



2020

The Gut-Brain Axis: Treating Depression Through Microbiome Alterations

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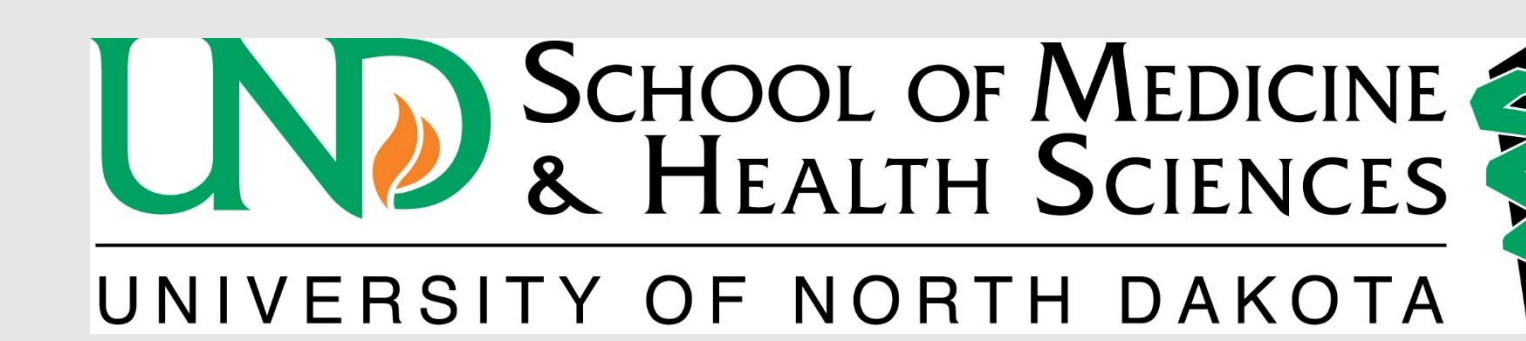
