K C Roy, A Gupta, M Ghosh, N P Sahu, S Banerjee, N B Mandal and S Bandyopadhyay (2002) Combination therapy with indolylquinoline derivative and sodium antimony gluconate cures established visceral leishmaniasis in hamsters. *Antimicrobial Agents and Chemotherapy*. **46** :259-261.

04. **A Basu**, G Chakrabarti, A Saha and S Bandyopadhyay (2000) Modulation of CD11c⁺ Dendritic cell functions in murine visceral leishmaniasis: Correlation with Parasite replication in the spleen. *Immunology* **99** 305-313.

03. G Chakraborti, **A Basu**, P P Manna, S B Mahato, N B Mandal and S Bandyopadhyay. (1999) Indolylquinoline derivatives are cytotoxic to *Leishmania donovani* promastigotes and amastigotes in vitro and effective in treating murine visceral leishmaniasis *Journ Antimicrob Chemotherapy* **43** 359- 366.

02. P P Manna, **A Basu**, A Saha, Md Q Hassan, S Mukherjee, S Majumder, S Adhya and S Bandyopadhyay(1997).*Leishmania donovani* infects and survives in human lymphocyte cell lines *in vitro*. *Current Science* **73**: 610-614.

01. G Chakrabarti, **A Basu**, P P Manna, S Bhattacharya, S Sen and S Bandyopadhyay. (1996) Peripheral blood mononuclear cells of patients with Indian visceral leishmaniasis suppress natural killer cell activity in vitro. *Trans of the Royal society of Trop Med and Hyg.* **90**: 582-585.

(b) List of books /reviews written

Reviews:

19. S Ghosh and **A Basu** (2017) Neuropathogenesis by Chandipura Virus: A conspirator in acute encephalitis syndrome in India. *NMJI (In press)*

18. A Nazmi, B Hazra, K Dutta, and **A Basu** (2014) Role of Pattern Recognition Receptors in Flavivirus Infections. *Virus Research* **185**:32-40.

17. M C Thounajam, D K Kaushik, and **A Basu** (2013) MicroRNAs in the Brain: It's regulatory

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11. S Das, and **A Basu** (2011) Viral Infection and Neural Stem/Progenitor Cell's fate: Implication in brain development and neurological disorders. *Neurochemistry International* 59(3):357-66. *Invited review for a special issue 'The potential of Stem Cells for 21st Century Neuroscience'*.

10. K Dutta, and **A Basu** (2011) Use of Minocycline in Viral Infections. *Ind Journ of Med Res* 133(5):467-70

09. D K Kaushik, M Gupta, and **A Basu** (2011) Microglial response to viral challenges: Every silver lining comes with a cloud. *Frontiers in Bioscience* 17:2187-205.

08. K Dutta, A Nazmi, and **A Basu** (2011) Chemotherapy In Japanese Encephalitis: Are We There Yet? *Infectious Disorders - Drug Targets* 11(3):300-14.

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06. S Chakraborty, D K Kaushik, M Gupta, and **A Basu** (2010) Inflammasome Signaling at The Heart of Central Nervous System Pathology. *J Neurosci Res* 88:1651-1631

05. D Adhya and **A Basu** (2010) Epigenetic Modulation of Host: New Insights into Immune

Evasion by Viruses. *Journal of Bioscience* 35(4):647-663.

04. K Dutta, P N Rangarajan, S Vрати, and **A Basu** (2010) Japanese Encephalitis: Pathogenesis, Prophylaxis and Therapeutics. *Current Science* 98 (3): 22-30 (*Special section: Biology and pathogenesis of Virus*)

03. D Ghosh and **A Basu** (2008) Present Perspectives on Flaviviral Chemotherapy. *Drug Discovery Today* 13 (13-14): 619-624.

02. S Das and **A Basu** (2008) Inflammation: A new candidate in modulating adult neurogenesis *J Neurosci Res* 86 (6): 1199-1208

01. **A Basu**, J K Krady and S W Levison (2004) Interleukin 1: A master regulator of neuro-inflammation. *J Neurosci Res* **15**; **78(2)**: 151-156.

Editorial/Commentary:

01. S Ghosh, and **A Basu** (2016) Acute Encephalitis Syndrome in India: The changing scenario. *Ann Neurosci* 2016; 23:131-133.

