Shoham   TNF	Author	Cytokine	Study	Result		
Shoham   1987   II-1B   Intravenous and intraventricular   Increases SWS   Increases SREM sleep   Increases NREM sleep   Increases SREM sleep   Increases Incre	Experimental	administration	of cytokines			
1987   IL-1B	-			Increases SWS		
Fang 1997	1987 <sup>1</sup>	IL-1B	injection into rats	Increases SWS		
Takahashi   TNF inhibitor   Traventricular injection into   Decreases IL-1-induced   NREM sleep   Decreases TNF-induced   Decreased Decreases TNF-induced   Decreased Decr	Fang 1997 <sup>2</sup>	TNF		Increases NREM sleep		
Takahashi 1999³         TNF inhibitor IL-1 inhibitor         Intraventricular injection into rabbits         Decreases IL-1-induced NREM sleep Decreases TNF-induced NREM sleep           Dickstein 1999³         TNF Intraventricular injection into rats         Increases SWS           Obal 1995³         IL-1 Intraventricular injection into rats         Increases NREM sleep and SWS           Krueger 1987°         IFN alpha antibodies         Intraventricular or intravenous injection into rabbits         Increases SWS           Kubota 2001²         IL-2 Intraventricular injection into rabbits         Increased NREM sleep; some decreases in REM sleep           Kushikata 1998³         IL-4 Intraventricular injection into rabbits         Decreases REM sleep; some decreases in REM sleep           Spath- Schwalbe 1998³         IL-6 Intraventricular injection into rats         Decreases REM sleep, but variable effects on SWS           Spath- Schwalbe 1998³         IL-6 Intraventricular injection into rats         Increases then decreases NREM sleep; no effect on REM           Benedict 2009³¹¹         IL-10 Intraventricuar injection into rats         Decreases NREM sleep           Kushikata 1999³³         IL-10 Intraventricuar injection into rabbits         Decreases NREM sleep           IL-15         Intraventricular injection into rabbits         Decreases NREM sleep           IL-15         Intraventricular injection into rabbits         Decreases NREM sleep	J	IL-1B	, ,	•		
1999   18-1	Takahashi		Intraventricular injection into	•		
IL-1 inhibitor   Decreases TNF-induced NREM sleep			-			
Dickstein 1999 <sup>4</sup> Dickstein 1999 <sup>5</sup> IL-1  Intraventricular injection into rats  GHRH antibodies  Krueger 1987  IL-2  Intraventricular injection into rabbits  Kubota 2001 <sup>7</sup> Spath- Schwalbe 1998  Spath- Schwalbe 1998  Benedict 2003 <sup>10</sup> Benedict 2003 <sup>10</sup> Benedict 2009 <sup>11</sup> Benedict 2009 <sup>11</sup> Rushikata  IL-6  Intraventricular injection into rats  Benedict 2009 <sup>11</sup> Benedict 2009 <sup>12</sup> Kushikata  IL-10  Intraventricular injection into rabbits  Kubota 2000 <sup>14</sup> Benedict 2001 <sup>8</sup> Benedict 2009 <sup>15</sup> Kushikata  IL-10  Intraventricular injection into rats  Kushikata  IL-10  Intraventricular injection into rats  Increases NREM sleep  Increases		IL-1 inhibitor		•		
Dickstein 1999 <sup>4</sup>   TNF						
1999 <sup>4</sup>   Sheep   IL-1   Intraventricular injection into rats   Increases NREM sleep and SWS	Dickstein	TNF	Intraventricular injection in	·		
Doal 1995   GHRH antibodies   III-1   Intraventricular injection into rats   Decreases NREM sleep and SWS			_			
Factor of the part of the pa	Obal 1995 <sup>5</sup>	IL-1		Increases NREM sleep and		
Krueger 1987			<u>-</u>	•		
Krueger 1987 <sup>6</sup>   IRN alpha   Intraventricular or intravenous injection into rabbits   Increases SWS		GHRH		Decreases IL-1-induced		
Intraventricular or intravenous injection into rabbits   Increases SWS		antibodies		NREM sleep and SWS		
1987   Intraventricular injection into rabbits   Increased NREM sleep; some decreases in REM sleep	Krueger	IFN alpha	Intraventricular or intravenous	·		