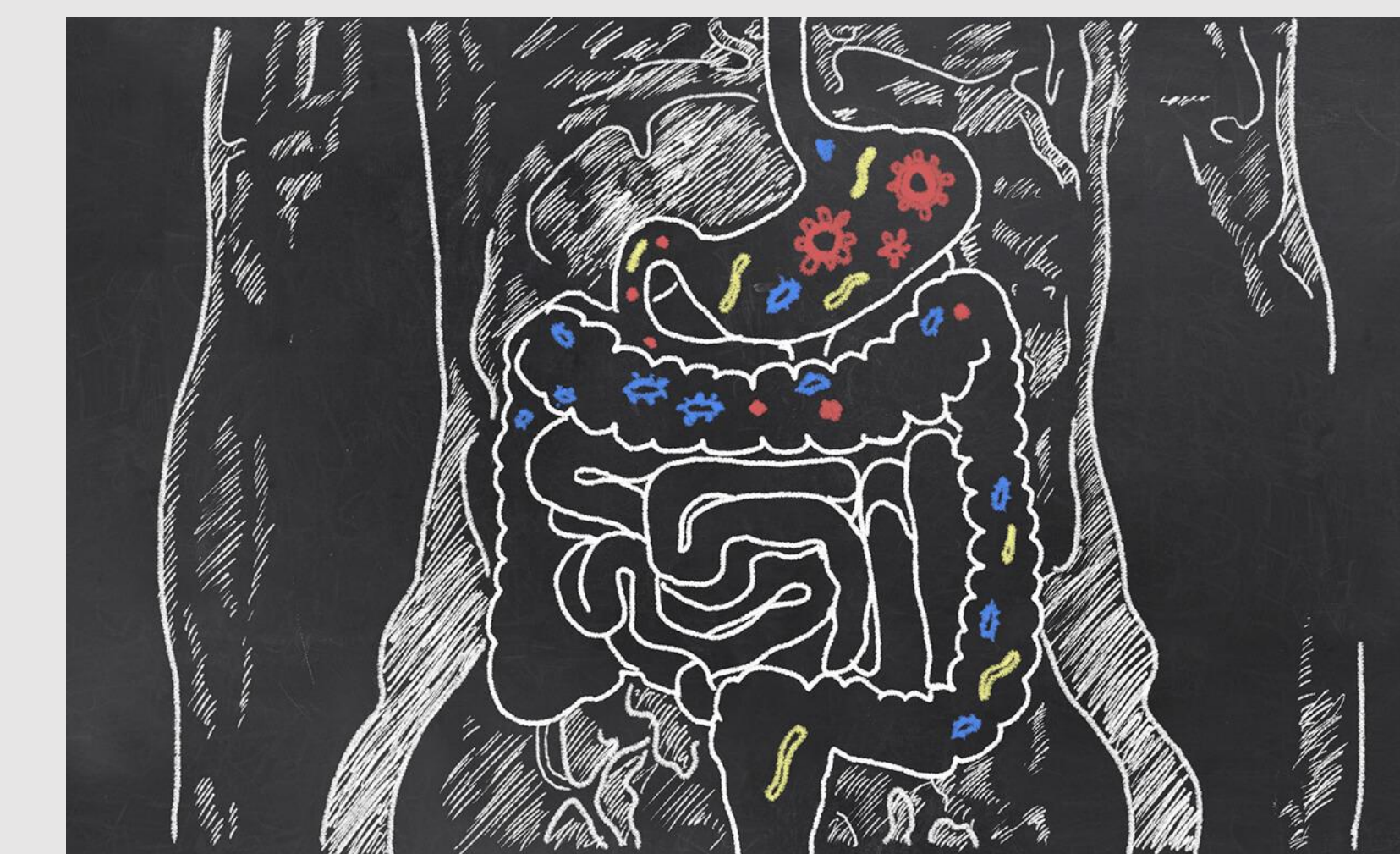
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The Gut-Brain Axis: Treating Depression Through Microbiome Alterations

