EDELWEISS PUBLICATIONS
OPEN ACCESS

Volume 2 Issue 1 | PDF 110 | Pages 3

Edelweiss: Psychiatry Open Access

Mini Review ISSN: 2638-8073

Approaching to the Essence of Major Depressive Disorder

Xu Fan[1#], Chen Jie[2#], Deng Yushuang[3#], Chen Linli[4#], Yang Jing[5], Ma Zhongrui[6], Yu Jianping[7], Peng Jiayuan[1], Yang Shu[1], Li Wenwen[8] and Xu Ronghua[9*]

Affiliation

[1]Public Health School, Chengdu Medical College, Chengdu, Sichuan, P.R. of China
[2]School of Chinese Medicine, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Hong Kong S.A.R, P.R. of China
[3]Department of Neurology, The Second People's Hospital of Chengdu, Sichuan Province, P.R. of China
[4]Division of General Practice, West China Hospital, Sichuan University, Sichuan Province, P.R. of China
[5]Department of Medical Center, Vanderbilt University, 2525 West End Avenue, Suite 1100, Nashville, TN, USA
[6]Department of Neurology, Chengdu Fifth People's Hospital, Chengdu, Sichuan Province, P.R. of China
[7]Department of Neurology, The First Affiliated Hospital of Chengdu Medical College, Chengdu Sichuan Province, P.R. of China
[8]Institute of Neuroscience, Department of Pathology, Faculty of Basic Medicine, Chongqing Medical University, Chongqing, P.R. of China
[9]Department of Neurosurgery, The Second People's Hospital of Chengdu, Chengdu, Sichuan Province, P.R. of China

***Corresponding author:** Xu Rong Hua, Department of Neurosurgery, The Second People's Hospital of Chengdu, No.10 Qingyun South Street, Chengdu, Sichuan, China, Tel: 86-28-6510 8800, Fax: 86-28-6510 8801, E-mail: 497575914@qq.com

[#]Contributed equally

Citation: Fan X, Jie C, Yushuang D, Linli C, Jing Y, Zhongrui M, Jianping Y, Jiayuan P, Shu Y, Wenwen L and Ronghua X. Approaching to the essence of major depressive disorder (2018) Edelweiss Psyi Open Access 2: 15-17

Received: Sep 29, 2018
Accepted: Oct 03, 2018
Published: Oct 11, 2018

Background of Major Depressive Disorder

Major Depressive Disorder (MDD) is a serious neuropsychic disease. It destroys person's family relationship and social connections seriously. Latest WHO investigation disclosed nearly 4.4% of the population worldwide (approximately 322 million people) were being affected by MDD extensively [1]. While in China, Dong M, et al. reported the occurrence rate of suicide attempt during hospitalization and after the onset of MDD were 17.3% (95% CI: 12.4-23.7%) and 42.1% (95% CI: 26.1-60.0%) respectively [2]. Another research made by Grupta S, et al. announced MDD in urban China might be under-diagnosed and untreated [3].

Gene-Related Antidepressant Studies

Currently MDD is often resistant to standard antidepressant treatment. Venlafaxine is norepinephrine reuptake inhibitor and widely used to cure MDD for many decades [4]. It presents lower rate of dizziness [5], more acceptability and tolerability [6], better efficacy [7]. Recently, 2018 Olgiati P, et al., compared treatment effect between Anti-Depressant (AD) naturalistic studies and Treatment-Resistant Depression (TRD, Venlafaxine). They pooled the publications from 2000 to 2017 and concluded that the nature of TRD is complicated and different with other subtype of MDD [8]. In the same year, Cipriani, A et al pooled 522 trials comprising 116477 participants, found that venlafaxine, amitriptyline, mirtazapine, escitalopram, paroxetine, agomelatine and vortioxetine presented better than placebo in efficacy and acceptability [9]. Accumulating clinical and basic gene-related researches, such as miRNAs, SNPs, Epigenetics, manifest an emerging focus on identifying the Differentially Expressed (DE) genes and associated antidepressant response in MDD. For examples, Taro Kishi demonstrated that rs10997875 in SIRT1 gene play a crucial role pathophysiology of MDD in Japanese population [10,11] and Shen X disclosed that the Tryptophan hydroxylase 2 gene have a sex-dependent-effect on MDD [12]. Moreover, Hu Y disclosed that the rs1549854 and rs1432441 polymorphisms of the MAP2K1 gene may be associated with MDD [13]. Our previous studies [14] employed the analysis of Differential Co-Expression (DCE) and Differential Regulation (DR) to compare the transcriptomic profiles of MDD patients, and validated the Venlafaxine having an obvious effect on the gene expression profile significantly.

System Biology Expand our Horizon on MDD

Early in 2010, de la Fuente A announced the disease-associated gene may be involved in the specific regulatory network. Therefore transcriptional profiles under the disease state may disclose the facts of interaction between gene and environment [15]. With the rapid developing of system biology, several novel approaches for uncovering the mechanism of MDD have emerged.