County   C			injection into rabbits			
Property of the property of	Kubota	IL-2	-	Increased NREM sleep;		
Kushikata 1998  IL-4  Intraventricular injection into rabbits  IL-6  Intravenous injection into humans  IL-6  Intraventricular injection into rats  IL-6  Intraventricular injection into nats  IL-6  Intraventricular injection into nats  IL-6  Intraventricular injection into nats  IL-10  Intraventricular injection into rats  IL-10  Intraventricular injection into rats  IL-15  Intraventricular injection into rabbits  IL-15  Intraventricular injection into rabbits  IL-15  Intraventricular injection into rabbits  IL-16  Intraventricular injection into rabbits  IL-17  Intraventricular injection into rabbits  IL-18  Intraventricular injection into rabbits  Increases NREM sleep  Increases N	2001 <sup>7</sup>		-	•		
1998 rabbits some decreases in REM sleep  Spath- IL-6 Intravenous injection into humans variable effects on SWS  1998				sleep		
Spath- Spath- Schwalbe 1998  Hogan 2003 <sup>10</sup> Benedict 2009 <sup>11</sup> Opp 1995 <sup>12</sup> Kushikata 1999  IL-10  Intraventricular injection into humans  IL-15  Kushikata 1999 <sup>13</sup> Kubota 2000 <sup>14</sup> TGFB  Kubota 2000 <sup>15</sup> Kubota 2001 <sup>16</sup> Kubota 2000 <sup>17</sup> Kubota 2000 <sup>18</sup> Kubota 2000 <sup>18</sup> Kubota 2000 <sup>19</sup> Ku	Kushikata	IL-4	Intraventricular injection into	Decreases NREM sleep;		
Spath-  Schwalbe   1998	1998 <sup>8</sup>		rabbits	some decreases in REM		
Schwalbe 1998 <sup>9</sup> Hogan 2003 <sup>10</sup> Benedict 2009 <sup>11</sup> Opp 1995 <sup>12</sup> Kushikata 1999 <sup>13</sup> IL-10  Intraventricular injection into rats  Kushikata 1999 <sup>13</sup> IL-15  Intraventricular injection into rats  Kubota 2000 <sup>14</sup> TGFB  Kubota 2001 <sup>15</sup> Kubota 2001 <sup>15</sup> Kubota 2001 <sup>15</sup> Kubota 2001 <sup>15</sup> Kubota 2000 <sup>16</sup> IL-18  Intraventricular injection into rats and rabbits  Kubota 2001 <sup>15</sup> Kubota 2001 <sup>16</sup> Kubota 2001 <sup>17</sup> Kubota 2001 <sup>18</sup> Kubota 2001 <sup>18</sup> Kubota 2001 <sup>19</sup> K				sleep		
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Hogan 2003 <sup>10</sup> IL-6 Intraventricular injection into rats NREM sleep; no effect on REM  Benedict 2009 <sup>11</sup> IL-6 Intranasal administration to humans  Opp 1995 <sup>12</sup> IL-10 Intraventricuar injection into rats  Kushikata 1L-10 Intraventricuar injection into rabbits Increases NREM sleep  Kubota 1L-13 Intraventricular injection into sleep  Kubota 2000 <sup>14</sup> TGFB rabbits Intraventricular injection into pecreases NREM sleep  Kubota IL-18 Intraventricular injection into pecreases NREM sleep  Kubota IL-18 Intraventricular injection into pecreases NREM sleep  Kubota IL-18 Intraventricular injection into rabbits Decreases NREM sleep  Kubota inhibitor rats and rabbits Decreases IL-1B-induced sleep  Endogenous levels of cytokines  Fang 1997 <sup>2</sup> TNF Knockout mice for TNF receptor Decreased baseline NREM	Schwalbe		humans	variable effects on SWS		
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2000 <sup>16</sup> inhibitor     rats and rabbits     sleep       Endogenous levels of cytokines       Fang 1997 <sup>2</sup> TNF     Knockout mice for TNF receptor     Decreased baseline NREM	2001 <sup>15</sup>		rabbits			
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Fang 1997 <sup>2</sup> TNF Knockout mice for TNF receptor Decreased baseline NREM	2000 <sup>16</sup>	inhibitor	rats and rabbits	sleep		
·						
compared with controls sleep	Fang 1997 <sup>2</sup>	TNF	Knockout mice for TNF receptor	Decreased baseline NREM		
			compared with controls	sleep		

Fang 1998 <sup>17</sup>	IL-1	Knockout mice for IL-1 receptor compared with controls	Decreased baseline NREM sleep