Alexandra Bachman-Williams PA-S

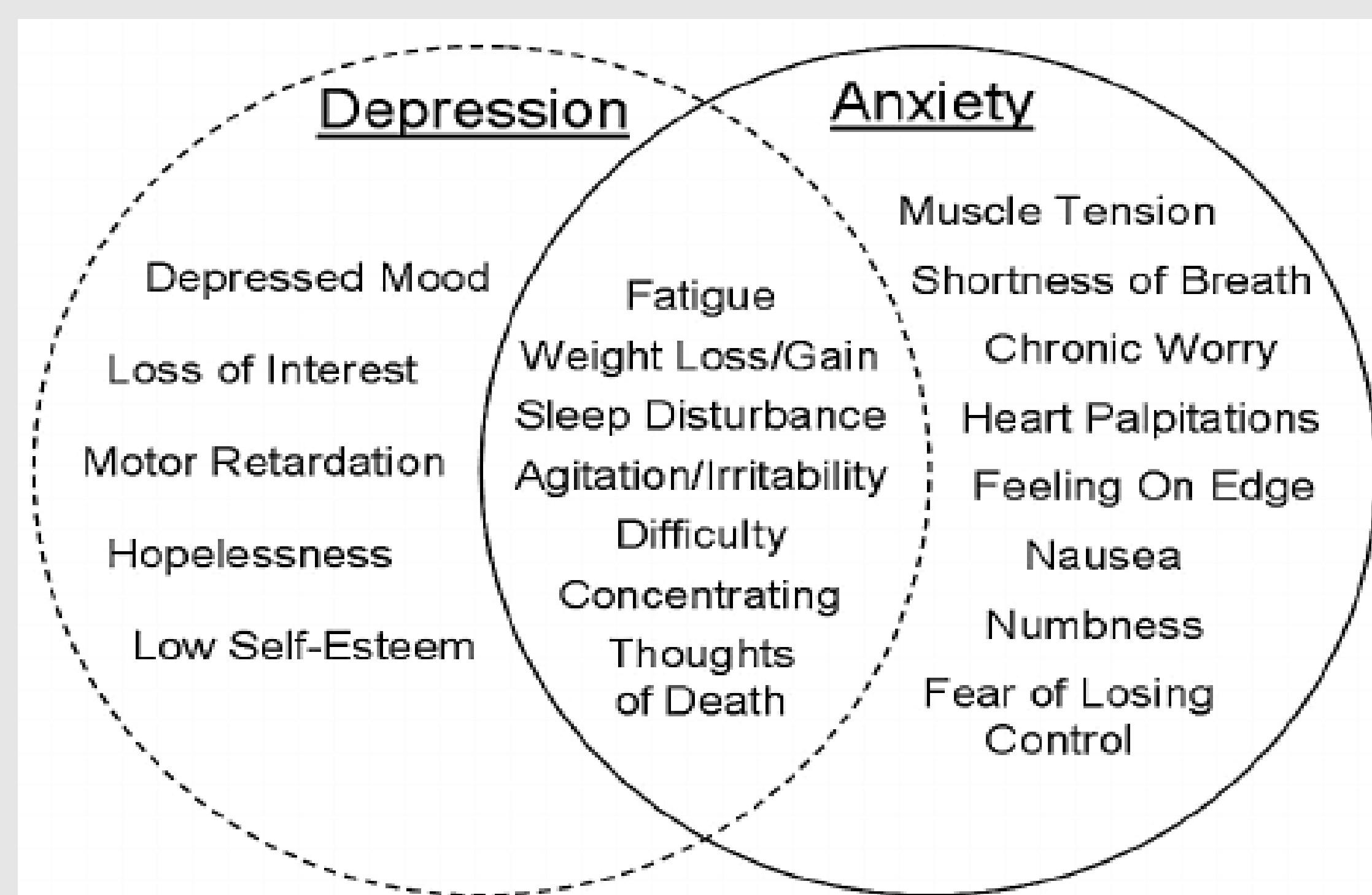
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Abstract