02 A Ghosh, Streit WJ, Minghetti L, **Basu A** (2013) Microglia in Development and Disease. *Clinical and Developmental Immunology* 2013; 2013:736459 [Editorial]

03. D Adhya, K Dutta, and **A Basu** (2013) Japanese encephalitis claiming hundreds in India – epidemic in the National Capital Region imminent. *International Health* 5(3):166-8

Book Chapter:

1) K Dutta, A. Nazmi and **A. Basu**.(2013) Japanese encephalitis virus and human CNS infection. *In Neuroviral Infections*, ed S.K. Singh, D. Ruzek, CRC Pr 1 LLC. [ISBN-10: 1439868522]

2) D K Kaushik, and **A Basu** (2013) Microglial activation: measurement of cytokines by flow cytometry. *In Microglia: Methods and Protocols*, ed J L. Venero, B Joseph, *Methods Mol Biol*; 1041:71-82 Springer Protocols (Humana Press)

3) K Dutta, and **A Basu** (2014) Japanese Encephalitis: A Tale of Inflammation and Degeneration in the Central Nervous System. *In Neuroinflammation and Neurodegeneration* eds P.K. Peterson and M. Toborek. Springer-Science.

4) K Dutta, S Ghosh, and **A Basu** (2016) Infections and Inflammation in the Brain and Spinal

Cord: A Dangerous Liaison. In *Inflammation: The Common Link in Brain Pathologies* eds N R Jana, A Basu, and P N Tandon. Springer-Science.

(c) Overseas Visits (indicate the duration of the visit with dates, name of the institute/laboratory/organization and country, purpose etc.):

Sl. No.	Duration		Institute and the country of visit	Purpose of visit
	From DD/MM/YY	To DD/MM/YY		
1.	22.06.2006	26.06.2006	University of Kyoto, Japan	Invited speaker in 8 th Neurobiology and Neuroinformatics Workshop
2.	02.11.2007	09.11.2007	San Diego, USA	a) To attend Society for Neuroscience meeting; b) Invited speaker at BD Biosciences R&D facility
3.	21.04.09	24.04.2009	Wuhan, PR China	Invited speaker in 15 th Society for Neuroimmunopharmacology Conference
4.	25.07.2011	28.07.2011	Shanghai Institute of Biochemistry and Cell Biology, Shanghai, PR China.	To attend Shanghai Symposium: Signaling, Inflammation and Cancer.
5.	05.09.2011	06.09.2011	St. Johns College, Cambridge, UK	To attend: The Cambridge Neural Stem Cell Symposium.
6.	03.03.2012	07.03.2012	Baltimore, USA	To attend 43 rd Annual meeting of American Society for Neurochemistry.
7.	28.05.2012	30.05.2012	Valencia, Spain	Invited speaker in 9 th International Symposium on Polymer Therapeutics: From Laboratory to clinical practice
8.	26.06.2012	29.06.2012	Isparta, Turkey	Invited speaker in 4 th International Congress on Cell Membrane and Oxidative stress.
9.	23.08.2014	26.08.2014	Kaohsiung, Taiwan	Symposium organizer, speaker, and session chair. Asian-Pacific Society for Neurochemistry meeting
10.	09.10.2014	11.10.2014	Athens, Greece	17 th International Symposium of Molecular Medicine. Speaker and session chair
11.	17.07.2016	21.07.2016	Vancouver, Canada	IUBMB-2016. Speaker.

(d) Particulars of memberships of academies/scientific societies/professional bodies:

- 1) **Elected Fellow of the National Academy of Sciences, India (NASI)-2011**
- 2) **Elected Fellow of the West Bengal Academy of Science and Technology, 2012**
- 3) **Elected Fellow of the Indian National Science Academy (INSA)-2017**

(e) Awards won (give full particulars such as title, awarding agency / organization, the achievements for which award was conferred etc.):

- 1) **National Bioscience Award for Career Development-** (Department of Biotechnology, Government of India), 2010.
- 2) **Vasvik Industrial Research Award** (Biological Sciences and technology)-2011
- 3) **J B Srivastav Oration Award** (ICMR)-2011
- 4) **Rajib Goyal Prize** (Life Sciences)-2012-13
- 5) **NASI- Reliance Industries Platinum Jubilee Award** for Application Oriented Innovations in Biological Sciences-2013.
- 6) **Tata Innovation Fellowship** (Department of Biotechnology)-2015
- 7) **Senior Scientist Oration Award** (Indian Immunology Society)-2015

Member of Editorial Boards (include full Journal name)

2012-present Editorial Board, **Scientific Reports** (Nature Publication Group) [IF: 5.5]

2012-present Editorial Board, **Journal of Neuro-inflammation** (Biomed Central) [IF: 5.4]

2012-present Editorial Advisory Board, **F1000 Research**.

2012- Present Faculty member in the **Faculty of 1000 in the section Neurological Disorders-** Infectious Diseases of the Nervous System.

2013: Guest Editor, **Clinical and Developmental Immunology**; for a special issue "Microglia in Development and Disease".