Opp 1994 <sup>18</sup>	Anti-IL-1B	Intraventricular injection into rats after sleep deprivation	Reduces sleep
Takahashi 1995 <sup>19</sup>	Anti-TNF antibody	Intraventricular injection into rats and rabbits	Decreases NREM sleep
Moldofsky 1986 <sup>20</sup>	IL-1	Measurement in plasma of humans during sleep/wake cycle	Increase at onset of SWS
Gudewill 1992 <sup>21</sup>	IL-1B	Measurement in plasma of humans during sleep/wake cycle	Some increases during sleep
	TNF		No change
	IL-6		Some increases during sleep
Lissoni 1998 <sup>22</sup>	IL-2	Measurement in humans during sleep/wake cycle	Peaks during sleep
Redwine	IL-2	Measurement in plasma of	No change with sleep
2000 <sup>23</sup>	IL-6	humans during sleep/wake cycle	Increase at sleep onset
Dimitrov 2006 <sup>24</sup>	IL-6R	Measurement in plasma of humans during sleep/wake cycle	Increased during sleep
Hogan 2003 <sup>10</sup>	Anti-IL-6 antibodies	Intraventricular injection into rats	No effect on spontaneous sleep
Thomas 2010 <sup>25</sup>	IL-6	Measurement after stimulation of human monocytes during sleep/wake cycle	Increased IL-6 associated with decreased SWS and increased REM sleep, and fatigue the next day
Benedict 2007 <sup>26</sup>	IL-7	Measurement in plasma of humans during sleep/wake cycle	Increases during REM sleep
Kubota 2000 <sup>16</sup>	NFKB inhibitor	Intraventricular injection into rats and rabbits	Decreases REM and NREM sleep
Dimitrov 2004 <sup>27</sup>	IL-2, IL-4, TNF, IFN gamma	Flow cytometry analysis of blood cells in humans during sleep/wake cycle	Increased Th1 activity in early sleep, shift to Th2 dominance in late sleep
Sleep depriva	ation and cytoki	nes	
Born 1997 <sup>28</sup>	TNF	Measurement in plasma after 24 h sleep deprivation in humans	No change
	IL-1B	Production by T cells after 24 h sleep deprivation in humans	No change
	IL-2		Decreased
	IL-6		No change
Mackiewicz 1996 <sup>29</sup>	IL-1B	Quantitative gene expression after 24 h sleep deprivation in rats	Increase in expression
Shearer 2001 <sup>30</sup>	TNFR-1	Measurement in plasma after	Increased
	IL-6	88 hours total compared to partial sleep deprivation in humans	Increased

Irwin	TNF	Measurement after monocyte	Increased
2006 <sup>31</sup>	IL-6	stimulation after 1 night partial	Increased
		sleep deprivation in humans	
Redwine	IL-6	Measurement after 4 hours	Regular increase at sleep
2000 <sup>23</sup>		sleep loss	onset delayed by
			deprivation
Haack	IL-6	Measurement in plasma after 8	Increased
2007 <sup>32</sup>		nights partial sleep deprivation	
22		in humans	
Frey 2007 <sup>33</sup>	IL-1B,	Measurement in plasma after	Increased
	IL-1RA	24 h sleep deprivation in	
	IL-6	humans	Decreased
Yehuda	IL-1B, TNF, IL-	Measurement in plasma after	Increased
2009 <sup>34</sup>	6, IL-17	72 h sleep deprivation in rats	
Rosa Neto	TNF	Measurement in adipose tissue	Decreased
2010 <sup>35</sup>	IL-6	after 96 h paradoxical sleep	Increased
	IL-10	deprivation in rats	No change
Chennaoui	TNF	Measurement in plasma after	Increased
2011 <sup>36</sup>	TNFR1, IL-6	24 h sleep deprivation in	No change
27		humans	
Ruiz 2010 <sup>37</sup>	IL-1B, IL-2, IL-	Measurement in plasma after	No change
	4, IL-6, IL-10,	48 h sleep deprivation in	
	TNF, IFN	humans	
	gamma		
Moller-	IL-6	Gene expression after 7 nights	Increased IL-6 expression
Levet		partial sleep loss	
2013 <sup>38</sup>			
Moller-	IL-1R	Gene expression after 7 nights	Increased IL-1R expression
Levet		partial sleep loss	
2013 <sup>38</sup>			

SWS – slow wave sleep, NREM – non rapid eye movement, REM - rapid eye movement, TNF – tumor necrosis factor, TNFR – TNF receptor, IL – interleukin, IL-1R – interleukin-1 receptor, IFN – interferon, TGFB – transforming growth factor beta

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