- The purpose of this study is to explore the role of gut microbiome alterations in the treatment of anxiety and depression.
- There are multiple pathological pathways that lead to the development of anxiety and depression.
- Research shows a link between pathogenic bacteria and low grade inflammation. This causes a disruption of neurotransmitters that are current targets of pharmacological treatment of depression and anxiety.
- Transfer of “pathogenic” bacteria caused increased symptoms of anxiety and depression.
- Treatment with probiotics and “protective” bacteria showed decreased BDI scores and improved symptoms.
- Studies were small but show need for further research.



Introduction

- 8.1% of Americans suffer from depression.
- 85% of patients with depression also report significant anxiety (CDC, 2018). Medical professionals should have the most up to date research regarding treatment.
- 40% of sufferers do not seek treatment.

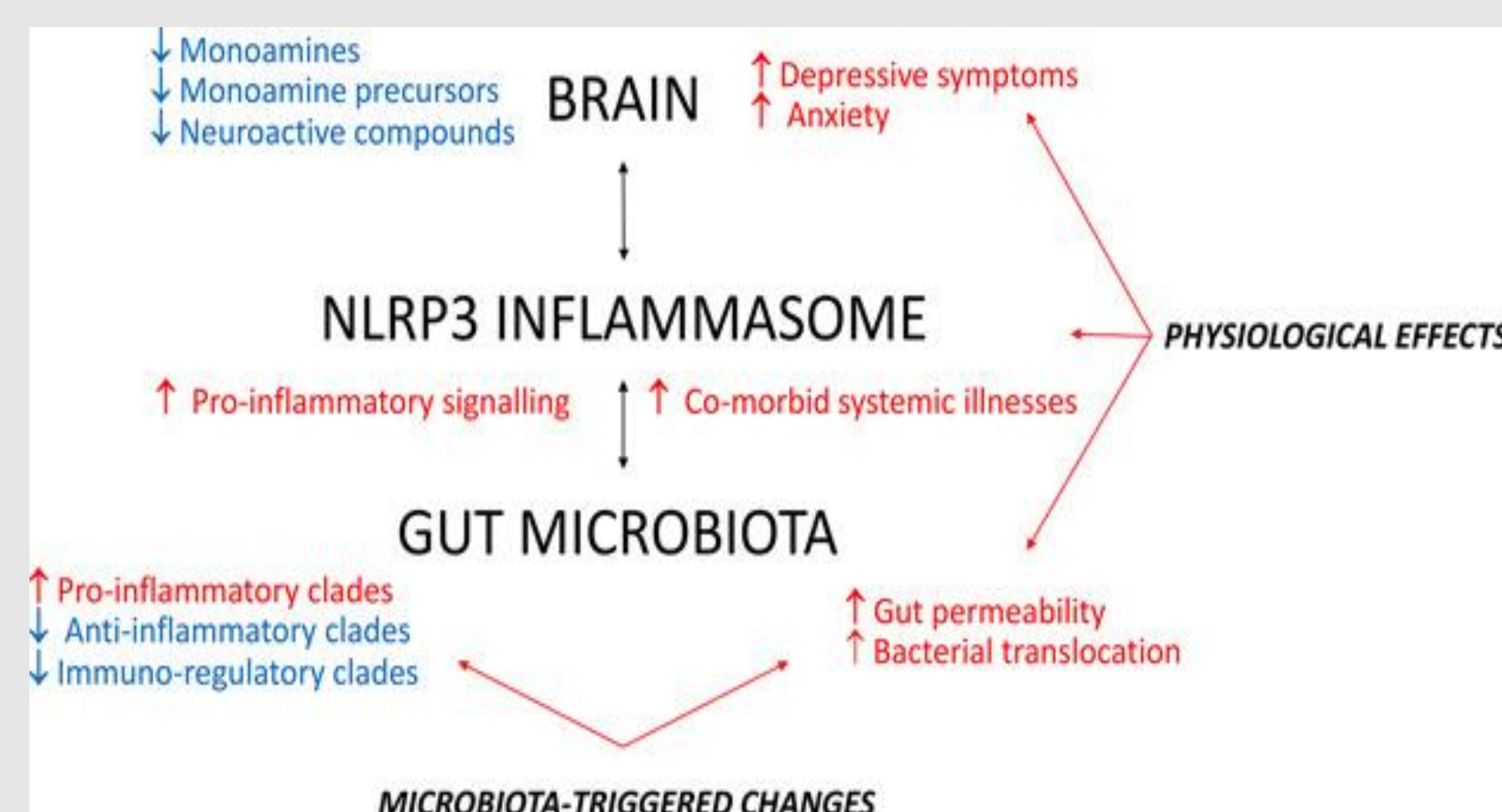
Statement of the Problem

Medical professionals should be informed of most up-to-date treatments and primary disease prevention.