For example in 2018, Akil H discussed the possibility and feasibility of multi-scale framework to disclose the relationship between disease-related gene expression to brain circuit, further by using of neuroimage technique to identify the candidate circuits and molecules [16]. In 2016, Miyata S employed the transcriptomic biomarkers from blood in patients with late-onset MDD and testified the CIDEC (Cell Death-Inducing DFFA-Like Effector C) has the tremendous potential discriminant validity (specificity 87.5%, Sensitivity 91.3%) [17]. Moreover, in 2015, Malki K discovered some convergent genes participated in the pathogenesis of MDD in an integrative rat-human study. 8% of these genes were functionally linked with stress response signaling cascade, involving nuclear factor kappa-light-chain-enhancer of activated B (NF-κB) cells, activator protein 1 (AP-1) and ERK/MAPK pathway, which has correlated with MDD's neuroplasticity and neurogenesis systematically [18].

Also, 2014 Powell TR validated the putative transcriptomic biomarker differentiates MDD significantly in the inflammatory cytokine pathway [19]. Several studies as to the dysmetabolism of MDD presented novel perspectives of MDD. In 2010, Oxenkrug GF emphasized that Tryptophan kynurenine pathway presents a significant gathering point of intercommunication between gene and environment in MDD [20,21]. 7 years later, Sorgdrager FJH revealed an imbalance between HPA axis function and tryptophan metabolism in recurrent of MDD [22].Meanwhile, in 2016 Ali-Sisto T found that purine metabolism was dysregulated in patients with MDD [23].

Core Brain Circuit of MDD

Thanks to the discovery process for finding the precise target brain circuits that MDD affected, we got more precise knowledge on MDD. In 2013 Li K validated that βCaMKII as a robust regulator in lateral habenula mediating core symptoms of depression [24]. 5 years later, Yang Y et al. cross-validated that lateral habenula plays a crucial mediator function in the pathophysiology of depression [25]. They further block Ketamine bursting in the lateral habenula, which lead to rapid can relieve from depression [26]. In 2016, Lv Q blocked the N-methyl-D-aspartic acid receptors; local synaptic can inhibit the prolonged network of cortico-limbic-striatal circuit by using of monkey's model of MDD [27].

Summary

Dating back to 1834, Lamarck stated laws that the frequent use of organ can gradually strengthen, developing and enlargement. Otherwise, it will be progressively diminishing its functional capacity until it finally disappears [28].These perspectives of evolution may be lighting the road of cure of MDD.

For example, 2017 Kerling A demonstrated the exercise training may increase brain-derived neurotropic factor BDNF, and it has beneficial effects in the treatment of MDD [29]. Accompanied by increasing mechanism understanding the essential neurobiology of MDD, the treatment guideline of MDD has been improved and modified annually [30].The mechanism of MDD will be revealed gradually, more and more patients would benefit from these translational researches.

Funding Statement

This work was supported by the Natural Science Foundation Project of China (81601208), Szechwan Province Science and Technology Agency Fund Project (2009FZ0027), Population and health project of Chengdu Municipal Science and Technology Bureau (10YTYB272SF-182) and Science & Technology Department of Sichuan Province Grants (2016JY0036).

References

1. Depression and other common mental disorders: Global health estimates (2017) W. H.O.
2. Dong M, Wang SB, Li Y, Xu DD, Ungvari GS, et al. Prevalence of suicidal behaviors in patients with major depressive disorder in China: A comprehensive meta-analysis (2018) J Affect Disord 225: 32-39.
3. Gupta S, Goren A, Dong P and Liu D. Prevalence, awareness, and burden of major depressive disorder in urban China (2016) Expert Rev pharmacoecon Outcomes Res 16: 393-407.
4. Bradley AJ and Lenox-Smith AJ. Does adding noradrenaline reuptake inhibition to selective serotonin reuptake inhibition improve efficacy in patients with depression? A systematic review of meta-analyses and large randomised pragmatic trials (2013) J Psychopharmacol 27: 740-758.
5. Guaiana G, Gupta S, Chiodo D, Davies SJ, Haederle K, et al. Agomelatine versus other antidepressive agents for major depression (2013) Cochrane Database syst Rev 12: CD008851.
6. Cipriani A, Koesters M, Furukawa TA, Nosè M, Purgato M, et al. Duloxetine versus other anti-depressive agents for depression (2012) Cochrane Database syst Rev 10: CD006533.
7. Ostuzzi G, Matcham F, Dauchy S, Barbui C and Hotopf M. Antidepressants for the treatment of depression in people with cancer (2015) Cochrane Database syst Rev 6: CD011006.
8. Olgiati P, Serretti A, Souery D, Dold M, Kasper S, et al. Early improvement and response to antidepressant medications in adults with major depressive disorder. Meta-analysis and study of a sample with treatment-resistant depression (2018) J Affect Disord 227: 777-786.
9. Cipriani A, Furukawa AT, Salanti G, Chaimani A, Atkinson ZL, et al. Comparative efficacy and acceptability of 21 antidepressant drugs for the acute treatment of adults with major depressive disorder: A systematic review and network meta-analysis (2018) Lancet 391: 1357-66.
10. Kishi T, Yoshimura R, Kitajima T, Okochi T, Okumura T, et al. SIRT1 gene is associated with major depressive disorder in the Japanese population (2010) J Affect Disord 126: 167-173.
11. Kim HD, Hesterman J, Call T, Magazu S, Keeley E, et al. SIRT1 Mediates Depression-Like Behaviors in the Nucleus Accumbens (2016) J Neurosci 36: 8441-8452.
12. Shen X, Wu Y, Qian M, Wang X, Hou Z, et al. Tryptophan hydroxylase 2 gene is associated with major depressive disorder in a female Chinese population (2011) J Affect Disord 133: 619-624.
13. Hu Y, Hong W, Smith A, Yu S, Li Z, et al. Association analysis between mitogen-activated protein/extracellular signal-regulated kinase (MEK) gene polymorphisms and depressive disorder in the Han Chinese population (2017) J Affect Disord 222: 120-125.
14. Xu F, Yang J, Chen J, Wu Q, Gong W, et al. Differential co-expression and regulation analyses reveal different mechanisms underlying major depressive disorder and subsyndromal symptomatic depression (2015) BMC Bioinformatics 16: 112.
15. De la Fuente A. From 'differential expression' to 'differential networking'-identification of dysfunctional regulatory networks in diseases (2010) Trends Genet 26: 326-333.

