BIOINFORMATIC PREDICTION AND COEXPRESSION NETWORK IDENTIFIES REPURPOSED NOVEL DRUGS FOR PAPILLARY THYROID CANCER

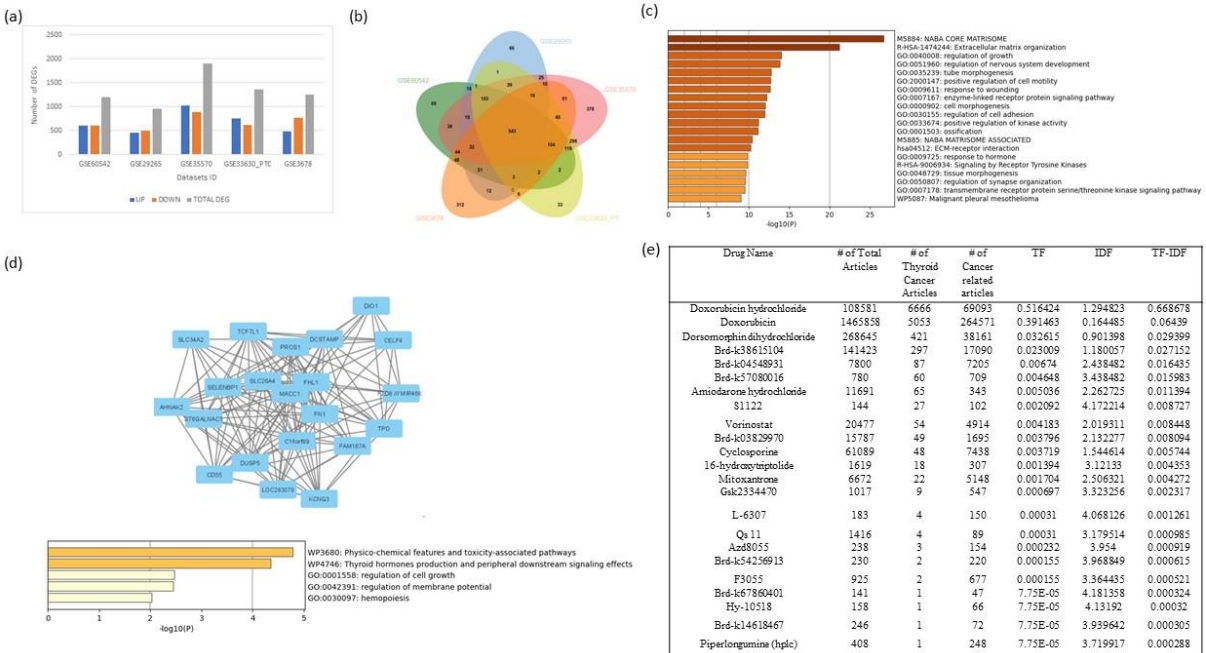
Kubra Temiz, Esra Gov

Bioengineering Department, Adana Alparslan Türkeş Science and Technology University
Department of Bioengineering, Adana Alparslan Türkeş Science and Technology University, Building M1, Office: 202, Saricam, Adana, 01250, Turkey
email: tmizkubra@gmail.com
email: egov@atu.edu.tr

Abstract

Thyroid cancer is a type of cancer that affects the endocrine system and has a high malignancy. Papillary thyroid cancer, the most common subtype of thyroid cancer, also has well-differentiated features. Early diagnosed and well-differentiated thyroid cancer is generally associated with a good prognosis and/or survival rate. Therefore, it is of great importance to determine the molecular signatures of the disease. In this study, five papillary thyroid cancer-related gene expression datasets were analyzed using linear models for microarray data (LIMMA) method. Differentially expressed genes (DEG) have been identified and gene set enrichment analysis was performed via ConsensusPathDB and the MetaScape tool. Coexpression network was constructed by using mutual DEG expression profiles and network modules were found a disease module with 21 nodes, 145 edges, 69% density, and significantly correlated genes in all datasets was obtained compared with normal thyroid tissues. Genes in the disease module were processed in L1000CDS^2, resulting in 42 drug lists and identified as drug repurposing candidates, and text mining analyzes was performed by using Python library urllib3. Doxorubicin hydrochloride, doxorubicin, and Dorsomorphin dihydrochloride drugs with the highest TF-IDF are already used in the treatment of thyroid cancer. FDA-approved AS605240, piperlongumine, and TWS119 drugs and/or small molecules that are not used in thyroid cancer have been identified as candidate drugs that can be used in the treatment of thyroid cancer. As a result of FDA-approved drugs piperlongumine, and TWS119 may be promising candidates for thyroid cancer. Preclinical testing, as well as additional drug validation, may ensure new cure preference for thyroid cancer.

Keywords : drug repurposing, papillary thyroid cancer, coexpression network, gene expression



(e)

Drug Name	# of Total Articles	# of Thyroid Cancer Articles	# of Cancer related articles	TF	IDF	TF-IDF
Doxorubicin hydrochloride	108581	6666	69093	0.516424	1.294823	0.668678
Doxorubicin	1465858	5053	264571	0.391463	0.164485	0.06439
Dorsomorphin dihydrochloride	268645	421	38161	0.032615	0.901398	0.029399
Brd-k38615104	141423	297	17090	0.023009	1.180057	0.027152
Brd-k04548931	7800	87	7205	0.00674	2.438482	0.016435
Brd-k57080016	780	60	709	0.004648	3.438482	0.015983
Amiodarone hydrochloride	11691	65	343	0.005036	2.262725	0.011394
$1122	144	27	102	0.002092	4.172214	0.008727
Vorinostat	20477	54	4914	0.004183	2.019311	0.008448
Brd-k03829970	15787	49	1695	0.003796	2.132277	0.008094
Cyclosporine	61089	48	7438	0.003719	1.544614	0.005744
16-hydroxytriptolide	1619	18	307	0.001394	3.12133	0.004353
Mitoxantrone	6672	22	5148	0.001704	2.506321	0.004272
Gsk2334470	1017	9	547	0.000697	3.323256	0.002317
L-6307	183	4	150	0.00031	4.068126	0.001261
Qs 11	1416	4	89	0.00031	3.179514	0.000985
Azd8055	238	3	154	0.000232	3.954	0.000919
Brd-k54256913	230	2	220	0.000155	3.968849	0.000615
F3055	925	2	677	0.000155	3.364435	0.000521
Brd-k67860401	141	1	47	7.75E-05	4.181358	0.000324
Hy-10518	158	1	66	7.75E-05	4.13192	0.00032
Brd-k14618467	246	1	72	7.75E-05	3.939642	0.000305
Piperlongumine (hplc)	408	1	248	7.75E-05	3.719917	0.000288
As605240	97	0	21	0	4.343805	0
N9-isopropylolomoucine	454	0	119	0	3.673521	0
Tws119	66	0	23	0	4.511033	0

Figure 1 Identification of DEGs a) distribution of DEGs by datasets b) The overrepresentation pathway analysis of DEGs c) Venn diagram of common DEGs d) Potential gene set for papillary thyroid cancer: Coexpressed module genes and biological insights of the genes. e) Drug repurposing results