Research Question

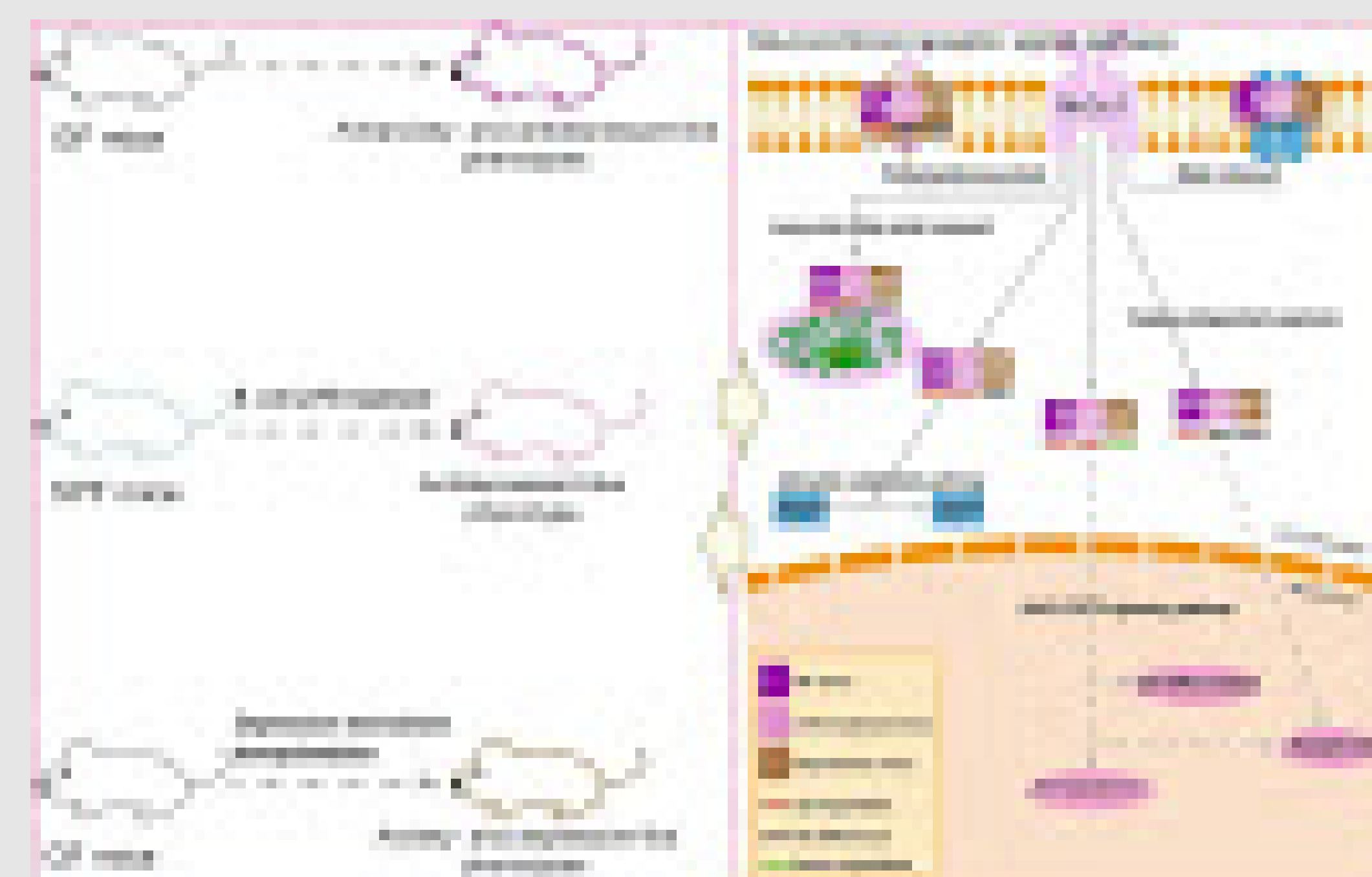
- In patients with depression or anxiety, do gut microbiota transplants improve symptoms of depression?
- In patients with depression or anxiety, is there an alteration in gut microbiota associated with the development of mood disorders?



Literature Review

Gut microbiome and the link to depression and anxiety

- Bert et al. (2015) worked to establish a pathophysiologic link between gut bacteria and the development of mood disorders. Increased inflammation markers were found in patients with depression.
- Xueyan et al. (2019) found mice that were exposed to chronic stress exhibited increased depressive and anxiety behaviors (P<0.05). Additionally, the microbiome of the stressed rats was altered (P<0.05). 12 neurotransmitters were found to be decreased (P<0.05).



- Naseribafrouei et al. (2014) showed underrepresentation of “protective bacteria” (P<0.05) and overgrowth of pathogenic bacteria (P<0.03). Pathogenic bacteria correlated with increased valceric acid and lower GABA binding.

Gut microbiome transplants as therapy

- Akkasheh et al. (2016) found improved BDI depression scores in patients treated with probiotics (P<0.001).
- Patients with SSRI resistant depression were treated with probiotics by Bambling et al (2017). Results showed improved scores to BDI (P<0.05) and OQ45 (P = 0.001).
- Rao et al. (2009) performed small, double-blind, pilot study which treated CFS patients with clinical anxiety with Lactobacillus casei, which is known for its protective effects. Those treated with probiotics showed significant increase in “good” gut microbiome (73.7%) and decrease in Bifidobacteria, known for its inflammatory effects. BDI scores in treated participants showed significantly lower BDI scores (P<0.011).