16. Akil H, Gordon J, Hen R, Javitch J, Mayberg H, et al. Treatment resistant depression: A multi-scale, systems biology approach (2018) Neurosci Biobehav Rev 84: 272-288.
17. Miyata S, Masashi Kurachi, Okano Y, Sakurai N, Kobayashi A, et al. Blood Transcriptomic Markers in Patients with Late-Onset Major Depressive Disorder (2016) Plos One 11: e0150262.
18. Malki K, Pain O, Tosto MG, Rietz Du E, Carboni L, et al. Identification of genes and gene pathways associated with major depressive disorder by integrative brain analysis of rat and human prefrontal cortex transcriptomes (2015) Translational psychiatry 5: e519.
19. Powell TR, Peter McGuffin, D'Souza MU, Cohen-Woods S, Hosang MG, et al. Putative transcriptomic biomarkers in the inflammatory cytokine pathway differentiate major depressive disorder patients from control subjects and bipolar disorder patients (2014) Plos One 9: e91076.
20. Oxenkrug GF. Tryptophan kynurenine metabolism as a common mediator of genetic and environmental impacts in major depressive disorder: the serotonin hypothesis revisited 40 years later (2010) Isr J Psychiatry Relat Sci 47: 56-63.
21. Oxenkrug GF. Genetic and hormonal regulation of tryptophan kynurenine metabolism: implications for vascular cognitive impairment, major depressive disorder, and aging (2007) Ann N Y Acad Sci 1122: 35-49.
22. Sorgdrager FJH, Doornbos B, Penninx B, de Jonge P and Kema IP. The association between the hypothalamic pituitary adrenal axis and tryptophan metabolism in persons with recurrent major depressive disorder and healthy controls (2017) J Affect Disord 222: 32-39.
23. Ali-Sisto T, Tolmunen T, Toffol E, Viinamäki H, Mäntyselkä P, et al. Purine metabolism is dysregulated in patients with major depressive disorder (2016) Psychoneuroendocrinology 70: 25-32.
24. Li K, Zhou T, Liao L, Yang Z, Wong C, et al. BetaCaMKII in lateral habenula mediates core symptoms of depression (2013) Science 341: 1016-1020.
25. Yang Y, Wang H, Hu J and Hu H. Lateral habenula in the pathophysiology of depression (2018) Curr Opin Neurobiol 48: 90-96.
26. Yang Y, Cui Y, Sang K, Dong Y, Ni Z, et al. Ketamine blocks bursting in the lateral habenula to rapidly relieve depression (2018) Nature 554: 317-322.
27. Lv Q, Yang L, Li G, Wang Z, Shen Z, et al. Large-Scale Persistent Network Reconfiguration Induced by Ketamine in Anesthetized Monkeys: Relevance to Mood Disorders (2016) Biol Psychiatry 79: 765-775.
28. Lamarck. An Exposition with Regard to the Natural History of Animals (1914) Zoological Philosophy, London.
29. Kerling A, Kück M, Tegtbur U, Grams L, Hanke A, et al. Exercise increases serum brain-derived neurotrophic factor in patients with major depressive disorder (2017) J Affect Disord 215: 152-155.
30. Simons P, Cosgrove L, Shaughnessy AF and Bursztajn H. Antipsychotic augmentation for major depressive disorder: A review of clinical practice guidelines (2017) Int J law Psychiatry 55: 64-71.