2014-present Academic Editor **PLoS One**. [IF: 3.5]

2014- present Handling editor, **Journal of Neurochemistry**. [IF: 4.2]

2015-present editorial board, **Metabolic Brain Disease** [IF: 2.5]

2015-present editorial board, **Frontiers in Molecular Neuroscience** [IF: 4.2]

(f) List of Patents taken/applied:

The author of 1 invention in the field of Microbiology/ New drug discovery:

1) A process for the preparation of 2-methyl-4-(acetonylido)- amino quinoline, a novel compound useful as an antileishmanial agent. N P Sahu, N B Mandal, S Banerjee, A P Kundu, M Raha, S Bandyopadhyay, C Pal, **A Basu**, and G Chakrabarti [*Patent No: 191818, Country: India, File date: 1999-08-19*]

9. Details not exceeding 500 words including

(a) Title, Summary & Justification for being awarded of the Biotech Product & Process Developed during the past five years in the areas of biosciences/ biotechnology

Title: *Repurposing of Minocycline as a therapy for the patients with Japanese Encephalitis (JE), and Acute Encephalitis Syndrome (AES)*

Absence of safe, efficient as well as cost effective vaccine and anti-viral drug prompts Dr Basu and his group to explore the potential of neuroprotective and/or anti-inflammatory/and or anti-viral compounds as a therapeutic strategy for JE. By exploring the pathways which are involved in inflammation, Anirban's laboratory has identified several anti-inflammatory compounds with therapeutic potential in an experimental model of JE. One of this compound is Minocycline. *Minocycline is an approved drug with a long standing record of acceptable safety and has a similar spectrum to Doxycycline, both for bacterial infections as well as for Rickettsia.*

Based upon pre-clinical study undertaken in the laboratory of Dr Basu at National Brain Research Center, recently a Phase III clinical trial has been completed at King George Medical University (KGMU), Lucknow, where minocycline has been used as a therapy for Japanese Encephalitis patients and the patients with Acute Encephalitis Syndrome (AES). This trial showed that there was a significant advantage for patients who survived their first day in hospital. There was an advantage in all the other parameters where Minocycline was used, w.r.t. the placebo arm. These findings could form the basis for planning a larger study and possibly including minocycline in the management of AES and JE. [BMC Infect Dis. 2016 Feb 4;16(1):67].

Based upon our pre-clinical work another trial has been conducted recently by Dr Anita Mehta of Dept. of Pediatrics, BRD Medical College Institute, Gorakhpur on the use of Minocycline, this time in specific cases of Japanese Encephalitis (JE) [*International Journal of Pediatric Research, May, 2016/ Vol 3/ Issue 5*]. Here again there was a significant advantage with Minocycline in terms of hospital stay, and Minocycline arm does better in the study.

Altogether, findings from two trial strongly indicate the possibility of including minocycline as a part of the management for JE and AES patients.

(b) Status of its commercialization including the name of the industry to which transferred :

At present NBRC and DBT is working with Director General Health Services, Ministry of Health and Family Welfare, ICMR and National Vector Borne Diseases Control Program to consider minocycline for AES patients in a pilot project. NBRC is also in touch with several state governments like Uttar Pradesh and Odisha to introduce Minocycline in the management of JE and AES.

(c) Status of patent obtained/applied and

Minocycline is an off patent drug, and at this moment the new indication of an old drug is not patentable in India.

(d) Production figures of product and cost realized during last five years for which the nominee is recommended for the award:

Several pharmaceutical company in this country makes minocycline. Unimark Remedies from Mumbai has manufactured the minocycline formulations for the clinical trial.

10. Any other relevant information in support of the nomination:

For the findings related to the development (repurposing) of minocycline as a novel therapy for Japanese Encephalitis and Acute Encephalitis syndrome, Dr Basu has been awarded several Industry sponsored awards which are specifically marked for the application/product development related discovery. Two most important of them are i) *Vasvik Industrial Research Award* for the Biological Sciences and technology, and ii) *NASI- Reliance Industries Platinum Jubilee Award* for Application Oriented Innovations in Biological Sciences. Acknowledging his deep commitment to find innovative solutions to this major health problem in the country, Department of Biotechnology conferred him highly competitive *TATA Innovation Fellowship*.

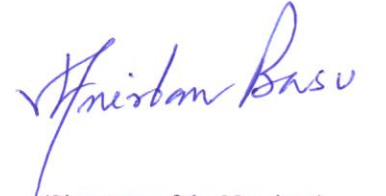
11. Aadhar No: 3630 1736 7047

Date:

18/07/2017

Place:

NBRC, Manesar, Haryana.


(Signature of the Nominee)

Certificate by the sponsor

This is to certify that the above information given by the Nominee is correct. I recommend him/her for consideration for the Biotech Product, Process Development and Commercialization Awards 2017 of the Department of Biotechnology, Ministry of Science and Technology, Government of India.

Date:

Place:



(Signature of the sponsor*)
प्रो० सुब्रत सिन्हा
Prof. Subrata Sinha
निदेशक / Director
राष्ट्रीय मस्तिष्क अनुसंधान केन्द्र
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