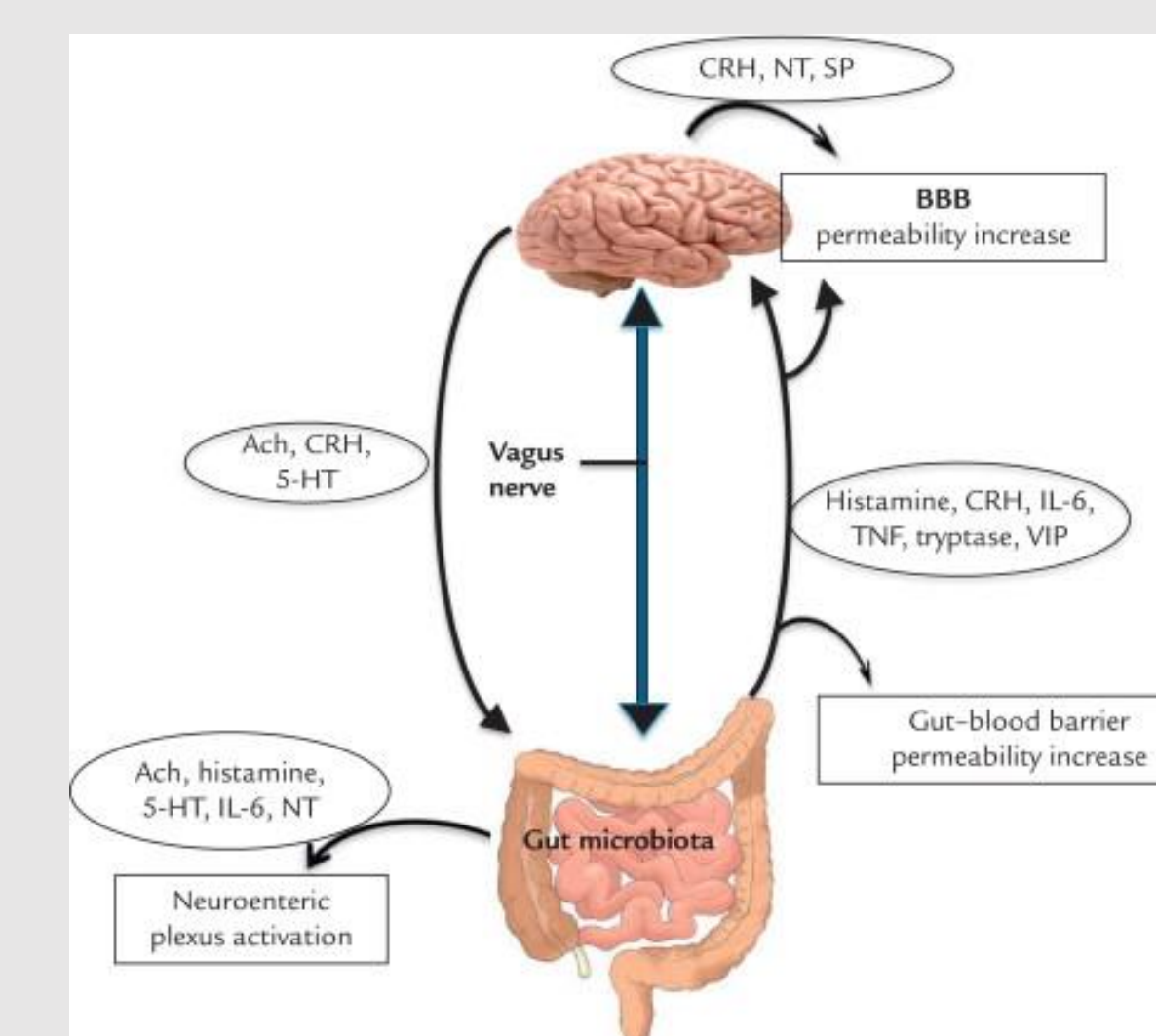
	BIFIDOBACTERIA						LACTOBACILLUS						
	Total	No change	Increase	Decrease	Total	No change	Increase	Decrease					
Placebo	16	-	6	37.5	10	62.5	16	-	7	43.8	9	56.2	
Treatment	19	-	14	73.7	5	26.3	19	1	5.3	14	73.7	4	21.0

- Kazemi et al. (2019) performed larger study analyzing probiotic effects on BDI scores. Patients treated with Lactobacillus helveticus and Bifidobacterium longus had significantly lower BDI scores (P<0.042). Additionally, kynurenine/tryptophan pathways were measured and found to be significantly lower in participants treated with probiotics (P<0.048). Metabolites of kynurenine/tryptophan cause a deficiency of serotonin, a common target of mood disorder therapy.

Discussion

- In regard to mood disorders and a causative link to gut microbiome, research by Xueyan et al. found a link between chronic stress, gut microbiome alterations and depressive like behaviors.
- An additional study by Kelly et al. (2016) transferred gut bacteria from patients with diagnosed depression, establishing a causative role of pathogenic bacteria.

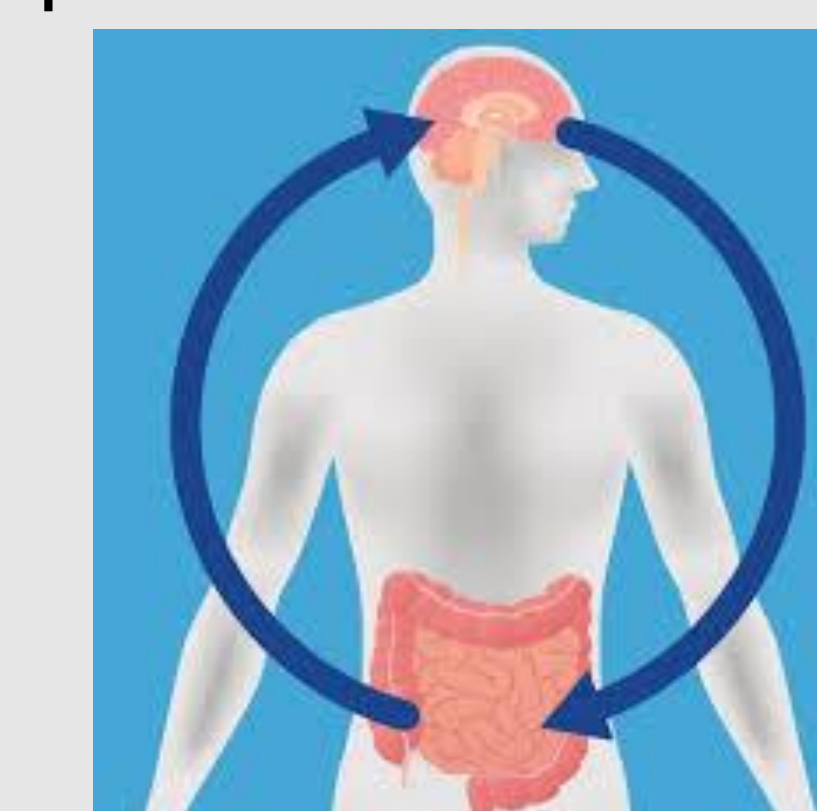
–From the presented research it is reasonable to connect the pathogenic gut bacteria to a possible source for the development of mood disorders. More, larger studies are needed, however, there is convincing evidence of a pathogenic cause to warrant further research.



- In regard to gut microbiome alterations to treat mood disorders, research by Rao et al., Akkanesh et al., and Bambling et al., showed improved BDI scores in patients that were treated with Probiotics.
 - This included patients with depression that was resistant to pharmacological treatment with SSRIs.
- Mood disorders can be linked to increased inflammation. Protective bacteria within the gut have been shown to decrease inflammatory markers. Larger studies are needed, but pilot studies do indicate a potential role that gut microbiome alterations may play in prevention and treatment of mood disorders.

Applicability to Clinical Practice

- Depression affects a large number of Americans and will be seen in all facets of healthcare. Patient with depression often suffer comorbidly from anxiety. It is important for healthcare providers to be aware of most up-to-date information regarding treatment and prevention.
- Current treatment is aimed at neurotransmitter deficiency and not treating the underlying cause.
- This research indicates need for further investigation into primary prevention of the disease.



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Acknowledgements

I would like to thank Dr. Brynn Luger and Mr. Jacob Holmen for their professional contributions and input with this scholarly project. I would also like to thank my advisor Jay Metzger and Daryl Sieg for their guidance throughout the program and with this project. Additionally, I would like to thank my wife and family for their understanding, support, and patience through every step of this process.